



**Karnataka State Disaster Management Authority**  
Revenue Department (Disaster Management)  
Government of Karnataka



# **KARNATAKA STATE FLOOD RISK MANAGEMENT ACTION PLAN 2022**







GOVT. OF KARNATAKA

# **KARNATAKA STATE FLOOD RISK MANAGEMENT ACTION PLAN - 2022**

**Revenue Department  
(Disaster Management)  
Government of Karnataka**







## **MESSAGE**

I am happy to note that the Karnataka State Disaster Management Authority (KSDMA), Revenue Department (DM), Government of Karnataka has prepared the Karnataka State Action Plan for Flood Risk Management 2022 following the guidelines laid down by National Disaster Management Authority (NDMA), Ministry of Home Affairs, Govt. of India.

The action plan has incorporated the experiences learnt from the past floods in the State. The Government of Karnataka is committed to provide efficient governance and ensure failsafe flood risk management mechanism at State, District and GP level. Keeping in view the frequent occurrence of floods in the State, the responsibility framework and protocols brought out in this plan clearly delineates the roles, responsibilities & actions to be implemented by the departments, local bodies, functionaries and local community to promote a culture of preparedness and mitigation in the State.

The plan envisages the participation of various agencies concerned including the community to set in motion the flood management activities for effective response and recovery without loss of critical time & infrastructure in the event of floods. The plan facilitates in bringing together all necessary sources of Government, Private, NGOs, Community and individuals for taking appropriate actions in time. I appreciate the efforts of KSDMA in preparing the comprehensive plan and wish it would help in achieving flood resilient Karnataka in near future.

**Shri. Basavaraj Somappa Bommai**

Chief Minister of Karnataka & Chairman

Karnataka State Disaster Management Authority

Government of Karnataka





Room No. 317-317A  
3rd Floor, Vidhana Soudha  
Bengaluru-560 001  
Telephone No: 080-22253835  
22033234

## **MESSAGE**

Karnataka State Disaster Management Authority (KSDMA) has been providing overall disaster governance in the State effectively ensuring inter-agency coordination both at State and District level. It is learnt from the past experiences that the community living in low lying areas and hazardous locations had suffered comparatively higher flood risk and losses. The administrative intervention alone will not be adequate for mitigation and response since the efforts have to be backed up through community-based organizations, local governments, NGOs and the private sector.

The Karnataka has prepared the Karnataka State Action Plan for Flood Risk Management 2022 prepared as per the NDMA guidelines encompasses preparedness, resources inventory, mitigation and response including the development activities as a means of disaster-resilient rural and urban areas. The plan provides a framework for the State and District agencies an agenda to be followed for short, medium and long term strategic actions at every level.

Karnataka has initiated proactive measures to constitute and set up SDMF and SDRF to cater to the speedy mitigation and response for flood risk. The flood management plan lays down clearly the responsibilities, operating procedures for the officers, functionaries and departments that need to be activated before, during and after the flood. This serves as a guiding tool for all the District Administrations to align their district plans as per the strategies laid down in the State Flood Management Action Plan.

I congratulate Dr Manoj Rajan, Commissioner, KSDMA for bringing out an inclusive Flood Management Action Plan which will serve as a guiding tool for all the administrators and in turn align their DM plans and accomplish flood resilience in the State.

**Shri. R. Ashoka**  
Minister of Revenue & Vice-Chairman  
Karnataka State Disaster Management Authority  
Government of Karnataka





## **FOREWORD**

In recent years over twenty districts have suffered the brunt of moderate to severe floods in the State. Recognizing the fact, the State Government has established an effective institutional mechanism for flood risk management to mitigate the impact of flood risk. To facilitate and guide the flood risk management activities in the state, KSDMA has prepared “**Karnataka State Action Plan for Flood Risk Management 2022**” as per the NDMA’s guidelines for the first time in the State clearly describing the flood status, preparedness, mitigation and response strategies. The plan provides relevant inputs to the stakeholders to effectively deal with flood risk management at the micro-level. At the same time, the global initiatives on DRR have been streamlined to district and local levels by fixing responsibilities to district administrations, PRIs, ULBs, NGOs, communities and others.

The Karnataka State Action Plan for Flood Risk Management 2022 elucidates various thematic areas of flood risk management including understanding the flood risk, inter-agency coordination, preparedness and mitigation, disaster risk reduction, capacity building, build back better recovery and rehabilitation. The Government has strengthened the institutional structure at District and State levels to manage flood risk by mobilizing all possible resources in time. The District Disaster Management Authorities would be the nerve centre and has been provided with adequate resources and powers to take all necessary preparedness, mitigation and response measures.

The State through its Organisations has been actively involved in training and capacity enhancement of the functionaries of PRIs, ULBs, Departments, NGOs and community at the grass-root level for effective management of floods. The State flood management action plan will guide and give directions to the functionaries, departments and other agencies to take stringent actions to ensure the vision of flood resilient Karnataka.

We compliment the Commissioner, KSDMA for preparing this comprehensive State Flood Management Action Plan for the Year 2022-23.

**Tushar Giri Nath, IAS**  
**Principal Secretary to Government**  
**Revenue Department (Disaster Management)**

**Vandita Sharma**  
**ACS & Development**  
**Commissioner**

**P Ravi Kumar**  
**Chief Secretary &**  
**Chairman, SEC**







**Commissioner**  
KSDMA  
Revenue Department (DM)  
Government of Karnataka

## **PREFACE**

The Karnataka State has been facing successive disasters threatening normal life and property, of a large number of people and unsettling communities at large. To deal with such devastating situations of huge magnitude and to gear up in short time a Comprehensive Disaster Management Plan has to be in place, detailing the various action plans to enable the state machinery to handle the situations efficiently and effectively.

Karnataka State has been experiencing severe floods both in Krishna River Basin and Cauvery River Basins during monsoon Season, causing enormous loss and damage to life, property, crops and infrastructure. The floods in the State has been attributed to heavy to very heavy rainfall and copious inflows into river Krishna and its tributaries in upper regions resulting in very heavy discharge to the reservoirs of Karnataka leading to flooding of the low-lying area and inundating large swathe of agricultural land along with the river courses.

Disaster Management Planning is a dynamic one in as much as each disaster unravels its changing face and it is essential to evolve a revised strategic plan to deal with such new threats. Accordingly, the Karnataka State Disaster Management Authority (KSDMA) took up the important task of preparing a new Karnataka State Disaster Management Plan 2022-2023 (KSDMP) in line with the provisions of the DM Act 2005. The new KSDMP includes relevant factors from the Global Agreements on DRR, the guidelines in the National and State DM Policies and also experiences gained from the recent Disasters in the state.

Lessons learnt from previous years were incorporated in Dam management, which has enabled us to plan for Integrated Dam management and to effectively coordinate with Maharashtra and Kerala. Accordingly, water releases from reservoirs are regulated taking into account rainfall forecast, possible inflows to the reservoirs, carrying capacity of the river downstream. This has reduced the flooding of downstream villages along the banks of the river. Information on Dam water release and alerts were given well in advance to villages along the river banks before the release of water from reservoirs at frequent intervals. This has resulted in minimalizing of flooding of downstream villages along the banks of the river. An inter-state coordination mechanism was evolved for the forewarning of downstream areas before the release of water from reservoirs.

The State Executive Committee (SEC) has provided valuable guidance and inputs for the revision of this Flood Action Plan. The draft plan was prepared after incorporating the valuable inputs and suggestions from departments and CDM-ATI. The State Government has been proactive in taking flood preparedness. Despite COVID 19 situation, flood preparedness was also of high priority for the state and preparation for the South West monsoon during 2021 itself. The State Government has been periodically reviewing the operations on monsoon calamity in the state.

The Karnataka State Action Plan for Flood Risk Management 2022 has several new and important features. The responsibility of different stakeholders with respect to Floods has been clearly defined. The responsibility framework plan provides valuable and actionable information to the Government agencies and the community at large to effectively deal with floods. This plan will serve as a guide for the District administrations to prepare for the ensuing monsoons. A novel feature in the New Plan is about the preparation of flood DM plan at Gram panchayath and Ward level. This initiative is intended to facilitate the respective Gram Panchayaths/ wards to involve, prepare and implement their own DM plan.

With contributions from various people, all efforts are made to make this Karnataka State Action Plan for Flood Risk Management 2022 include methodologies and enable all the concerned to handle emerging dimensions of floods more effectively. For the first time River Basin wise and Gram Panchayats flood vulnerable districts have been identified and village level flood preparedness through the Gram Panchayat Disaster Management Plan has been developed. The plan comprises of Gram Panchayat Profile, Hazard, Risk Vulnerability and Capacity Assessment, Mitigation and Preparedness Plan, Response Plan, Contact Numbers & SOPs, Guidelines etc. This initiative is to engage the community in flood preparedness and response.

I express my sincere gratitude to Chairman and Members of KSDMA, I express my thanks to Sri. P Ravi Kumar, Chief Secretary, Smt. Vandita Sharma, ACS & Development Commissioner, Smt. Manjula V, Director General, ATI, Sri. Manjunath Prasad, Principal Secretary (Revenue department) whose continuous support, guidance and critical suggestions have greatly enhanced the quality of this Plan.

I acknowledge my special thanks to Dr. Shivakumar Naiklal from KSNDMC for their contributions in preparing this Karnataka State Action Plan for Flood Risk Management 2022. I also thank the all officers of Line departments, experts from KSDMA, KSNDMC.

**Dr. Manoj Rajan**

**Commissioner**

Karnataka State Disaster Management Authority  
Revenue Department (Disaster Management)

## **EXECUTIVE SUMMARY**

Flood is one of the most severe disasters affecting people across the globe. India is the worst flood-affected country in the world accounts for one-fifth of the global death count due to floods. Nearly 75 per cent of the total Indian rainfall is concentrated over a short monsoon season of four months (June-September). As a result, the rivers witness a heavy discharge during these months, leading to widespread floods. About 40 million hectares of land in the country is liable to floods according to National Flood Commission, and an average of 18.6 million hectares of land is affected annually. The annual average cropped area affected is approximately 3.7 million hectares. The most flood-prone areas in the country are the Brahmaputra, Ganga and Meghana River basins in North and North-east India. These rivers carry 60 per cent of the nation's total river flow. The other flood-prone areas are the west-flowing rivers such as the Narmada and Tapi in the north-west region; east-flowing rivers like Mahanadi, Godavari, Krishna and Cauvery in Central India and the Deccan region.

There are several causative factors for flooding. The inadequate capacity of the rivers to contain the high flows brought down from the upper catchment due to heavy rainfall leads to flooding. Areas having poor drainage characteristic gets flooded by the accumulation of water from heavy rainfall. Excess irrigation water applied to command area and increase in groundwater level due to seepage from canals and irrigated field accentuate the problem of waterlogging. Flooding is accentuated by erosion and silting of the riverbeds resulting in a reduction of carrying capacity of the river channel, leading to changes in river courses & obstructions to flow due to landslides, synchronization of floods in the main and tributary rivers and retardation due to tidal effects. With the increase in population and developmental activity, there has been a tendency to occupy the flood plains, which has resulted in a more serious nature of damage over the years. Because of the varying rainfall distribution, many a times, areas which are not traditionally prone to floods also experience severe inundation. Floods have different dimensions, inundation due to spills over the banks, drainage congestion due to poor drainage characteristics, erosion due to change in the river course.

In India after the unprecedented floods of 1954, the Government of India took several initiatives and have constituted several committees since 1954, High-level committee on floods 1957, Ministerial Committee on Flood control 1964, The working group on Flood Control for Five-year plan, Rashtriya Riya Barh Ayog 1980, National water policy 1987 and National Commission for Integrated Water Resource Development Plan 1996 and other structural and non-structural measures including basin wise flood action plans and integrated water and flood management plans to study the problems of floods and flood risk reduction and mitigation measures in the country.

In the last decade, the country has borne catastrophic flooding. When floods occur, they can effectively wipe out decades of investments in infrastructure, seriously cripple economic prosperity, and result in thousands of deaths and epidemics. The majority of the deaths associated with such disasters can be found within the most vulnerable members of society, namely women and children.

Karnataka is the 8th largest state in India prone to various natural disaster mainly drought and flood. Flood is one of the most common and recurring Natural Disasters in Karnataka, in the last decades. Karnataka state is experienced 16 years of drought and 11 years of flood in the last 2 decade. The State receives an annual normal rainfall of about 1150 mm, in which more than 70% of the rainfall occurs during the SW monsoon season alone. Moreover, the high variability in the spatial and temporal distribution of rainfall within and across the regions in the state, causes extreme moisture conditions, either Flood or Drought.

Large parts of North Interior Karnataka, which is under the Krishna River basin is prone to severe floods. Similarly, the Malnad region and parts of South Interior Karnataka, which are in the Cauvery river basin, are also prone to floods and associated with landslides/mudflows. Heavy and high-intensity rainfall during the Monsoon season has been causing floods in one or the other parts of the state resulting in loss of life, livelihood, property, enormous damage to the standing crops, destroying critical infrastructure. The floods in the State has been attributed to heavy to very heavy rainfall and copious inflows into river Krishna and its tributaries in upper regions resulting in very heavy discharge to the reservoirs of Karnataka leading to flooding of the low-lying area and inundating large swathe of agricultural land along the river courses.

Karnataka identifies 1,728 villages as vulnerable to flood. For the first time, 912 Gram Panchayats vulnerable to floods in 13 districts have been identified and village level flood preparedness through the Gram Panchayat Disaster Management Plan has been developed. The plan comprises of Gram Panchayat Profile, Hazard, Risk Vulnerability and Capacity Assessment, Mitigation and Preparedness Plan, Response Plan, Contact Numbers & SOPs, Guidelines etc. This initiative is to engage the community in flood preparedness and response.

Disaster mitigation is a sustained action taken to reduce or eliminate long-term risk to life and property. It involves planning, policy changes, programs, projects, and other activities that can mitigate the impacts of disaster on a defined planning area. The responsibility for disaster mitigation lies with many, including private property owners, business, industry, and local, state government. Recognizing that there is no one solution for mitigating floods, planning provides a mechanism to identify the best alternatives within the capabilities of a jurisdiction.

It has been recognised that, while floods cannot be prevented, they can certainly be managed to minimise loss of lives, livelihood systems, property and damage to infrastructure and public utilities. Various measures for the management of floods will ultimately lead to a reduction in vulnerability to floods. Sustained efforts are required to address the problem to reduce the impact of floods in the short term and flood risk in the medium and the long term. With the enactment of the DM Act, 2005 and the constitution of the NDMA, there has been a paradigm shift from the reactive response-centric regime where most of the efforts and resources were used for providing emergency response and relief after floods, to an approach that lays greater emphasis on efforts and resources for strengthening preparedness and mitigation through appropriate intervention apart from consolidating capacity for emergency response. This shift in approach is expected to be achieved with the active participation of the communities and the other stakeholders in all aspects of Flood management.

The implementation of the flood risk management action plan will result in a safer and resilient State capable of managing the floods effectively and thus promote the economic development of the flood-prone areas in the country. Alternative measures must be sought to provide security for lives, livelihoods and economic production. These could include 'flood-proofing' urban and rural settlements, the development of improved crop varieties and more efficient use of irrigation and fertilizers.

The purpose of this document is to provide an overview of the actions that can be taken to manage and minimize the potential impacts of floods. In this regard, this document has attempted to frame action plans to strengthen Karnataka flood resilience and to undertake to break the current event-disaster cycle by adopting a holistic approach with Advanced Science and Technology tools, advance early forecasting techniques, Integrated water management practices and applying experience gained from past flood events and mitigation efforts employed elsewhere for sustainable flood risk reduction and flood management programmes.

The Karnataka State Action Plan for Flood Risk Management Plan 2022 has been devised based on lessons learnt from past experiences, stakeholders expectations, best cases adopted in the country. It provides information on the Flood profile of Karnataka, River basin wise Vulnerability, Flood forecasting & early warning System, Roles and responsibility of different departments in flood risk reduction. The plan documents the Institutional framework available for managing Floods, it also gives a template for districts to evaluate Flood Preparedness and an Evaluation Matrix to assess their preparedness. The SOPs and roles and responsibilities of various departments lay down integrated risk management of floods. Lastly, Gram Panchayath / ULBs Disaster Management Plan templates help and promote the first responders to be better prepared for managing floods.

## ABBREVIATIONS

|         |                                                                          |
|---------|--------------------------------------------------------------------------|
| ATI     | Administrative Training Institute                                        |
| CBO     | Community Based Organization                                             |
| CDM     | Centre for Disaster Management                                           |
| CWC     | Central Water Commission                                                 |
| DC      | Deputy Commissioner                                                      |
| DDMA    | District Disaster Management Authority                                   |
| DDMP    | District Disaster Management Plan                                        |
| DEOC    | District Emergency Operation Centre                                      |
| DM      | Disaster Management                                                      |
| DRR     | Disaster Risk Reduction                                                  |
| ESF     | Emergency Support Functions                                              |
| GIS     | Geographical Information Systems                                         |
| GO      | Government Order                                                         |
| GSI     | Geological Survey of India                                               |
| GoK     | Government of Karnataka                                                  |
| GP      | Gram Panchayat                                                           |
| IDPIWTD | Infrastructure Development, Ports, and Inland Water Transport Department |
| IRS     | Incident Response System                                                 |
| IT      | Information Technology                                                   |
| IRS     | Incident Response System                                                 |
| ISRO    | Indian Space Research Organisation                                       |
| IMD     | India Meteorological Department                                          |
| KSDMP   | Karnataka State Disaster Management Plan                                 |
| KSDMA   | Karnataka State Disaster Management Authority                            |
| KSNDMC  | Karnataka State Natural Disaster Monitoring Centre                       |
| KRSAC   | Karnataka State Remote Sensing Application Centre                        |
| NCC     | National Cadet Corps                                                     |
| NDMA    | National Disaster Management Authority                                   |
| NDRF    | National Disaster Response Force                                         |

|       |                                            |
|-------|--------------------------------------------|
| NGO   | Non-Governmental Organisation              |
| NREGA | National Rural Employment Guarantee Act    |
| NSS   | National Service Scheme                    |
| NYKS  | Nehru Yuva Kendra Sangathan                |
| PRI   | Panchayati Raj Institution                 |
| PWD   | Public Works Department                    |
| SCMC  | State Crisis Management Committee          |
| SDMA  | State Disaster Management Authority        |
| SDRF  | The State Disaster Response Force          |
| SEC   | State Executive Committee                  |
| SEOC  | State Emergency Operation Centers          |
| SIDM  | The State Institute of Disaster Management |
| SOP   | Standard Operating Procedures              |
| WRD   | Water Resource Department                  |





## *Table of* **CONTENTS**

|    |                                                                                                           |     |
|----|-----------------------------------------------------------------------------------------------------------|-----|
| 01 | INTRODUCTION                                                                                              | 01  |
| 02 | PROFILE OF KARNATAKA                                                                                      | 11  |
| 03 | FLOOD VULNERABILITY OF KARNATAKA,<br>RIVER BASIN APPROACH                                                 | 37  |
| 04 | FLOOD MONITORING, FORECASTING<br>AND EARLY WARNING SYSTEM IN KARNATAKA                                    | 121 |
| 05 | DISASTER MANAGEMENT ACT REGULATION<br>AND ENFORCEMENT FOR FLOOD MANAGEMENT                                | 159 |
| 06 | FLOOD RISK REDUCTION, ASSESSMENT, ROLES<br>AND RESPONSIBILITY IN FLOOD MANAGEMENT                         | 167 |
| 07 | SOCIAL ASPECTS, INSTITUTIONAL FRAMEWORK<br>AND FINANCIAL ARRANGEMENTS FOR FLOOD<br>REDUCTION AND RESPONSE | 199 |
| 08 | FLOOD ACTION PLAN: PREPAREDNESS<br>AND RESPONSE                                                           | 227 |
| 09 | CAPACITY DEVELOPMENT                                                                                      | 341 |
| 10 | FLOODS: DO'S AND DON'TS                                                                                   | 349 |
|    | ANNEXURE LIST OF CONTACT ADDRESSES                                                                        | 357 |
|    | REFERENCES                                                                                                | 369 |



# 01

---

## INTRODUCTION

---

|                            |    |
|----------------------------|----|
| 1.1 Background .....       | 01 |
| 1.2 Rationale .....        | 02 |
| 1.3 Definitions .....      | 03 |
| 1.4 Types of Floods .....  | 03 |
| 1.5 Causes of Floods ..... | 08 |



## INTRODUCTION

### 1.1 Background

Man has experienced flood since time immemorial and he has learnt to live with the floods. However, there was ample space always at higher elevation for evacuation. Population pressure on the flood plains has deprived this advantage in various parts of the country. In fact, drought and flood syndromes have been a yearly feature in India affecting one or the other region. The recurrence of extreme precipitation anomalies, leading to the availability of too much or too little water – resulting in floods or droughts respectively – is a normal component of natural climate variability and often has far-reaching socio-economic and environmental implications.

Flooding is caused by the inadequate capacity within the banks of the rivers to contain the high flows brought down from the upper catchments due to heavy rainfall. Flooding is accentuated by erosion and silting of the riverbeds, resulting in a reduction of the carrying capacity of river channels; earthquakes and landslides leading to changes in river courses and obstructions to flow; synchronization of floods in the main and tributary rivers; retardation due to tidal effects; encroachment of flood plains; and haphazard and unplanned growth of urban areas. The adverse impacts of floods and droughts include loss of life and property; mass migration of people and animals; environmental degradation; and shortage of food, energy, water, and other basic needs. The degree of vulnerability to such natural disasters has been highest in developing countries, where, often it is the poor who suffer the most as sheer necessity forces them to occupy the most vulnerable areas.

The monsoon dominates the rainfall pattern in India, flooding in the country is the result of a complex series of factors. These include huge inflows of water into the rivers from upstream catchment areas of the major rivers coinciding with heavy monsoon rainfall. Low floodplain gradients, congested drainage in older floodplain areas, the location, and effects of the confluences of the major rivers inside the country, and the influence of tides and storm surges. The coastal areas of the states of Andhra Pradesh, Orissa, Tamil Nadu and West Bengal and Karnataka, experience cyclones, which are often accompanied by heavy rainfall leading to flooding. Tropical cyclones are most likely to occur during the pre- and post- monsoon periods (April-May and October-November respectively) and have not been known to coincide with monsoon flood peaks. The onset of the monsoon generally occurs in June. The rivers normally reach their flood peaks during July and August,

## 1.2 Rationale

India receives about 75% of rainfall in southwest monsoon. The frequency of flood incidents is in increasing trend. The suitable flood action plans of a country and states is a part of decision support system. Karnataka State is currently facing a fourth consecutive year of floods 2018, 2019, 2020 and 2021 causing enormous loss and damage to life, property, crops, and infrastructure. The floods in the State have been attributed to heavy to very heavy rainfall and copious inflows into river basins and channels leading to flooding of low-lying area and inundating large swathe of agriculture land along the river courses. Therefore, a mechanism and flood action plan play an important role in monitoring flood condition through managing the water levels in dams, dissemination of flood alerts and warnings in the downstream catchment area during monsoons. Since water is a State subject, necessary steps have to be taken by the State Governments, dam authorities and other stakeholders for integrated flood risk management. In this regard this flood action plan is helps to pertinent to operation and management of flood condition of the state.

Action plans on variety of structural measures of flood storages & diversions, straightening of meanders, restoration of natural drainage, raising river banks, control on development in flood plains, establishing flood lines, rehabilitation/removing encroachment, Integrated ROS, and non-structural of robust and quantitative forecasting, vulnerability maps, technology support, institutional arrangements, policy measures, integrated water management and community based flood management can significantly reduce the loss of life, socio-economic damages and disruptions to the communities.

The main purpose and objectives of flood action plans are as follows:

- Assess the flood hazard, vulnerability and risks in the state and Assess their adequacies in dealing with a flood disaster.
- Institutional strengthening, technological support, up-gradation of information systems for effective response to flood disasters in the state
- Make the state flood disaster management plan an effective response and Promoting a culture of prevention and preparedness for floods.
- Encouraging flood preparedness & mitigation measures.
- Mainstreaming DM concerns into the developmental planning process.
- Putting in place a streamlined and institutional framework for preparedness, mitigation & response to flood disasters.
- To implement state-wide capacity development & training plan for all departments & local bodies.

- To implement safety measures for boat safety
- Developing contemporary forecasting and early warning systems backed by responsive and fail-safe communications and Information Technology (IT) support.
- Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat.
- State flood action plan to guide the district administrations to manage floods and to serve as guideline for preparing their own district flood management action plan.

### 1.3 Definitions

WMO states that a flash flood is: “A flood of short duration with a relatively high peak discharge” the American Meteorological Society (AMS) defines flash floods as *“A flood that rises and falls quite rapidly with little or no advance warning, usually as the result of intense rainfall over a relatively small area”*. In general floods are a general and temporary condition of partial or complete inundation of normally dry land areas as a result of an: Overflow of inland waters; and Unusual and rapid accumulation of run-off of surface waters from any source.

### 1.4. Types of Flood:

**Flash floods:** Flash floods are rapid onset floods that occur 6-12 hours or less after the associated rainfall. Flash floods occur particularly in mountainous or hilly region with rather steep terrain gradients and high surface runoff. They can also be triggered by the failure of hydraulic infrastructure such as dams or levees, outburst of glacier lakes. Due to the short lead time for advance preparation, warning, and evacuation etc, the loss of human, infrastructures, and economic loss is substantial. The increasing trend of intense cyclonic storms over Arabian Sea, makes it more vulnerable to Cyclonic storm. Under the influence of the Severe Cyclonic Tauktae Strom over the Arabian sea, during 2021 the parts of Coastal and Malnad districts of the State recorded extremely to very heavy rainfall accompanied with strong tidal waves and gusty winds during 15th to 16th May 2021. Significant wave height of 3.2-5.1 metres along the Karnataka Coast and surface current speeds reaching 40-50 kmph and gusting up to 60-70 kmph were recorded along and off Karnataka Coast. As a result, 125 villages of 8 Coastal, Malnad and North Interior districts have been affected at various degrees causing damage to critical infrastructure.

Depression and cyclonic storms in the coastal areas and Western Ghats of Karnataka are more vulnerable to flash floods caused by cloud bursts. Sudden release of waters from upstream reservoirs namely Almatti, Narayanapura, Harangi, KRS reservoirs resulted in flooding along the downstream areas.

Incidents of high intensity rainfall over short durations, which cause flash floods even in the area where rains are rare phenomena, are on the rise and the problem needs to be tackled in a scientific manner.

**Riverine flooding:** Riverine flooding can extend over large areas in the mid and lower reaches of a river system, where terrain gradients are lower. Structural failure of buildings in these reaches is less common due to the lower flow velocities. The main parameters influencing the magnitude of flood damage are the depth of inundation and for a number of sectors the inundation time (especially for agriculture), sediment and pollution loads. Due to the heavy economic activity on floodplains in many parts of the world, damages, and losses of riverine flooding account for substantive parts of the overall flood losses. The floods during 2005, 2006, 2007 and 2021 were incessant very heavy to extremely heavy rainfall in the upper Krishna catchment area of Maharashtra has generated copious inflows into the reservoirs in Upper Krishna reservoirs, filling the dams in record time. As a result, river Krishna and its tributaries in middle and lower Krishna basin were in spate causing flooding of low lying villages of Belagavi, Bagalkot, Dharwad, Haveri, Raichur, Yadgir, Vijayanagar, Vijayapura and Gadag districts. Subsequently, incessant heavy rains in Coastal and Malnad region caused flash floods in large parts of Uttara Kannada district and in parts of Shivamogga, Hassan, Chikkamagaluru and Kodagu districts.

**Coastal flooding:** Coastal flooding is in most cases induced by storm surges (wind-induced), or as a combination between storm surge, high tide, and elevated levels of river discharge, leading to backwater effects in the river delta areas. Tsunamis as sources of coastal flooding are a less frequent phenomenon, however, as has been tragically illustrated in the December 2004 Indian Ocean Tsunami, can have effects on unprecedented scales. The combination of damages induced by contact with flood waters, and wind damage to structures is characteristic for this type of floods. The coastal length of Karnataka is 280 km which 7<sup>th</sup> longest coastline in India costal flood in coastal district of Dakshina Kannada, Udupi and Uttara Kannada are common during monsoon season due large flows in west flowing rivers.

**Urban Flooding:** Increasing trend of urban flooding is a universal phenomenon and poses a great challenge to city administration and urban planners the world over. Problems associated with urban floods range from relatively localized incidents to major incidents, resulting in cities being inundated from a few hours



to several days. Therefore, the impact can also be widespread, including temporary relocation of people, damage to civic amenities, deterioration of water quality and risk of epidemics. The problems posed by urban flooding are quite challenging and aggravate with continuous climate change, with its adverse impact affecting variation in rainfall and intra-city /intra-region disparities in the distribution of rainfall.

**Groundwater flooding:** Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate and saturation in the ground and cause the water table to rise above normal levels it's also cause for induced landslide activities. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground. The districts of Kodagu, Shivamogga, Chikmagalur and Dakshina Kannada district experienced severe landslide activities due to capillary rise in groundwater flooding at saturated level due to heavy to very heavy rainfall during 2018, 2019 and 2021.

### **Differences between Flash Floods and Riverine Floods (WMO, 2007a)**

It needs to be recognized that the traditional flood management approach employed for low. land riverine floods is not always enough for flash floods, mainly due to difficulties with accurate forecasting for flash floods because of the short warning lead times. Hence, it is necessary to apply much more closely local data, information and knowledge, and to foster the local preparedness and response capacities. 20 Compared with riverine floods, flash floods often occur in mountainous areas or in the foothills (WMO, 2007a), due to steep slopes and in some cases, thin surface soil layers. In mountainous terrain, there also are quite limited spaces for large retention reservoirs or levees. The comparison between riverine floods and flash floods are shown in Table 1.

**Table 1 — Riverine Floods vs. Flash Floods (WMO, 2007a; Shrestha, 2008)**

|                                      | Flash Floods                                                                                                                                                                                                                                                                                                                                  | Riverine Floods                                                                                                                                                                                                                                                                                  |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Features</b>                      | <ul style="list-style-type: none"> <li>• Rapid water level rise above natural channels</li> <li>• Reaches peak flow within minutes up to a few hours</li> <li>• Rapid recession (within minutes to few hours)</li> <li>• Often dissipate quickly</li> <li>• Not necessarily related to base flow levels</li> <li>• short lag times</li> </ul> | <ul style="list-style-type: none"> <li>• Slow water level rise beyond natural channels</li> <li>• Reaches peak flow within days to weeks</li> <li>• Slow recession (within days to weeks)</li> <li>• Mostly coinciding with high base flow levels</li> <li>• Medium to long lag times</li> </ul> |
| <b>Causes</b>                        | <ul style="list-style-type: none"> <li>• Very high intensity rainstorms/cloudbursts</li> <li>• Rapid snow/glacial melt due to rapid increase in temperature</li> <li>• Dam (both artificial and natural) breaks</li> </ul>                                                                                                                    | <ul style="list-style-type: none"> <li>• Prolonged seasonal precipitation of low to high intensity</li> <li>• Seasonal snow and glacial melt</li> </ul>                                                                                                                                          |
| <b>Associated Problems</b>           | <ul style="list-style-type: none"> <li>• Often carry high sediment and debris loads</li> <li>• Very high hydraulic force and erosive power</li> </ul>                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Inundation</li> </ul>                                                                                                                                                                                                                                   |
| <b>Frequency</b>                     | <ul style="list-style-type: none"> <li>• Occasionally, any time during the year</li> </ul>                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Annually during rainy season</li> </ul>                                                                                                                                                                                                                 |
| <b>Affected Area</b>                 | <ul style="list-style-type: none"> <li>• River plains and valleys</li> <li>• Alluvial fans</li> <li>• Mostly local extent</li> <li>• generally small to medium areas are affected</li> </ul>                                                                                                                                                  | <ul style="list-style-type: none"> <li>• River plains and valleys</li> <li>• Local to regional extent</li> <li>• Large areas can be affected</li> </ul>                                                                                                                                          |
| <b>Predictability</b>                | <ul style="list-style-type: none"> <li>• very difficult to forecast</li> <li>• Local information is very valuable</li> <li>• Hydro-meteorological forecasting is necessary</li> </ul>                                                                                                                                                         | <ul style="list-style-type: none"> <li>• with appropriate technology and measures in place, forecasting is easily possible</li> </ul>                                                                                                                                                            |
| <b>Potential Mitigation Measures</b> | <ul style="list-style-type: none"> <li>• Early warning systems</li> <li>• Community preparedness and awareness</li> <li>• Appropriate emergency measures</li> </ul>                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Real-time flood forecasting</li> <li>• Community preparedness and awareness</li> <li>• Appropriate emergency measures</li> </ul>                                                                                                                        |

## Cloudbursts

Due to peculiar climatic conditions, some parts of the state experience sudden unprecedented heavy rain known as cloud bursts. The coastal areas and Western Ghats in Karnataka are more prone to such phenomena. Principal rain bearing meteorological systems that lead to short duration heavy rainfall and which may also cause floods are:

- (i) Monsoon depressions
- (ii) Fluctuations in the intensity and location of the monsoon trough over the plains of India
- (iii) Amid-troposphere circulation/low pressure off the coasts
- (iv) Offshore vortices

Apart from these, land-based lows or depressions during monsoon cyclones and persistence of low-pressure areas over adjoining coastal areas may sometimes lead to floods.

**The IMD and CWC in association with state government will develop forecasting and warning systems in areas prone to floods caused by cloudbursts.**

## River Erosion

The Kodagu floods during 2018 and 2019 have led to erosion of river streams resulting in deviation of river flows due to heavy rainfall in the month of August. The erosion carried a large volume of sediments along the river channel. This phenomenon if continued may result in accumulation of sediments in the reservoirs and thereby reduce the storage capacity. The erosion of banks by the rivers and the consequent loss of life and property are major problems. Rivers tend to erode their beds and banks in the hilly regions resulting in the deepening and widening of rivers. When a river enters the flood plains, it shows a tendency to braid and develop number of channels causing silting of the riverbed, change in course and bank erosion. In the plains, a river shows a meandering tendency with meanders moving downstream causing erosion on the concave and deposition on the convex side and cut offs. This causes large-scale bank erosion. Thus, bank erosion and consequent loss of land and properties is a constant phenomenon all along the course of the river. The study of the problem and remedial measures for training of the river into defined channel has gained importance due to increase in population pressure and want of alternative sources of livelihood for the people whose land and properties are lost to rivers.

**The WRD along with the state government will undertake river-wise studies of the problem of erosion and estimate the area liable to erosion by rivers, identify vulnerable spots and plan remedial measures**

to protect such areas. Latest technological developments for low-cost measures, such as reinforced cement concrete (RCC) porcupines, will be considered while planning such measures.

### 1. 5 Causes of Floods

Many factors influenced the cause of flood mainly antecedent conditions, drainage, Catchment size, land use and land cover pattern, geology, vegetation, and meteorological conditions etc. Inadequate capacity of the rivers to contain within their banks the high flows brought down from the upper catchment areas following heavy rainfall, leads to flooding. The tendency to occupy the flood plains has been a serious concern over the years. Because of the varying rainfall distribution, many a time, areas which are not traditionally prone to floods also experience severe inundation. Areas with poor drainage facilities get flooded by accumulation of water from heavy rainfall. Excess irrigation water applied to command areas and increase in ground water levels due to seepage from canals and irrigated fields also are factors that accentuate the problem of waterlogging. The problem is exacerbated by factors such as silting of the riverbeds, reduction in the carrying capacity of river channels, erosion of beds and banks leading to changes in river courses, obstructions to flow due to landslides, synchronisation of floods in the main and tributary rivers and retardation due to tidal effects.

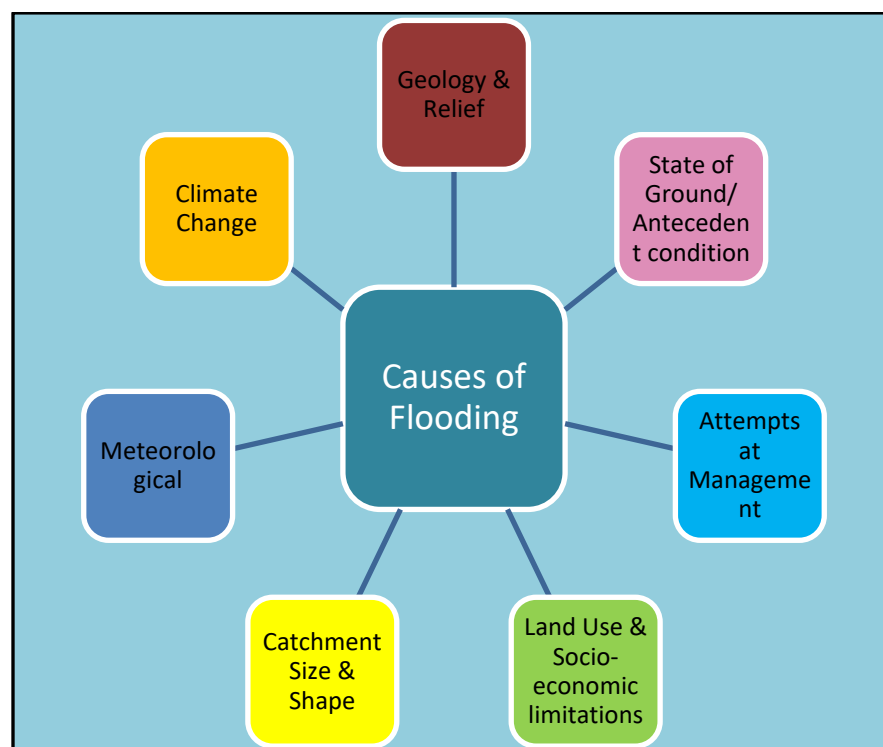


Figure – 1 Causes of Flood

# 02

---

## PROFILE OF KARNATAKA

---

|                                         |    |
|-----------------------------------------|----|
| 2.1 Geography of Karnataka .....        | 11 |
| 2.2 Population of Karnataka .....       | 12 |
| 2.3 Rainfall Pattern in Karnataka ..... | 12 |
| 2.4 Agriculture in Karnataka .....      | 24 |
| 2.5 Water Resources in Karnataka .....  | 24 |
| 2.6 Rivers System of Karnataka .....    | 25 |
| 2.7 Major Reservoirs of Karnataka ..... | 27 |
| 2.8 River Basins of Karnataka .....     | 28 |



## PROFILE OF KARNATAKA

### 2.1 Geography of Karnataka

Karnataka is situated on the western edge of the Deccan Peninsular region of India. It is located approximately between 11.5° North and 18.5° North latitudes and 74° East and 78.5° East longitudes. The Karnataka is the eighth largest state in the country having an area of 1.91 lakh sq.kms. and comprises of humid, sub humid, semiarid and arid climatological regions which are delineated in to 10 Agro-Climatic Zones. About 2/3rd of the geographical area falls under semiarid to arid conditions. Karnataka is divided into four regions on the basis of topography and climate. They are the Coastal, Malnad (Western Ghats hilly region), North Interior Karnataka and South Interior Karnataka (The Plains). The State comprises of 31 districts, 227 taluks, 850 Hoblies, 6641 Gram Panchayaths and 29,406 villages.

The coast line stretches for a distance of about 320 kilometres along the Arabian Sea and the region is about 30-40 kilometres broad and it is extant between the sea and the Western Ghats. The coastal region has three districts namely Uttarakannada, Udupi and Dakshina Kannada. It receives copious rains between June and September from South West monsoon.

Some regions of North Canara harbour dense forests Malnad region is formed by the Sahyadri mountain range of Western Ghats. It is distributed in the districts of Shivamogga, Hassan, Chikmagalur and Madikeri (Coorg). It runs for a distance of about 400 kilometres from North to South and has an average height of about 900 ft. M.S.L. However certain peaks in this region are much higher. They are Kuduremukha (1900 M.), Bababudangiri (1975 M.) and Mullayanagiri (1975M.) The Ghats are rather steep in their western extremities and taper down towards the east. The region is totally covered by dense forests. It receives rains ranging between 5000 mm - 7500 mm between June and September during the monsoon season.

The Northern Karnataka Plateau covers the districts of Belagavi, Raichur, Bidar, Vijayapur, Dharwad, Gadag, Bagalkote, Kalburgi, Koppal Yadgir and Ballari. The area is mainly composed of the Deccan Trap. It represents an extensive deforested plateau landscape. The Northern Karnataka Plateau has an elevation of 300 metres to 600 metres from MSL. The plateau slopes towards the east. The landscape is mainly covered with rich black cotton soils. The vast expanse of treeless plateau is interspersed with river plains, watersheds, residual hills and ridges. The river plains are represented by River Krishna, Bhima,

Ghataprabha, and Malaprabha. The Krishna basin flood prone areas are most riverine floodplains. With heavy rains in the catchment areas of Krishna basin in Maharashtra, several bridges and barrages in the north Interior Karnataka, particularly Belagavi, Bagalkote, Raichur, Kalburgi districts will get submerged. Bidar District falling under Godavari river basin get submerged when Manjara and Karanja rivers over flows due to heavy rains.

The South Interior Karnataka (Southern Plateau) includes the districts of Chamarajanagar, Mysore, Mandya, Ramanagara, Bangalore Urban, Bangalore Rural, Kolar, Chikkaballapura, Tumakuru, Davanagere and Chitradurga. This plateau region has a general elevation of 600 metres to 900 metres with a high degree of slope. It is encircled by the Western Ghats on the West and South. The Cauvery River basin forms a significant part of this plateau.

## **2.2. Population of Karnataka:**

Total population of Karnataka was 6.11 crore as per General Census of 2011 (male- 3.10 crore and female 3.01 crore), out of which, number of Scheduled caste and Scheduled Tribe was 1.05 Core and 0.42 Crore, respectively. The Projected population of 2019 is 6.95 crores. As per the Agricultural census of 2015-16, there were 86, 80,739 agricultural land holdings with operated area of 118, 05,102 hectares. There were 69,80,864 small and marginal farmers accounting for 80% of the total holdings and operated area of small and marginal farmers was 51,87,218 hectares accounting for 44% of the total operational holdings.

## **2.3 Rainfall Pattern in Karnataka**

Karnataka State has wide varieties of climatic types. About 77% of the total geographic area of the State covering interior Karnataka is arid or semi-arid. Karnataka also possess some of the wettest areas in the country, due to certain orographic features and the location of the Western Ghats very close to the Arabian Sea.

The rainfall in Karnataka distributed in 3 seasons of pre monsoon, southwest monsoon and northeast monsoon. The southwest monsoon plays dominant role and share more than 70% of the annual rainfall followed by pre monsoon and northeast monsoon. The annual rainfall ranges from less than 500 mm to more than 4000 mm, averaging to about 1150 mm which is distributed over 40 to 100 rainy days. However, both the spatial and temporal distribution of rainfall varies drastically from region to region and decrease from west to east within the state. The seasonal precipitation is crucial for irrigation, drinking water purposes and industrial use.



The Coastal region comprising three districts viz. Uttara Kannada, Udupi and Dakshina Kannada Districts receives a normal annual rainfall more than 4000 mm, in which more than 80 % of the rainfall occurs during SW monsoon season (June to September). The Malnad region, the stretch of Western Ghats in Karnataka, comprising Kodagu, Chikmagalur, Hassan and Shivamogga districts is humid and here the annual rainfall ranges from 1,000 to 3,800 mm. The Agumbe, one of the peaks situated in Thirthahalli Taluk of Shivamogga district, receives the highest rainfall in Karnataka close to ~ 6,000 mm.

The North Interior Karnataka (NIK) comprising 12 Districts receive about 767 mm of rainfall annually. More than 70 % of the Normal Annual Rainfall occurs during Southwest monsoon season and 20% during Northeast monsoon season.

Similarly, the South Interior Karnataka (SIK) comprising 11 Districts receive about 738 mm annually. More than 50 % of the Normal Annual Rainfall occurs during Southwest monsoon season and 30% during Northeast monsoon season.

#### **Pre-Monsoon (January to May) Mean rainfall:**

The average rainfall for the state in Pre-monsoon season is 135mm with a standard deviation of 43mm. The rainfall varies from 60-100mm in the North Karnataka to 100-200 mm in the southern part of the state. The total pre-monsoon rain contributes about 12% to annual rainfall. The CV of rainfall is below 50% in South Interior Karnataka (SIK) and is 80-200% in Coastal Karnataka

#### **South-West Monsoon (June to September) Mean rainfall:**

The average rainfall for the state in Southwest Monsoon season is 804 mm with a standard deviation of 120mm. The season contributes about 71% to the annual rainfall. The mean rainfall is as high as 3000 to 4000 mm in Coastal districts and sharply decreases towards east to about 400 mm in the interior parts of the state. The contours of rainfall are almost parallel to the Coast. The CV of rainfall in different parts of the state during SW monsoon season varies from 15% to 50%.

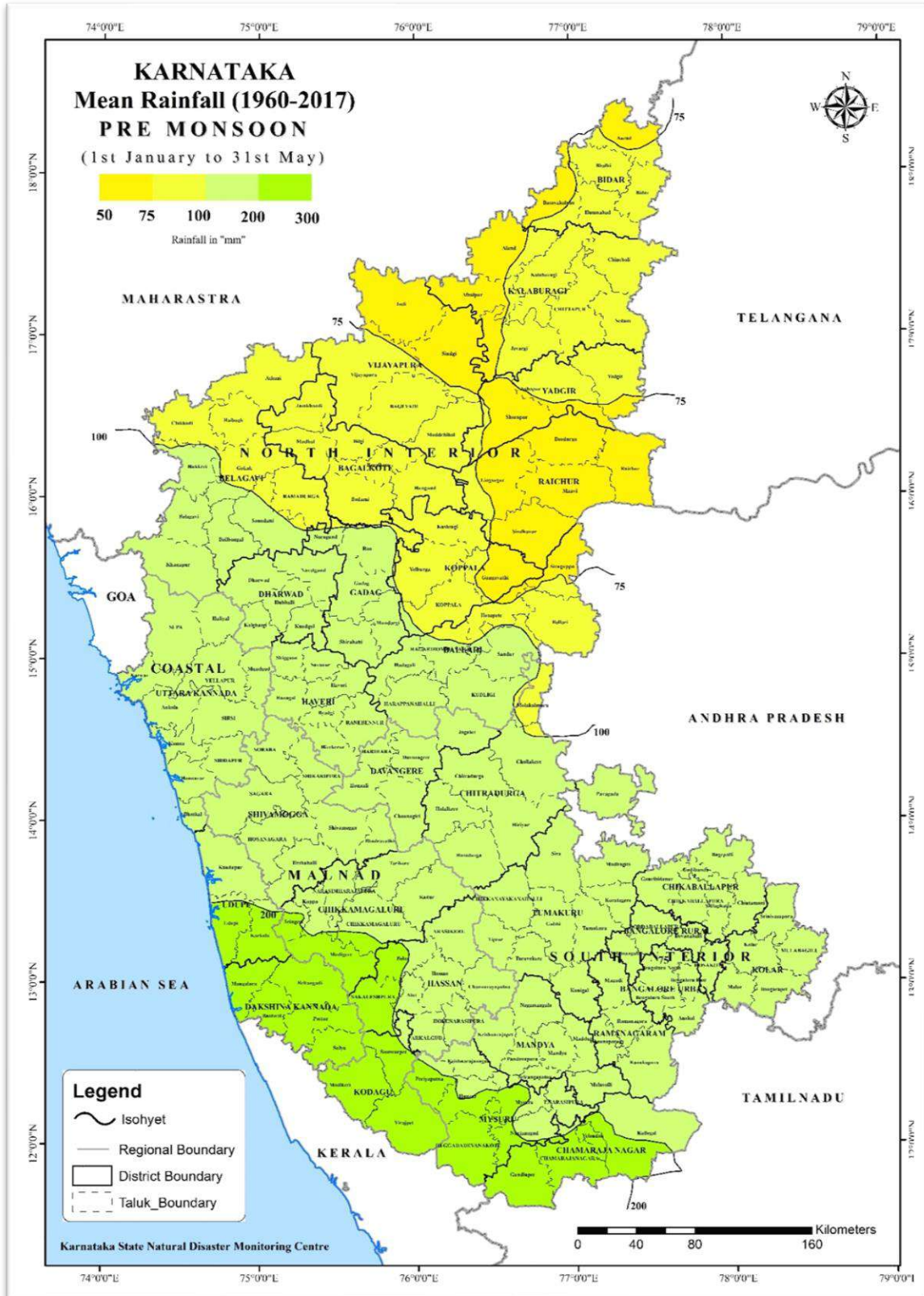
#### **North -East Monsoon (October to December) Mean rainfall:**

The average rainfall for Karnataka during the Northeast Monsoon (NE) season is 187mm with a standard deviation of 61mm. The average Rainfall in the North Interior Karnataka and South Interior Karnataka ranges from 100-200mm and remaining parts of the state ranges from 200-400mm. The CV of rainfall varies from 60-100% in North eastern part of state and less than 50% in southern parts of the state. The average rainfall in the North Interior Karnataka and parts of South Interior Karnataka ranges from 100-200mm and remaining parts of the state ranges from 200-400mm.

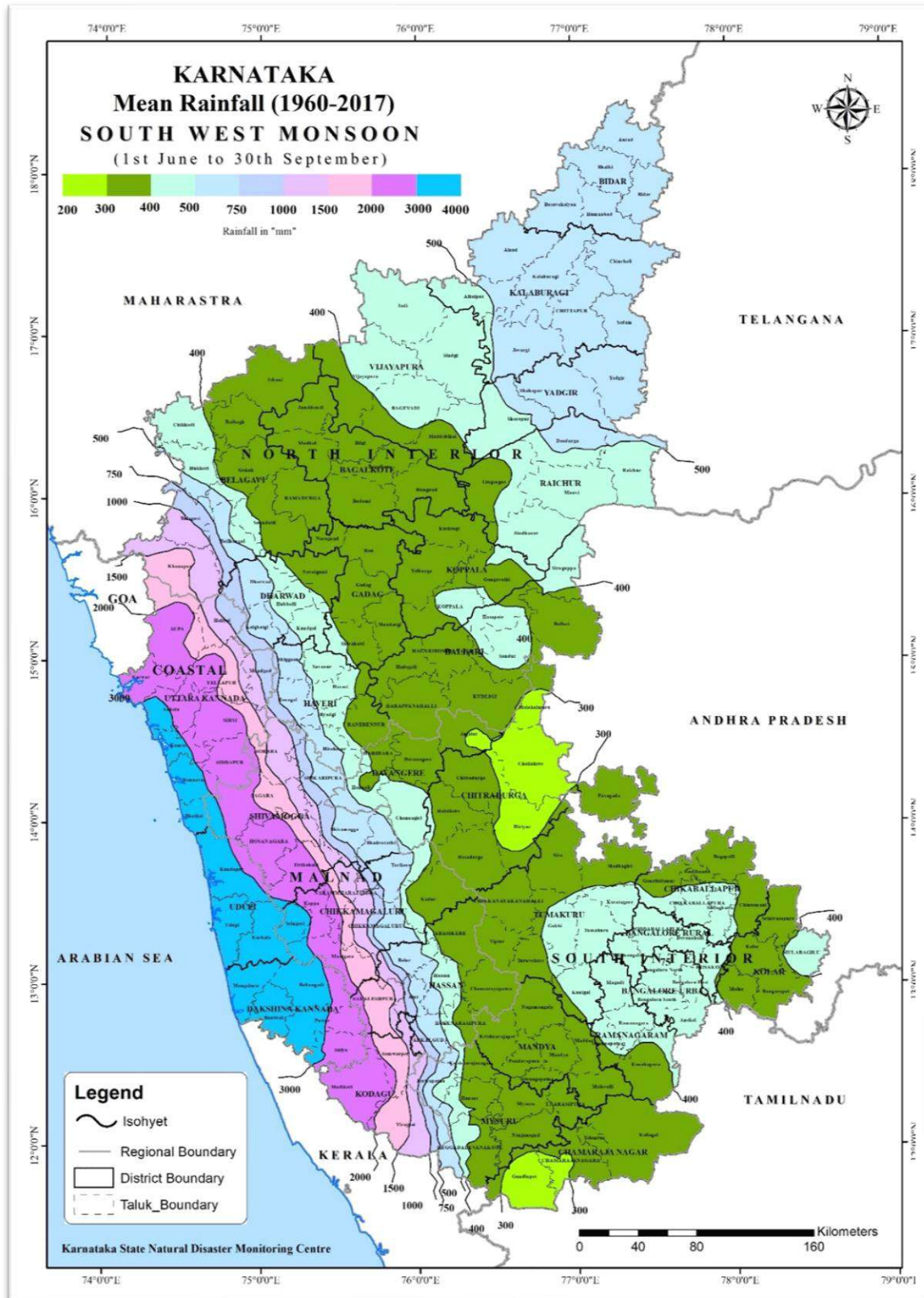
The Pre-Monsoon, South-West Monsoon and North-East Monsoon rainfall are shown map 1 to 3.

Table – 2 District wise seasonal Normal Rainfall

| District wise Seasonal Normal Rainfall (1961-2010), Rainfall in "mm" |                                 |                          |                                  |                                 |             |
|----------------------------------------------------------------------|---------------------------------|--------------------------|----------------------------------|---------------------------------|-------------|
| Taluk Sl.No.                                                         | District Name                   | Pre-Monsoon (Jan to May) | South-West Monsoon (June to Sep) | North-East Monsoon (Oct to Dec) | Annual      |
| <b>Region</b>                                                        | <b>South Interior Karnataka</b> | <b>143</b>               | <b>369</b>                       | <b>202</b>                      | <b>714</b>  |
| 1                                                                    | Bengaluru Urban                 | 156                      | 471                              | 219                             | 846         |
| 2                                                                    | Bengaluru Rural                 | 141                      | 444                              | 213                             | 798         |
| 3                                                                    | Ramanagara                      | 178                      | 436                              | 226                             | 840         |
| 4                                                                    | Kolar                           | 117                      | 399                              | 219                             | 735         |
| 5                                                                    | Chikkaballapura                 | 108                      | 416                              | 211                             | 736         |
| 6                                                                    | Tumakuru                        | 125                      | 358                              | 186                             | 669         |
| 7                                                                    | Chitradurga                     | 103                      | 282                              | 155                             | 540         |
| 8                                                                    | Davanagere                      | 105                      | 393                              | 161                             | 659         |
| 9                                                                    | Chamarajanagara                 | 203                      | 320                              | 263                             | 787         |
| 10                                                                   | Mysuru                          | 205                      | 419                              | 214                             | 837         |
| 11                                                                   | Mandya                          | 166                      | 316                              | 217                             | 699         |
| <b>Region</b>                                                        | <b>North Interior Karnataka</b> | <b>83</b>                | <b>479</b>                       | <b>140</b>                      | <b>702</b>  |
| 12                                                                   | Ballari                         | 74                       | 366                              | 159                             | 599         |
| 13                                                                   | Vijayanagar                     | 99                       | 389                              | 155                             | 643         |
| 14                                                                   | Koppala                         | 82                       | 383                              | 149                             | 614         |
| 15                                                                   | Raichur                         | 69                       | 440                              | 146                             | 654         |
| 16                                                                   | Kalaburagi                      | 67                       | 576                              | 127                             | 770         |
| 17                                                                   | Yadgir                          | 68                       | 517                              | 134                             | 719         |
| 18                                                                   | Bidar                           | 71                       | 650                              | 117                             | 838         |
| 19                                                                   | Belagavi                        | 95                       | 599                              | 133                             | 826         |
| 20                                                                   | Bagalkote                       | 80                       | 362                              | 141                             | 582         |
| 21                                                                   | Vijayapura                      | 63                       | 396                              | 133                             | 591         |
| 22                                                                   | Gadag                           | 106                      | 372                              | 147                             | 624         |
| 23                                                                   | Haveri                          | 122                      | 512                              | 166                             | 800         |
| 24                                                                   | Dharwad                         | 125                      | 514                              | 148                             | 787         |
| <b>Region</b>                                                        | <b>Malnad</b>                   | <b>168</b>               | <b>1556</b>                      | <b>226</b>                      | <b>1950</b> |
| 25                                                                   | Shivamogga                      | 129                      | 1991                             | 205                             | 2325        |
| 26                                                                   | Hassan                          | 168                      | 754                              | 220                             | 1142        |
| 27                                                                   | Chikkamagaluru                  | 164                      | 1447                             | 221                             | 1833        |
| 28                                                                   | Kodagu                          | 253                      | 2188                             | 288                             | 2729        |
| <b>Region</b>                                                        | <b>Coastal</b>                  | <b>158</b>               | <b>3101</b>                      | <b>259</b>                      | <b>3518</b> |
| 29                                                                   | Dakshina Kannada                | 243                      | 3388                             | 376                             | 4006        |
| 30                                                                   | Udupi                           | 201                      | 4022                             | 312                             | 4535        |
| 31                                                                   | Uttara Kannada                  | 103                      | 2647                             | 187                             | 2936        |
| <b>State</b>                                                         |                                 | <b>120</b>               | <b>852</b>                       | <b>182</b>                      | <b>1153</b> |

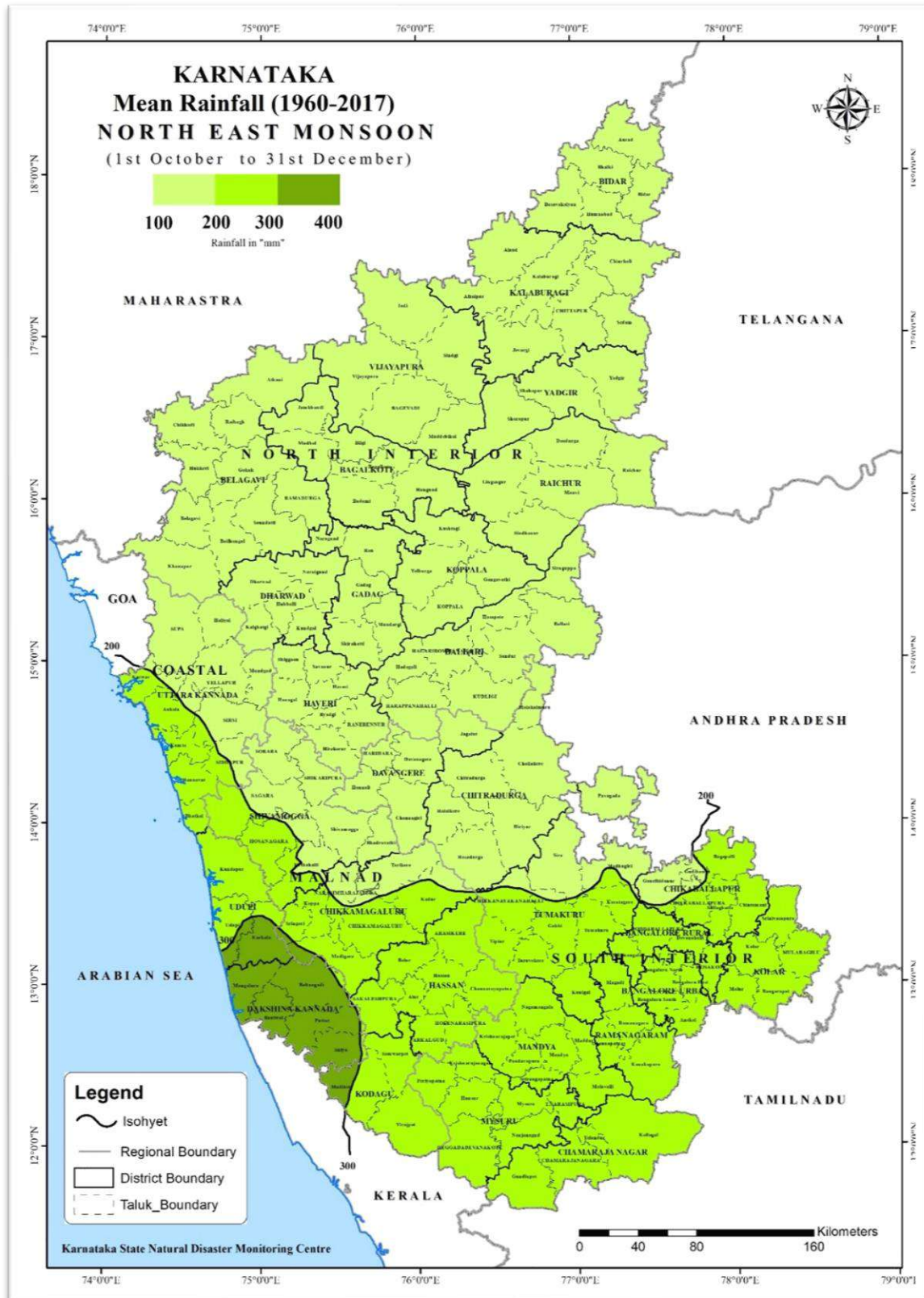


Map – 1 Mean Rainfall - Pre-Monsoon Season



Map –2 Mean Rainfall - South-West Monsoon





Map – 3 Mean Rainfall - North-East Monsoon

### **Excess Rainfall Pattern in Karnataka:**

#### **Heaviest Rainfall in one day (24 Hrs):**

Heaviest rainfall in one day records in Coastal line of Udupi and Uttara Kannada district between 400 to 500mm. Malnad region and north-eastern parts area get around 200 to 300mm and remaining region of north and south interior Karnataka get 100 to 200mm.

#### **Percentage years of Rainfall – Excess more than 25% of Normal:**

Majority of state over North and South interior Karnataka recorded excess more than 25% of the normal of 20 to 30% of the years. Most of the Coastal and Malnad region recorded of 10 to 20% of the year's excess more than 25% of the normal.

#### **Percentage years of Rainfall – Excess more than 50% of Normal**

Parts of the Belagavi and South interior Karnataka recorded in excess more than 50% of the normal of 15 to 20% of the years. Coastal and Malnad region recorded of less than 5% of the year's excess more than 50% of the normal.

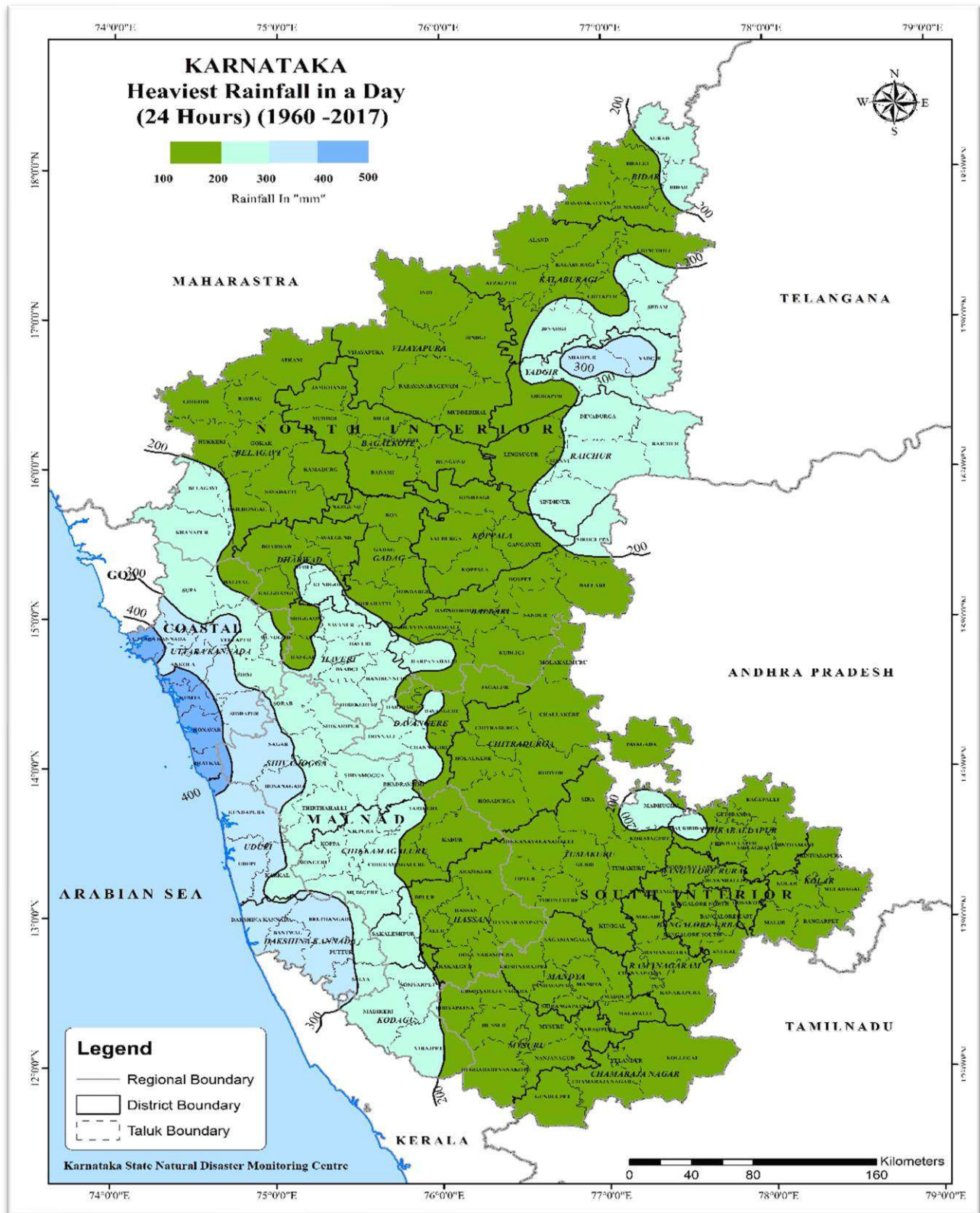
#### **Percentage years of Rainfall – Excess more than 75% of Normal**

Parts of the North and South interior Karnataka recorded in excess more than 75% of the normal of 2 to 8% of the years. Coastal and Malnad region recorded of less than 2% of the year's excess more than 75% of the normal.

#### **Highest Percentage Departure annual (1960 - 2017)**

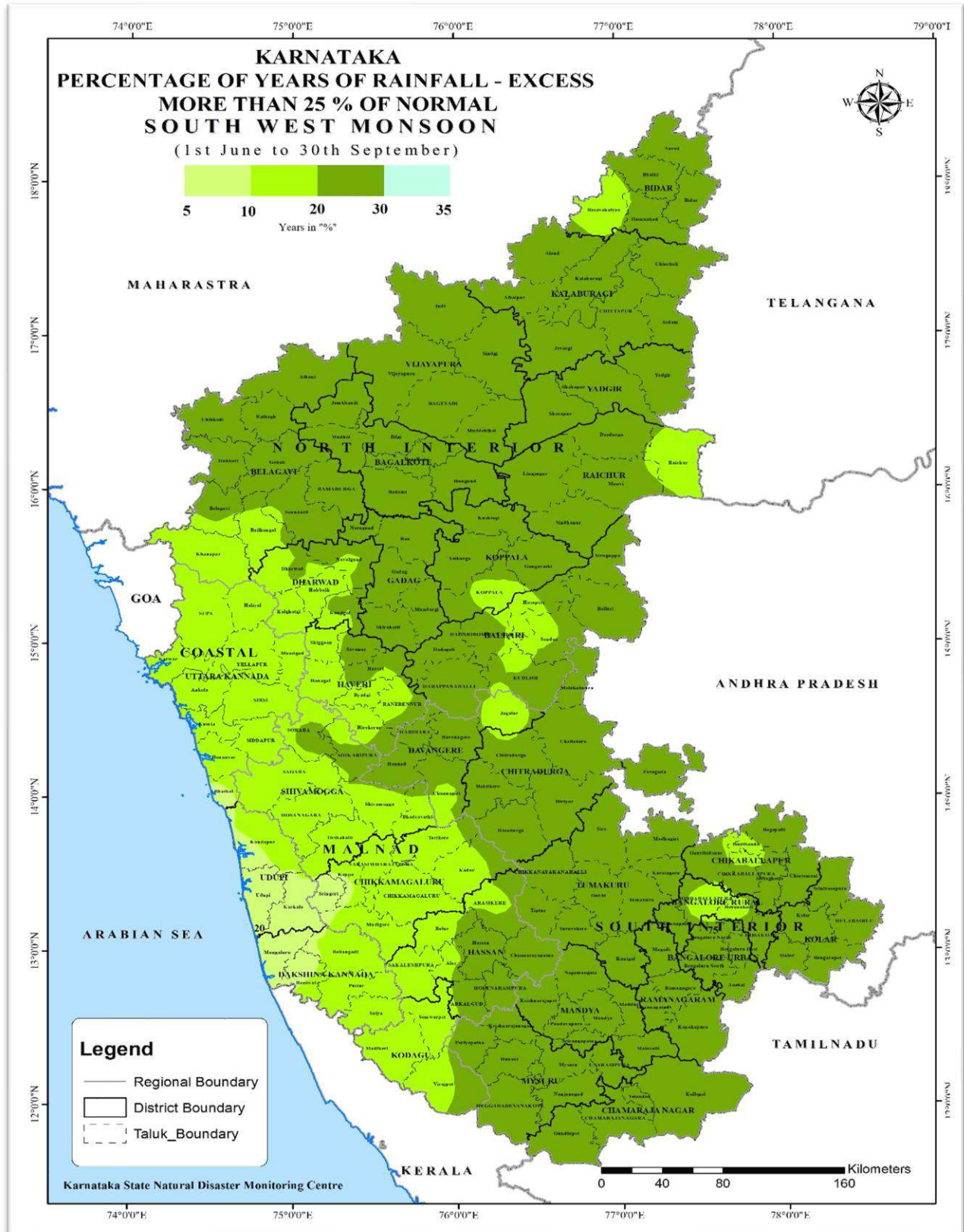
Highest Percentage departure from Normal observed with 100 to 126% over the parts Yadgir and Raichur districts. Northern region observed maximum of 75 to 100% departures and coastal and southern part observed 38 to 75% of departures from the normal over the years.

The maps are shown in **Map 4 -8**



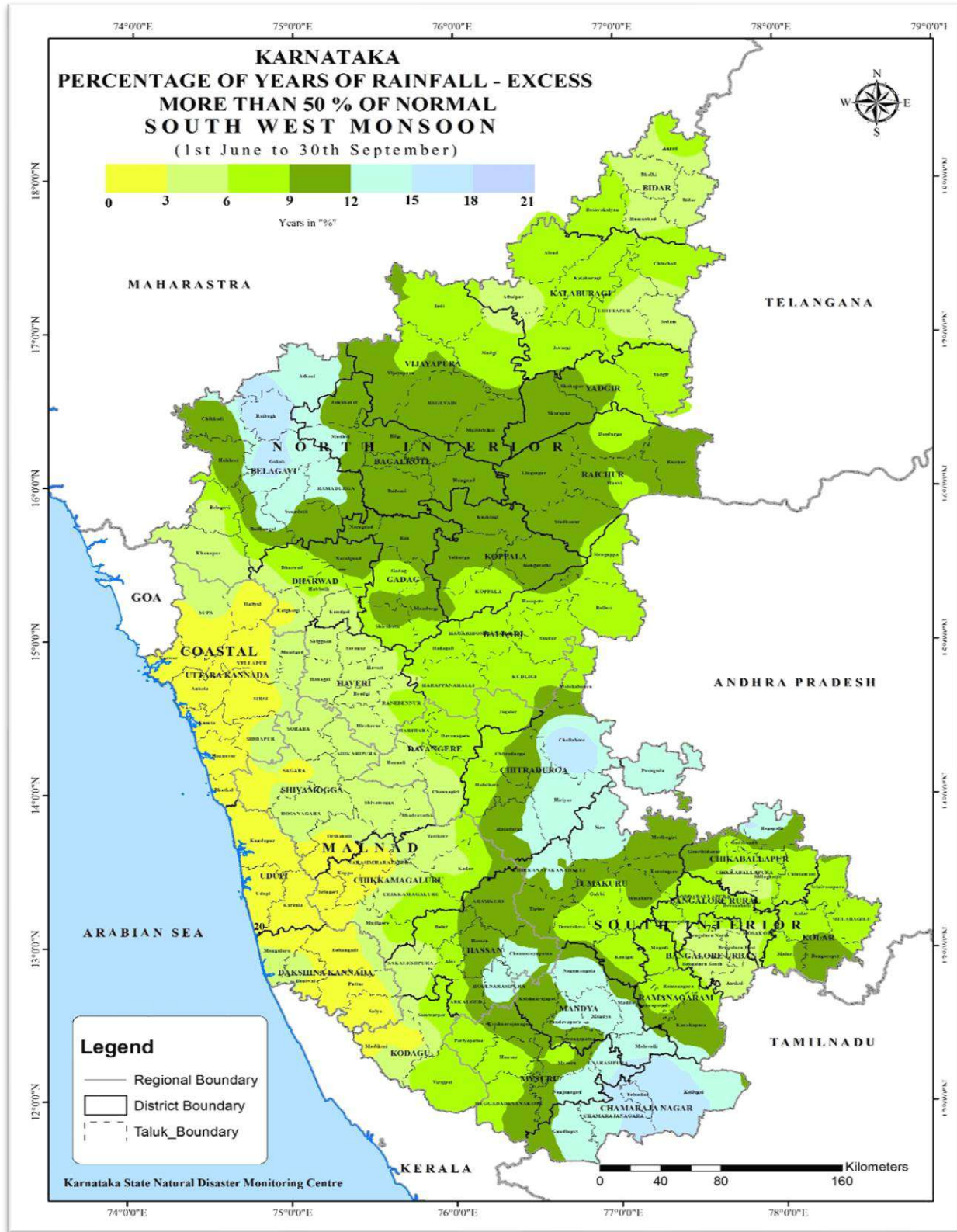
Map 4 - Heaviest Rainfall in one day (24 Hrs)



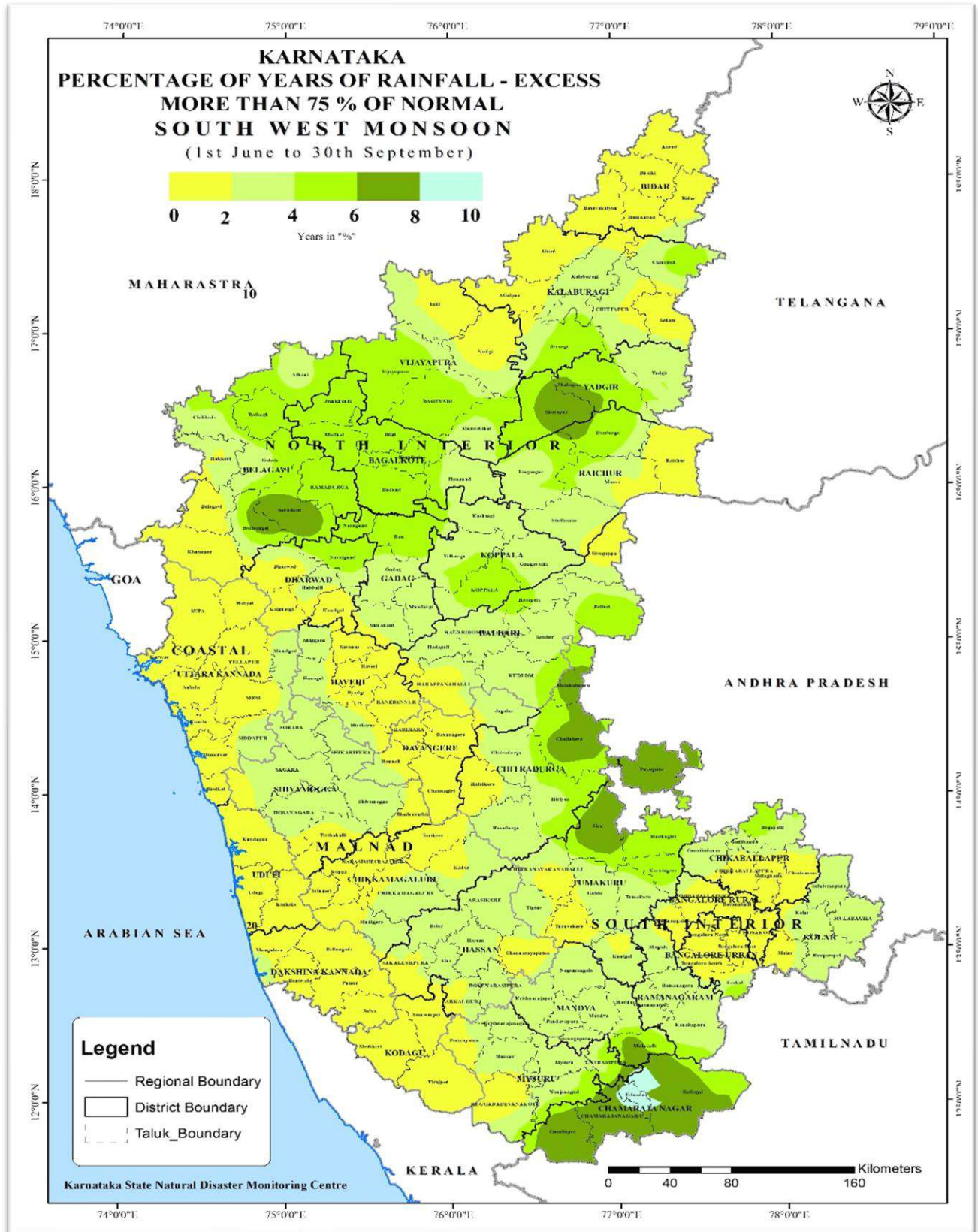


Map- 5 Percentage years of Rainfall – Excess more than 25% of Normal



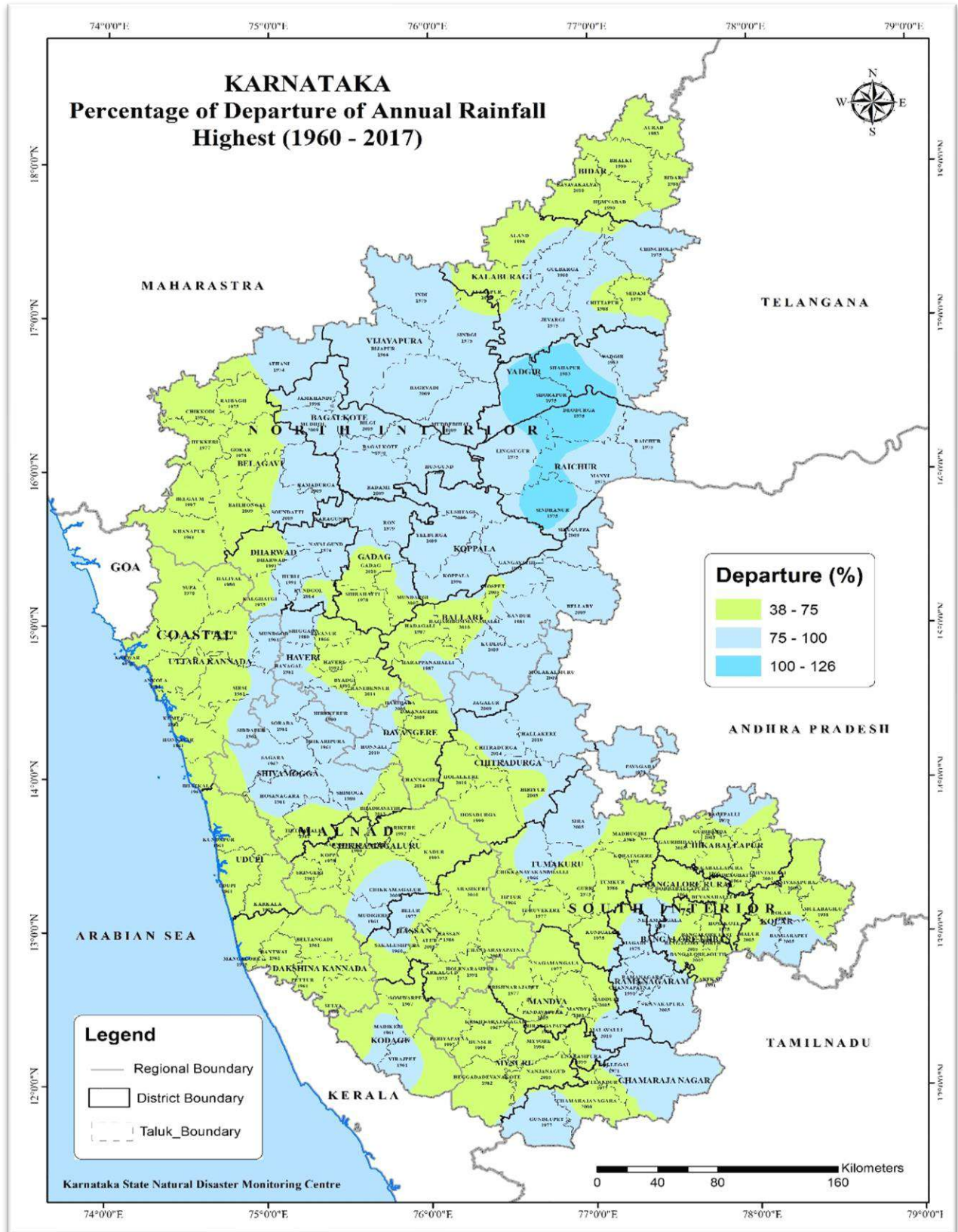


Map -6 Percentage years of Rainfall – Excess more than 50% of Normal



Map-7 Percentage years of Rainfall – Excess more than 75% of Normal





Map-8 Highest Percentage Departure annual(1960 - 2017)

## 2.4. Agriculture in Karnataka:

Karnataka is agrarian state more than 70% of the people are depend on agriculture and most of the cultivable area around 70% is under rain fed. As per the Agriculture Census of 2015-16 Karnataka its accounting cultivable area 62 % out of its' total geographical area of 190.50 lakh hectares. Agriculture crops accounting for about 64%. The main agricultural crops are paddy, sugar cane, cereals and pulses. Kharif Season-wise covers major agricultural area of normal area of 67.99 lakh hectares, and in Rabi 30.46 lakh hectares.

Horticultural crops includes arecanut, coconut, mango, banana and other seasonal fruit baring and vegetable crops. Mainly Arecanut, coconut, and spices and rubber plantations are concentrated in parts of coastal and Malnad and Coorg districts have coffee plantations. Northern part of Karnataka play an important role in production of cereals, pulses, oil seeds and other cash crops its plays an important role in contribution of GDP of the country.

## 2.5 Water Resources in Karnataka:

Surface water is available in Karnataka in the form of rivers, lakes, waterfalls, reservoirs, etc. Being the seventh largest state in India (area-wise). Karnataka possesses about six percent of the country's total surface water resources of about 17 lakh million cubic metres (Mcum). Around 60% of this is provided by the west flowing rivers while the remaining comes from the east flowing rivers. Karnataka has seven river systems. Together with their tributaries they form a catchment of 191,773 km<sup>2</sup>. The Western Ghats are a major divide for river basins. Rivers flowing westward into the Arabian Sea carry 40% of the state's surface water and those flowing eastward 60%. The availability of water from these river basins is estimated to be 7,663 thousand million cubic feet per annum (TMC/a) of which 45% (3,475 TMC/a (or) 98 billion m<sup>3</sup>/a) can be economically utilised.

### Lakes and Tanks and Ground water:

A portion of water demand is met from lakes and tanks. Karnataka has about 37,000 traditional tanks with a potential command area of 685,000 ha. About 60% of these are on the southern plateau, 25% in the Malnad region and 15% on the northern plateau. Besides traditional tanks, there are about 20,000 irrigation tanks in the state with an irrigation potential of 6.5 lakh ha. Tanks alone serve nearly 80% of the minor irrigation potential. The state also has about 1,100 other minor surface irrigation structures that include barrages, bridges-cum-barrages, moles in river courses (anicuts) and pick-ups for lift irrigation.

Groundwater is considered ubiquitous, it is not uniformly available. Weathered hard rocks account for 97% of the aquifers, the great majority being granite (90%) and the remainder Deccan trap basalts. Alluvial coastal flood plains account for only 2% of aquifers and other formations for just 1%. Tube and bore wells irrigate a net area of 12.5 lakh ha, contributing 37% to the state's net irrigated area. The water balance of Karnataka is 92% of water through rainfall and 8% from the upper riparian state Maharashtra, totalling to 236 billion/ m<sup>3</sup> year. About 50% of is lost in evaporation from the soil and transpiration of plants. This is generally referred to as evapotranspiration.

## 2.6 River System of Karnataka:

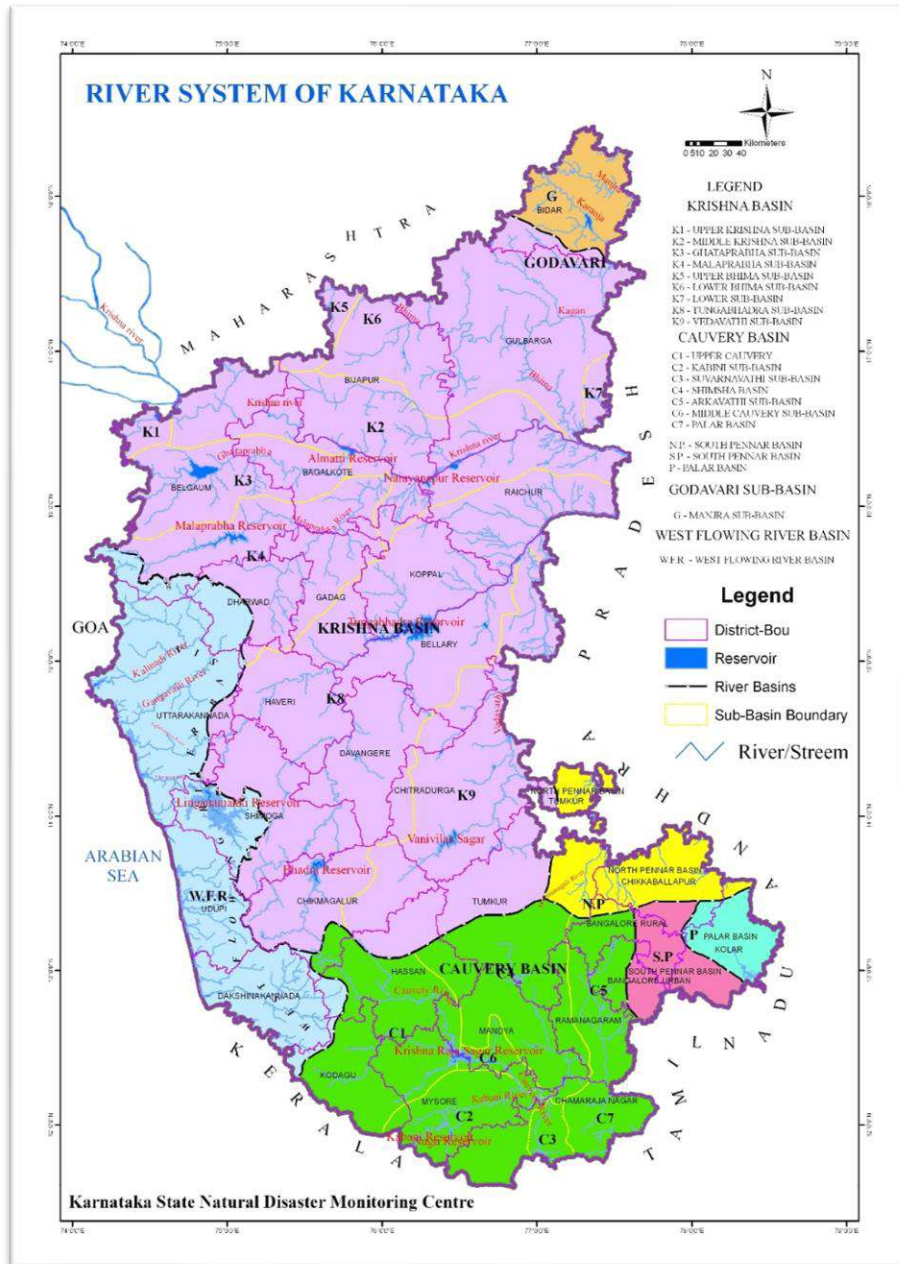
Karnataka blessed with seven major rivers are the source of water for drinking and household, integral to agriculture, hydropower, tourism, and transportation in certain areas. Most of the rivers originate in the Western Ghats and runs towards the eastern side of the state and almost all the major east-flowing rivers are inter-state rivers. These are some of the largest rivers in the state and drain towards the Bay of Bengal. The attributes of seven major river basin of Karnataka are given in **Table-3**.

**Table-3 River Basins in Karnataka**

| River System Drainage | Area Sq. km.   | Percentage Average | Annual Yield TMC |
|-----------------------|----------------|--------------------|------------------|
| Krishna               | 113,290        | 59.48              | 969.44           |
| Cauvery               | 34,270         | 17.99              | 425.00           |
| West Flowing Rivers   | 24,250         | 12.73              | 1998.83          |
| Godavari              | 4,410          | 2.31               | 49.97            |
| North Pennar          | 6940           | 3.64               | 32               |
| South Pennar          | 4370           | 2.29               |                  |
| Palar                 | 2970           | 1.56               |                  |
| <b>Total</b>          | <b>190,500</b> | <b>100</b>         | <b>3,475.24</b>  |

| Drainage                  |             | Area   |    | Districts                                                                                      |
|---------------------------|-------------|--------|----|------------------------------------------------------------------------------------------------|
| Basin                     | Sub basin   | Sq. Km | %  |                                                                                                |
| <b>Godavari</b>           |             | 4405   | 2  | Bidar                                                                                          |
| <b>Krishna</b>            | Bhima       | 19345  | 10 | Bidar, Vijayapura, Kalaburagi, Yadgiri                                                         |
|                           | Malaprabha  | 19233  | 10 | Belagavi, Bagalakote, Vijayapura, Dharwad                                                      |
|                           | Tungabhadra | 37786  | 20 | Ballari, Koppla, Raichur, Davanagere, Gadag, Haveri, Chikmagalur, Shivamogga and Uttarakannada |
|                           | Upper       | 17685  | 9  | Belagavi, Vijayapura                                                                           |
|                           | Vedavathi   | 19222  | 10 | Ballari, Hassan, Chitradurga, Tumakuru                                                         |
| <b>Cauvery</b>            | Arkavati    | 4500   | 2  | Bengaluru urban,                                                                               |
|                           | Hemavathi   | 5006   | 3  | Hassan, Chikkamagalur                                                                          |
|                           | Kabini      | 5160   | 3  | Kodagu, Mysuru                                                                                 |
|                           | Simsa       | 7810   | 4  | Bengaluru, Mandya, Hassan                                                                      |
|                           | Suvarnavati | 4050   | 2  | Chamarajanagara                                                                                |
|                           | Upper       | 7747   | 4  | Kodagu, Mandya, Mysore                                                                         |
| <b>West Flowing River</b> | Kalinadi    | 9291   | 5  | Belagavi, Dharwad, Uttarakannada                                                               |
|                           | Netravati   | 7057   | 4  | Kodagu, Hassan, Dakshina Kannada                                                               |
|                           | Sharavati   | 5540   | 3  | Uttarakannada, Shivamogga                                                                      |
|                           | Sita swarna | 4344   | 2  | Dakshinakananda, Shivamogga                                                                    |
| <b>Palar</b>              |             | 2826   | 1  | Kolar                                                                                          |
| <b>Pennar</b>             |             | 7146   | 4  | Bengaluru Rural                                                                                |
| <b>Ponnaiyar</b>          |             | 2638   | 2  | Bengaluru urban, Bengaluru rural                                                               |

Source: Central Water Commission (CWC), Govt of India.



Map – 9 River System of Karnataka

## 2.7 Major Reservoirs of Karnataka:

In Karnataka for effective usage of water for various purpose of civil supply, irrigation and hydroelectricity major and minor reservoirs are undertaken. The hydroelectric generation reservoirs are Linganamakki, Supa and Varahi and other major reservoirs are built across the rivers of Krishna river basin and Cauvery river basin. The details of the major reservoir of Karnataka are given in **Table -4**.



**Table -4: Details of the Major Reservoir of Karnataka**

| Sl. No | Reservoirs   | River       | FRL in feet above MSL | Gross Storage Capacity in TMC | Height of the dam in meters | Length of the Dam in meters |
|--------|--------------|-------------|-----------------------|-------------------------------|-----------------------------|-----------------------------|
| 1      | Linganamakki | Sharavati   | 1819.00               | 156.62                        | 61.26                       | 2749.29                     |
| 2      | Supa         | kali        | 1849.92               | 147.54                        | 101                         | 331.29                      |
| 3      | Varahi       | Varahi      | 1949.50               | 35.2                          | 59                          | 580                         |
| 4      | Harangi      | Harangi     | 2859.00               | 8.5                           | 53                          | 845.8                       |
| 5      | Hemavathi    | Hemavathi   | 2922.00               | 35.76                         | 58.5                        | 4692                        |
| 6      | K.R.S.       | Cauvery     | 124.80                | 45.05                         | 42.62                       | 2621                        |
| 7      | Kabini       | Kabini      | 2284.00               | 19.52                         | 59.44                       | 2732                        |
| 8      | Bhadra       | Bhadra      | 2158.00               | 71.5                          | 59.14                       | 1708                        |
| 9      | Tungabhadra  | Tungabhadra | 1633.00               | 132.47                        | 49.39                       | 2443                        |
| 10     | Ghataprabha  | Ghataprabha | 2175.00               | 51.16                         | 53.34                       | 10183                       |
| 11     | Malaprabha   | Malaprabha  | 2079.50               | 37.73                         | 43.13                       | 154.52                      |
| 12     | Almatti      | Krishna     | 1704.81               | 123.25                        | 49.29                       | 1564.85                     |
| 13     | Narayanapura | Krishna     | 1615.00               | 37.965                        | 29.72                       | 10637.52                    |

Source: WRD, Govt. of Karnataka

## 2.8 River Basins of Karnataka:

The state experienced food condition mainly in the basins of Krishna and Cauvery basins. The Krishna basin comprises districts of northern Karnataka with unevenly distributed rainfall and highly rain fed areas the recent flood years of flood during 2019 and 2020 cause severe damage and huge impacts on socio economy of these district. The Cauvery river basin plays an important role in agriculture and socio-



economic conditions of the southern districts. Kodagu district faced consecutive three years flood and landslide and cause severe damages to agriculture, horticulture, public infrastructure, and public property as well. The release of water from the Cauvery basin tributaries and from the reservoirs to downstream cause of inundation of agriculture land and horticulture crops and damage and loss of property and public infrastructure.

### **2.8.1 Krishna Basin:**

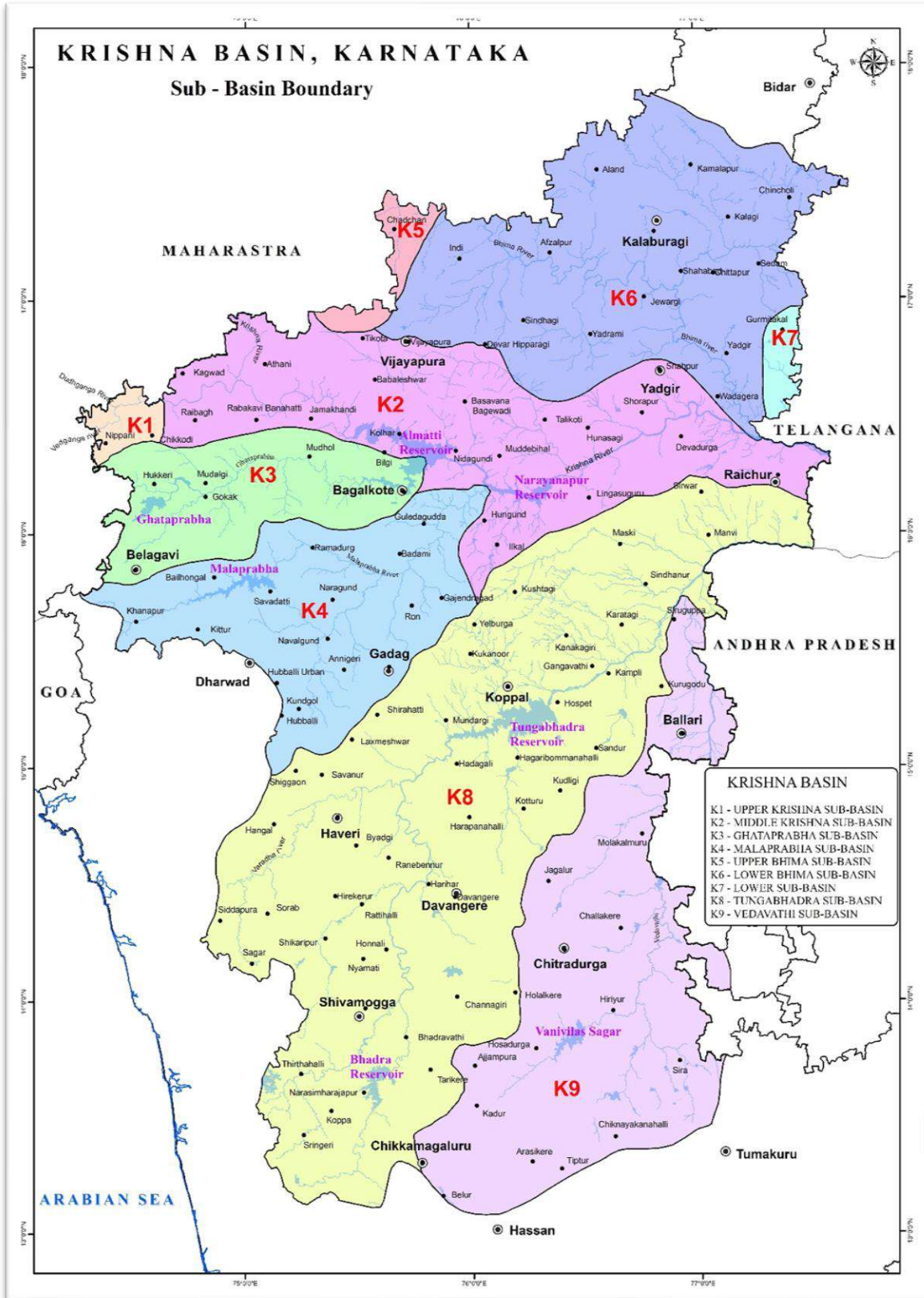
The River Krishna is an Inter-State river in Southern India extends over the states of Karnataka (43.8%), Andhra Pradesh (29.81%) and Maharashtra (26.36%). It is the second largest river in Peninsular India, rises in the Western Ghats at an altitude of 1337 m. near Mahabaleshwar in Maharashtra State. Flows across the whole width of the peninsula, from west to east, for a length of about 1400 km. The catchment area of Karnataka is 113.271 Sq.km, in Andhra Pradesh 76.252 Sq. kms and in Maharashtra 69,425 Sq.km. in Maharashtra the entire catchment area is about 2,58,948 Sq. Kms which is 8% of the total geographical area of the country. The principal tributaries joining Krishna are the Ghataprabha, Malaprabha, Bhima, Tungabhadra and Musi. The Major Reservoirs in Krishna Basin in Karnataka are Bhadra, Tungabhadra, Ghataprabha, Malaprabha, Almatti and Narayanapura.

**Land use:** Major part of the basin (75.86%) is covered with agricultural area. Approximately 10% of the basin area is covered by forest, wasteland covers around 7% of the total basin area and around 4% of the basin area is covered by water bodies. Average annual surface water potential of this basin has been assessed at 78.1 BCM. Out of this, 58.0 BCM is utilizable water. The overall catchment of the basin comprises of 9 sub-basins, which have been further clustered into 391 watersheds each of which represents a different tributary system.

**Soil:** Soil is composed of minerals, mixed with some organic matter, which differ from its parent materials in terms of its texture, structure, consistency, colour, chemical, biological, and other characteristics. Information on the soil profile is also required for simulating the hydrological character of the basin. The important soil types found in the basin are black soils (regur), red soils, laterite and lateritic soils, alluvium, mixed soils (red and black, red, and yellow, etc.) and saline and alkaline soils. Deep black soil is found mostly in Bellary, Dharwad and in certain areas of Bijapur and Gulbarga. Cotton and groundnuts grow well in this type. There are some isolated patches of mixed black and red soils as in Shimoga and Chitradurga. Soil classification in the basin based on soil texture, soil erosion, soil slope and soil productivity, respectively. Most area of the basin is having Fine texture of Soil. Based on texture major part falls under fine texture category (72.62%) with rocky and water bodies accounting for the minimum of 3.31%.

Medium Texture (16.19%) and Coarse Texture (7.7%). Soil erosion is moderate in more than 56% of the total basin area with very severe erosion in 2.5% of the basin area. Slight erosion which is 24.18% of the total basin area has been mostly found in Krishna Lower Krishna Middle, Tungabhadra Lower and Tungabhadra Upper sub-basins.

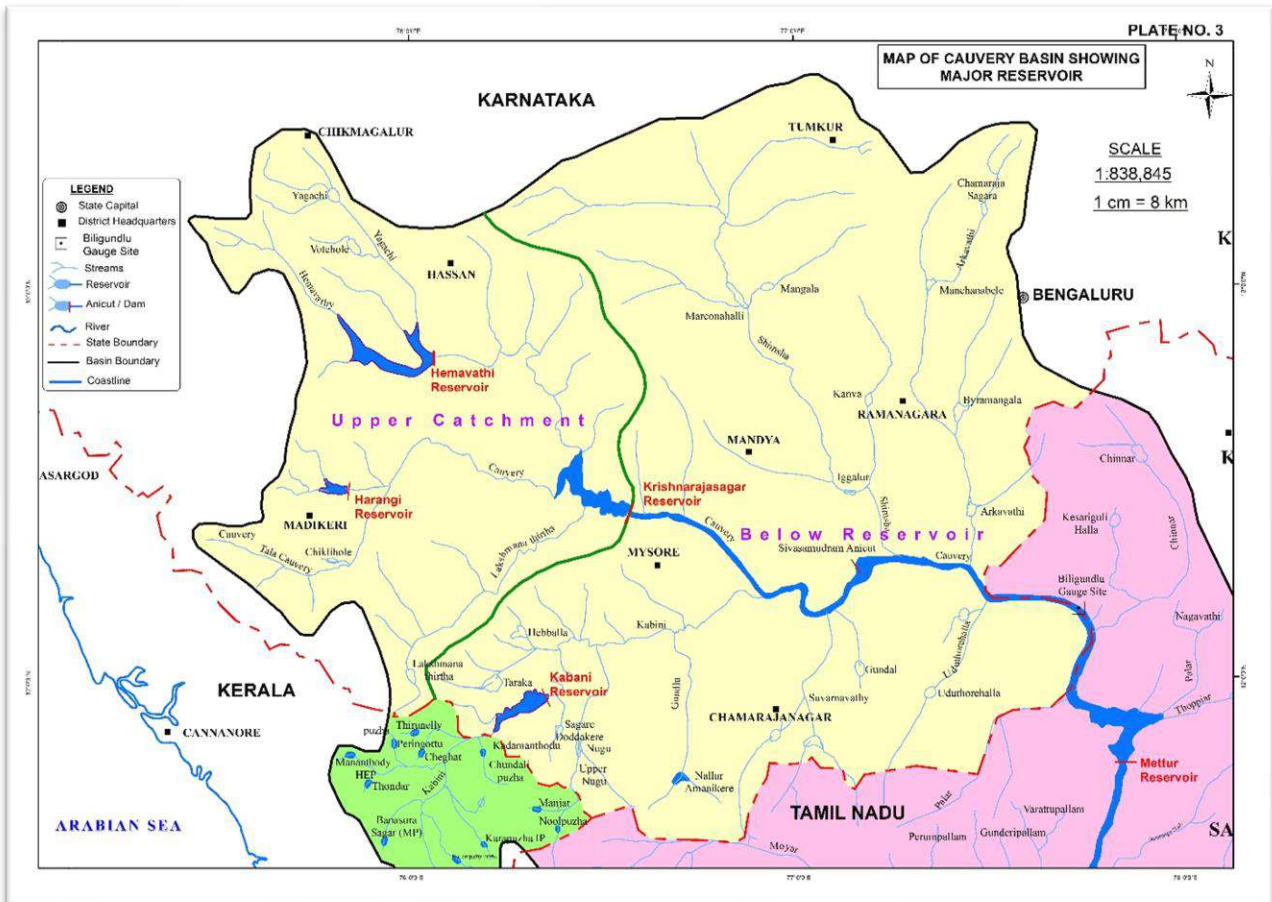
The Krishna basin is split into 9 sub-basins major area contribution namely Bhima lower sub-basin (9.28%), Bhima upper sub-basin (17.58%), Krishna lower sub-basin (15.5%), Krishna middle sub-basin (8.73%), Krishna upper sub-basin (21.4%), Tungabhadra lower sub-basin (16.31%), and Tungabhadra upper sub-basin (11.2%). Central Water Commission, Ministry of Water Resources has set up a network of flood forecasting stations covering all important flood prone rivers. Flood forecasting indicates the forecast or inflow level with its time of occurrence. Two kinds of forecasts are issued based on the utility of the forecast. Inflow forecasts assist in reservoir regulation (full reservoir level & maximum water level) and the level forecast is used for predicting water level (warning level & danger level) well ahead of its occurrence.



Map – 10 Krishna Basin, Karnataka

### 2.8.2 Cauvery Basin:

Cauvery is a Major River flowing in states of Karnataka and Tamilnadu. It is the fourth largest after Godavari and Mahanadi River in south India and the largest in Tamil Nadu which on its course, bisects the state into north and south. Originating in the foothills of Western Ghats at Tala Kaveri, Kodagu in Karnataka. The Major Reservoirs in Cauvery Basin in Karnataka are Harangi, Hemavathi, Krishna Raja Sagara (KRS) and Kabini.



Map – 11 Cauvery Basin, Karnataka

The Cauvery basin extends over states of Tamil Nadu, Karnataka, Kerala, and Union Territory of Puducherry, draining an area of 85,626.23 Sq.km which is nearly 2.7% of the total geographical area of the country with a maximum length and width of about 560 km and 245 km, respectively. Out of this, 42% area lies in Karnataka, 54% area in Tamil Nadu & Karaikkal region of Puducherry and 4% in Kerala. Important tributaries joining from left are the Harangi, the Hemavathi, the Shimsha and the Arkavathi whereas the Lakshman tirtha, the Kabini, the Suvarnavati, the Bhavani, the Noyil and the Amaravati join

from right. A major part of basin is covered with agricultural land accounting to 66.21% of the total area and 20.50 % of the basin is covered by forest area.

About 82.87% falls under moderately shallow to deep (>50 cm) followed by 11.76% extremely shallow (<10 cm) based on the depth of the soil. Based on soil texture, maximum area falls under fine texture (68.01%) followed by medium texture (17.90%). Soil erosion is a problem in this basin since 211357.95 ha area comes under very severe erosion activity comprising of 2.50% of the total basin area. 1512659.84 ha (17.93%) area comes under severe condition and about 50.33% area of the basin which constitutes 4246760.29 ha have moderate erosion. Major portion of the basin is having gentle slope accounting to 66.60% followed by 12.17% having steeply sloped as shown in **Map 11**.

The decadal growth rate has shown a sharp decline in this zone to 11.19% from 17.25% compared to all India decadal growth of 21.34% during 1991–2001. The literacy rate has improved to 73.47%, 65.38% and 67.07% in Tamil Nadu, Andhra Pradesh, and Karnataka respectively as against the national average of 65.38%.

The Cauvery basin constitute of three sub-basins- Cauvery upper, Cauvery middle and Cauvery lower sub-basin. Cauvery upper sub-basin covers an area of 10958.8 sq. km. and consisting of 18 watersheds, middle sub-basin having an area of 57280.98 sq. km and consisting of 86 watersheds and Lower sub-basin covering an area of 17386.45 sq. km. and consisting of 28 watersheds.

### 2.8.3 West Flowing River Basins:

The Western Ghats provides a principal geographical barrier in the path of the Arabian Sea branch of the Southwest monsoon and is principally responsible for the heavy rainfall over the western coastal belt. The Southwest monsoon season (June to September) is the principal rainy season, over 90 % of annual rainfall is realised in this period. The rivers flow at fullest capacity in this season and cause riverine flooding all along the river basins of west flowing rivers.

The rivers in the Western Ghats region generally originate at an elevation ranging from 400 meters to 1,600 meters above the mean sea level, close to the Western Ghats ridge. The rivers generally flow westward and meet the Arabian Sea after a short run varying from 50 kms to 300 kms. These rivers are very steep in the upper reaches and fairly steep in the middle reaches and relatively flat gradients near the Sea. Major West flowing rivers are Mandavi, Kali, Bedthi (or Gangavali), Aghnashini, Sharavathi and

Vekatapura. The other west-flowing rivers, which run through Karnataka, are the Chakra Nadi, the Varahi, the Netravathy, and the Barapole. 1.10

# 03

---

## FLOOD VULNERABILITY OF KARNATAKA, RIVER BASIN APPROACH

---

|                                                              |     |
|--------------------------------------------------------------|-----|
| 3.1 Floods in Karnataka .....                                | 37  |
| 3.2 Floods During 2021 .....                                 | 42  |
| 3.3 Urban Floods .....                                       | 57  |
| 3.4 Flood Hazard Zonation Basin Approach .....               | 63  |
| 3.5 Flood Hazard Zonation of Krishna Sub-Basins .....        | 64  |
| 3.6 Flood Hazard Zonation of Cauvery Basin .....             | 108 |
| 3.7 Flood Hazard Zonation of West flowing River Basins ..... | 112 |





## FLOOD VULNERABILITY OF KARNATAKA, RIVER BASIN APPROACH

### 3.1 Floods in Karnataka

In past two decades Karnataka has been frequently confronted and faced extreme weather events with various disasters such as drought, flood, hailstorm, etc., causing enormous loss and damage to life, property. Karnataka has experienced 8 years of flood situation including recent 4<sup>th</sup> consecutive years of floods of 2018, 2019, 2020 and 2021 in last decade. The rare severity floods carrying huge river flows were of rare severity.

The frequency range of flood in Karnataka is 2-8 years during 2005-2021. Floods are common in the districts of Coastal and Malnad region in the range 6-8 years followed by some taluks of north Karnataka in districts of Bidar, Yadgir, Kalaburagi and Raichur districts. North interior Karnataka districts more vulnerable flood compared to south interior districts, the flood frequency of Karnataka during 2005-2021 is shown in the **Map- 12**.

The rivers in Karnataka are not perennial in nature and they usually flow to their full capacity only when the catchment areas get good amount of rainfall during the SW Monsoon season. In the events of Excess rainfall during the season, an extreme volume of water is carried by rivers, creeks, and many other geographical features into areas where the water cannot be drained adequately therefore the flood occurs. The cause of flood mainly due formation low pressure with associated with upper air cyclonic circulation results very heavy to extremely heavy rainfall and also seasonal monsoon heavy rainfall in part of western Ghats and also associated with huge discharges released from the upper reservoirs of Maharashtra has compounded effects and damages and causing flood situation in Karnataka.

During 2005 State received moderate to heavy rainfall in the months of June and July. The spell of heavy rainfall in the State commenced from 23rd July, 2005 and lasted for about three weeks. These heavy rains filled up almost all reservoirs and caused unprecedented floods in the major rivers of the State.

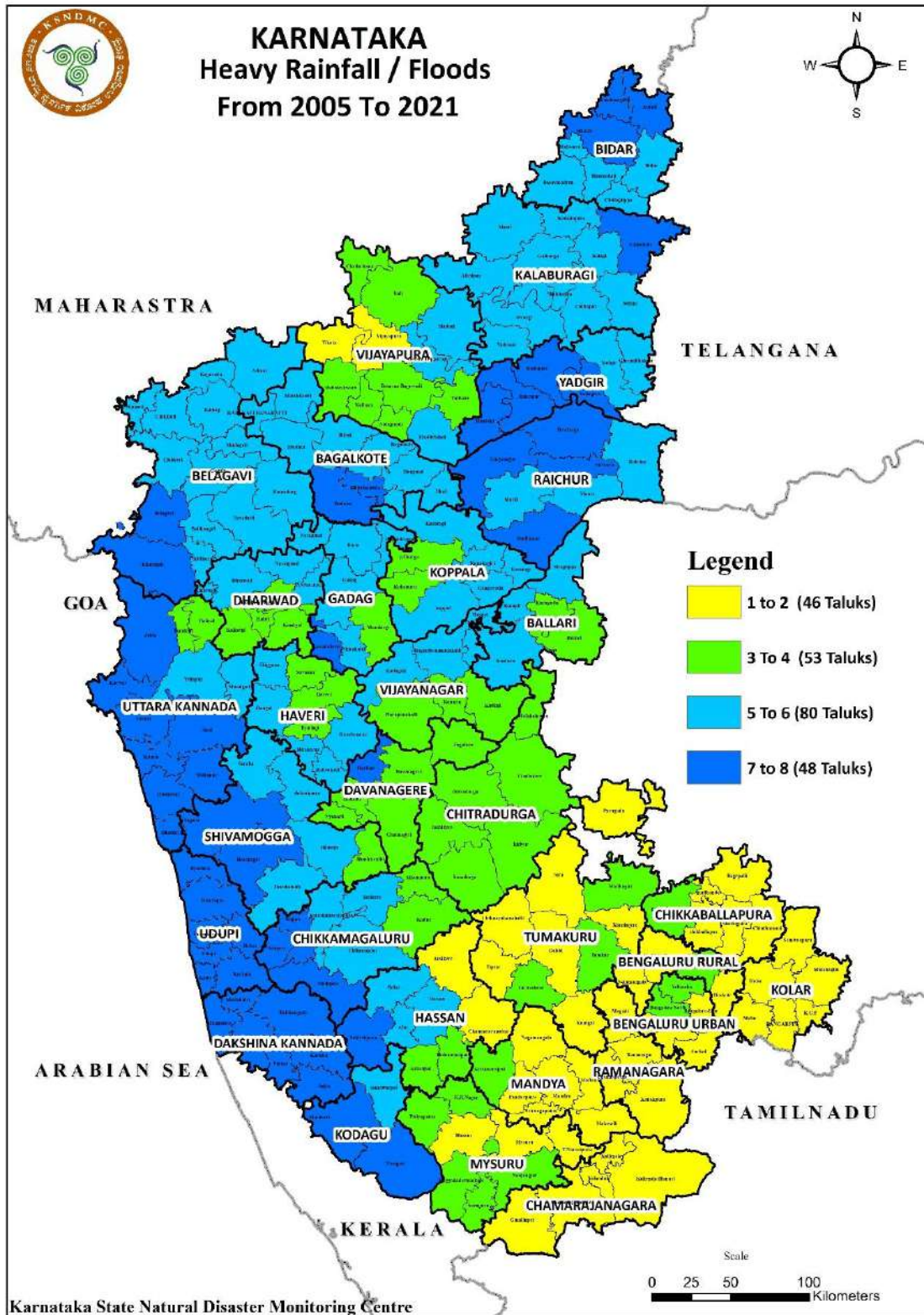
All reservoirs in the State (KRS, Harangi, Kabini, Tungabhadra, Hemavathi, Almatti, Narayanpur, Hidkal, Bhadra) are overflowing and the excess water is being released into the rivers leading to flood in the villages downstream. A total of 1290 villages have been affected of which 184 villages are submerged, about 29.05 lakh population are affected and cause of 123 human death and loss of 11,596 cattles/livestock. Its estimated About 74,027 houses are damages and about 1.63 lakh ha. agriculture area affected by flood.

During 2006 the successive flood situation continued in the districts of Bagalakote, Belagavi, Vijayapura, Kalaburagi and Raichur and about 127 villages are flood affected in districts of Kalaburagi, Vijayapura, and Belagavi districts. About 21,017 people from 5,094 families have been evacuated. Road communication was cut off in approximately 21 villages.

Due to deep depression during 21<sup>st</sup> June 2007 create havoc flood situation in districts of Dakshina Kannada, Shimoga, Chickmagalur, Kodagu, Udupi, Hassan, Uttara Kannada, Raichur, Kodagu, Bagalkote, Mangalore, Mysore, & Koppal. 39 deaths were reported from districts of Belgaum, Madikeri, Bellary, Shimoga, Gulbarga, Karwar and Koppal. 831 houses were fully damaged.

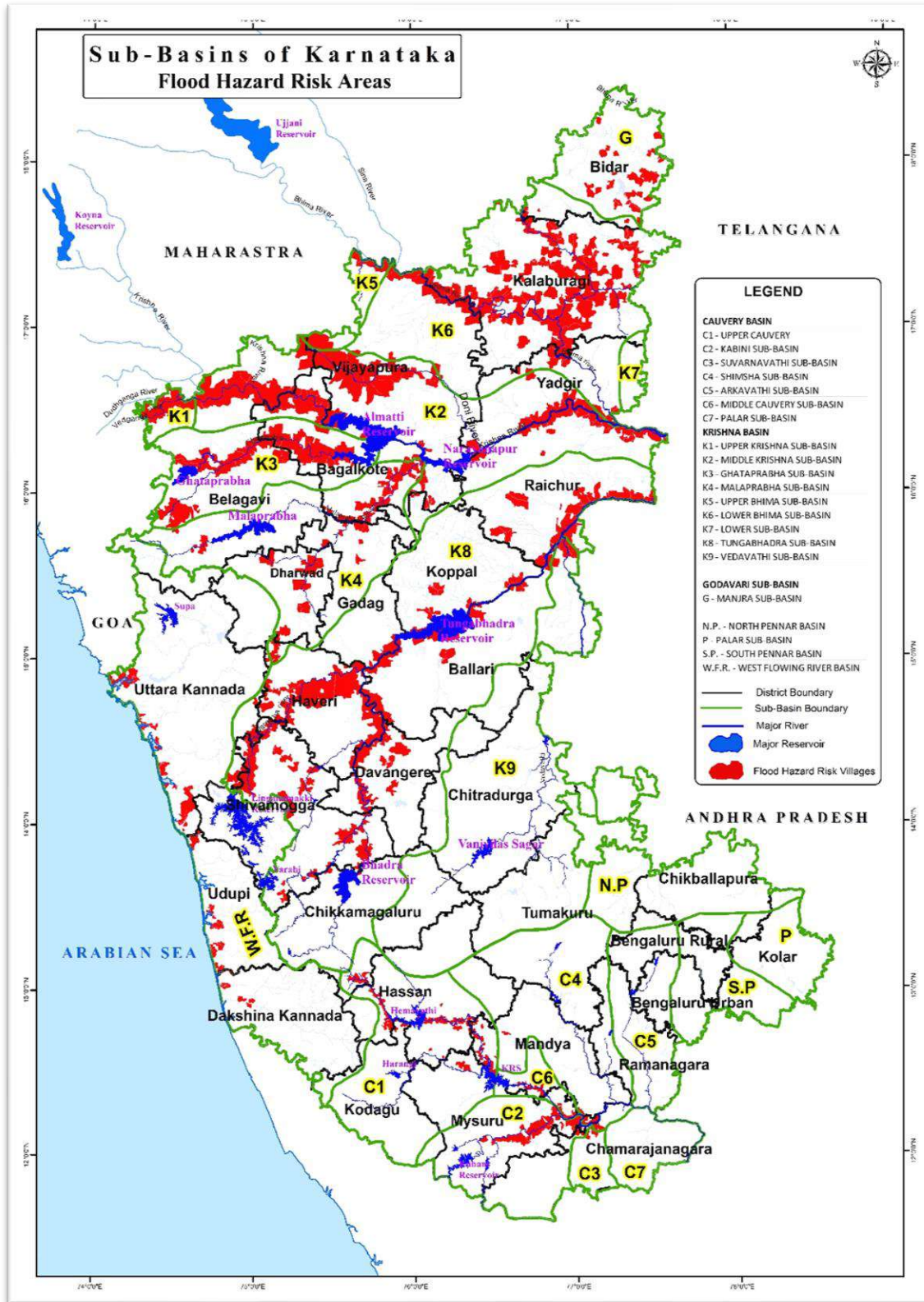
During 2009, the state received heavy rainfall of 377 mm in 24hrs which is highest in 100 years and 70% of the annual rainfall and departure ranges from 177 to 924% in five days in 15 districts of 84 taluks of north interior Karnataka which covers 63% of the state total area affected by heavy rainfall and severe flood and estimated loss of 19 thousand crores. Due to influence of well-marked low-pressure area over east central Arabian Sea and adjoining coastal areas of Karnataka during 2014 from 3rd week of August to till the end of August recorded high rainfall with 251% departure from normal which is highest in the last 43 years. During 2016 well marked low pressure area along with an associated upper air cyclonic circulation caused flood situation arises in north interior districts which comprises of black cotton soils which could not withstand the heavy downpour causes overland flows of rivers caused extreme damage for harvested crops to the farming community.

During 2018 the flood and rainfall induced Landslides occurred in Malnad (Kodagu, Chikmagalur, Hassan, Shivamogga) and Coastal Districts (Dakshina Kannada, Udupi & Uttara Kannada) of Karnataka due to above the normal rainfall. After 2018 flood followed by 2019 flood incident due to heavy downpour of 224 mm (3<sup>rd</sup> to 10<sup>th</sup> August) and some of the district received more than 700% departure from normal especially in North interior, Malnad and coastal region the situation further intensified by record discharge of water release caused extreme flooding and landslides in 103 taluks of 22 districts. Under the influence of cyclonic circulation, the state faced 3<sup>rd</sup> consecutive flood situation in part of north interior district, Malnad and coastal districts during 2<sup>nd</sup> fortnight of august, September and October 2020 as many 23 districts have been affected due to heavy rain, floods, and landslides.



Map –12 Flood Frequency of Karnataka





Map – 13 Flood risk areas of Karnataka

**Table – 5 Loss and Damages due to Floods/Heavy Rainfall in Karnataka during 2018 to 2020**

| Sl No | Year    | Major Flood Disaster Events                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | 2018-19 | <b>Floods/ Heavy Rainfall: 7 Districts and 25 taluks</b> <ul style="list-style-type: none"> <li>• 23,123-hectare Agriculture Crop loss</li> <li>• 72709-hectare Horticulture crop loss</li> <li>• 2.26 Lakh Ha Plantation crop loss</li> <li>• Human Death - 67</li> <li>• Animal death – 240</li> <li>• House damage – 7865</li> <li>• Damage to Roads – 6604.54 Kms</li> <li>• Damage to bridges - 670 Nos</li> <li>• Tanks (MI and ZP) - 930 nos</li> <li>• Damage to Govt Building - 2917 nos</li> <li>• Water supply and Sanitation - 55 nos</li> </ul> Estimated Loss: 3709.89 Crores.                                                                        |
| 2     | 2019    | <b>22 Districts and 103 taluks flood affected</b> <ul style="list-style-type: none"> <li>• 7,54,191-hectare Agriculture Crop loss</li> <li>• 1,09,492-hectare Horticulture crop loss</li> <li>• 1,06,425-hectare Coffee Crop loss</li> <li>• 244.48-hectare Sericulture crop loss</li> <li>• Animal death – 3400</li> <li>• Human Death - 91</li> <li>• House damage – 126701</li> <li>• Damage to Roads - 21,818Kms</li> <li>• Damage to bridges - 2913 Nos</li> <li>• Tanks (MI and ZP) - 1550 nos</li> <li>• Damage to Govt Building - 11063 nos</li> <li>• Water supply and Sanitation - 2624 nos</li> </ul> Estimated Loss: 33864.22 Crores.                   |
| 3     | 2020    | <b>23 Districts of 131 Taluks are flood affected</b> <ul style="list-style-type: none"> <li>• 17,04,893-hectare Agriculture Crop loss</li> <li>• 1,81,584-hectare Horticulture crop loss</li> <li>• 55,808-hectare Plantation Crop loss</li> <li>• 26,311-hectare Desilting and Agriculture Land loss</li> <li>• Human Death - 90</li> <li>• Animal death – 1841</li> <li>• House damage – 44892</li> <li>• Damage to Roads - 36975.72Kms</li> <li>• Damage to bridges - 3946 Nos</li> <li>• Tanks (MI and ZP) - 614 nos</li> <li>• Damage to Govt Building - 7433 nos</li> <li>• Water supply and Sanitation - 273 nos</li> </ul> Estimated Loss: 23185.64 Crores. |

The floods cause loss of human life and cattle's and enormous damage of houses, Agriculture / Horticulture sector and infrastructure in the state. The seasonal standing crops will be destroyed by the flowing water or due to prolonged inundation. But Horticulture crops, mostly the perennial crops will face two types of problem. Either the trees / plants get washed away or due to inundation and excess moisture causes spread of diseases and destroy the yield. The severity of flood is uneven and creates different flood situation and the number of taluks affected by flood and estimated loss is varies always. The losses in in different sectors and estimated loss in last decade is shown in **Table-5**.

Even after effect of flood in the state is also dreadful. The possibility of Epidemic Outburst amongst the Human population is a major concern. Similarly, the spread of diseases in the Livestock's is also quite common in the area. Maximum flood risk areas specifically in the Krishna basin & Cauvery basin. are shown in **Map – 13**.

### 3.2 Floods During 2021

In 2021, the State has been persistently experiencing extreme events since May 2021. Cyclone Tauktae during May, had caused damages to critical infrastructure in Coastal and parts of Malnad districts. During the South-West monsoon (June to Sep), a large part of the State experienced heavy rain resulting in floods and landslides, causing huge damages to crops, houses and critical infrastructure. During the North-east Monsoon due to depression over the Bay of Bengal and a trough over the Arabian sea during October, the State experienced two extreme events and the second event during 21st to 25th October. In November due to 2 successive depressions over the Bay of Bengal and a trough in the Arabian Sea caused unprecedented and incessant rainfall over the State.

**During the Pre-Monsoon** the cyclone hitting the western shores of India- Cyclone Tauktae is the fourth cyclone in the consecutive years to have developed in the Arabian Sea. Apart from this, the cyclones in the region usually are seen post-monsoon, however, this is also the fourth cyclone to form in the pre-monsoon period and of high intensity. Under the influence of the Extremely Severe Cyclonic Storm - TAUKTAE over the Arabian Sea, during 14 to 17th May 2021, major parts of Coastal districts and some parts of Malnad districts of the State have recorded heavy to extremely heavy rainfall. It was accompanied with strong tidal waves and gusty winds resulting in significant wave height reaching maximum up to 3.2-5.1 metres along the Karnataka Coast and surface current speeds reaching 40-50 kmph and gusting up to 60-70 kmph were recorded along and off Karnataka Coast. As a result, 125 villages of 8 Coastal, Malnad and North Interior districts have been affected at various degrees causing damage to critical infrastructure.

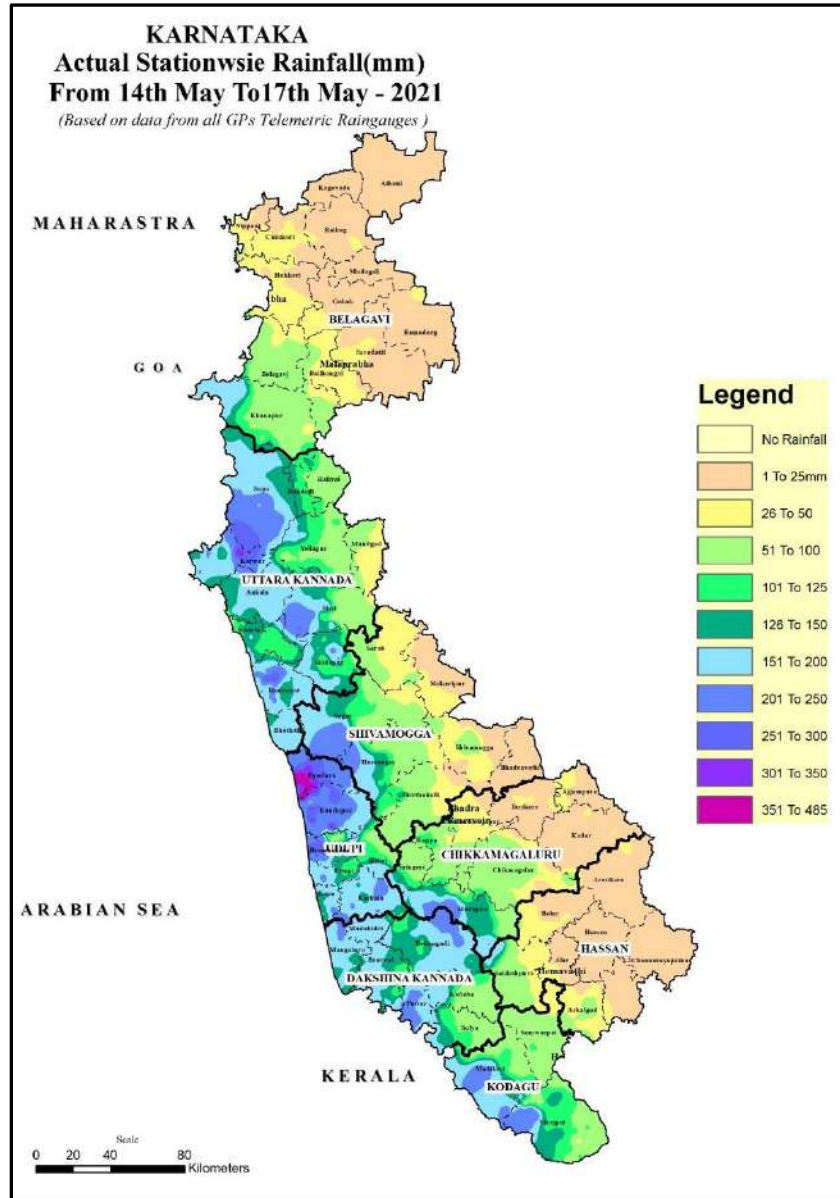




**Map – 14 Extremely Severe Cyclonic Storm “TAUKTAE” observed track during 14-19th May, 2021 over Arabian Sea. (Source: IMD)**

Synoptic features of extremely severe cyclonic storm “TAUKTAE” (pronounced as Tau’Te) and its genesis, intensification & movement during 11 – 19th May, 2021 over Arabian Sea:

The cyclone, which triggered heavy to Very Heavy Rainfall rains and strong wind, caused maximum damage in the districts of Coastal and Malnad Regions. The Districts of Udupi, Uttara Kannada, Dakshina Kannada, Kodagu, Chikkamagaluru, Shivamogga, Hassan and Belagavi received Heavy rainfall on 14<sup>th</sup> May 2021 which continued till 17<sup>th</sup> May 2021.



**Map – 15 Cumulative Actual Rainfall (mm) – 14<sup>th</sup> to 17<sup>th</sup> May 2021**

**Cumulative Actual Rainfall (mm) Recorded During the period 14<sup>th</sup> to 17<sup>th</sup> May 2021:**

- **Highest Rainfall of 485 mm Recorded in Nada Grampanchayath, Kundapura Taluk, Udupi district.**

- **700 Stations in Malnad, Coastal and Belagavi districts** have recorded more than **100 mm rainfall**, In that 158 stations recorded >200mm, **19 stations have recorded >300 mm** and **2 stations recorded >400 mm**.

**Table – 6 District wise No. of Stations Recorded >100 mm of Rainfall for the period 14<sup>th</sup> to 17<sup>th</sup> May 2021**

| Sl.No | District         | No. of Stations Recorded >100 mm | Highest rainfall (mm) | Highest Rainfall (mm) Location |
|-------|------------------|----------------------------------|-----------------------|--------------------------------|
| 1     | Uttara Kannada   | 175                              | 352                   | Kadra (GP)                     |
| 2     | Udupi            | 159                              | 485                   | Nada (GP)                      |
| 3     | Dakshina Kannada | 219                              | 236                   | Malavanthige (GP)              |
| 4     | Kodagu           | 48                               | 239                   | Bhagamandala                   |
| 5     | Shivamogga       | 35                               | 249                   | Kudarur (GP)                   |
| 6     | Belagavi         | 13                               | 172                   | Jamboti                        |
| 7     | Chikkamagaluru   | 26                               | 236                   | Idakani (GP)                   |
| 8     | Hassan           | 1                                | 203                   | Devalkere (GP)                 |

**Table – 7 District-wise Rainfall Pattern for the period 14<sup>th</sup> to 17<sup>th</sup> May 2021 is given below**

| Sl. No. | District         | Cumulative Rainfall Pattern (14th to 17th May 2021) |             |             |                   |
|---------|------------------|-----------------------------------------------------|-------------|-------------|-------------------|
|         |                  | Normal (mm)                                         | Actual (mm) | % Departure | Rainfall Category |
| 1       | Uttara Kannada   | 8                                                   | 145         | 1690        | Large Excess      |
| 2       | Udupi            | 19                                                  | 178         | 844         | Large Excess      |
| 3       | Dakshina Kannada | 20                                                  | 134         | 566         | Large Excess      |
| 4       | Kodagu           | 19                                                  | 104         | 446         | Large Excess      |
| 5       | Shivamogga       | 13                                                  | 69          | 423         | Large Excess      |
| 6       | Belagavi         | 8                                                   | 33          | 337         | Large Excess      |
| 7       | Chikkamagaluru   | 15                                                  | 57          | 270         | Large Excess      |
| 8       | Hassan           | 16                                                  | 25          | 54          | Excess            |

**During the South-West Monsoon** a low pressure area has formed in Northwest Bay of Bengal on 22nd July, 2021. The surface level winds and winds at 1.5 Kms above the surface level has been

so stronger off coast to Karnataka and Maharashtra as a result of low pressure formation in North Bay. These winds were laden with high amounts of moisture from an overheated Arabian Sea. As these winds rushed towards the low pressure area with abundant moisture in it, and they encountered the high range of the Western Ghats, resulted in heavy to extreme heavy rains. Also an Off-Shore trough at mean sea level runs from South Gujarat Coast to Kerala Coast was strong. Due to the above weather conditions associated synoptic features resulted in widespread heavy to very heavy rains with isolated places extremely heavy rains all along the Coastal, Malnad & adjoining interior Karnataka districts during the period from 21st July to 26th July, 2021.

Parts of Coastal, Malnad, and North Interior Karnataka of the State received incessant torrential rainfall during 21st to 26th July triggering landslides and floods in Uttara Kannada, Belagavi, Dharwad, Chikkamagaluru, Kodagu, Shivamogga, Hassan, Haveri, and Davanagere districts. Certain places in Uttara Kannada received 400 mm to 500 mm extremely heavy rainfall in a span of 24 hours, such extreme rainfall events are comparable to the typical rainfall dumped by tropical cyclones during landfall. Subsequently, rainfall fall, though with less intensity compared to the July 22nd rainfall, continued for 23rd and 24th July. Further, the incessant very heavy to extremely heavy rainfall in the upper Krishna catchment area of Maharashtra has generated copious inflows into the reservoirs in Upper Krishna reservoirs, filling the dams in record time. As a result, river Krishna and its tributaries in middle and lower Krishna basin were in spate causing flooding of low lying villages of Belagavi, Bagalkot, Dharwad, Haveri, Raichur, Yadgir, Vijayanagar, Vijayapura and Gadag districts. Subsequently, incessant heavy rains in Coastal and Malnad region caused flash floods in large parts of Uttara Kannada district and in parts of Shivamogga, Hassan, Chikkamagaluru and Kodagu districts. In total, 15 districts were affected.

**Cumulative Rainfall (mm) Recorded during the peak rainfall period 21<sup>st</sup> to 26<sup>th</sup> July 2021:**

On 23rd July 2021 Dongri Gp in Ankola Taluk of Uttara Kannada District received 541 mm highest rainfall in 24 hrs and 175 stations have recorded extreme rainfall events (more than 200 mm rainfall in 24 hrs). During the peak rainfall period 21st to 26th July 2021 Nitiru & Kairakunda stations in Shivamogga district and Itguli, Kasalrock, Manjaguni & Bandal stations in Uttara

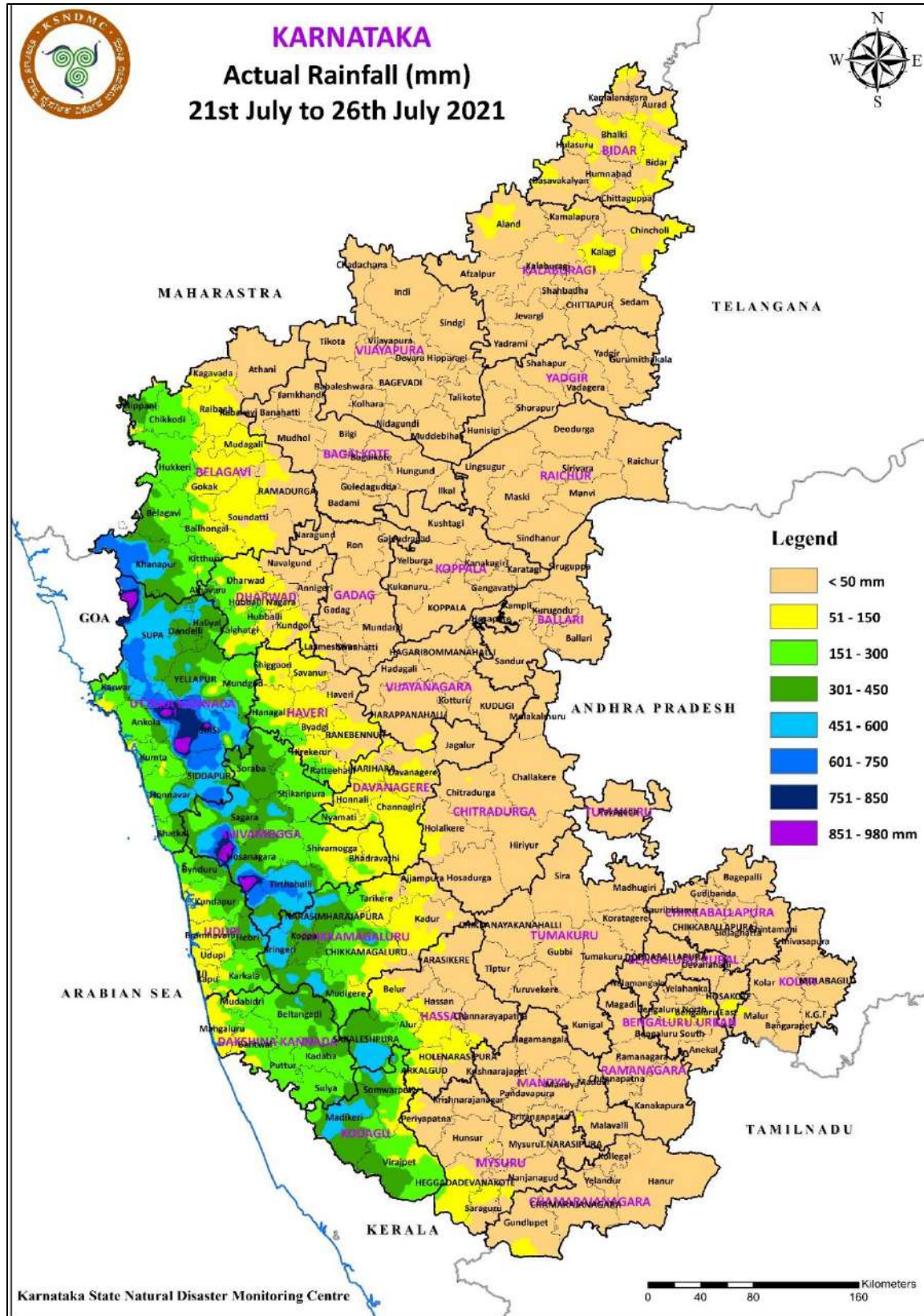
Kananda district have recorded more than 900 mm rainfall in just 6 days. These large amounts of daily rainfall would have anyway qualified as an extremely heavy rainfall event.

In the Major reservoirs Almatti and Narayanapura dams, anticipating heavy discharge considering incessant widespread heavy rainfall in the upper Krishna catchment region since third week of July 2021. The cumulative inflows from July 22nd to July 28th in 13 major reservoirs of Karnataka was about 339 TMC, which is 39% of the gross capacity of 13 reservoirs.

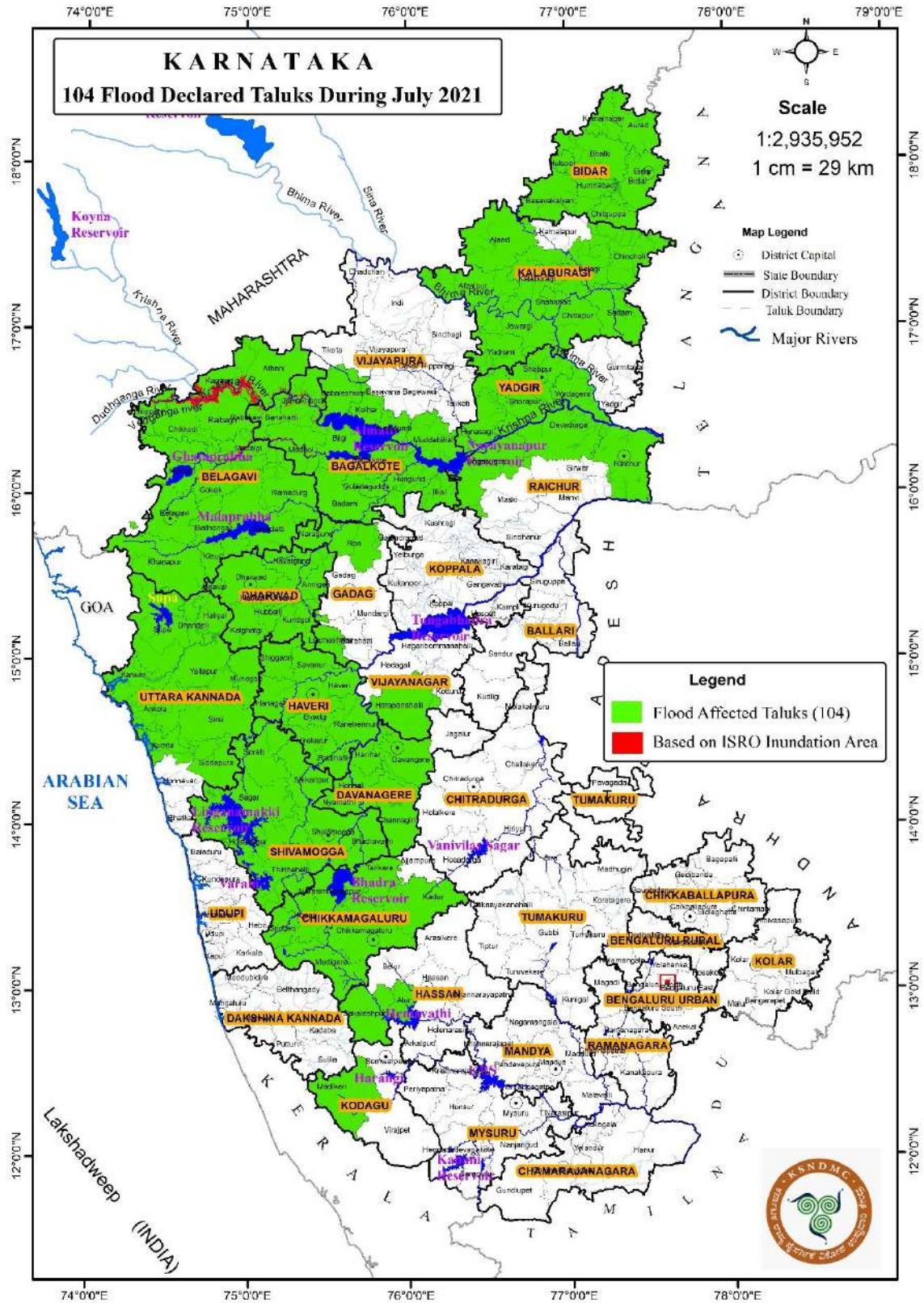
**Table – 8 District wise No. of Stations Recorded >100 mm of Rainfall for the period 21<sup>st</sup> to 26<sup>th</sup> June 2021:**

| Sl.No. | District         | Total Raingauge Stations | No. of Stations Recorded >100 mm | Highest rainfall (mm) | Highest Rainfall (mm) Location, Taluk |
|--------|------------------|--------------------------|----------------------------------|-----------------------|---------------------------------------|
| 1      | Shivamogga       | 275                      | 246                              | 986                   | Nitiru, Hosanagara                    |
| 2      | Uttara Kannada   | 243                      | 240                              | 962                   | Itguli, Sirsi                         |
| 3      | Belagavi         | 534                      | 326                              | 699                   | Jamboti, Khanapur                     |
| 4      | Chikkamagaluru   | 242                      | 124                              | 583                   | Kadabinabail , NR Pura                |
| 5      | Hassan           | 278                      | 53                               | 578                   | Hettur, Sakleshpura                   |
| 6      | Kodagu           | 106                      | 95                               | 560                   | Dundalli , Somwarpet                  |
| 7      | Dakshina Kannada | 241                      | 239                              | 459                   | Navooru, Beltangadi                   |
| 8      | Udupi            | 166                      | 124                              | 439                   | Hebri, Karkala                        |
| 9      | Haveri           | 215                      | 70                               | 362                   | Sammasagi, Hanagal                    |
| 10     | Dharwad          | 151                      | 62                               | 347                   | Benachi, Dharwad Taluk                |
| 11     | Davanagere       | 211                      | 72                               | 287                   | Chinnikatte, Honnali                  |



Map – 16 Cumulative Actual Rainfall (mm) – 21<sup>st</sup> to 26<sup>th</sup> July





Map – 17 Flood Affected Taluks During South-West Monsoon 2021

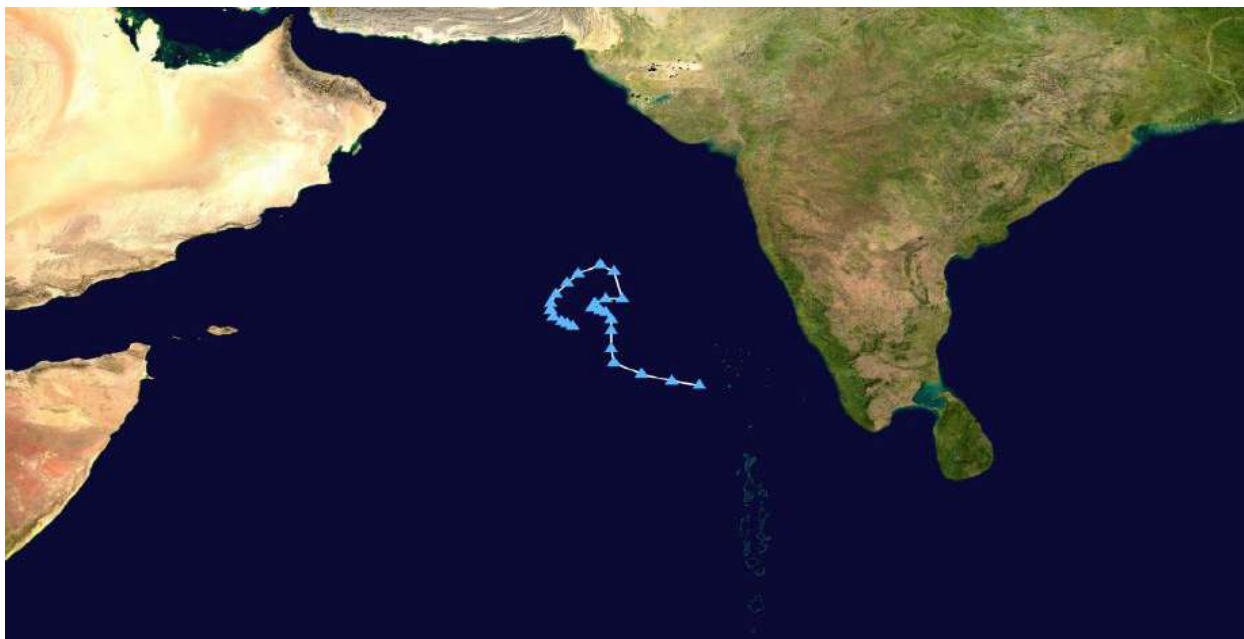
**During the North-East monsoon**, (1st October to 21st November 2021), simultaneous cyclonic circulation and low pressures over Bay of Bengal and Arabian sea resulted in untimely incessant widespread heavy rainfall over the State, especially in the South Interior Karnataka, Malnad and Coastal region.

From 1st October to 21st November 2021, the State received 307 mm as against its normal of 166 mm, recording 85 % more rainfall. 23 out of 31 districts have recorded excess to large excess rainfall. Due to depression over the Bay of Bengal and a trough over the Arabian sea during October, the State experienced two extreme events i.e. one during 6th to 13th recorded a 110% excess rainfall and the second event during 21st to 25th October recorded 123% more than the normal rainfall.

**04<sup>th</sup> to 20<sup>th</sup> Nov 2021- Synoptic features and associated weather systems resulted in rains over Karnataka state**

#### **Depression over East-Central Arabian Sea during 04<sup>th</sup> to 10<sup>th</sup> November 2021**

A Low-pressure area over Southeast Arabian Sea and adjoining Lakshadweep area with associated cyclonic circulation extending up to 4.5 km above mean sea level persisted on 04th. Further, system lay over Southeast and adjoining East central Arabian Sea with associated cyclonic circulation extending up to 5.8 km above mean sea level on 05th. On 06th, it intensified as a Well-Marked Low-Pressure Area over East-central Arabian Sea with the associated cyclonic circulation extending upto 5.8 km above mean sea level. On 07th it intensified into a Depression East-Central Arabian Sea, and the system moved away from Indian coast and thus became unimportant on 10th

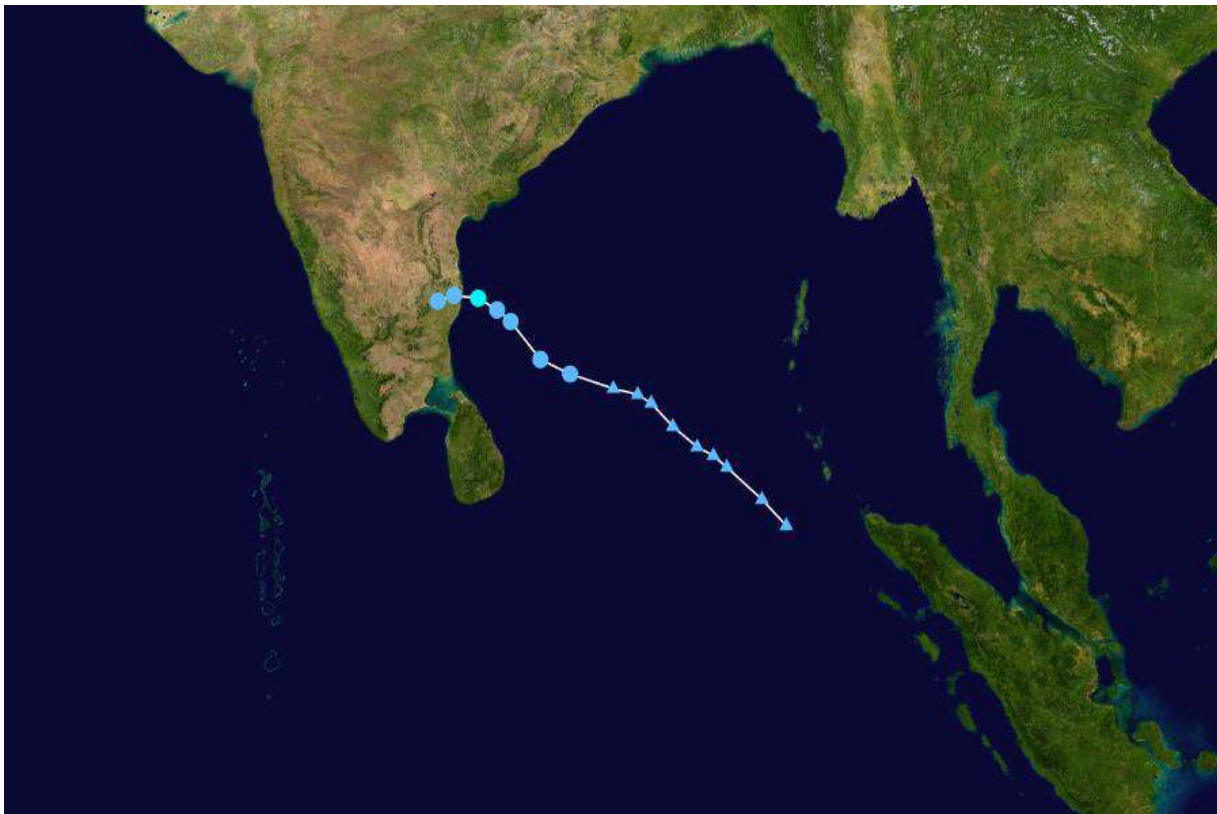


**Map – 18 Depression over East-central Arabian Sea during 04<sup>th</sup> to 10<sup>th</sup> November 2021**

### Depression over South-West Bay of Bengal during 09<sup>th</sup> to 15<sup>th</sup> November 2021

On 09th November, a Low-Pressure area formed over southeast Bay of Bengal & neighbourhood, and associated cyclonic circulation extended up to 4.5 km above mean sea level. Further, the system organized into a well-marked low-pressure area over central parts of South Bay, and associated cyclonic circulation extended up to 5.8 kilometres above mean sea level.

On 10th, it intensified into a depression over the southwest Bay of Bengal, moved and lay centred over southwest & adjoining West-Central Bay of Bengal. By 11th, it weakened into a Well-Marked Low Pressure over north Tamil Nadu and neighbourhood, weakened further into a low-pressure area and lay over north interior Tamil Nadu and neighbourhood and persisted on 12th, 13th. Further on 14th, it weakened into a cyclonic circulation over South Interior Karnataka & adjoining North Interior Tamil Nadu and merged with cyclonic circulation over east-central and adjoining southeast the Arabian Sea off Karnataka North Kerala coasts on 15th.



Map – 19 Depression over South-West Bay of Bengal during 09<sup>th</sup> to 15<sup>th</sup> November 2021

Another Low-Pressure area over the central and adjoining south Arabian sea with the associated cyclonic circulation extending up to 5.8 km above mean sea level persisted on 11th, 12th, 13th, 14th, layover the southeast Arabian Sea off Karnataka - the north Kerala coasts on 15th, 16th, layover East-central Arabian Sea off Goa south Maharashtra coasts and the associated cyclonic circulation extended up to 5.8 km above mean sea level on 17th.

A trough ran from the cyclonic circulation over the southeast Arabian sea to southwest Bay of Bengal across North Kerala and cyclonic circulation over South Interior Karnataka & adjoining north Interior Tamilnadu and extended up to 1.5 km above mean sea level 14th, persisted on 15th, ran from Low-Pressure area over the southeast Arabian sea to Low-Pressure area over the southeast Bay of Bengal extending up to 4.5 km above mean sea level on 16th, ran from the cyclonic circulation associated with the Low-Pressure Area over East-central Arabian Sea off Goa south Maharashtra coasts to south Tamil Nadu and extended up to 4.5 km above mean sea level on 17th.

#### **Depression over South-West Bay of Bengal during 17<sup>th</sup> to 20<sup>th</sup> November 2021**

A low-pressure area formed over Southeast & adjoining Southwest Bay of Bengal with the associated cyclonic circulation extending up to 5.8 km above mean sea level on 17th November. The well-marked low-pressure area intensified into a depression over Southwest Bay of Bengal off north Tamilnadu coast and lay centred at 0830 hours IST on 18th November.

The Depression over north Coastal Tamilnadu moved west-north-westwards with the speed of 12km and lay centred at 0830 hours IST of 19th November 2021 over north Tamilnadu, about 60 km East-Southeast of Vellore and weakened into a Well-marked Low-Pressure area at 1130hrs IST of 19th November and existed as a cyclonic circulation over South interior Karnataka and neighbourhood on 20th November.





**Map – 20 Depression over South-West Bay of Bengal during 17<sup>th</sup> to 20<sup>th</sup> November 2021**

#### **Rainfall Pattern during 1st October to 21st November 2021**

The State received 307 mm of rainfall as against normal rainfall of 166 mm, with percentage departure from normal being 85% , which is considered under Large Excess Category.

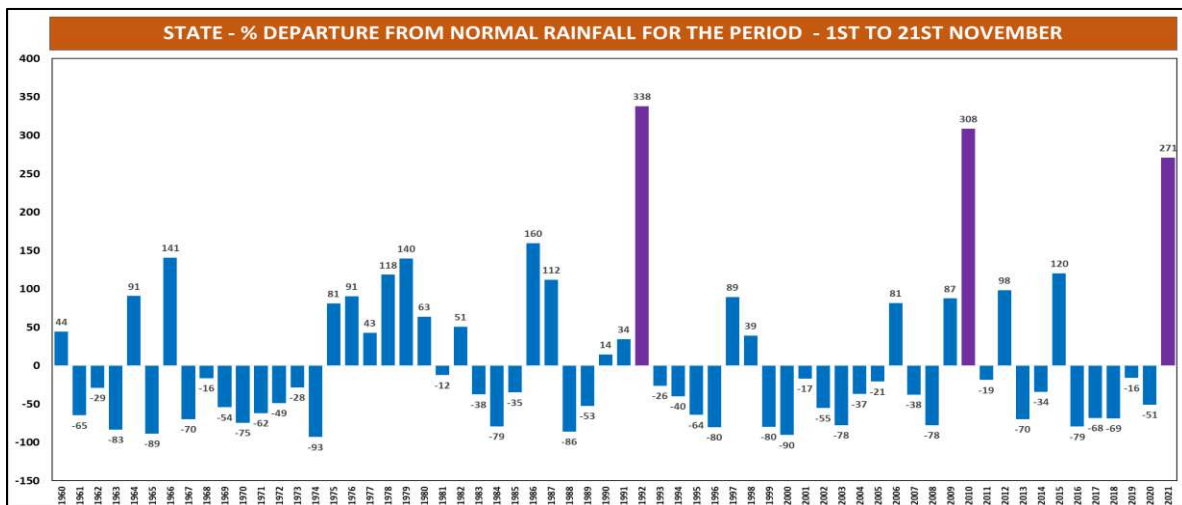
The analysis of region-wise rainfall distribution during the period (1st October to 21st November 2021), shows that the distribution of rainfall was about 145 % Excess Rainfall in South Interior Karnataka (SIK), 7 % Excess Rainfall in North Interior Karnataka (NIK), 111 % Excess rainfall in Malnad and 118 % Excess rainfall in Coastal region in the state.

**Table – 9 Region-wise Rainfall Pattern for the period 1<sup>st</sup> October to 21<sup>st</sup> November 2021 is given below:**

| REGION                   | Normal (mm) | Actual (mm) | % Departure | Category     |
|--------------------------|-------------|-------------|-------------|--------------|
| South Interior Karnataka | 181         | 443         | 145         | Large Excess |
| North Interior Karnataka | 130         | 139         | 7           | Normal       |
| Malnad                   | 205         | 432         | 111         | Large excess |
| Coastal                  | 240         | 524         | 118         | Large Excess |
| State                    | 166         | 307         | 85          | Large Excess |

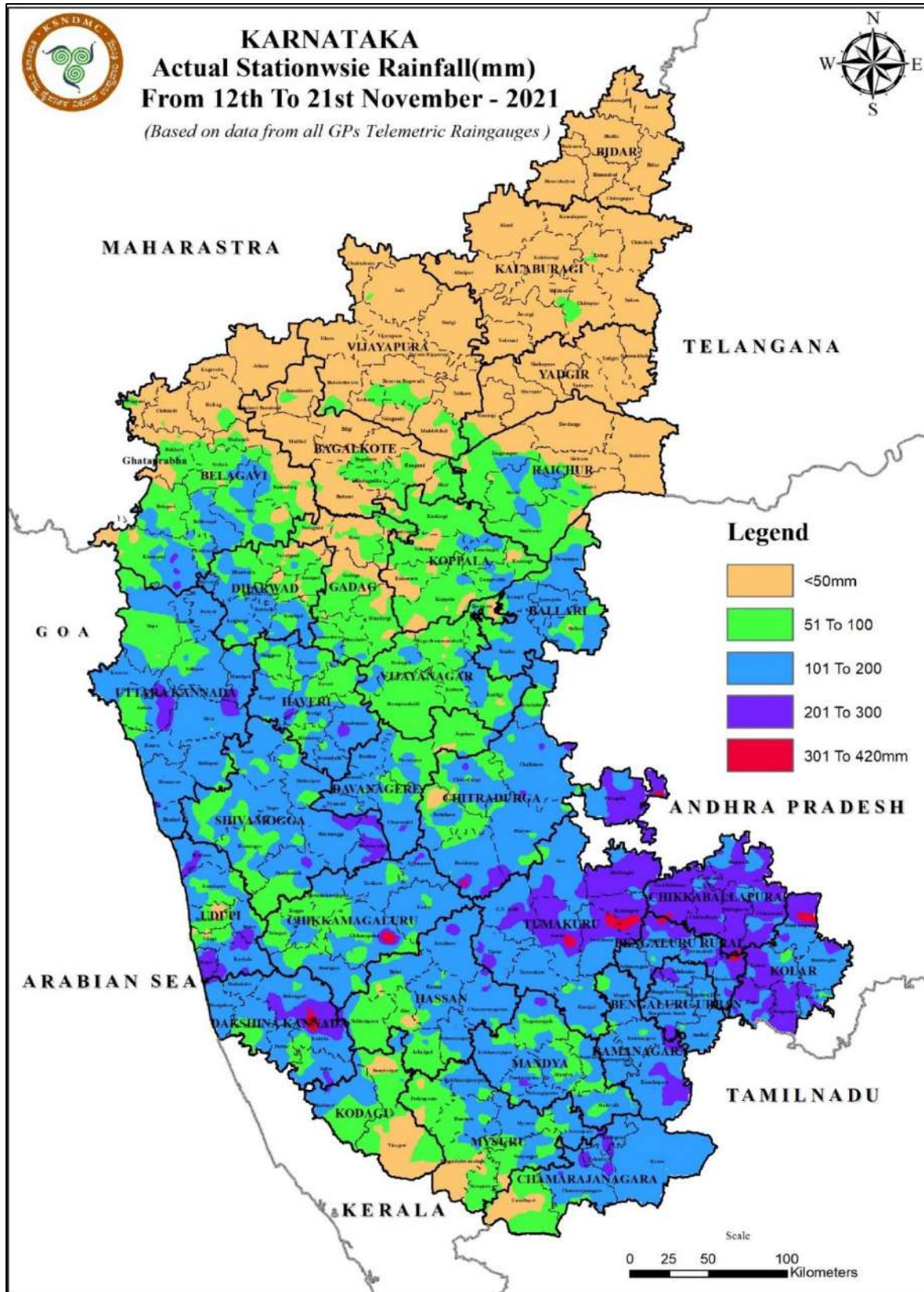
**Table – 10** During the period 1<sup>st</sup> October to 21<sup>st</sup> November 2021, 159 Taluks in 23 Districts received Excess to Large Excess Rainfall. The District-wise Rainfall Pattern is given below:

| Sl.No. | District         | Normal (mm) | Actual (mm) | % Departure | Rainfall Category |
|--------|------------------|-------------|-------------|-------------|-------------------|
| 1      | Chikkaballapura  | 187         | 562         | 201         | Large Excess      |
| 2      | Tumakuru         | 170         | 509         | 199         | Large Excess      |
| 3      | Bengaluru Rural  | 192         | 518         | 170         | Large Excess      |
| 4      | Kolar            | 187         | 490         | 162         | Large Excess      |
| 5      | Chitradurga      | 142         | 345         | 143         | Large Excess      |
| 6      | Udupi            | 284         | 680         | 140         | Large Excess      |
| 7      | Davanagere       | 145         | 345         | 137         | Large Excess      |
| 8      | Bengaluru Urban  | 196         | 449         | 129         | Large Excess      |
| 9      | Mandya           | 197         | 443         | 125         | Large Excess      |
| 10     | Mysuru           | 193         | 434         | 125         | Large Excess      |
| 11     | Chikkamagaluru   | 199         | 445         | 123         | Large Excess      |
| 12     | Dakshina Kannada | 347         | 765         | 121         | Large Excess      |
| 13     | Shivamogga       | 188         | 403         | 115         | Large Excess      |
| 14     | Ramanagara       | 203         | 432         | 112         | Large Excess      |
| 15     | Uttara Kannada   | 174         | 355         | 103         | Large Excess      |
| 16     | Hassan           | 202         | 407         | 101         | Large Excess      |
| 17     | Kodagu           | 256         | 503         | 96          | Large Excess      |
| 18     | Haveri           | 150         | 291         | 95          | Large Excess      |
| 19     | Chamarajanagara  | 223         | 402         | 80          | Large Excess      |
| 20     | Dharwad          | 134         | 209         | 56          | Large Excess      |
| 21     | Vijayanagar      | 142         | 216         | 51          | Large Excess      |
| 22     | Ballari          | 148         | 219         | 48          | Large Excess      |
| 23     | Belagavi         | 123         | 163         | 33          | Large Excess      |



**Figure - 2** State as whole received 129 mm Actual Rainfall during 1st to 21st November 2021 which is highest since 2011 and 3rd highest since 1960.





Map – 21 Actual Rainfall Pattern during 12<sup>th</sup> to 21<sup>st</sup> November 2021

**Table – 11 Loss and Damages due to Floods/Heavy Rainfall in Karnataka during 2021**

| Sl No | Season             | Major Flood Disaster Events                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Pre-Monsoon        | <b>23 Districts of 104 Taluks are flood affected</b> <ul style="list-style-type: none"> <li>• 215.23-hectare Horticulture crop loss</li> <li>• Animal death – 2</li> <li>• House damage – 473</li> <li>• Damage to Roads - 798Kms</li> <li>• Damage to bridges - 76 Nos</li> <li>• Tanks (MI and ZP) - 29 nos</li> <li>• Damage to Govt Building - 71 nos</li> </ul> <p>Estimated Loss: 209.30 Crores.</p>                                                                                                                                                                                                           |
| 2     | South-West Monsoon | <b>23 Districts of 104 Taluks are flood affected</b> <ul style="list-style-type: none"> <li>• 1,94,656 -hectare Agriculture Crop loss</li> <li>• 10076-hectare Horticulture crop loss</li> <li>• 2557-hectare Desilting and Agriculture Land loss</li> <li>• Animal death – 358</li> <li>• House damage – 18719</li> <li>• Damage to Roads - 22725Kms</li> <li>• Damage to bridges – 1779 Nos</li> <li>• Tanks (MI and ZP) - 915 nos</li> <li>• Damage to Govt Building - 5202 nos</li> <li>• Water supply and Sanitation - 137 nos</li> </ul> <p>Estimated Loss: 5690.52 Crores.</p>                                |
| 3     | North-Monsoon      | <ul style="list-style-type: none"> <li>• 78,9563 -hectare Agriculture Crop loss</li> <li>• 12,5442-hectare Horticulture crop loss</li> <li>• 74,530-hectare Plantation Crop loss</li> <li>• 417-hectare Desilting and Agriculture Land loss</li> <li>• Animal death – 376</li> <li>• House damage – 20083</li> <li>• Damage to Roads - 19366Kms</li> <li>• Damage to bridges - 1258 Nos</li> <li>• Tanks (MI and ZP) - 439 nos</li> <li>• Damage to Govt Building - 7711 nos</li> <li>• Water supply and Sanitation - 42 nos</li> </ul> <p>Estimated Loss: 11916.30 Crores.<br/>Estimated Loss: 23185.64 Crores.</p> |

Source: Revenue Dept. Govt. of Karnataka

### 3.3 Urban Floods

Increasing trend of urban flooding is a universal phenomenon and poses a great challenge to city administration and urban planners the world over. Problems associated with urban floods range from relatively localized incidents to major incidents, resulting in cities being inundated from a few hours to several days. Therefore, the impact can also be widespread, including temporary relocation of people, damage to civic amenities, deterioration of water quality and risk of epidemics. The problems posed by urban flooding are quite challenging and aggravate with continuous climate change, with its adverse impact affecting variation in rainfall and intra-city /intra-region disparities in the distribution of rainfall.

There has been an increasing trend of urban flood disasters in India over the past several years whereby major cities in India have been severely affected. The most notable amongst them are Bengaluru, Hyderabad, Ahmedabad, Delhi, Chennai, Mumbai, Surat, Kolkata, Jamshedpur, Srinagar, and Guwahati.

Unplanned development and encroachments of sprawling habitations alongside rivers and Water courses have meddled with the natural streams and watercourses. As a result of this, the runoff has increased in proportion to urbanization of the watersheds causing urban floods. New and intensified phase of urbanization coupled with spatial expansion of urban extents have compounded flood risk in the urban centres.

#### Understanding Urban Flood Hazards

Floods result from a combination of meteorological and hydrological extremes as indicated in the table below. In most cases floods are additionally influenced by human factors. Although these influences are very diverse, they generally tend to aggravate flood hazards by accentuating flood peaks. Thus, flood hazards in built environments have to be seen as the consequence of natural and man-made factors.

Karnataka State also has witnessed frequent floods in major cities causing loss of life and property. In the Past few years, Bengaluru, Mysuru, Tumakuru, Shivamogga, Davanagere, Hubballi-Dharwad, Belagavi, Mangalore, Udupi and other cities have been facing the urban flood events especially during the monsoon season.

Rapid urbanisation associated with unplanned human activities and degradation of environment and encroachments of natural flows have caused severe flood situations in the urban sectors. Therefore, urban flood has emerged as an important issue of disaster management in our country. As we are passing

through the peak process of urbanization, where about 300 Million people are expected to be added to our cities during the course in next two decades, there is a challenging task to ensure that the risks of flood in our cities are reduced.



**Figure – 3 The influence of urbanization on different components of the water cycle**

Towns have grown faster on account of increase/influx of population. Owing to lack of regulation/control, there has been considerable encroachment of flood plains. Damages become serious as a result of inadequate capacity of storm water drainage system. The problem of urban flooding has become serious as witnessed by the urban floods in Karnataka.

The cities of Karnataka mainly Bengaluru, Mangalore and Belagavi are facing flood situation in the past few decades. Especially Bengaluru capital city of Karnataka has grown to four times its size, from 250 sq. km to 800 sq. km today. Since the 1970s, the green cover in the city has shrunk from 68% to less than 3% today, the built-up area has shot up from 7% to more than 90% and shrinking of urban wetland is about



56% and 79% of the water bodies are encroached, a cascading system of more than 1,000 lakes have vanished.

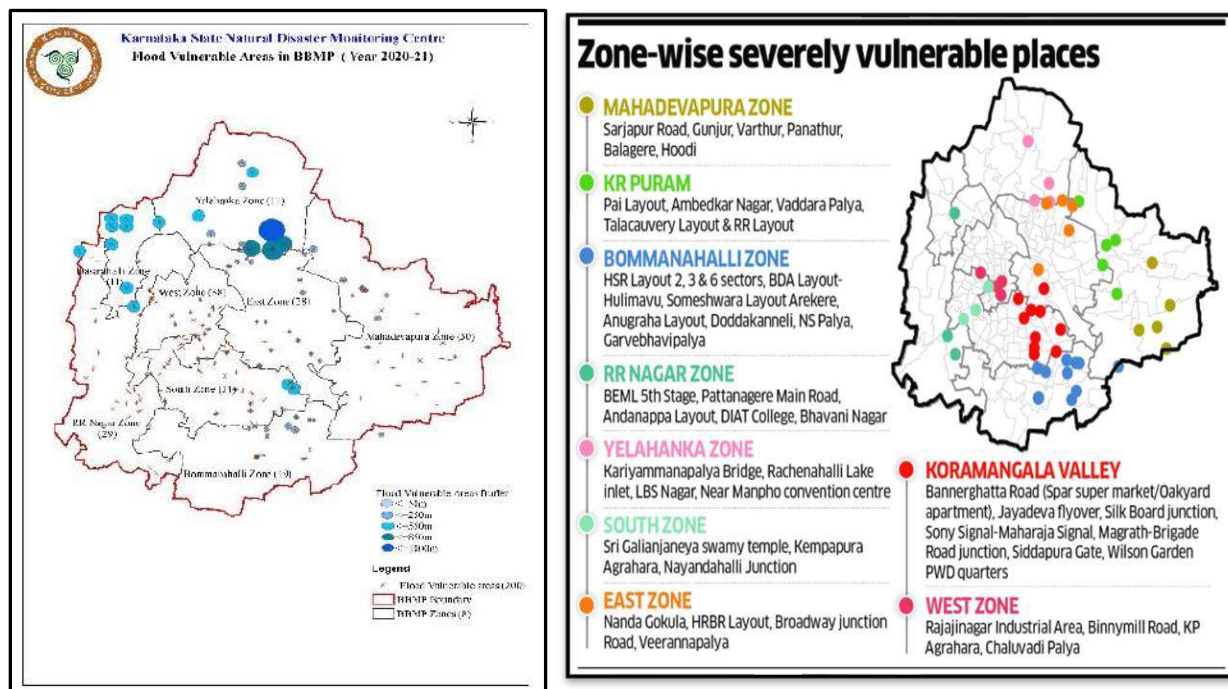
Increasing built up areas, paved surfaces, encroachment of natural water courses and low lying areas, less capacity storm water drains, increasing density of population, encroachment of storm water drains, disposal of sewage and solid waste into storm water drains are among some of the major reasons for floods in Bengaluru posing challenges to the people and civic agencies such as Bruhat Bengaluru Mahanagar Palike(BBMP), Bengaluru Development Authority(BDA), BWSSB(Bengaluru Water Supply and Sewerage Board), BMTCL(Bengaluru Metropolitan Transport Corporation) and those providing rescue and relief during extreme event disasters such as Fire and Emergency, Police, Home Guards, Health Dept. etc.

A rapid appraisal survey of flood affected areas particularly in the vicinity of Madivala tank revealed the fact that there is close linkage between the flood, storm water drainage, solid waste management, sanitation, roads (transport) and health (diseases). An apparent observation during the survey of flood affected areas indicated the truth that the storm water drainage systems without proper solid waste management cannot work. Similarly, for better transportation and basic sanitation, good storm water drainage systems are essential. In slums and low-lying areas, children and women were more frequently affected by diseases due to floods and resultant insanitary conditions. Mixing of sewage effluent with storm water and constraints for downstream flow have worsened due to irregular constructions and unregulated development activity along the natural water courses and water bodies. Most of natural drainage pathways and flood plains have been occupied and developed. It is noticed that the residents and the concerned authorities wake up on seasonal basis when the storm water enters their houses and neighbourhood during rainy season at a time when their life becomes stagnant and miserable. Storm water drainage assumes less importance as compared to water supply and other public services as it attracts attention only during flood as revealed by the residents.

Due to floods deaths, diseases, loss of property, damages to public infrastructure such as roads have become common and consume huge investment every year. The BBMP has been taking up repair and reconstruction works every year during rainy season after the flood damages which consume huge investment without providing permanent solution. It is indeed thriving to note that the BBMP has taken up civil works on a large scale in almost all the flood affected areas under the earlier JNNURM (Jawaharlal Nehru National Urban Renewal Mission) for revamping/remodeling of storm water drainage systems to

prevent flooding permanently to the possible extent. The extreme weather events come as a coincidence and happen when there intense rainfall within a short span of time. Even a 30 mm rainfall in a matter of 30 minutes could cause flooding, especially in the low-lying areas.

Though urban floods are blamed on unprecedented, intense bursts of rainfall, studies indicate that the damage caused is largely due to unplanned urbanisation. The city has been inundated during 2005, 2007, 2015, 2017, 2018, 2020 and 2021 while several areas of the city drown every year. In response to the problem the Karnataka State Natural Disaster Monitoring Center (KSNDMC) and Indian Institute of Science (IISc) in collaboration with the Bruhat Bengaluru Mahanagara Palike (BBMP) has taken up a 'Flood Forecast and Early Warning System' for Bengaluru. A total of 200 Flood Vulnerable Areas (FVA) were identified and mapped with varies flood extents out of which 58 locations were found to be under severely flood vulnerable category.



Map – 22 Flood vulnerable Areas in Bengaluru City

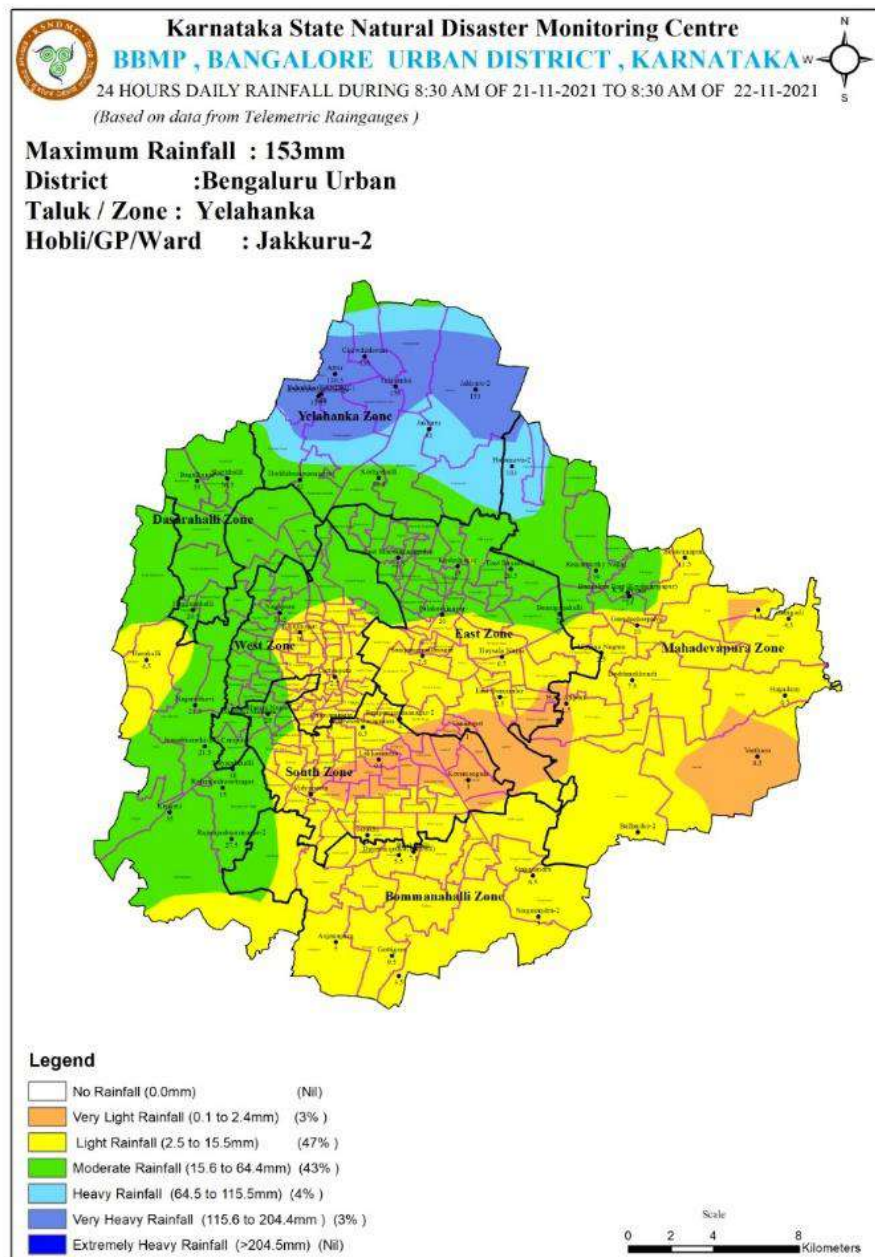
### 3.3.1 Floods in Bengaluru 2021

The city's topography is characterised by a series of well-defined valleys which radiate from a ridge and fall gradually in all directions. The four major valleys are Vrishabhavathi valley, Koramangala valley, Challaghatta valley and Hebbal valley. The lakes were built across these valleys and floodwater used to flow through these valleys. The lesser-known valleys are Marathalli in the east, Arkavathy and



Kethamaranahalli in the northwest, Kathriguppe and Tavarekere in the south and they also play an important role in forming a natural drainage system where rainwater can flow through.

During November, unprecedented heavy rain and flooding in Bengaluru city valleys and lake beds. Yelahanka lake, Singapura lake, Allasandra lake and Amanikere lake overflowed leading to flooding. Yelahanka zone received the highest rainfall of 153 mm followed by Horamavu in Mahadevapura zone (103 mm), Kannuru gram panchayat (143.5 mm).



**Map – 23 Heavy rain recorded on 22<sup>nd</sup> Nov 2021 at Yelahanka Zone**

**Table – 12 Rainfall on 22<sup>nd</sup> November 2021 in Yelahanka Zone**

| Sl.No. | RAIN  | HOBBI                             |
|--------|-------|-----------------------------------|
| 1      | 153   | Yelahanka (YelahankaZone)         |
| 2      | 150   | Yelahanka (YelahankaZone)         |
| 3      | 148   | Yelahanka-KSNDMC (YelahankaZone)  |
| 4      | 138   | Chowdeshwari Ward (YelahankaZone) |
| 5      | 130.5 | Attur (YelahankaZone)             |
| 6      | 103   | Horamavu(2) (MahadevapuraZone)    |
| 7      | 81    | Jakkur(1) (YelahankaZone)         |
| 8      | 80    | RRNagara_HMT Ward (RRNagarZone)   |
| 2325   | 56.5  | Shettihalli (DasarahalliZone)     |
| 2322   | 55    | Bagalakunte (DasarahalliZone)     |
| 2305   | 50.5  | Kodigehalli (YelahankaZone)       |
| 2349   | 43    | Doddabommasandra (YelahankaZone)  |

More than the loss of life and damage to property, the sense of insecurity and fear in the minds of people living in the flood plains is a cause of great concern. The aftereffects of floods such as the agony of survivors, spread of epidemics, non-availability of drinking water, essential commodities and medicines, loss of the dwellings etc. make floods the most feared among the natural disasters faced by mankind. The State has incurred loss and damages almost every year and the extent of losses have increased over the recent years as shown in the details below.

Heavy flooding was also witnessed at Junnisandra and Green Villa Layout in Mahadevapura, where sewage regularly overflows. Apartments like Rainbow Drive in Bellandur and Kendriya Vihar in Yelahanka were also inundated, with people wading through nearly waist-deep water. Similarly, other reports of water logging were lodged all across the city, from Dasarahalli, where Mallasandra Lake was reported to have overflowed, to Hulimavu, where a massive traffic jam occurred next to the Hulimavu metro station construction site. Blockages in storm water drains near RMZ Ecospace, Bellandur, were cleared to allow water to flow.

### 3.4 Flood hazard zonation Basin Approach

Basin flood management planning should reflect the overall vision and policy with special attention on the management of floods. The basin wise flood management helps to understand the basin conditions and flood conditions. A variety of data, information and analysis are required to understand the flood issues, evaluate the current socio-economic conditions and the impacts of floods, project the future scenarios of development and climate change and the ecological consequences for the formulation of the basin flood management plan.

The hydrological and meteorological data along with other physical characteristics of the basin are required for the analysis and simulation of physical characteristics of floods and flooding. Data of current social conditions, identification of beneficial aspects and negative socio economic impacts of floods, future economic development projections are required to decide the goals, target and activities to achieve the objectives. A quick analysis of the kind of data required for the basin flood management plan needs to be established right at the start. Following are the broad categories of data that may be required. Advanced geospatial technology, remote sensing techniques, high resolution satellite images process and hydraulic models enhanced the flood delineation, hazard zonation and flood mapping in recent years.

Flood hazard mapping provides land-use planners, flood risk managers and emergency managers with an overview of changes in the severity of flood hazard for a range of events. For flood hazard zonation many technical and scientific methodologies are used. In this document techniques and tools are widely used to identified by multi dataset of historical flood layers, inundation layer, annual flood layer, hazard layer, comprising satellite data, DEM Data, Google Earth data and conventional maps including survey of India (SOI) topographic sheets was used. IRS-1D LISS-III and Sentinel data collected from the National Remote Sensing Center (NRSC), Hyderabad, India and flood hazard zonation maps of NRSC has been used for the preparation of flood hazard zonation map Krishna Cauvery and west flowing river basins.

#### 3.4.1 Main reasons for flood disasters along river basins during the monsoon:

1. Persistent and simultaneous occurrence over large spatial areas, of heavy precipitation in short duration
2. Typical Topographical features and river meandering
3. Large Encroachments in Flood Plains and Reduction in flood discharge capacities of the rivers, due to many Structures built across Rivers

4. Sedimentation in main rivers – at confluences, along meanders
5. Absence of flood absorption capacities in reservoir planning of existing dams.
6. The discharge carrying capacity of the river was inadequate to accommodate the huge releases of water, the contribution of tributaries and the runoff of the free catchment
7. The lateral slope of the flood plains is very gentle. The flood plains are almost flat. This has resulted into spreading of flood on larger area on both the banks of the river.
8. Rivers are has so many curves and meanders. The velocity of the river is comparatively less while traversing curves and meanders, causing thereby more inundation on inner as well as outer sides of the curves and meanders as compared to straight reaches of the river.

To propose overall remedial measures to avoid such flood situation in future and /or to reduce its severity, technical analysis concerning micro level issues such as dam wise reservoir operation schedules, integrated arrangement for measurement & management for river discharges, control on constructions in flood zone, emergency operation plans, standard operating procedures etc. the Structural measures includes flood storages, Flood water diversion, straightening of meanders, restoration of natural river channels, rising the river banks, control of new development in flood plains, rehabilitation and remove of encroachment and Providing Gated spillways, raising heights of existing dams. The Non-structural measure comprises of integrated Reservoir operation system, Revising the flood lines, robust rainfall forecast, flood forecast models, vulnerability maps, advanced warning mechanism and Technology updation, Institutional Arrangements and Policy measures.

### **3.5 Flood zonation of Krishna sub basins**

#### **3.5.1 The Upper Krishna Sub-basin-K1:**

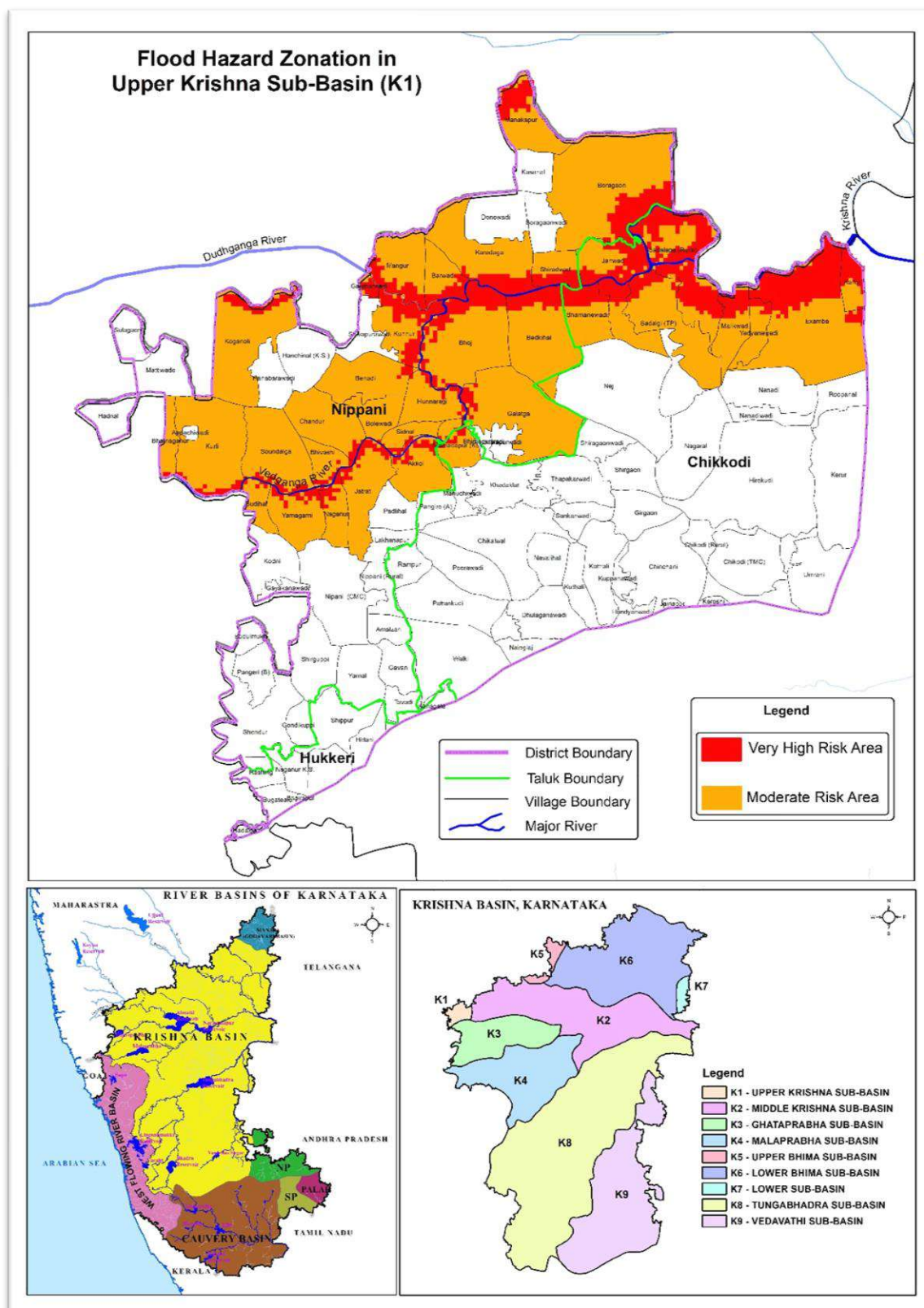
Covers in the districts of Satara, Sangli and Kolhapur and an area of 17.13 lakh ha. Having 77 watershed and comprises main tributaries of Koyna, Yerala, warana, Panhaganga, dudhganga and vedaganga. The Krishna basin falls in Deccan plateau and Western Ghats. Around 56 % of total sub basin area lies in the elevation zone of 600-900 m 44 % of total sub basin area lies in the elevation zone of 1370 – 900 m. The Upper Krishna basin has a tropical climate. The rainfall variation in sub basin from 6208 – 500 mm and the average annual rainfall in the upper Krishna basin is 1300 mm. The average annual mean temperature is 28 °C.

Some areas of the Krishna basin suffer from floods due to heavy floods in the basins. Sangli city is one of the most flood prone areas in the Krishna basin. Notable floods in the recent past were also observed in 1996, 2005, 2006, and 2009. It is reported that about 35 villages in the district of Satara are affected by floods every year from Koyna River. The extent of flooding could be so severe that these villages remain cut off from the rest of the area for about a week. More than 176 flood affected Villages are identified in Sangli, Satara and Kolhapur districts of Maharashtra and Belagavi district of Karnataka.

Flood Prone Area of Upper Krishna River Basin. In the last decadal flooding some of the very high risk and medium risk flood vulnerable regions and villages are delineated. The Dudhganga and Vedaganga rivers meets at Sadalagi, the heavy discharge of water a large of area is flooding. Along the basin of Vedaganga and Dudhganga adjacent regions and about 35 villages in Belagavi district in taluks of Chikkodi and Nippani are prone to severe flood and residing villages are commonly prone to moderate flood. There are 16 villages are identified under High risk Area and 19 villages are under moderate risk area. The Villages prone to flood are given in **Table -13** and The Flood hazard zonation of upper Krishna sub basin -K1 is shown in the **Map-24**.

#### Upper Krishna Sub-basin-K1: Flood Prone Districts

| Sl. No. | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|---------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|         |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1       | Belagavi      | 2             | 3             | 26                     | 16              | 19            | 35             |



Map-24 Upper Krishna Sub-basin -K1



Table – 13 List of Flood Prone Villages in Upper Krishna Sub-basin -K1

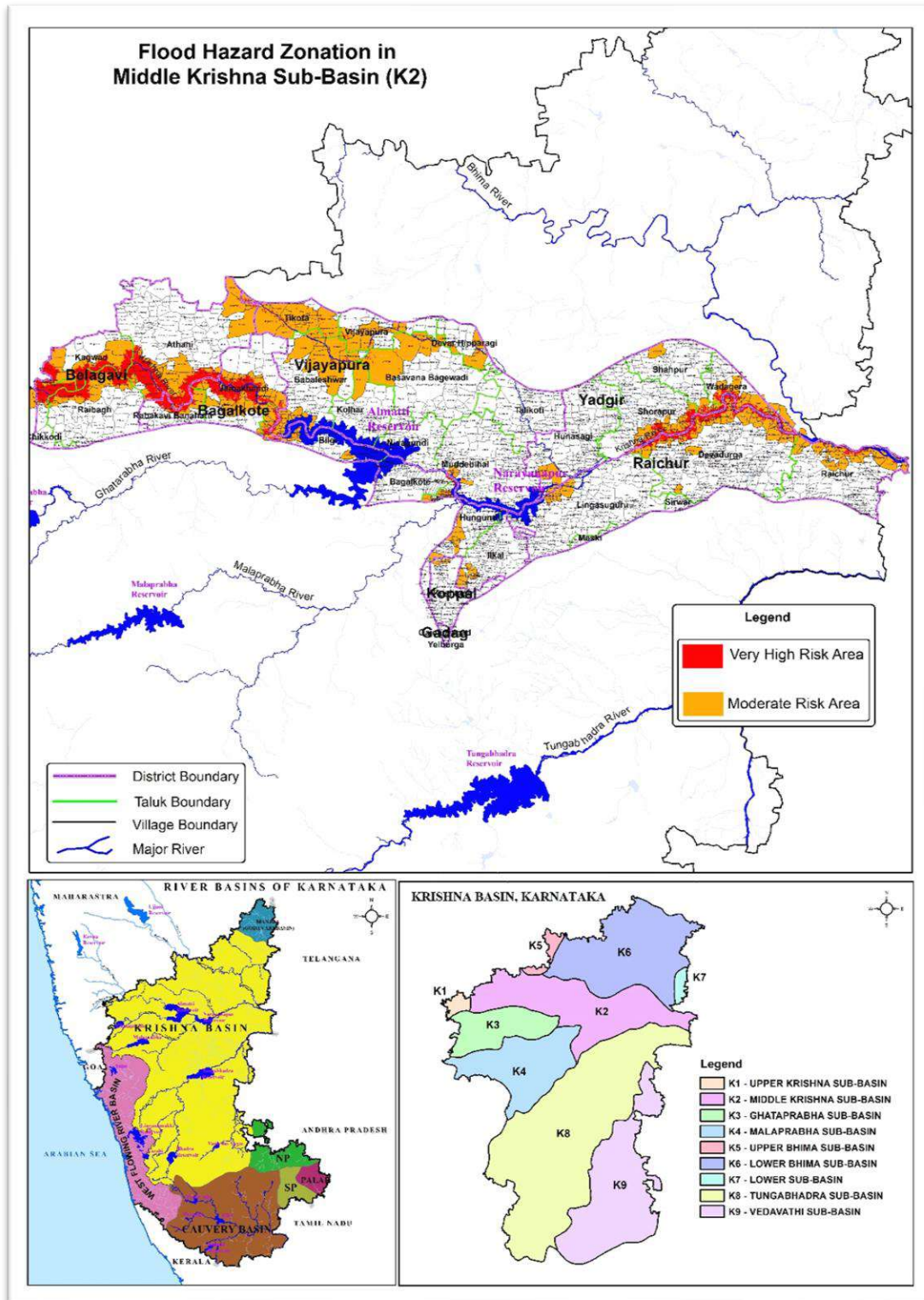
| Upper Krishna Sub-Basin (K1)       |               |              |            |              |            |            |                     |         |                  |                     |
|------------------------------------|---------------|--------------|------------|--------------|------------|------------|---------------------|---------|------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |            |                     |         |                  |                     |
| Dist. Sl.N o.                      | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.N o. | Gram Panchayat Name | Sl.N o. | Village Name     | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7          | 8                   | 9       | 10               | 11                  |
| 1                                  | Belagavi      | 1            | Chikkodi   | 1            | Sadalgi    | 1          | Malikawad           | 1       | Yadyanawadi      | Moderate Risk Area  |
|                                    |               |              |            |              |            | 2          | Sadalgi (TP)        | 2       | Malikwad         | Very High Risk Area |
|                                    |               |              |            |              |            |            |                     | 3       | Sadalgi (TP)     | Very High Risk Area |
|                                    |               |              |            |              |            |            |                     | 4       | Examba           | Very High Risk Area |
|                                    |               |              |            |              |            |            |                     | 5       | Sadalaga (Rural) | Very High Risk Area |
|                                    |               |              |            |              |            |            |                     | 6       | Shamanewadi      | Very High Risk Area |
|                                    |               |              |            |              |            | 4          | Sadalaga (Rural)    | 7       | Sadalaga (Rural) | Very High Risk Area |
|                                    |               |              |            |              |            | 5          | Janawad             | 8       | Janwad           | Very High Risk Area |
|                                    |               | 2            | Nippani    | 2            | Nippani    | 6          | Yamagrani           | 9       | Yamagarni        | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 10      | Naganur          | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 11      | Budihal          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 7          | Jatrat              | 12      | Jatrat           | Moderate Risk Area  |
|                                    |               |              |            |              |            | 8          | Akkol               | 13      | Akkol            | Moderate Risk Area  |
|                                    |               |              |            |              |            | 9          | Soundalaga          | 14      | Bhivashi         | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 15      | Soundalga        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 10         | Kurli               | 16      | Kurli            | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 17      | Bhatnaganur      | Moderate Risk Area  |
|                                    |               |              |            |              |            | 11         | Adi                 | 18      | Chandur          | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 19      | Bolewadi         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 12         | Benadi              | 20      | Benadi           | Moderate Risk Area  |
|                                    |               |              |            |              |            |            |                     | 21      | Koganoli         | Moderate Risk Area  |
|                                    |               |              |            | 3            | Sadalgi    | 14         | Mamadapur K.L.      | 22      | Mamadapur (KL)   | Moderate Risk Area  |
|                                    |               |              |            |              |            | 15         | Shidnal             | 23      | Shidnal          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 16         | Galataga            | 24      | Galatga          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 17         | Hunnaragi           | 25      | Hunnaragi        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 18         | Bhoj                | 26      | Bhoj             | Very High Risk Area |
|                                    |               |              |            |              |            | 19         | Bedakihal           | 27      | Bedkihal         | Very High Risk Area |
|                                    |               |              |            |              |            | 20         | Kunnur              | 28      | Kunnur           | Very High Risk Area |
|                                    |               |              |            |              |            |            |                     | 29      | Gajabarwadi      | Very High Risk Area |
|                                    |               |              |            |              |            | 21         | Barawad             | 30      | Barwad           | Very High Risk Area |
|                                    |               |              |            |              |            | 22         | Shiradawad          | 31      | Shiradwad        | Very High Risk Area |
|                                    |               |              |            |              |            | 23         | Mangur              | 32      | Mangur           | Very High Risk Area |
|                                    |               |              |            |              |            | 24         | Karadaga            | 33      | Karadaga         | Very High Risk Area |
|                                    |               |              |            |              |            | 25         | Doniwadi            | 34      | Boragaon         | Very High Risk Area |
|                                    |               |              |            |              |            | 26         | Manakapur           | 35      | Manakapur        | Moderate Risk Area  |

### 3.5.2 The Middle Krishna Sub-basin-K2:

The K2 Middle Krishna Sub Basin is a part of Krishna basin which comprises of 07 watersheds extending over an area of about 1438.60 Sq kms. The Middle Krishna Sub Basin is covered by Deccan Trap lava flows and laid in the districts of Belagavi, Vijayapura, Bagalakote, Koppala, Raichur and Yadgir districts of Karnataka. Groundwater and geohydrology is controlled by topography, geomorphology, and lithology. The basin is under rain shadow zone and having water scarcity. The annual rainfall in the basin varies between 488 mm to 544mm. Due to release of large amount of water from Koyna reservoir of Maharashtra and associated with heavy to very heavy rainfall cause flood situation in this basin. The Middle Krishna basin most vulnerable riverine flooding and its identified 274 villages are prone very high risk (90 villages) to moderate risk area (184 villages) prone to flood. The flood hazard zonation is shown in **Map-24** flood prone villages are given in **Table - 14**.

**Middle Krishna Sub-basin-K2: Flood Prone Districts**

| Sl.No.       | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|              |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1            | Koppal        | 1             | 1             | 1                      | —               | 1             | 1              |
| 2            | Raichur       | 3             | 8             | 23                     | 49              | 11            | 60             |
| 3            | Belagavi      | 4             | 7             | 48                     | 51              | 14            | 65             |
| 4            | Bagalkote     | 5             | 7             | 32                     | 34              | 25            | 59             |
| 5            | Vijayapura    | 7             | 9             | 32                     | 19              | 33            | 52             |
| 6            | Yadgir        | 4             | 7             | 14                     | 31              | 5             | 36             |
| <b>Total</b> |               | <b>24</b>     | <b>39</b>     | <b>150</b>             | <b>184</b>      | <b>89</b>     | <b>273</b>     |



Map-25 Middle Krishna Sub-basin -K2

Table – 14 List of Flood Prone Villages in Middle Krishna Sub basin -K2

| Middle Krishna Sub-Basin (K2)      |               |              |            |              |            |           |                     |        |                  |                     |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                  |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name     | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10               | 11                  |
| 2                                  | Raichur       | 2            | Devadurga  | 1            | Hanamsagar | 1         | Antarathana         | 1      | Kadoor           | Moderate Risk Area  |
|                                    |               |              |            |              |            | 2         | Karidigudda         | 2      | Antarthana       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 3         | Karegudda           | 3      | Nilvanji         | Very High Risk Area |
|                                    |               |              |            |              |            | 4         | Gugal               | 4      | Anjal            | Very High Risk Area |
|                                    |               |              |            |              |            | 5         | Dondambli           | 5      | Gopalpur         | Very High Risk Area |
|                                    |               |              |            |              |            | 6         | Koppar              | 6      | Anchesugur       | Very High Risk Area |
|                                    |               |              |            |              |            | 7         | Hemnal              | 7      | Herur            | Very High Risk Area |
|                                    |               |              |            |              |            | 8         | Gabbur              | 8      | Yatgal           | Very High Risk Area |
|                                    |               |              |            |              |            | 9         | Jalihalli           | 9      | Wagadambl        | Very High Risk Area |
|                                    |               |              |            |              |            | 10        | Chinchodi           | 10     | Huvinhadgi       | Very High Risk Area |
|                                    |               |              |            |              |            | 11        | Karidigudda         | 11     | Joladhadgi       | Very High Risk Area |
|                                    |               |              |            |              |            | 12        | Guntgol             | 12     | Dondambli        | Very High Risk Area |
|                                    |               |              |            |              |            | 13        | Yapaldinni          | 13     | Benkal           | Very High Risk Area |
|                                    |               |              |            |              |            | 14        | Chandrabanda        | 14     | Karkihalli       | Very High Risk Area |
|                                    |               |              |            |              |            | 15        | Devarsugur          | 15     | Konchapli        | Very High Risk Area |
|                                    |               |              |            |              |            | 16        | Kalmali             | 16     | Mydargol         | Very High Risk Area |
|                                    |               |              |            |              |            | 17        | Gurgunta            | 17     | Hunur            | Very High Risk Area |
|                                    |               |              |            |              |            | 18        | Lingasuguru         | 18     | Kopper           | Very High Risk Area |
|                                    |               |              |            |              |            | 19        | Chikkasugur         | 19     | Kurkihali        | Very High Risk Area |
|                                    |               |              |            |              |            | 20        | Chikkasugur         | 20     | Paratpur         | Very High Risk Area |
|                                    |               |              |            |              |            | 21        | Chikkasugur         | 21     | Baswantpur       | Very High Risk Area |
|                                    |               |              |            |              |            | 22        | Chikkasugur         | 22     | Apprahal         | Very High Risk Area |
|                                    |               |              |            |              |            | 23        | Chikkasugur         | 23     | Madarkal         | Very High Risk Area |
|                                    |               |              |            |              |            | 24        | Chikkasugur         | 24     | Hireraikumpi     | Very High Risk Area |
|                                    |               |              |            |              |            | 25        | Chikkasugur         | 25     | Chickraikumpi    | Very High Risk Area |
|                                    |               |              |            |              |            | 26        | Chikkasugur         | 26     | Itagi            | Very High Risk Area |
|                                    |               |              |            |              |            | 27        | Chikkasugur         | 27     | Gugal            | Very High Risk Area |
|                                    |               |              |            |              |            | 28        | Chikkasugur         | 28     | Devergud         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 29        | Chikkasugur         | 29     | Veergot          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 30        | Chikkasugur         | 30     | Bunkaldoddi      | Very High Risk Area |
|                                    |               |              |            |              |            | 31        | Chikkasugur         | 31     | Chinchodi        | Very High Risk Area |
|                                    |               |              |            |              |            | 32        | Chikkasugur         | 32     | Lingadhalli      | Very High Risk Area |
|                                    |               |              |            |              |            | 33        | Chikkasugur         | 33     | Suladgud         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 34        | Chikkasugur         | 34     | Chapalki         | Very High Risk Area |
|                                    |               |              |            |              |            | 35        | Chikkasugur         | 35     | Bagur            | Very High Risk Area |
|                                    |               |              |            |              |            | 36        | Chikkasugur         | 36     | Mudgot           | Very High Risk Area |
|                                    |               |              |            |              |            | 37        | Chikkasugur         | 37     | Herundi          | Very High Risk Area |
|                                    |               |              |            |              |            | 38        | Chikkasugur         | 38     | Buddinni         | Very High Risk Area |
|                                    |               |              |            |              |            | 39        | Chikkasugur         | 39     | Roudal Banda     | Very High Risk Area |
|                                    |               |              |            |              |            | 40        | Chikkasugur         | 40     | Jungi-Rampur     | Very High Risk Area |
|                                    |               |              |            |              |            | 41        | Chikkasugur         | 41     | Upperi (Small)   | Very High Risk Area |
|                                    |               |              |            |              |            | 42        | Chikkasugur         | 42     | Sunkal           | Very High Risk Area |
|                                    |               |              |            |              |            | 43        | Chikkasugur         | 43     | Halbhavi         | Very High Risk Area |
|                                    |               |              |            |              |            | 44        | Chikkasugur         | 44     | Jaldurga         | Very High Risk Area |
|                                    |               |              |            |              |            | 45        | Chikkasugur         | 45     | Budidipad        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 46        | Chikkasugur         | 46     | Athkur           | Very High Risk Area |
|                                    |               |              |            |              |            | 47        | Chikkasugur         | 47     | Dongarampur      | Moderate Risk Area  |
|                                    |               |              |            |              |            | 48        | Chikkasugur         | 48     | Korvakala        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 49        | Chikkasugur         | 49     | Korvakhurd       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 50        | Chikkasugur         | 50     | Agrahar          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 51        | Chikkasugur         | 51     | Wadloor          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 52        | Chikkasugur         | 52     | Ganjhalli        | Very High Risk Area |
|                                    |               |              |            |              |            | 53        | Chikkasugur         | 53     | Yedlapur         | Very High Risk Area |
|                                    |               |              |            |              |            | 54        | Chikkasugur         | 54     | Korvihali        | Very High Risk Area |
|                                    |               |              |            |              |            | 55        | Chikkasugur         | 55     | Korthkunda       | Very High Risk Area |
|                                    |               |              |            |              |            | 56        | Chikkasugur         | 56     | Deosugur         | Very High Risk Area |
|                                    |               |              |            |              |            | 57        | Chikkasugur         | 57     | Shaktinagar (CT) | Moderate Risk Area  |
|                                    |               |              |            |              |            | 58        | Chikkasugur         | 58     | Kadlur           | Very High Risk Area |
|                                    |               |              |            |              |            | 59        | Chikkasugur         | 59     | Gurjapur         | Very High Risk Area |
|                                    |               |              |            |              |            | 60        | Chikkasugur         | 60     | Arshanagi        | Very High Risk Area |
|                                    |               |              |            |              |            | 61        | Chikkasugur         | 61     | Karekal          | Very High Risk Area |
|                                    |               |              |            |              |            | 62        | Chikkasugur         | 62     | Chicksugur       | Moderate Risk Area  |

| Middle Krishna Sub-Basin (K2)      |               |              |            |              |            |           |                     |        |                 |                     |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|-----------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                 |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name    | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10              | 11                  |
|                                    |               |              |            |              |            | 25        | Mahishawadagi       | 63     | Mahishwadgi     | Very High Risk Area |
|                                    |               |              |            |              |            | 26        | Nandeshawar         | 64     | Janawad         | Very High Risk Area |
|                                    |               |              |            |              |            | 27        | Shegunashi          | 65     | Nandeshwar      | Very High Risk Area |
|                                    |               |              |            |              |            | 28        | Satti               | 66     | Shegunshi       | Very High Risk Area |
|                                    |               |              |            |              |            | 29        | Naganur -Pk         | 67     | Satti           | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 68     | Dodwad          | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 69     | Naganur P.K.    | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 70     | Avarkhod        | Very High Risk Area |
|                                    |               |              |            |              |            | 30        | Shankarhatti        | 71     | Khavatkoppa     | Very High Risk Area |
|                                    |               |              |            |              |            | 31        | Savadi              | 72     | Savadi          | Very High Risk Area |
|                                    |               |              |            |              |            | 32        | Sapsagar            | 73     | Chikkud         | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 74     | Saptasagar      | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 75     | Teerth          | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 76     | Darur           | Very High Risk Area |
|                                    |               |              |            |              |            | 33        | Radderahatti        | 77     | Radderahatti    | Moderate Risk Area  |
|                                    |               |              |            |              |            | 34        | Nadi-Ingalgaon      | 78     | Nadi-Ingalgaon  | Very High Risk Area |
|                                    |               |              |            |              |            | 35        | Halyal              | 79     | Halyal          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 36        | Hulagabali          | 80     | Hulagabali      | Very High Risk Area |
|                                    |               |              |            |              |            | 37        |                     | 81     | Shinal          | Very High Risk Area |
|                                    |               |              |            |              |            | 38        | Tangadi             | 82     | Tangadi         | Very High Risk Area |
|                                    |               |              |            |              |            | 39        | Zunjarwad           | 83     | Junjarwad       | Very High Risk Area |
|                                    |               |              |            |              |            | 40        | Shirahatti          | 84     | Shirahatti      | Very High Risk Area |
|                                    |               |              |            |              |            | 41        | Nandagaon           | 85     | Nandagaon       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 42        | Telsang             | 86     | Telsang         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 43        | Kannala             | 87     | Bannur          | Moderate Risk Area  |
|                                    |               |              |            |              |            | 44        | Kakamari            | 88     | Kakamari        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 45        | Kottalagi           | 89     | Kottalgi        | Moderate Risk Area  |
|                                    |               |              |            |              |            | 46        | Ankali              | 90     | Ankali          | Very High Risk Area |
|                                    |               |              |            |              |            | 47        | Manajari            | 91     | Manjari         | Very High Risk Area |
|                                    |               |              |            |              |            | 48        | Yadur               | 92     | Yadur           | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 93     | Hosa Yedur      | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 94     | Yadurwadi       | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 95     | Manjariwadi     | Very High Risk Area |
|                                    |               |              |            |              |            | 49        | Manajari            | 96     | Ingali          | Very High Risk Area |
|                                    |               |              |            |              |            | 50        | Ingali              | 97     | Ingali          | Very High Risk Area |
|                                    |               |              |            |              |            | 51        | Chandur             | 98     | Chandur - Tek   | Very High Risk Area |
|                                    |               |              |            |              |            | 52        | Kallol              | 99     | Kallol          | Very High Risk Area |
|                                    |               |              |            |              |            | 53        | Nasalapur           | 100    | Nasalapur       | Very High Risk Area |
|                                    |               |              |            |              |            | 54        | Diggewadi           | 101    | Diggewadi (Old) | Very High Risk Area |
|                                    |               |              |            |              |            | 55        | Savadatti           | 102    | Soundatti       | Very High Risk Area |
|                                    |               |              |            |              |            | 56        | Jalalpur            | 103    | Jalalpur        | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 104    | Chinchali       | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 105    | Bhiradi         | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 106    | Khemalapur      | Very High Risk Area |
|                                    |               |              |            |              |            | 57        | Bhiradi             | 107    | Paramanandwadi  | Very High Risk Area |
|                                    |               |              |            |              |            | 58        | Khemalapur          | 108    | Paramanandwadi  | Very High Risk Area |
|                                    |               |              |            |              |            | 59        | Paramanandwadi      | 109    | Siddapur        | Very High Risk Area |
|                                    |               |              |            |              |            | 60        | Siddapura           | 110    | Kudachi (Rural) | Very High Risk Area |
|                                    |               |              |            |              |            | 61        | Kudachi (Rural)     | 111    | Kudchi (TP)     | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 112    | Shiragur        | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 113    | Gundwad         | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 114    | Molwad          | Very High Risk Area |
|                                    |               |              |            |              |            | 62        | Shiragur            | 115    | Kusnal          | Very High Risk Area |
|                                    |               |              |            |              |            | 63        | Kusnal              | 116    | Shahapur        | Very High Risk Area |
|                                    |               |              |            |              |            | 64        | Jugul               | 117    | Shiraguppi      | Moderate Risk Area  |
|                                    |               |              |            |              |            | 65        | Shiraguppi          | 118    | Shiraguppi      | Very High Risk Area |
|                                    |               |              |            |              |            | 66        | Krishana Kittur     | 119    | Krishna Kittur  | Very High Risk Area |
|                                    |               |              |            |              |            | 67        | Ugar - Bk           | 120    | Ugar Budruk     | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 121    | Ugar Khurd      | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 122    | Jugul           | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 123    | Mangavati       | Very High Risk Area |
|                                    |               |              |            |              |            | 68        | Jugul               | 124    | Banajawad       | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 125    | Shedbal         | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 126    | Ainapur         | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 127    | Katral          | Very High Risk Area |
|                                    |               |              |            |              |            | 69        | Krishana Kittur     | 128    | Kagawad         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 70        | Tangadi             | 129    | Kagawad         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 71        | Kagawad             | 130    | Mole            | Moderate Risk Area  |
|                                    |               |              |            |              |            | 72        | Mole                | 131    | Mole            | Moderate Risk Area  |
| 3                                  | Belagavi      | 8            | Kagwad     | 16           | Kagwad     |           |                     |        |                 |                     |

| Middle Krishna Sub-Basin (K2)      |               |              |                    |              |                   |                     |                     |                    |                   |                     |
|------------------------------------|---------------|--------------|--------------------|--------------|-------------------|---------------------|---------------------|--------------------|-------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                    |              |                   |                     |                     |                    |                   |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name         | Hobli Sl.No. | Hobli Name        | GP Sl.No.           | Gram Panchayat Name | Sl.No.             | Village Name      | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4                  | 5            | 6                 | 7                   | 8                   | 9                  | 10                | 11                  |
| 4                                  | Bagalkote     | 9            | Bilgi              | 17           | Bilgi             | 73                  | Badagi              | 128                | Gulbal            | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 129                | Budiha(S.G.)      | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 130                | Budiha(S.G.)      | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 131                | Badgi             | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 74                  | Teggi               | 132                | Ballur            | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 75                  | Galagali            | 133                | Galagali          | Very High Risk Area |
|                                    |               |              |                    |              |                   | 76                  | Inam-Hanchinal      | 134                | Hanchinal(Inam)   | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 135                | Gudadinni         | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 136                | Girgaon           | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 137                | Rabkavi           | Very High Risk Area |
|                                    |               |              |                    |              |                   | 77                  | Kolur               | 138                | Chowdapur         | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 139                | Chickhanchinal    | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 140                | Kolur             | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 141                | Mundaganur        | Very High Risk Area |
|                                    |               | 9            | Bilgi              | 18           | Anagvadi          | 78                  | Girisagar           | 142                | Girisagar         | Moderate Risk Area  |
|                                    |               |              |                    | 79           | Nagur             | 143                 | Nagur               | Moderate Risk Area |                   |                     |
|                                    |               | 10           | Hungund            | 19           | Hungund           | 80                  | Hungund (Rural)     | 144                | Hungund (Rural)   | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 145                | Hungund (Rural)   | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 146                | Hungund (TP)      | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 147                | Sangam            | Very High Risk Area |
|                                    |               |              |                    |              |                   | 83                  | Bisaladinni         | 148                | Valakaladinni     | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 149                | Bisaladinni       | Very High Risk Area |
|                                    |               |              |                    |              |                   | 84                  | Jamkhandi (Rural)   | 150                | Jamkhandi (Rural) | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 151                | Jamkhandi (CMC)   | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 86                  | Kunchanur           | 152                | Chingundi         | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 153                | Jakanur           | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 154                | Kunchanur         | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 155                | Kumbarhal         | Moderate Risk Area  |
|                                    |               | 87           | Kumbar-Hall        | 156          | Jamkhandi (Rural) | Very High Risk Area |                     |                    |                   |                     |
|                                    |               |              |                    | 157          | Sanal             | Moderate Risk Area  |                     |                    |                   |                     |
|                                    |               | 88           | Alagur             | 158          | Alagur            | Very High Risk Area |                     |                    |                   |                     |
|                                    |               | 89           | Kankanavadi        | 159          | Kankanawadi       | Very High Risk Area |                     |                    |                   |                     |
|                                    |               |              |                    | 160          | Kadakol           | Very High Risk Area |                     |                    |                   |                     |
|                                    |               | 90           | Maigur             | 161          | Shiraguppi        | Very High Risk Area |                     |                    |                   |                     |
|                                    |               |              |                    | 162          | Maigur            | Very High Risk Area |                     |                    |                   |                     |
|                                    |               | 20           | Jamakhandi         | 20           | Jamakhandi        | 91                  | Muttur              | 163                | Muttur            | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 164                | Bidari            | Very High Risk Area |
|                                    |               |              |                    |              |                   | 92                  | Bidari              | 165                | Janawad           | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 166                | Kavatagi          | Very High Risk Area |
|                                    |               |              |                    |              |                   | 93                  | Chikkpadasalagi     | 167                | Chikkpadasalgi    | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 168                | Naganur           | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 94                  | Hirepadasalagi      | 169                | Hirepadasalgi     | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 170                | Jambagi.(B.K.)    | Very High Risk Area |
|                                    |               |              |                    |              |                   | 95                  | Jambagi-B.K         | 171                | Takkalaki         | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 172                | Takkod            | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 173                | Shurpali          | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 174                | Jambagi.(K.D.)    | Moderate Risk Area  |
|                                    |               | 11           | Jamakhandi         | 21           | Savalagi          | 96                  | Shurpali            | 175                | Tubachi           | Very High Risk Area |
|                                    |               | 12           | Ilkal              | 22           | Ilkal             | 97                  | Balakundi           | 176                | Ishwarnagar       | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 177                | Hireupnal         | Moderate Risk Area  |
|                                    |               |              |                    |              |                   |                     |                     | 178                | Balakundi         | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 98                  | Hire Kodagali       | 179                | Hanamanal         | Moderate Risk Area  |
|                                    |               |              |                    |              |                   | 99                  | Balakundi           | 180                | Ilkal (CMC)       | Moderate Risk Area  |
|                                    |               | 13           | Rabakavi Banahatti | 23           | Terdal            | 100                 | Asangi              | 181                | Madanamatti       | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 182                | Asangi            | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 183                | Halingali         | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 184                | Kulhalli          | Very High Risk Area |
|                                    |               |              |                    |              |                   |                     |                     | 185                | Tamadaddi         | Very High Risk Area |
|                                    |               | 104          | Hipparagi          | 186          | Hipparagi         | Very High Risk Area |                     |                    |                   |                     |



| Middle Krishna Sub-Basin (K2)      |               |              |                   |              |                 |           |                     |        |                    |                     |
|------------------------------------|---------------|--------------|-------------------|--------------|-----------------|-----------|---------------------|--------|--------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                   |              |                 |           |                     |        |                    |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name        | Hobli Sl.No. | Hobli Name      | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name       | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4                 | 5            | 6               | 7         | 8                   | 9      | 10                 | 11                  |
| 5                                  | Vijayapura    | 14           | Basavana Bagewadi | 24           | Managuli        | 105       | Managuli            | 187    | Managuli           | Very High Risk Area |
|                                    |               |              |                   |              |                 | 106       | Ukkali              | 188    | Ukkali             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 107       | Markabbinalli       | 189    | Bisanal            | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 190    | Bommanahalli       | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 191    | Donur              | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 192    | Mullal             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 193    | Neginal            | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 108       | Donur               | 194    | Yambatnal          | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 109       | Jumanal             | 195    | Jumnal             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 110       | Hitnalli            | 196    | Hittinahalli       | Very High Risk Area |
|                                    |               |              |                   |              |                 | 111       | Sarwad              | 197    | Khatijapur         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 112       | Bijapur (Rural)     | 198    | Bijapur (Rural)    | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 199    | Bijapur (Rural)    | Moderate Risk Area  |
|                                    |               | 15           | Vijayapura        | 25           | Vijayapura      | 113       | Hegadihal           | 200    | Ukumanal           | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 114       | Kumatagi            | 201    | Kumatagi           | Moderate Risk Area  |
|                                    |               | 16           | Muddebihal        | 26           | Muddebihal      | 115       | Kolur               | 202    | Devoor             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 203    | Handargall         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 116       | Yarazari            | 204    | Kandaganur         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 117       | Khakandaki          | 205    | Kakhandaki         | Very High Risk Area |
|                                    |               |              |                   |              |                 | 118       | Karjol              | 206    | Tonsyal            | Very High Risk Area |
|                                    |               |              |                   |              |                 | 119       | Babaleswar          | 207    | Babaleshwar        | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 208    | Adavisangapur      | Very High Risk Area |
|                                    |               |              |                   |              |                 | 120       | Honaganahalli       | 209    | Honaganahalli      | Very High Risk Area |
|                                    |               |              |                   |              |                 | 121       | Sarwad              | 210    | Dadamatti          | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 211    | Sarawad            | Very High Risk Area |
|                                    |               |              |                   |              |                 | 122       | Nidoni              | 212    | Nidoni             | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 213    | Kanamuchanal       | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 214    | Dhanyal            | Very High Risk Area |
|                                    |               |              |                   |              |                 | 123       | Tajpur.H            | 215    | Jambagi(H)         | Very High Risk Area |
|                                    |               | 17           | Babaleshwar       | 28           | Mamdapur        |           |                     | 216    | Chikka-Galagali    | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 217    | Hosur              | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 218    | Kanabur            | Very High Risk Area |
|                                    |               |              |                   |              |                 | 124       | Hosur               | 219    | Jainapur           | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 125       | Jainapur            | 220    | Babalad            | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 126       | Gunadal             | 221    | Shirabur           | Very High Risk Area |
|                                    |               |              |                   |              |                 |           |                     | 222    | Sutagundi          | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 223    | Lingadalli         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 224    | Devara-Gennur      | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 127       | D.Gennur            | 225    | Atalatti           | Very High Risk Area |
|                                    |               |              |                   |              |                 | 128       | Toravi              | 226    | Toravi (Part)      | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 227    | Kotyal             | Moderate Risk Area  |
|                                    |               | 18           | Tikota            | 29           | Tikota          | 129       | Kotyal              | 228    | Harnal             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 229    | Ratnapura          | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 130       | Tajpur.H            | 230    | Malakandevarahatti | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 231    | Honawad            | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 131       | Honawad             | 232    | Rampur             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 233    | Tikota             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 132       | Tikota              | 234    | Mulawad            | Very High Risk Area |
|                                    |               | 19           | Kolhar            | 30           | Kolhar          | 133       | Mulawad             | 235    | Jalwad             | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 134       | Jalwad              | 236    | Yalwar             | Moderate Risk Area  |
|                                    |               |              |                   | 31           | Devar Hipparagi |           |                     | 237    | Nagaraldon         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 |           |                     | 238    | Satihall           | Moderate Risk Area  |
|                                    |               | 20           | Devar Hipparagi   | 32           | Huvinihiprgi    | 135       | Yalawar             | 237    | Nagaraldon         | Moderate Risk Area  |
|                                    |               |              |                   |              |                 | 136       | Satihall            | 238    | Satihall           | Moderate Risk Area  |

| Middle Krishna Sub-Basin (K2)      |               |              |            |              |                |           |                     |        |                   |                     |
|------------------------------------|---------------|--------------|------------|--------------|----------------|-----------|---------------------|--------|-------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |                |           |                     |        |                   |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name     | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name      | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6              | 7         | 8                   | 9      | 10                | 11                  |
| 6                                  | Yadgir        | 21           | Shahpur    | 33           | Gogi           | 137       | Gogi (K)            | 239    | Gogikona          | Moderate Risk Area  |
|                                    |               |              |            |              |                |           |                     | 240    | Markal            | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 241    | Tonnur            | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 242    | Chandral          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 243    | Goudoor           | Very High Risk Area |
|                                    |               |              |            | 34           | Hayyalbuzurg   | 138       | Kollur (M)          | 244    | Kollur            | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 245    | Mushtalli         | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 246    | Kagarhal          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 247    | Shalgi            | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 248    | Aralhalli         | Very High Risk Area |
|                                    |               | 22           | Shorapur   |              |                | 139       | Devapur             | 249    | Kampapur          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 250    | Devapur           | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 251    | Bevinhal          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 252    | Hemwadgi          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 253    | Sugur             | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 254    | Adwadgi           | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 255    | Choudeshwarhal    | Very High Risk Area |
|                                    |               |              |            |              |                | 140       | Sugoor              | 256    | Karnal            | Moderate Risk Area  |
|                                    |               |              |            | 35           | Shorapur       | 141       | Hemanoor            | 257    | Hemnoor           | Very High Risk Area |
|                                    |               |              |            | 36           | Kakkeri        | 142       | Tinthni             | 258    | Tinthni           | Very High Risk Area |
|                                    |               | 23           | Wadagera   |              |                |           |                     | 259    | Kodal             | Very High Risk Area |
|                                    |               |              |            |              |                | 143       | Bendeembli          | 260    | Kadrapur          | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 261    | Habshiha          | Moderate Risk Area  |
|                                    |               |              |            |              |                |           |                     | 262    | Itga Simt Wadgera | Very High Risk Area |
|                                    |               |              |            |              |                | 144       | Tumakura            | 263    | Tumkur            | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 264    | Channur Jagir     | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 265    | Konkal            | Very High Risk Area |
|                                    |               |              |            | 37           | Wadagera       | 145       | Konkal              | 266    | Gondenoor         | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 267    | Ekchinti          | Very High Risk Area |
|                                    |               |              |            |              |                | 146       | Haiyal (B)          | 268    | Hayyal (B)        | Very High Risk Area |
|                                    |               | 24           | Hunasagi   |              |                | 147       | Konkal              | 269    | Aneksugur         | Very High Risk Area |
|                                    |               |              |            | 38           | Hayyala Buzurg | 148       | Aikur               | 270    | Alkur             | Very High Risk Area |
|                                    |               |              |            |              |                | 149       | Narayanpur          | 271    | Jangangaddi       | Very High Risk Area |
|                                    |               |              |            |              |                |           |                     | 272    | Kotigud           | Moderate Risk Area  |
|                                    |               | 24           | Hunasagi   |              |                |           |                     | 273    | Rayangola         | Very High Risk Area |
|                                    |               |              |            | 39           | Kodekal        | 150       | Jogundbhavi         | 274    | Jogandabhavi      | Moderate Risk Area  |

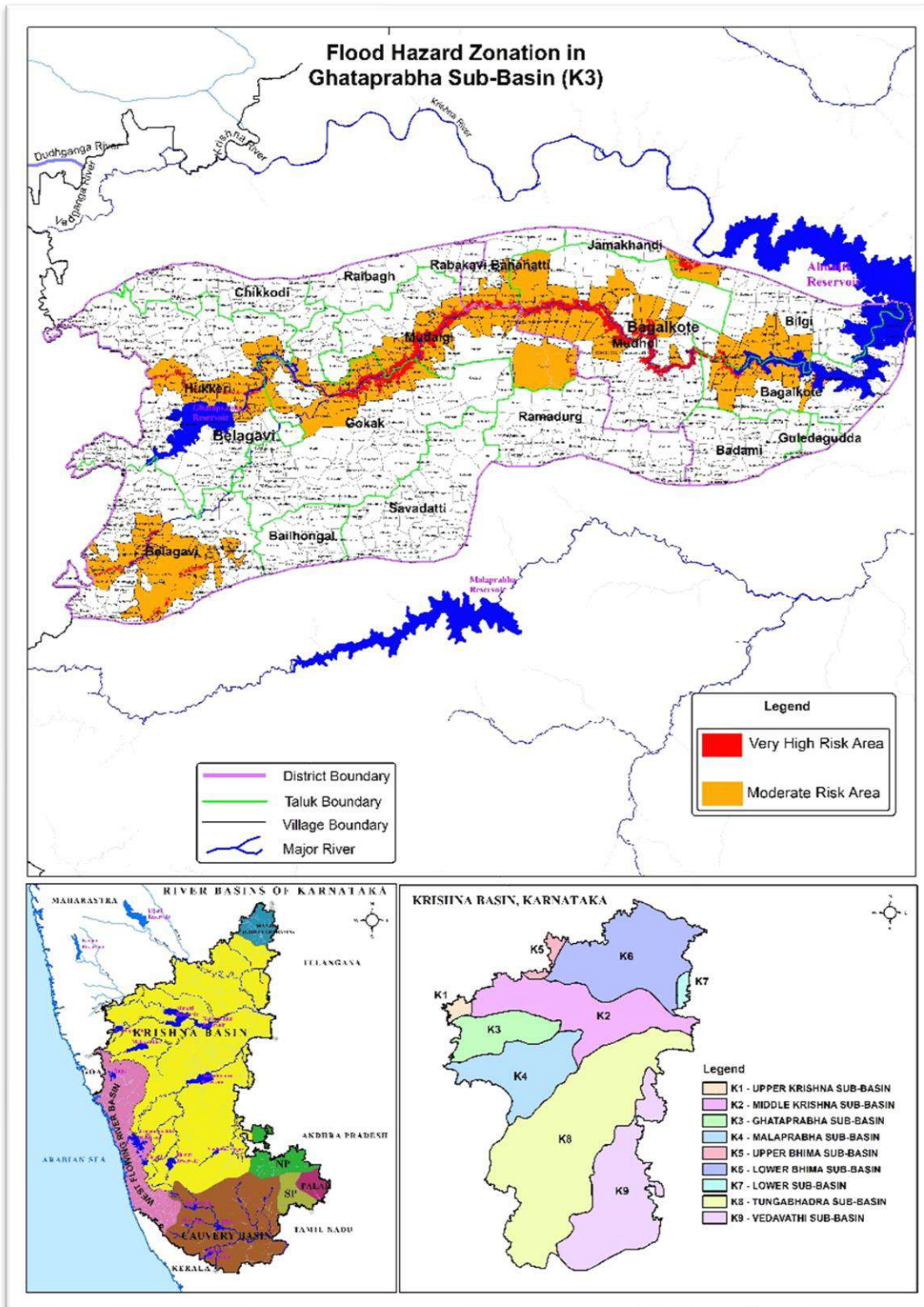
### 3.5.3 Ghataprabha Sub-basin-K3:

The Ghataprabha River originates in the Western Ghats at an altitude of 884 meters and flows eastward for a distance of 283 kilometers before its confluence with the Krishna River at Almatti. The catchment area of Ghataprabha lies between latitude 15° 45' and 16° 25' N and longitude 74° 00' and 75° 55' E. The Ghataprabha River flows eastwards for a distance of 283 km before joining Krishna at Kudalasangama, about 35 km north-east of Kaladgi at an elevation of 500 m. The river flows for about 60 km in the Ratnagiri and Kolhapur Districts of Maharashtra before entering the Belgaum District of Karnataka. In Karnataka, it flows through Belgavi and Bagalakote districts and joins the Krishna about 16 km from Almatti. The catchment area of Ghataprabha including its tributaries is 8,829km<sup>2</sup>. The Ghataprabha sub basin is also high

variable in rainfall ranging from 6500mm in upper catchment and 500 mm in lower catchment. There are 12 watershed and major project in sub basin. The basin experienced flash floods in last decades and also heavy release of water from the upper basin of Krishna basin cause flood situation all along the adjacent regions and villages of Belagavi and Bagalakote district. In Belagavi district the taluks of Belagavi, Gokak, Hukkeri, Mudalagi, and in Bagalakote district taluks of Bagalakote, Bilagi, Jamakandi, Mudhol, Rabakavibanahatti taluks are prone to flood conditions and also the storage of huge flood water and backwater of Alamatti reservoirs inundates a large portion of villages and create flood situation. The flood hazard zonation of high risk area to moderate risk area are depicted in **Map-26**. There are 45 villages are prone high risk and 117 villages are prone moderate risk, flood prone villages are given in **Table -15**.

#### Ghataprabha Sub-basin-K3: Flood Prone Districts

| Sl.No.       | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|              |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1            | Belagavi      | 4             | 11            | 56                     | 20              | 72            | 92             |
| 2            | Bagalkote     | 5             | 7             | 36                     | 25              | 45            | 70             |
| <b>Total</b> |               | <b>9</b>      | <b>18</b>     | <b>92</b>              | <b>45</b>       | <b>117</b>    | <b>162</b>     |



Map-26 Ghataprabha Sub-basin -K3

Table – 15 List of Flood Prone Villages in Ghatpraba Sub basin -K3

| Ghatprabha Sub-Basin (K3)          |               |              |            |              |              |           |                        |        |                        |                     |
|------------------------------------|---------------|--------------|------------|--------------|--------------|-----------|------------------------|--------|------------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |              |           |                        |        |                        |                     |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name | Hobli SI.No. | Hobli Name   | GP SI.No. | Gram Panchayat Name    | SI.No. | Village Name           | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6            | 7         | 8                      | 9      | 10                     | 11                  |
| 1                                  | Belagavi      | 1            | Belagavi   | 1            | Belagavi     | 1         | Peeranwadi             | 1      | Peeranwadi (CT)        | Moderate Risk Area  |
|                                    |               |              |            |              |              | 2         | Belgaum (M Corp. + OG) | 2      | Belgaum (M Corp. + OG) | Moderate Risk Area  |
|                                    |               |              |            | 2            | Hirebagevadi | 3         | Mutaga                 | 3      | Mutga (CT)             | Moderate Risk Area  |
|                                    |               |              |            |              |              | 4         | Nilaji                 | 4      | Nilaji                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 5         | Balekundari Kh         | 5      | Balekundri (K.H)       | Moderate Risk Area  |
|                                    |               |              |            |              |              | 6         | Sulebhavi              | 6      | Sulebhavi (CT)         | Moderate Risk Area  |
|                                    |               |              |            | 3            | Kakti        | 7         | Mucchandi              | 7      | Khanagaon (B.K)        | Moderate Risk Area  |
|                                    |               |              |            |              |              | 8         | Kalakhamba             | 8      | Chandur                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 9         | Ashte                  | 9      | Muchandi               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 10        | Kangrali Kh            | 10     | Kalakhamb              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 11        | Kangrali Bk            | 11     | Aste                   | Moderate Risk Area  |
|                                    |               |              |            |              |              | 12        | Kadoli                 | 12     | Chandgad               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 13        | Kakti                  | 13     | Alatage                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 14        | Honaga                 | 14     | Goundawad (Part)       | Moderate Risk Area  |
|                                    |               |              |            | 4            | Uchagaon     | 15        | Jafarwadi              | 15     | Jafarwadi              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 16        | Kadoli                 | 16     | Kadoli                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 17        | Devagiri               | 17     | Devagiri               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 18        | Kakti                  | 18     | Kakati (CT)            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 19        | Honaga                 | 19     | Honaga                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 20        | Kallehol               | 20     | Kallehol               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 21        | Sulga (U)              | 21     | Sulge (Uchagaon)       | Moderate Risk Area  |
|                                    |               |              |            |              |              | 22        | Turmuri                | 22     | Bachi                  | Moderate Risk Area  |
|                                    |               |              |            | 5            | Gokak        | 23        | Turamari               | 23     | Turamari               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 24        | Kangrali Kh            | 24     | Kangrali (KH) (CT)     | Moderate Risk Area  |
|                                    |               |              |            |              |              | 25        | Uchagaon               | 25     | Uchagaon               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 26        | Ambewadi               | 26     | Mannur                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 27        | Ambewadi               | 27     | Ambewadi               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 28        | Kangrali Bk            | 28     | Kangrali (BK) (CT)     | Moderate Risk Area  |
|                                    |               |              |            |              |              | 29        | Kolavi                 | 29     | Gokak (Rural)          | Moderate Risk Area  |
|                                    |               |              |            |              |              | 30        | Kolavi                 | 30     | Gokak (CMC)            | Very High Risk Area |
|                                    |               |              |            | 6            | Kowjalgi     | 31        | Melavanki              | 31     | Adibatti               | Very High Risk Area |
|                                    |               |              |            |              |              | 32        | Melavanki              | 32     | Melavanki              | Very High Risk Area |
|                                    |               |              |            |              |              | 33        | Chigadolli             | 33     | Chigadolli             | Very High Risk Area |
|                                    |               |              |            |              |              | 34        | Udagatti               | 34     | Kalarkoppa             | Very High Risk Area |
|                                    |               |              |            | 7            | Arbhavi      | 35        | Udagatti               | 35     | Hadiginal              | Very High Risk Area |
|                                    |               |              |            |              |              | 36        | Udagatti               | 36     | Udagatti               | Very High Risk Area |
|                                    |               |              |            |              |              | 37        | Talakatnal             | 37     | Talakatnal             | Very High Risk Area |
|                                    |               |              |            |              |              | 38        | Molmanatti             | 38     | Molmanatti             | Moderate Risk Area  |
|                                    |               |              |            |              |              | 39        | Lolasur                | 39     | Shingalapur            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 40        | Lolasur                | 40     | Lolasur                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 41        | Nallanatti             | 41     | Basaligundi            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 42        | Nallanatti             | 42     | Shivapur               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 43        | Nandagaon              | 43     | Nallanatti             | Moderate Risk Area  |
|                                    |               |              |            |              |              | 44        | Dhupadal               | 44     | Dhupadal               | Moderate Risk Area  |
|                                    |               |              |            | 8            | Hukkeri      | 45        | Mutnal                 | 45     | Mutnal                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 46        | Nandagaon              | 46     | Nandagaon              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 47        | Khanapur               | 47     | Khanapur               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 48        | Balobal                | 48     | Balobal                | Very High Risk Area |
|                                    |               |              |            |              |              | 49        | Beerangaddi            | 49     | Beerangaddi            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 50        | Shindihatti            | 50     | Shindihatti            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 51        | Hospet                 | 51     | Hospet                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 52        | Ankalgudiketra         | 52     | Ankalgudiketra         | Moderate Risk Area  |
|                                    |               |              |            |              |              | 53        | Nadigudiketra          | 53     | Nadigudiketra          | Moderate Risk Area  |
|                                    |               |              |            |              |              | 54        | Yarnal                 | 54     | Yarnal                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 55        | Ingali                 | 55     | Ingali                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 56        | Hosur                  | 56     | Hosur                  | Moderate Risk Area  |
|                                    |               |              |            | 9            | Sankeswar    | 57        | Yargatti               | 57     | Yargatti               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 58        | Badkundri              | 58     | Badkundri              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 59        | Goudawad               | 59     | Goudawad               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 60        | Bastawad               | 60     | Bastawad               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 61        | Madamakkana            | 61     | Madamakkana            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 62        | Beniwad                | 62     | Beniwad                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 63        | Noginhal               | 63     | Noginhal               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 64        | Sultanpur              | 64     | Sultanpur              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 65        | Awargol                | 65     | Awargol                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 66        | Kotabagi               | 66     | Kotabagi               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 67        | Zangathihal            | 67     | Zangathihal            | Moderate Risk Area  |
|                                    |               |              |            |              |              | 68        | Gudas                  | 68     | Gudas                  | Moderate Risk Area  |
|                                    |               |              |            |              |              | 69        | Hanchinal              | 69     | Chikalgud              | Moderate Risk Area  |
|                                    |               |              |            |              |              | 70        | Kurani                 | 70     | Kurani                 | Moderate Risk Area  |
|                                    |               |              |            |              |              | 71        | Arjunwad               | 71     | Arjunwad               | Moderate Risk Area  |
|                                    |               |              |            |              |              | 72        | Kochari                | 72     | Kochari                | Moderate Risk Area  |
|                                    |               |              |            |              |              | 73        | Hebbal                 | 73     | Hebbal                 | Moderate Risk Area  |

| Ghataprabha Sub-Basin (K3)         |               |              |                    |              |            |           |                     |        |                    |                     |
|------------------------------------|---------------|--------------|--------------------|--------------|------------|-----------|---------------------|--------|--------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                    |              |            |           |                     |        |                    |                     |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name         | Hobli SI.No. | Hobli Name | GP SI.No. | Gram Panchayat Name | SI.No. | Village Name       | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4                  | 5            | 6          | 7         | 8                   | 9      | 10                 | 11                  |
| 1                                  |               | 4            | Mudalgi            | 10           | Arbhavi    | 45        | Hunashyal.P.G       | 74     | Hunshyal (P.G.)    | Very High Risk Area |
|                                    |               |              |                    |              |            | 46        | Waderahatti         | 75     | Waderatti          | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 47        | Masaguppi           | 76     | Fulagaddi          | Very High Risk Area |
|                                    |               |              |                    |              |            | 48        | Patagundi           | 77     | Masaguppi          | Very High Risk Area |
|                                    |               |              |                    |              |            | 49        | Munyal              | 78     | Patagundi          | Moderate Risk Area  |
|                                    |               |              |                    | 11           | Kowjalgi   |           |                     | 79     | Kamalahinni        | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 80     | Rangapur           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 81     | Munyal             | Very High Risk Area |
|                                    |               |              |                    |              |            | 50        | Yadawad             | 82     | Yadwad             | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 51        | Tigadi              | 83     | Tigadi             | Very High Risk Area |
|                                    |               |              |                    |              |            | 52        | Kamanakatti         | 84     | Kopadatti          | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 53        | Sunadhali           | 85     | Sunadhali          | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 86     | Bairanatti         | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 54        | Hunashyal.P.Y.      | 87     | Hunshyal (P.Y.)    | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 88     | Bisanakoppa        | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 55        | Avaradi             | 89     | Hale Yaragudri     | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 90     | Avaradi            | Very High Risk Area |
|                                    |               |              |                    |              |            | 56        | Dhavaleshwar        | 91     | Dhavaleshwar       | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 92     | Aralimatti         | Very High Risk Area |
|                                    |               |              |                    |              |            | 57        | Gaddanakeri         | 93     | Gaddanakeri        | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 58        | Kaladagi            | 94     | Kaladgi            | Very High Risk Area |
|                                    |               |              |                    |              |            | 59        | Chikkashellikeri    | 95     | Govindkopp         | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 96     | Muranal            | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 60        | Muranal             | 97     | Kesanur *          | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 98     | Yadahalli          | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 61        | Yadahalli           | 99     | Chebbi             | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 100    | Ankalagi           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 101    | Sharadal           | Very High Risk Area |
|                                    |               |              |                    |              |            | 62        | Khajjidoni          | 102    | Udagatti           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 103    | Devanal            | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 104    | Sokanadgi          | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 63        | Devanal             | 105    | Chikk-Sansi        | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 64        | Chikkashellikeri    | 106    | Hire-Sansi         | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 107    | Yadahalli          | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 108    | Amalzari           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 109    | Lingapur(S.K)      | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 110    | Katarki            | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 111    | Shiraguppi         | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 112    | Kundargi           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 113    | Venkatapura        | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 114    | Anagawadi          | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 115    | Budhihal(S.H)      | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 116    | Bavalatti          | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 69        | Budihal-Sh          | 117    | Kovalli            | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 118    | Koppa(S.K)         | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 70        | Chikkalagundi       | 119    | Algundi            | Moderate Risk Area  |
| 2                                  | Bagalkote     | 5            | Bagalkote          | 12           | Kaladgi    | 65        | Yadahalli           | 120    | Gani               | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 66        | Kataraki            | 121    | Rugi               | Very High Risk Area |
|                                    |               | 6            | Bilgi              | 13           | Bilgi      | 67        | Kundaragi           | 122    | Uttur              | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 68        | Anagawadi           | 123    | Jaliber            | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 124    | Ranjanagi          | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 125    | Mallapur(P.J)      | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 126    | Mirji              | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 127    | Vantigodi          | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 128    | Channal            | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 129    | Mudhol (TMC)       | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 130    | Akkimaradi         | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 131    | Nagaral            | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 132    | Malali             | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 133    | Mudhol(Rural)      | Moderate Risk Area  |
|                                    |               | 7            | Jamakhandi         | 14           | Anagvadi   | 71        | Linganur            | 134    | Belagali           | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 72        | Gulagal-Jambagi     | 135    | Bhantnur           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 136    | Hebbal             | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 137    | Chitrabanukoti     | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 138    | Timmapur           | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 139    | Pettur             | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 140    | Chikkur            | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 141    | Badnur             | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 81        | Bhantnur            | 142    | Junnur             | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 143    | Muddapur           | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 82        | Kasaba-Jambagi      | 144    | Kasba Jambagi(B.K) | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 145    | Budni Khurd        | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 146    | Antapur            | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 147    | Baragi             | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 148    | Bidri              | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 149    | Machaknur          | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 150    | Budni (B.K)        | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 151    | Alagundi(B.K)      | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 152    | 1501006017002      | Moderate Risk Area  |
|                                    |               |              |                    |              |            |           |                     | 153    | Chinchakhandi(K.D) | Very High Risk Area |
|                                    |               |              |                    |              |            | 85        | Chichakhandi-K.D    | 154    | Jambgi(K.D)        | Very High Risk Area |
|                                    |               |              |                    |              |            | 86        | Gulagal-Jambagi     | 155    | Gulgal Jambagi     | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 156    | Ingalagi           | Very High Risk Area |
|                                    |               |              |                    |              |            |           |                     | 157    | Yadahalli          | Moderate Risk Area  |
|                                    |               | 8            | Mudhol             | 17           | Lokapur    | 88        | Vajramatti          | 158    | Vajjaramatti       | Moderate Risk Area  |
|                                    |               |              |                    |              |            | 89        | Madabhavi           | 159    | Marapur            | Very High Risk Area |
|                                    |               |              |                    |              |            | 90        | Nandagav            | 160    | Nandagoan          | Very High Risk Area |
|                                    |               | 9            | Rabakavi Banahatti | 18           | Mudhol     | 91        | Dhavaleshwar        | 161    | Dhavaleshwar       | Very High Risk Area |
|                                    |               |              |                    |              |            | 92        | Mahalingpur (TMC)   | 162    | Mahalingpur (TMC)  | Moderate Risk Area  |



### 3.5.4 Malaprabha Sub-basin -K4:

Malaprabha sub basin is a right bank tributary of Krishna River. The Malaprabha catchment lies between North latitudes 15° 00' and 16° 12' and east longitudes 74° 14' and 76° 05'. The Malaprabha River originates from the Chorla Ghats, a section of the Western Ghats, at an elevation of about 792m about 35m south-west of Belgaum District of Karnataka. The river flows east and north-west and joins Krishna at Kapila Sangam in the Bijapur District at an elevation of about 488 m. Malaprabha traverses a length of 306 km before meeting the Krishna River.

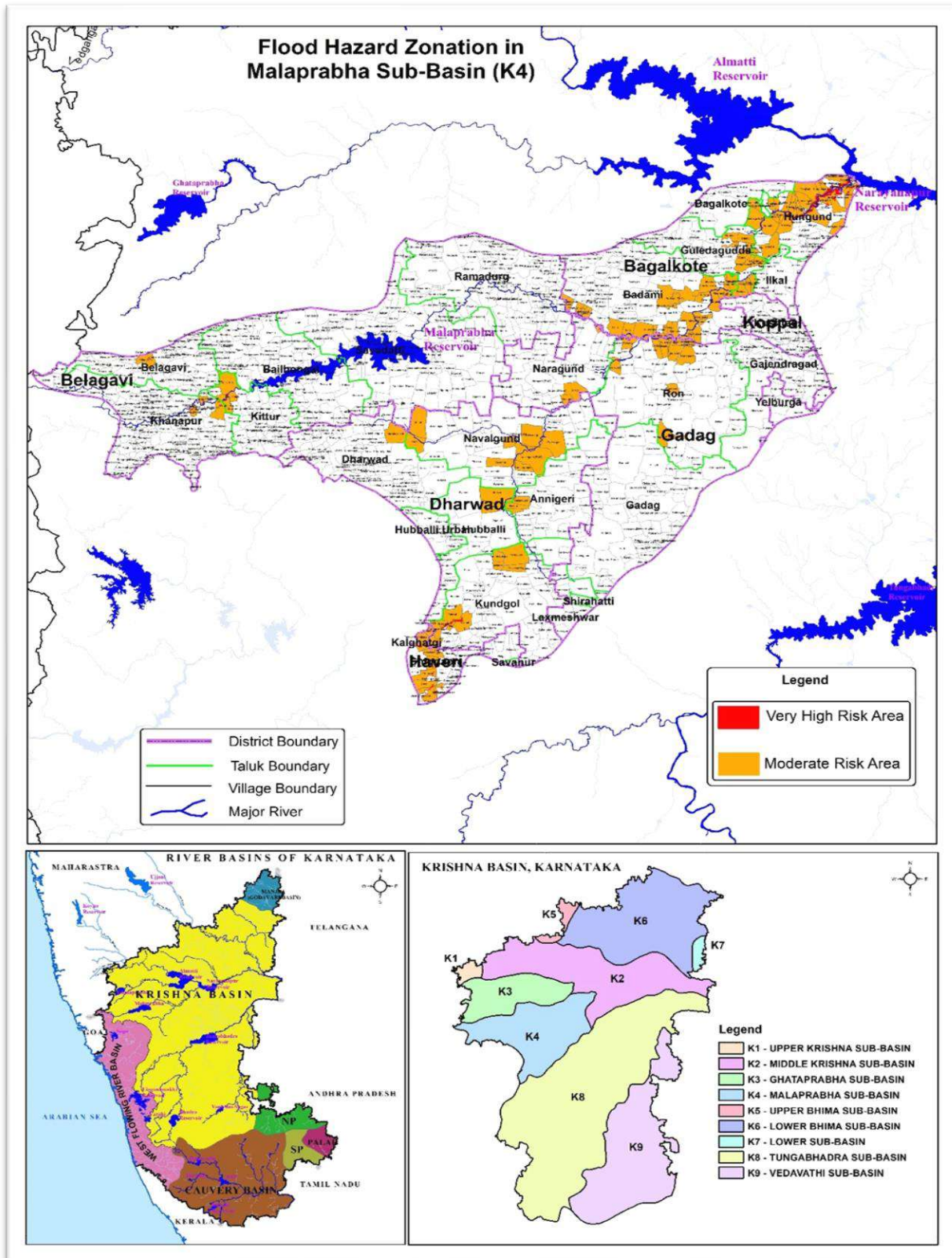
The Bennihala and the Hirehalla are the principal tributaries of the river Malaprabha. The total catchment area of the Malaprabha including its tributaries is 11,549 sq. km, which lies wholly in the State of Karnataka. It flows for a distance of 304 km and joins the Krishna river at an altitude of 488 meters near Kudal Sangama in Bagalkot district in Karnataka. It also flows through Dharwar District. Hubli city gets the drinking water from this reservoir. The Naviluteertha Dam is constructed near Munavalli in Belgaum District with a storage capacity of 1.07 km<sup>3</sup>. It irrigates more than 2,000 square kilometres of land. This reservoir is called Renukasagar.

The flood situation is commonly noticed in main tributaries of Bennihalla and Hirehalla during the southwest monsoon season due to heavy to very heavy rainfall associated with release of water from the upper basins of Krishna basin and also the storage of Alamatti reservoir and Narayanapura reservoir at full capacity create back water in inundation of villages all along the basin of Malaprabha.

From the flood hazard zonation map it is depicted that the Malaprabha sub basin lies districts Bagalakote, Dharwad, Gadag, Haveri and Belagavi districts. Bagalakote district is most vulnerable district compare to other districts. In Malaprabha sub basin it is identified that 8 villages are high risk and about 114 villages are under moderate risk it is shown in the **Map-27** and list of flood prone villages are given in **Table -16**.

#### Malaprabha Sub-basin -K4: Flood Prone Districts

| Sl.No. | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|        |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1      | Belagavi      | 3             | 3             | 7                      | —               | 9             | 9              |
| 2      | Bagalkote     | 3             | 6             | 31                     | 8               | 55            | 63             |
| 3      | Gadag         | 2             | 5             | 12                     | —               | 16            | 16             |
| 4      | Haveri        | 1             | 1             | 5                      | —               | 9             | 9              |
| 5      | Dharwad       | 5             | 6             | 16                     | —               | 25            | 25             |
| Total  |               | 14            | 21            | 71                     | 8               | 114           | 122            |



Map-27 Malaprabha Sub basin -K4

Table – 16 List of Flood Prone Villages in Malprabha Sub-basin -K4

| Malaprabha Sub-Basin (K4)          |               |              |            |              |            |           |                     |        |                  |                    |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|------------------|--------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                  |                    |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name     | Flood Hazard Class |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10               | 11                 |
| 1                                  | Belagavi      | 1            | Belagavi   | 1            | Belagavi   | 1         | Yallur              | 1      | Yellur (CT)      | Moderate Risk Area |
|                                    |               | 2            | Khanapur   | 2            | Khanapur   | 1         | Kodachawad          | 2      | Kagganagi        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 3      | Chikadinkop      | Moderate Risk Area |
|                                    |               |              |            |              |            | 2         | Itagi               | 4      | Itagi            | Moderate Risk Area |
|                                    |               |              |            |              |            | 3         | Hirehattiholi       | 5      | Hire-Hattiholi   | Moderate Risk Area |
|                                    |               | 3            | Kittur     | 3            | Kittur     | 4         | Devarashighalli     | 6      | Marganakoppa     | Moderate Risk Area |
|                                    |               |              |            |              |            | 5         | Dastikoppa          | 7      | Veerapur         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 8      | Dastikoppa       | Moderate Risk Area |
|                                    |               |              |            |              |            | 6         | M.K.Hubli           | 9      | M.K.Hubli        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     |        |                  |                    |
| 2                                  | Bagalkote     | 4            | Badami     | 4            | Badami     | 7         | Kataraki            | 10     | Manneri          | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 11     | Jakanur          | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 12     | Neeralagi        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 13     | Katharaki        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 14     | Thaminal         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 15     | Chikkanasabi     | Moderate Risk Area |
|                                    |               |              |            |              |            | 8         | Beloor              | 16     | Dhanakashirur    | Moderate Risk Area |
|                                    |               |              |            |              |            | 9         | Cholachagudd        | 17     | Cholachagudda    | Moderate Risk Area |
|                                    |               |              |            |              |            | 10        | Mangalur            | 18     | Hirenasabi       | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 19     | Mangalur         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 20     | Gonal            | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 21     | Shirabadagi      | Moderate Risk Area |
|                                    |               |              |            |              |            | 11        | Badami (TMC)        | 22     | Badami (TMC)     | Moderate Risk Area |
|                                    |               |              |            |              |            | 12        | Nandikeshwar        | 23     | Nelwagi          | Moderate Risk Area |
|                                    |               |              |            |              |            | 13        | Badami (Rural) *    | 24     | Badami (Rural) * | Moderate Risk Area |
|                                    |               |              |            |              |            | 14        | Nandikeshwar        | 25     | Nandikeshwar     | Moderate Risk Area |
|                                    |               |              |            |              |            | 15        | Pattadakall         | 26     | Bachinagudd      | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 27     | Pattadakall      | Moderate Risk Area |
|                                    |               |              |            | 5            | Kulgeri    | 16        | Hebballi            | 28     | Hebballi         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 29     | Mumaraddikoppa   | Moderate Risk Area |
|                                    |               |              |            |              |            | 17        | Kittali             | 30     | Sulla            | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 31     | Kittali          | Moderate Risk Area |
|                                    |               |              |            |              |            | 18        | Alur-Sk             | 32     | Beeranur         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 33     | Talakawad        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 34     | Alur .S.K.       | Moderate Risk Area |
|                                    |               |              |            |              |            | 19        | Kakanur             | 35     | Karalakoppa      | Moderate Risk Area |

| Malaprabha Sub-Basin (K4)          |               |              |             |              |             |           |                     |        |                   |                     |
|------------------------------------|---------------|--------------|-------------|--------------|-------------|-----------|---------------------|--------|-------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |             |              |             |           |                     |        |                   |                     |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name  | Hobli SI.No. | Hobli Name  | GP SI.No. | Gram Panchayat Name | SI.No. | Village Name      | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4           | 5            | 6           | 7         | 8                   | 9      | 10                | 11                  |
|                                    |               | 5            | Hungund     | 6            | Hungund     | 20        | Chittaragi          | 36     | Chittaragi        | Very High Risk Area |
|                                    |               |              |             |              |             | 21        | Hiremalagavi        | 37     | Chickmagi         | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 38     | Khairwadgi        | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 39     | Chickmalagavi     | Very High Risk Area |
|                                    |               |              |             |              |             | 22        | Belagall            | 40     | Belgal            | Very High Risk Area |
|                                    |               |              |             |              |             |           |                     | 41     | Medinapur         | Very High Risk Area |
|                                    |               |              |             |              |             |           |                     | 42     | Huvanur           | Very High Risk Area |
|                                    |               |              |             |              |             | 23        | Hiremalagavi        | 43     | Hiremalagavi      | Moderate Risk Area  |
|                                    |               |              |             |              |             | 24        | Dhannur             | 44     | Iddalgi           | Moderate Risk Area  |
|                                    |               |              |             |              |             | 25        | Ganjihal            | 45     | Nandanoor         | Very High Risk Area |
|                                    |               |              |             |              |             |           |                     | 46     | Ganjihal          | Very High Risk Area |
|                                    |               |              |             |              |             | 26        | Kudalasangam        | 47     | Sangam            | Very High Risk Area |
|                                    |               |              |             |              |             | 27        | Bisaladinni         | 48     | Chowdakamaladinni | Moderate Risk Area  |
|                                    |               |              |             | 7            | Amingarh    | 28        | Ihole               | 49     | Nimbalgundi       | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 50     | Aiahole           | Moderate Risk Area  |
|                                    |               |              |             |              |             | 29        | Huvinahalli         | 51     | Ramathal          | Moderate Risk Area  |
|                                    |               |              |             |              |             | 30        | Hiremagi            | 52     | Hiremagi          | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 53     | Bevinial          | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 54     | Budihal (Inam)    | Moderate Risk Area  |
|                                    |               |              |             |              |             | 31        | Kamatgi (CT)        | 55     | Kamatgi (CT)      | Moderate Risk Area  |
|                                    |               |              |             |              |             | 32        | Muganur             | 56     | Kadiwal Kallapur  | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 57     | Suralikal         | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 58     | Basawanal         | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 59     | Basarikatti       | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 60     | Budihal (S.K.)    | Moderate Risk Area  |
|                                    |               |              |             | 8            | Karadi      | 33        | Dhannur             | 61     | Kamadatta         | Moderate Risk Area  |
|                                    |               | 6            | Guledagudda | 9            | Guledagudda | 34        | Mangalagudda        | 62     | Katapur           | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 63     | Mangalagudda      | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 64     | Chimmalagi        | Moderate Risk Area  |
|                                    |               |              |             |              |             | 35        | Layadagundi         | 65     | Kataginahalli     | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 66     | Layadagundi       | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 67     | Kotnalli          | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 68     | Asangi            | Moderate Risk Area  |
|                                    |               |              |             |              |             | 36        | Nagaral-S.P         | 69     | Subbalahunashi    | Moderate Risk Area  |
|                                    |               |              |             |              |             | 37        | Haladur             | 70     | Allur. S.P.       | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 71     | Haradolli         | Moderate Risk Area  |
|                                    |               |              |             |              |             |           |                     | 72     | Haladur           | Moderate Risk Area  |

| Malaprabha Sub-Basin (K4)          |               |              |            |              |            |           |                     |        |                     |                    |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|---------------------|--------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                     |                    |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name | Hobli SI.No. | Hobli Name | GP SI.No. | Gram Panchayat Name | SI.No. | Village Name        | Flood Hazard Class |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10                  | 11                 |
| 3                                  | Gadag         | 7            | Naragund   | 10           | Naragund   | 38        | Banahatti           | 73     | Kurlageri           | Moderate Risk Area |
|                                    |               |              |            | 11           | Konnur     | 39        | Surkod              | 74     | Surkod              | Moderate Risk Area |
|                                    |               |              |            |              |            | 40        | Konnur              | 75     | Budihal             | Moderate Risk Area |
|                                    |               |              |            |              |            | 41        | Chikkamannur        | 76     | Hiremannur          | Moderate Risk Area |
|                                    |               | 8            | Ron        | 12           | Ron        |           |                     | 77     | Basarakod           | Moderate Risk Area |
|                                    |               |              |            |              |            | 42        | Amaragol            | 78     | B-S-Beler           | Moderate Risk Area |
|                                    |               |              |            |              |            | 43        | Koujageri           | 79     | Malawad             | Moderate Risk Area |
|                                    |               |              |            | 13           | Hole Alur  |           |                     | 80     | Hunagundi           | Moderate Risk Area |
|                                    |               |              |            |              |            | 44        | Hunagundi           | 81     | Benahal             | Moderate Risk Area |
|                                    |               |              |            |              |            | 45        | Holealur            | 82     | Holealur            | Moderate Risk Area |
|                                    |               |              |            |              |            | 46        | Holemannur          | 83     | Gadgoli             | Moderate Risk Area |
|                                    |               |              |            |              |            | 47        | Menasagi            | 84     | Menasigi            | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 85     | Kuruvinakoppa       | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 86     | Hole Hadagali       | Moderate Risk Area |
|                                    |               |              |            |              |            | 48        | Amaragol            | 87     | Amaragol            | Moderate Risk Area |
|                                    |               |              |            | 14           | Nargil     | 49        | D.S.Hadagali        | 88     | Hadagali -S- Dambal | Moderate Risk Area |
| 4                                  | Haveri        | 9            | Shiggaon   | 15           | Dhunds     |           |                     | 89     | Hosur               | Moderate Risk Area |
|                                    |               |              |            |              |            | 50        | Hosur               | 90     | Yattinahalli        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 91     | Aratal              | Moderate Risk Area |
|                                    |               |              |            |              |            | 51        | Dhundasi            | 92     | Dhundshi            | Moderate Risk Area |
|                                    |               |              |            |              |            | 52        | Madli               | 93     | Kunnur              | Moderate Risk Area |
|                                    |               |              |            |              |            | 53        | N M Tadas           | 94     | Adavisomapur        | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 95     | Kamalanagar         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 96     | Tadas               | Moderate Risk Area |
| 5                                  | Dharwad       | 10           | Dharwad    | 16           | Aminbhavi  | 54        | Tadas               | 97     | Muthalli            | Moderate Risk Area |
|                                    |               |              |            |              |            | 55        | Harobelawadi        | 98     | Harobelavadi        | Moderate Risk Area |
|                                    |               |              |            |              |            | 56        | Kiresur             | 99     | Kirasur             | Moderate Risk Area |
|                                    |               |              |            |              |            | 57        | Hebsur              | 100    | Hebsur              | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 101    | Belligatti          | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 102    | Jigalur             | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 103    | Ramanakoppa         | Moderate Risk Area |
|                                    |               |              |            |              |            | 58        | Ramanakoppa         | 104    | Hosakatti           | Moderate Risk Area |
|                                    |               |              |            |              |            | 59        | Guruvinahalli       | 105    | Vithalapur          | Moderate Risk Area |
|                                    |               |              |            |              |            | 60        | Kubihal             | 106    | Kubihal             | Moderate Risk Area |
|                                    |               |              |            |              |            | 61        | Yeliwala            | 107    | Yaliwal             | Moderate Risk Area |
|                                    |               |              |            | 18           | Kundgol    |           |                     | 108    | Chikkanarti         | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 109    | Mullahalli          | Moderate Risk Area |
|                                    |               |              |            |              |            | 62        | Yaraguppi           | 110    | Yaraguppi           | Moderate Risk Area |
|                                    |               |              |            | 19           | Saunshi    | 63        | Gudenakatti         | 111    | Yarinarayanpur      | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 112    | Kumaragoppa         | Moderate Risk Area |
|                                    |               |              |            |              |            | 64        | Yamanur             | 113    | Yamanur             | Moderate Risk Area |
|                                    |               |              |            |              |            | 65        | Navalgund (TMC)     | 114    | Navalgund (TMC)     | Moderate Risk Area |
|                                    |               |              |            | 20           | Moraba     |           |                     | 115    | Ahetti              | Moderate Risk Area |
|                                    |               |              |            |              |            | 66        | Shirur              | 116    | Shirur              | Moderate Risk Area |
|                                    |               |              |            |              |            | 67        | Gudisagar           | 117    | Gudisagar           | Moderate Risk Area |
|                                    |               |              |            |              |            | 68        | Halakusugal         | 118    | Shanawad            | Moderate Risk Area |
|                                    |               |              |            |              |            | 69        | Belavatagi          | 119    | Belavatagi          | Moderate Risk Area |
|                                    |               | 13           | Navalgund  | 21           | Annigeri   |           |                     | 120    | Dundur              | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 121    | Bennur              | Moderate Risk Area |
|                                    |               |              |            |              |            |           |                     | 122    | Ballarawad          | Moderate Risk Area |
|                                    |               | 14           | Annigeri   | 21           | Annigeri   |           |                     |        |                     |                    |
|                                    |               |              |            |              |            | 70        | Shishvinahalli      |        |                     |                    |

### 3.5.5 Upper Bhima Sub-basin -K5:

The Bhima River is a major tributary of Krishna river. It originates from a Jyotirling, named Bhimashankar in Ambegaon Taluka of Pune district. About 25 % of the area in the Sub-basin (up to Ujani ) is hilly & highly dissected, 55 % is plateau & 20 % plain & valley filled. The latitude and longitude of Upper Bhima is 17.18 N 19.24 N and 73.20 E 76.15 E and Catchment area of about 45335. sq.Km. The upper Bhima sub basin flows southeast for 861 kilometres through Maharashtra, Karnataka, and Telangana states, before confluence with the Krishna River at Kadlur (Raichur) in Karnataka.

The Upper Bhima Sub Basin -K5 is mainly covered by Deccan trap lava flows the pile of volcanic lava flows laying one over the other and is more or less uniform in chemical composition. The Rainfall variation in Upper Bhima Sub basin -K5 ranges from maximum 4240 mm to 415 mm, with an average of 688 mm. The river flow in taluks of Indi, Vijayapura and Tikkota taluks of Vijayapura district and part of Athani and Raibag taluks in Belagavi districts of Karnataka. Bhima sub Basin experienced severe floods several times during recent decade. The Main tributary of upper Bhima sub basin in Karnataka is Doni river. All along the basin of Doni river flash flood situation are common in case of heavy to very heavy rainfall associated with water release from the upper Bhima sub basin catchment area. The flood prone regions of upper Bhima sub basin are delineated in part of vijayapura and Belagavi district along the river of Bhima and Doni river basin is depicted in **Map-28** and **Table – 17** it's depicted that 2 villagers are prone very high risk area and 13 villages under moderate risk.

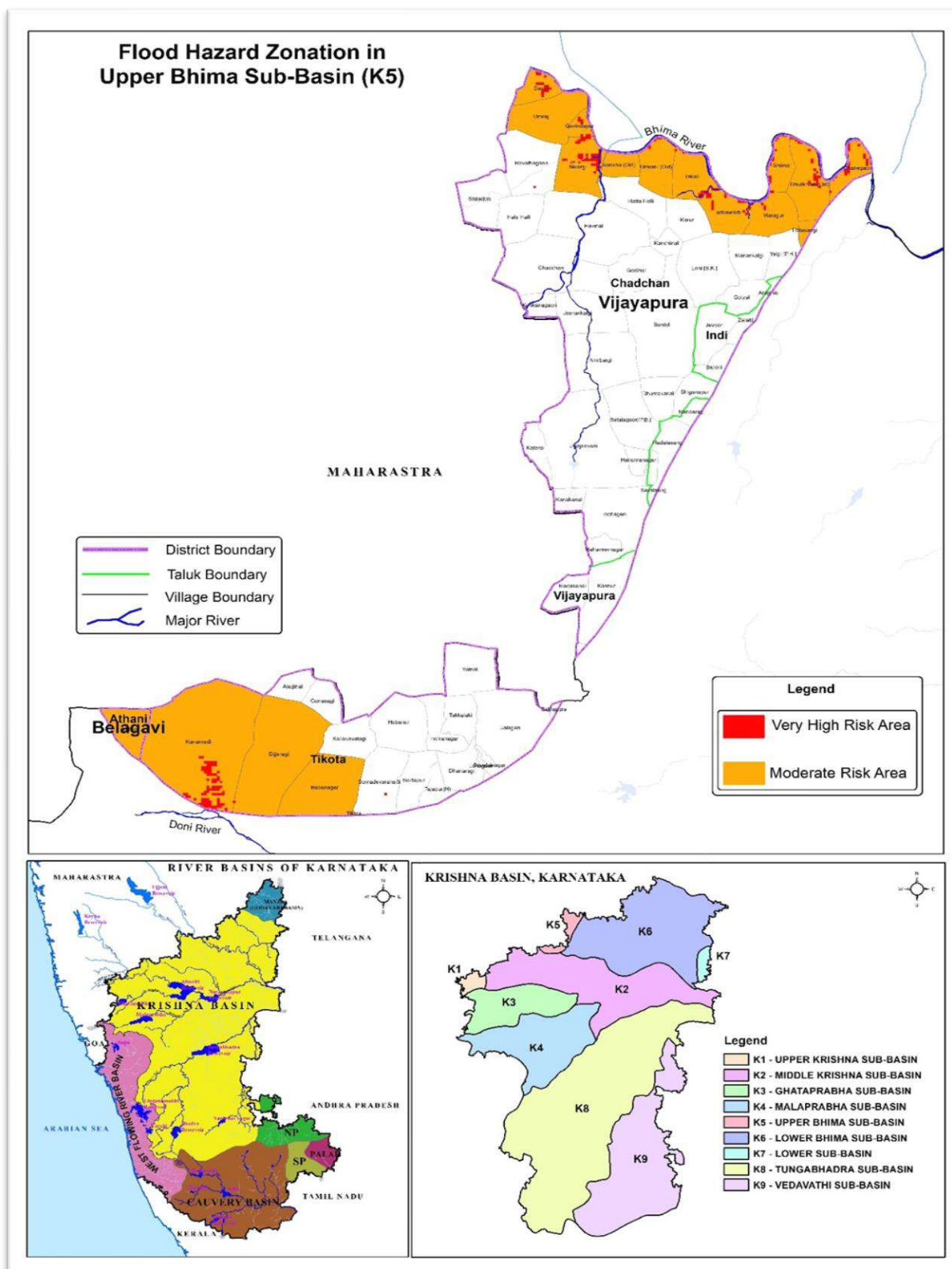
#### Upper Bhima Sub-basin -K5: Flood Prone Districts

| Sl.No. | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|        |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1      | Belagavi      | 2             | 2             | 7                      | 2               | 13            | 15             |



Table – 17 List of Flood Prone Villages in Upper Bhima Sub basin -K5

| Upper Bhima Sub-Basin (K5)         |               |              |            |              |            |           |                     |        |                 |                     |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|-----------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                 |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name    | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10              | 11                  |
| 1                                  | Vijayapura    | 1            | Chadchan   | 1            | Chadchan   | 1         | Dhulakhed           | 1      | Maragur         | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 2      | Dhulikhed (Old) | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 3      | Chanegaon       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 2         | Umarani             | 4      | Taddewadi       | Very High Risk Area |
|                                    |               |              |            |              |            |           |                     | 5      | Takali          | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 6      | Umrani (Old)    | Moderate Risk Area  |
|                                    |               |              |            |              |            | 3         | D.Nimbaragi         | 7      | Nivargi         | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 8      | Govindapur      | Moderate Risk Area  |
|                                    |               |              |            |              |            | 4         | Dhulakhed           | 9      | Shirnal         | Moderate Risk Area  |
|                                    |               |              |            |              |            | 5         | Hattalli            | 10     | Sankha (Old)    | Moderate Risk Area  |
|                                    |               |              |            |              |            | 6         | Umaraja             | 11     | Umrar           | Moderate Risk Area  |
|                                    |               |              |            |              |            |           |                     | 12     | Dasur           | Moderate Risk Area  |
|                                    |               | 2            | Tikota     | 2            | Tikota     | 7         | Babanagar           | 13     | Babanagar       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 8         | Bijjaragi           | 14     | Bijjaragi       | Moderate Risk Area  |
|                                    |               |              |            |              |            | 9         | Kanamadi            | 15     | Kanamadi        | Moderate Risk Area  |



Map-28 Upper Bhima Sub-basin -K5

**3.5.6 Lower Bhima Sub-basin -K6 :** The K-6 Lower Bhima Sub Basin is a part of Bhima basin which covers an area of 3564 Sq. km. Annual rainfall in the Lower Bhima Sub Basin varies between 242 mm to 1124 mm. The entire area of the Lower Bhima Sub Basin (K-6) is occupied by the Deccan Trap formation represented by nearly horizontal lava flows of basaltic composition. The lower Bhima sub basin flows mainly Kalaburagi, Yadgir, Vijayapura and Bidar districts. K-6 Lower Bhima Sub basin is severally deficit Sub basin. Hence No severe floods are experienced in sub basin but in recent decade the basin faced and experienced flood situation due to heavy rainfall in the basin and also receive huge flow from the upper catchment area cause flood situation in districts of Kalaburagi, Yadgir, Bidar and Vijayapura Districts. The flood hazard zonation map of Lower Bhima sub basin is shown in **Map 29** from the map and **table – 18** it's depicted that about 112 villages are under very high risk area and 180 villages are under moderate risk area.

#### Lower Bhima Sub-basin -K6: Flood Prone Districts

| Sl.No.       | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|              |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1            | Kalaburagi    | 11            | 31            | 134                    | 89              | 149           | 238            |
| 2            | Bidar         | 2             | 3             | 4                      | –               | 7             | 7              |
| 3            | Vijayapura    | 4             | 5             | 16                     | 16              | 13            | 29             |
| 4            | Yadgir        | 3             | 6             | 10                     | 7               | 11            | 18             |
| <b>Total</b> |               | <b>20</b>     | <b>45</b>     | <b>164</b>             | <b>112</b>      | <b>180</b>    | <b>292</b>     |

Table – 18 List of Flood prone Villages in Lower Bhima Sub basin -K6

| Lower Bhima Sub-Basin (K6)         |               |              |                |              |            |           |                     |        |                  |                     |
|------------------------------------|---------------|--------------|----------------|--------------|------------|-----------|---------------------|--------|------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                |              |            |           |                     |        |                  |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name     | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name     | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4              | 5            | 6          | 7         | 8                   | 9      | 10               | 11                  |
| 1                                  | Kalaburagi    | 1            | Afzalpur       | 1            | Afzalpur   | 1         | Ghattarga           | 1      | Ghattarga        | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 2      | Hawalga          | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 3      | Kolnur           | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 4      | Guddewadi        | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 5      | Shivpur          | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 6      | Kesapur          | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 7      | Guolnur          | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 8      | Kalur            | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 9      | Batgera          | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 10     | Karkanahalli     | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 11     | Tellur           | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 12     | Afzalpur (Rural) | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 13     | Gour (K)         | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 14     | Awarad           | Moderate Risk Area  |
|                                    |               | 2            | Afzalpur       | 2            | Atanur     | 4         | Hasargundagi        | 15     | Umerga           | Very High Risk Area |
|                                    |               |              |                |              |            | 5         | Bandarwad           | 16     | Banderwad        | Moderate Risk Area  |
|                                    |               |              |                |              |            | 6         | Deval Ghanagapur    | 17     | D.Ghangapur      | Very High Risk Area |
|                                    |               |              |                |              |            | 7         | Choudapur           | 18     | Chinmmgera       | Moderate Risk Area  |
|                                    |               |              |                |              |            | 8         | Gobbur (B)          | 19     | Shivajinagar     | Moderate Risk Area  |
|                                    |               |              |                |              |            | 9         | Madara(B)           | 20     | Ingalgi (B)      | Moderate Risk Area  |
|                                    |               |              |                |              |            | 10        | Bhairamadagi        | 21     | Bhairamadgi      | Moderate Risk Area  |
|                                    |               |              |                |              |            | 11        | Kugnur              | 22     | Goudgaon         | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 23     | Dudangi          | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 24     | Mangaroli        | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 25     | Algi (B)         | Very High Risk Area |
|                                    |               |              |                |              |            | 12        | Allagi B            | 26     | Soan             | Very High Risk Area |
|                                    |               |              |                |              |            | 13        | Gour (B)            | 27     | Bhosga           | Moderate Risk Area  |
|                                    |               |              |                |              |            | 14        | Bankalaga           | 28     | Bhankalga        | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 29     | Hiriyal          | Moderate Risk Area  |
|                                    |               |              |                |              |            | 15        | Udachan             | 30     | Udchan           | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 31     | Shivoor          | Very High Risk Area |
|                                    |               |              |                |              |            | 16        | Ram Nagar           | 32     | Kodagnur         | Very High Risk Area |
|                                    |               |              |                |              |            | 17        | Mannur              | 33     | Mannur           | Very High Risk Area |
|                                    |               | 2            | Aland          | 3            | Karajgi    | 18        | Tadakal             | 34     | Bharked          | Moderate Risk Area  |
|                                    |               |              |                |              |            | 19        | Alanga              | 35     | Sirur (G)        | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 36     | Gadlegaon        | Moderate Risk Area  |
|                                    |               |              |                |              |            | 20        | Bhodhan             | 37     | Bhodhan          | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 38     | Betjewargi       | Moderate Risk Area  |
|                                    |               |              |                |              |            | 21        | Kamalanagar         | 39     | Kamalanagar      | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 40     | Sawalgi (K)      | Moderate Risk Area  |
|                                    |               |              |                |              |            | 22        | Bhodhan             | 41     | Bilgunda         | Moderate Risk Area  |
|                                    |               |              |                |              |            | 23        | Belamagi            | 42     | Sangunda         | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 43     | Belamogi         | Moderate Risk Area  |
|                                    |               |              |                |              |            | 24        | Yalsangi            | 44     | Benisirur        | Moderate Risk Area  |
|                                    |               |              |                |              |            | 25        | Hittalsiroor        | 45     | Kudki            | Moderate Risk Area  |
|                                    |               | 6            | Nimbarga Tanda |              |            | 26        | Suntnoor            | 46     | Vaijapur         | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 47     | Alur (B)         | Moderate Risk Area  |
|                                    |               |              |                |              |            | 27        | Nimbarga            | 48     | Nimbarga         | Moderate Risk Area  |
|                                    |               |              |                |              |            | 28        | Hittalsiroor        | 49     | Hithal Sirur     | Very High Risk Area |
|                                    |               |              |                |              |            |           |                     | 50     | Battarga         | Very High Risk Area |
|                                    |               |              |                |              |            | 29        | Dhangapur           | 51     | Dhangapur        | Moderate Risk Area  |
|                                    |               |              |                |              |            |           |                     | 52     | Devanti          | Moderate Risk Area  |
|                                    |               |              |                |              |            | 30        | Hittalsiroor        | 53     | Jawali.D         | Very High Risk Area |

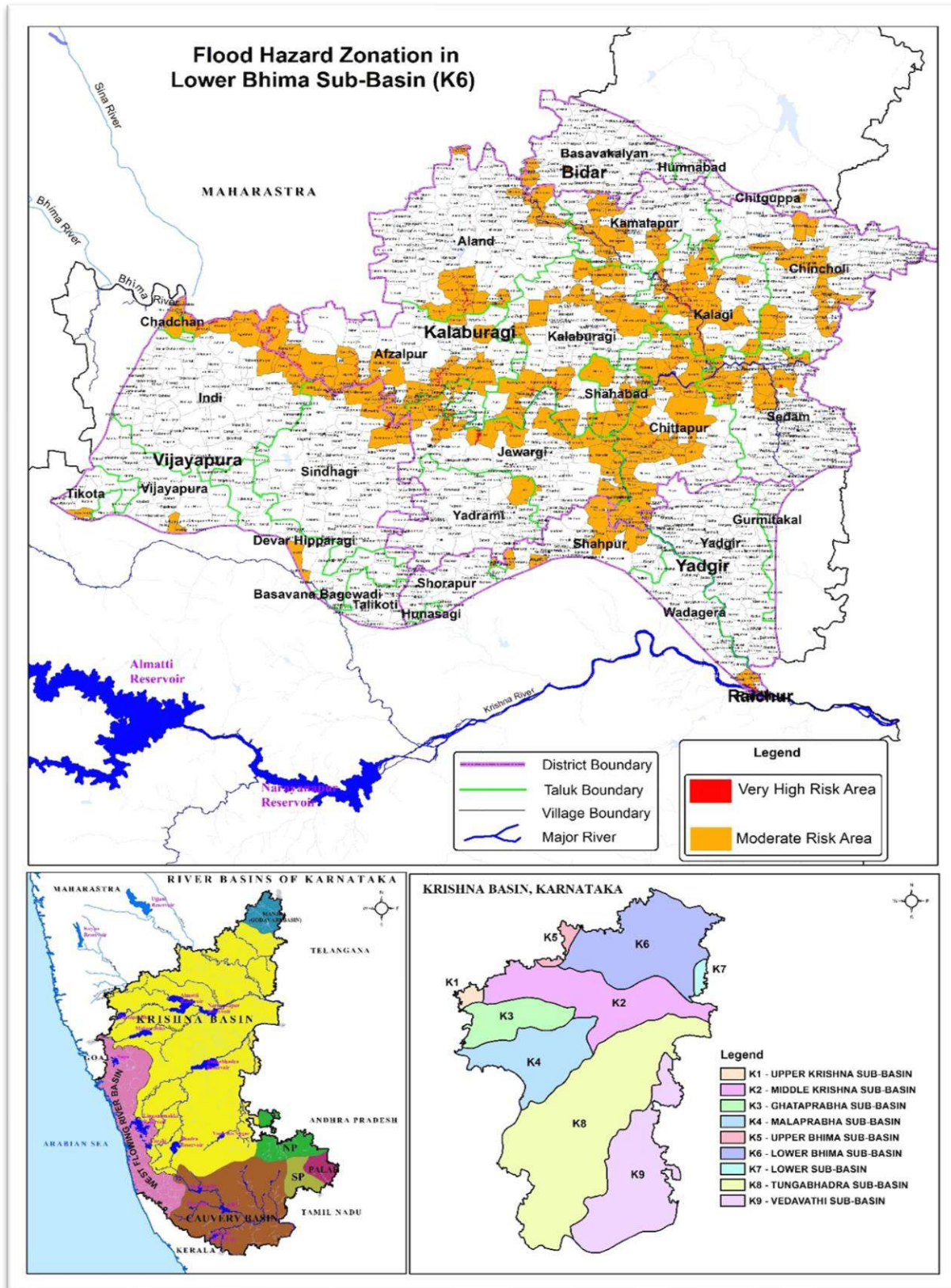
| Lower Bhima Sub-Basin (K6)         |                  |                 |            |                 |                 |              |                        |        |                  |                     |
|------------------------------------|------------------|-----------------|------------|-----------------|-----------------|--------------|------------------------|--------|------------------|---------------------|
| List of Flood Hazard Risk Villages |                  |                 |            |                 |                 |              |                        |        |                  |                     |
| Dist.<br>Sl.No.                    | District<br>Name | Taluk<br>Sl.No. | Taluk Name | Hobli<br>Sl.No. | Hobli Name      | GP<br>Sl.No. | Gram Panchayat<br>Name | Sl.No. | Village Name     | Flood Hazard Class  |
| 1                                  | 2                | 3               | 4          | 5               | 6               | 7            | 8                      | 9      | 10               | 11                  |
|                                    |                  | 3               | Chincholi  | 7               | Chincholi       | 31           | Miriyani               | 54     | Kallur Road      | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 32           | Anwar                  | 55     | Ganganpalli      | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 56     | Anwar            | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 33           | Chincholi (TP)         | 57     | Chincholi (TP)   | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 58     | Neemahosalli     | Very High Risk Area |
|                                    |                  |                 |            | 8               | Ainapur         | 34           | Garampalli             | 59     | Goudanhalli      | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 60     | Degalmadi        | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 61     | Garampalli       | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 35           | Chimmanchod            | 62     | Tajlapur         | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 63     | Chimmanchod      | Very High Risk Area |
|                                    |                  |                 |            | 9               | Sulepet         | 36           | Salebeernalli          | 64     | Tumkunta         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 65     | Salebeernalli    | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 37           | Gadikeshwar            | 66     | Chintpalli       | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 67     | Raikod           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 68     | Gadikeshwar      | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 38           | Karchkhed              | 69     | Karachkhed       | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 70     | Chatarsal        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 71     | Iragpalli        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 72     | Sangam[K]        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 39           | Kerolli                | 73     | Benkanhalli      | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 74     | Bhantanahalli    | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 40           | Garagapalli            | 75     | Garagapalli      | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 76     | Pardarmotakpalli | Moderate Risk Area  |
|                                    |                  |                 |            | 10              | Kodli Chincholi | 41           | Kanakpur (Karakmukli)  | 77     | Karakmukli       | Very High Risk Area |
|                                    |                  | 4               | Chittapur  | 11              | Chittapur       | 42           | Kardal                 | 78     | Kardal           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 43           | Kamarwadi              | 79     | Alura            | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 44           | Chitapur (TMC)         | 80     | Chitapur (TMC)   | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 45           | Malgatti               | 81     | Malgatti         | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 46           | Dandothi               | 82     | Margol           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 83     | Mudbol           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 84     | Jeevangi         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 85     | Bhagodi          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 86     | Katamdevarhalli  | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 87     | Dandothi         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 47           | Pethsirur              | 88     | Pethsirur        | Moderate Risk Area  |
|                                    |                  |                 |            | 12              | Gundgurti       | 48           | Ivani                  | 89     | Belgumpu         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 90     | Tonsinhalli (T)  | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 49           | Gundagurthi            | 91     | Gundagurthi      | Very High Risk Area |
|                                    |                  |                 |            |                 |                 |              |                        | 92     | Mattimudu        | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 50           | Madbul                 | 93     | Wacha            | Moderate Risk Area  |
|                                    |                  |                 |            | 13              | Nalavara        |              |                        | 94     | Hadnoor          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 51           | Sannati                | 95     | Banhatti         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 96     | Hulandgera       | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 97     | Kanganahalli     | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 98     | Sonthi           | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 52           | Kollur                 | 99     | Kollur           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 53           | Rampurahalli           | 100    | Maradgi          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 54           | Kadbur                 | 101    | Sugur (N)        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 102    | Turnur           | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 103    | Malag (N)        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 104    | Kolkunda         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 105    | Kadaboar         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 55           | Ladlapur               | 106    | Konchur          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 56           | Kardal                 | 107    | Hannikere        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 57           | Alloli                 | 108    | Alhalli          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 58           | Halkatta               | 109    | Balwadgi         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 59           | Kadbur                 | 110    | Chamnoor         | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 60           | Halkatta               | 111    | Devapur          | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 |              |                        | 112    | Halkatta         | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 61           | Kamarwadi              | 113    | Kamarwadi        | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 62           | Ingalagi               | 114    | Kundanoor        | Very High Risk Area |
|                                    |                  |                 |            |                 |                 | 63           | Wadi (TMC)             | 115    | Wadi (TMC)       | Moderate Risk Area  |
|                                    |                  |                 |            |                 |                 | 64           | Ingalagi               | 116    | Ingalgi          | Very High Risk Area |

| Lower Bhima Sub-Basin (K6)         |               |              |            |              |            |           |                     |        |                    |                     |  |
|------------------------------------|---------------|--------------|------------|--------------|------------|-----------|---------------------|--------|--------------------|---------------------|--|
| List of Flood Hazard Risk Villages |               |              |            |              |            |           |                     |        |                    |                     |  |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name       | Flood Hazard Class  |  |
| 1                                  | 2             | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10                 | 11                  |  |
|                                    |               | 5            | Kalaburagi | 14           | Kalaburagi | 65        | Hagaraga            | 117    | Hagargi            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 66        | Tajsultanpur        | 118    | Kapnoor            | Very High Risk Area |  |
|                                    |               |              |            | 15           | Aurad      | 67        | Sannur              | 119    | Bolewad            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 120    | Kalbenur           | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 68        | Srinivas Saradgi    | 121    | Srinivas Saradgi   | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 122    | Malgathi           | Very High Risk Area |  |
|                                    |               |              |            |              |            | 69        | Bhupalteganoor      | 123    | Injihal            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 124    | Bhopal Tegnur      | Very High Risk Area |  |
|                                    |               |              |            |              |            | 70        | Algood              | 125    | Algud              | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 71        | Aurad (B)           | 126    | Awrad (B)          | Very High Risk Area |  |
|                                    |               |              |            |              |            |           |                     | 127    | Bannura            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 72        | Kumasi              | 128    | Kumsi              | Moderate Risk Area  |  |
|                                    |               |              |            | 16           | Farhatabad | 73        | Fhirozabad          | 129    | Ferozabad          | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 130    | Nadvinhalli        | Very High Risk Area |  |
|                                    |               |              |            |              |            | 74        | Heroor (B)          | 131    | Belgump (K)        | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 132    | Herur (B)          | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 75        | Basavapattana       | 133    | Kawalga (K)        | Very High Risk Area |  |
|                                    |               |              |            |              |            | 76        | Saradagi (B)        | 134    | Siradgi (Bhatad)   | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 135    | Kawalga (B)        | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 77        | Kavalga (B)         | 136    | Hagargundagi       | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 78        | Farhatabad          | 137    | Farhatabad         | Very High Risk Area |  |
|                                    |               |              |            | 17           | Pattan     | 79        | Sharan Sirasagi     | 138    | Kollur             | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 139    | Malni              | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 140    | Melkunda (K)       | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 81        | Savalgi (B)         | 141    | Savalgi (B)        | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 82        | Bhimalli            | 142    | Keribhosga         | Very High Risk Area |  |
|                                    |               | 6            | Jewargi    | 18           | Jewargi    | 83        | Tajsultanpur        | 143    | Taj Sultanpur      | Very High Risk Area |  |
|                                    |               |              |            |              |            | 84        | Harwal              | 144    | Harwal             | Very High Risk Area |  |
|                                    |               |              |            |              |            | 85        | Kolkur              | 145    | Raddewadgi         | Moderate Risk Area  |  |
|                                    |               |              |            | 19           | Andola     |           |                     | 146    | Kolkur             | Very High Risk Area |  |
|                                    |               |              |            |              |            | 86        | Nelogi              | 147    | Kutnoor            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 148    | Rampur             | Very High Risk Area |  |
|                                    |               |              |            |              |            |           |                     | 149    | Hanchinal Bhari    | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 150    | Hotinmadu          | Very High Risk Area |  |
|                                    |               |              |            |              |            | 87        | Biral (B)           | 151    | Biryal (B)         | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 152    | Honnal             | Very High Risk Area |  |
|                                    |               |              |            |              |            |           |                     | 153    | Malla (K)          | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 154    | Malla (B)          | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 88        | Naribol             | 155    | Rajwal             | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 156    | Naribole           | Very High Risk Area |  |
|                                    |               |              |            | 20           | Nelogi     | 89        | Madari              | 157    | Kattisangavi       | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 158    | Yangunti           | Very High Risk Area |  |
|                                    |               |              |            |              |            |           |                     | 159    | Madri              | Very High Risk Area |  |
|                                    |               |              |            |              |            | 90        |                     | 160    | Nelogi             | Very High Risk Area |  |
|                                    |               |              |            |              |            | 91        | Nedalagi            | 161    | Mayoor             | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 92        | Balundagi           | 162    | Balwandgi          | Very High Risk Area |  |
|                                    |               |              |            |              |            | 93        | Kallur (K)          | 163    | Kallur (B)         | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 164    | Kudalgi            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 165    | Hullur             | Very High Risk Area |  |
|                                    |               |              |            |              |            | 94        | Hullura             | 166    | Narayanpur         | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 167    | Harnal (K)         | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 95        | Ankalga             | 168    | Hanchinal S.Nelogi | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 169    | Ankalga            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 170    | Mogan Itga         | Moderate Risk Area  |  |
|                                    |               |              |            |              |            | 96        | Itga                | 171    | Gulihal            | Moderate Risk Area  |  |
|                                    |               |              |            |              |            |           |                     | 172    | Itga               | Very High Risk Area |  |



| Lower Bhima Sub-Basin (K6)         |               |              |                |              |             |           |                     |                    |               |                     |                     |                    |         |                    |  |
|------------------------------------|---------------|--------------|----------------|--------------|-------------|-----------|---------------------|--------------------|---------------|---------------------|---------------------|--------------------|---------|--------------------|--|
| List of Flood Hazard Risk Villages |               |              |                |              |             |           |                     |                    |               |                     |                     |                    |         |                    |  |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name     | Hobli Sl.No. | Hobli Name  | GP Sl.No. | Gram Panchayat Name | Sl.No.             | Village Name  | Flood Hazard Class  |                     |                    |         |                    |  |
| 1                                  | 2             | 3            | 4              | 5            | 6           | 7         | 8                   | 9                  | 10            | 11                  |                     |                    |         |                    |  |
|                                    |               | 7            | Sedam          | 21           | Sedam       | 97        | Malkhed             | 173                | Nrupathanga   | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 174                | Bhimnagar     | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 175                | Rajivnagar    | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 176                | Malkhed (J)   | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 177                | Samkhed       | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 98        | Sedam (Rural)       | 178                | Sedam (Rural) | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 179                | Sedam (Rural) | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 99        | Uoodagi             | 180                | Hanganhalli   | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 100       | Sedam (TMC)         | 181                | Sedam (TMC)   | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 101       | Kukkunda            | 182                | Beeranhalli   | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 183                | Kukunda       | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 102       | Yadaga              | 184                | Taranhalli    | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 103       | Neelhalli           | 185                | Sangavi (M)   | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 104       | Telkur              | 186                | Telkur        | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 187                | Habal (T)     | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               | 22           | Adki           | 105          | Batagera -K | 188       | Batgera(B)          | Moderate Risk Area |               |                     |                     |                    |         |                    |  |
|                                    |               | 8            | Kalagi         | 23           | Kalagi      |           | 106                 | Tengali            | 189           | Tengli              | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 107                 | Kodadur            | 190           | Mangalgi            | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 108                 | Rajapur            | 191           | Rajapur             | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 109                 | Kalgi              | 192           | Kalgi               | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 110                 | Gotoor             | 193           | Gotur               | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 194           | Sugur (K)           | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 111                 | Chincholli (H)     | 195           | Chincholi (H)       | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 196           | Banbi               | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 197           | Hulgera             | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 112                 | Heroor (K)         | 198           | Kalhipperga         | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 199           | Herur (K)           | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 113                 | Bedsur             | 200           | Sanjay Nagar        | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 24                  | Kodli              |               | 114                 | Kodli               | 201                | Allapur | Moderate Risk Area |  |
|                                    |               |              |                |              |             |           |                     |                    |               | 115                 | Ratkal              | 202                | Sunthan | Moderate Risk Area |  |
|                                    |               |              |                |              |             |           |                     |                    |               |                     |                     | 203                | Ratkal  | Moderate Risk Area |  |
|                                    |               |              |                | 25           | Gundgurti   |           | 116                 | Korwar             | 204           | Mukramba            | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 205           | Muchakhed           | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 117                 | Gotoor             | 206           | Kalgurthi           | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 207           | Malaghan            | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 118                 | Hebbal             | 208           | Kansoor             | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 209           | Bennur (K)          | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 210           | Hebbal              | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 211           | Tonchi              | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 212           | Jeevanmardgi        | Very High Risk Area |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 213           | Shelgi              | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 214           | Belura              | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                | 9            | Kamalapur   | 26        | Kamalapur           | 119                | Jeevangi      | 215                 | Bhunyara(K)         | Moderate Risk Area |         |                    |  |
|                                    |               | 216          | Jeevangi       |              |             |           |                     |                    |               | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               | 27           | Mahagaon Tanda |              |             | 120       | Kurikota            | 217                | Ankalga       | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 218                | Siradhane     | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 121       | Nagur               | 219                | Tadkal        | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 220                | Bhusangi      | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 122       | Babalad (Ik)        | 221                | Kannura       | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 222                | Mahagaon      | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 123       | Mahagoan            | 223                | Dastapur      | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             | 124       | Holakunda           | 224                | Apchand       | Very High Risk Area |                     |                    |         |                    |  |
|                                    |               | 28           | Narona         |              |             |           | 125                 | Shrichand          | 225           | Hodal               | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 126                 | Muddadaga          | 226           | Madki               | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 127                 | Ambalga            | 227           | Kudmud              | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     |                    | 228           | Ambalga             | Moderate Risk Area  |                    |         |                    |  |
|                                    |               |              |                |              |             |           | 128                 | Lad Mugali         | 229           | Ladmugli            | Very High Risk Area |                    |         |                    |  |
|                                    |               | 10           | Yadrami        | 30           | Ijeri       | 130       | Ijeri               | 230                | Pangarga      | Moderate Risk Area  |                     |                    |         |                    |  |
|                                    |               |              |                |              |             |           |                     | 231                | Ijeri         | Moderate Risk Area  |                     |                    |         |                    |  |

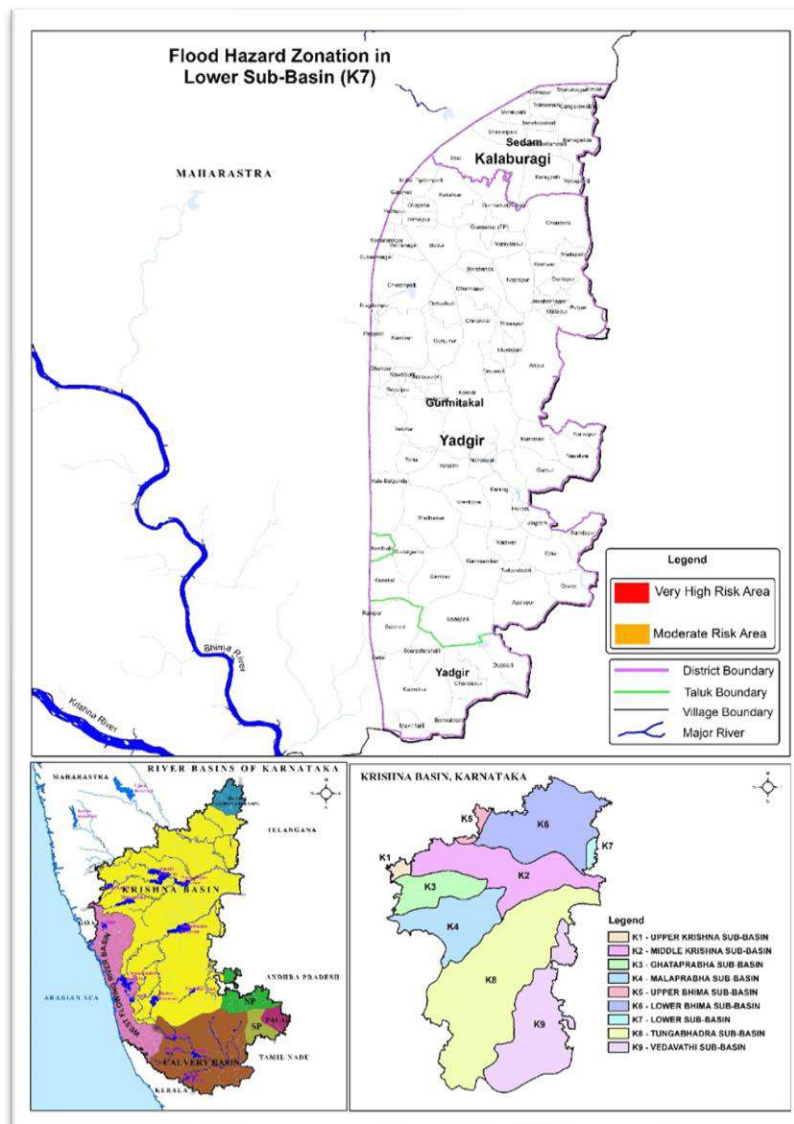
| Lower Bhima Sub-Basin (K6)         |               |              |               |              |            |                     |                       |                     |                     |                     |          |                     |         |     |            |                     |  |
|------------------------------------|---------------|--------------|---------------|--------------|------------|---------------------|-----------------------|---------------------|---------------------|---------------------|----------|---------------------|---------|-----|------------|---------------------|--|
| List of Flood Hazard Risk Villages |               |              |               |              |            |                     |                       |                     |                     |                     |          |                     |         |     |            |                     |  |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name    | Hobli Sl.No. | Hobli Name | GP Sl.No.           | Gram Panchayat Name   | Sl.No.              | Village Name        | Flood Hazard Class  |          |                     |         |     |            |                     |  |
| 1                                  | 2             | 3            | 4             | 5            | 6          | 7                   | 8                     | 9                   | 10                  | 11                  |          |                     |         |     |            |                     |  |
|                                    |               | 11           | Shahabad      | 31           | Shahabad   | 131                 | Honagunta             | 232                 | Hongunta            | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 233                 | Kadhalli            | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 132                 | Tonasnhalli(S)        | 234                 | Gola (K)            | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 133                 | Shahabad (CMC)        | 235                 | Shahabad (CMC)      | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 134                 | Bhankur               | 236                 | Bhankur (OG)        | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 237                 | Mutga               | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 135                 | Maratur               | 238                 | Martur              | Moderate Risk Area  |          |                     |         |     |            |                     |  |
| 2                                  | Bidar         | 12           | Basavakalyan  | 32           | Kohinoor   |                     |                       | 239                 | Gilagili            | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 240                 | Hattarga (Sarhad)   | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 241                 | Sirgur              | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 242                 | Gadlegaon (K)       | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 137                 | Kohinoor              | 243                 | Mankhed             | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 138                 | Harkud                | 244                 | Kherda (K)          | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               | 13           | Chitguppa     | 34           | Nirna      | 139                 | Changlera             | 245                 | Alipur              | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               | 14           | Vijayapura    | 35           | Vijayapura | 140                 | Honnutagi             | 246                 | Honnutagi           | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               | 3            | Vijayapura    | 15           | Indi       | 36                  | Indi                  | 141                 | Miragi              | 247                 | Miragi   | Very High Risk Area |         |     |            |                     |  |
| 142                                | Lalasangi     |              |               |              |            |                     |                       | 248                 | Rodagi              | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 249                 | Khedgi              | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 250                 | Bhuyar              | Very High Risk Area |          |                     |         |     |            |                     |  |
| 143                                | Khedagi       |              |               |              |            |                     |                       | 251                 | Nagarhalli          | Moderate Risk Area  |          |                     |         |     |            |                     |  |
| 144                                | Gubbewada     |              |               |              |            |                     |                       | 252                 | Mannur              | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 253                 | Agarkhed            | Very High Risk Area |          |                     |         |     |            |                     |  |
| 145                                | Agarkhed      |              |               |              |            |                     |                       | 254                 | Gubbewad            | Very High Risk Area |          |                     |         |     |            |                     |  |
| 146                                | Gubbewada     |              |               |              |            |                     |                       | 255                 | Shiragur Inam (Old) | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 256                 | Baragudi            | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 257                 | Hingani             | Very High Risk Area |          |                     |         |     |            |                     |  |
| 148                                | Padanur       |              |               |              |            |                     |                       | 258                 | Padanur             | Very High Risk Area |          |                     |         |     |            |                     |  |
| 149                                | Kakkalameli   |              |               |              |            |                     |                       | 259                 | Kakkalameli         | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 260                 | Kulekumatgi         | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 261                 | Shirasgi            | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 262                 | Bagalur             | Moderate Risk Area  |          |                     |         |     |            |                     |  |
| 150                                | Bagalur       |              |               |              |            |                     |                       | 263                 | Havalgi             | Very High Risk Area |          |                     |         |     |            |                     |  |
| 151                                | Devar Navadgi |              |               |              |            |                     |                       | 264                 | Kumashigi           | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 265                 | Kadlewad(P.A)       | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 266                 | Shambewad           | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 267                 | Devangaon           | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 268                 | Byadgihal (Old)     | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 269                 | Tarapur (Old)       | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 270                 | Tavarkhed (Old)     | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 271                 | Kadani              | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 272                 | Halasangi           | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 273                 | Anachi              | Very High Risk Area |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       | 274                 | Shiragur Khalasa    | Moderate Risk Area  |          |                     |         |     |            |                     |  |
| 4                                  | Yadgir        |              |               |              |            |                     |                       | 18                  | Shahpur             | 40                  | Shahpur  | 156                 | Shirwal | 275 | Sirwal     | Very High Risk Area |  |
|                                    |               |              |               |              |            |                     |                       |                     |                     |                     |          | 157                 | Anabi   | 276 | Anabi      | Moderate Risk Area  |  |
|                                    |               |              |               |              |            |                     |                       |                     |                     |                     |          |                     |         | 277 | Ibrahimpur | Moderate Risk Area  |  |
|                                    |               |              |               | 278          | Tangadgi   | Moderate Risk Area  |                       |                     |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               | 279          | Hursgundgi | Very High Risk Area |                       |                     |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               | 159          | Hurasagundagi | 280          | Habballi   | Moderate Risk Area  |                       |                     |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               | 160          | Chamanal   | 281                 | Nadihal               | Moderate Risk Area  |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               | 161          | Ukkinal    | 282                 | Ukkinal               | Moderate Risk Area  |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 283                 | Achola                | Moderate Risk Area  |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               | 43           | Hattikuni  | 162                 | Arakera (B)           | 284                 | Siddarthnagar       | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               | 19           | Yadgir        | 44           | Saidapur   | 163                 | Badiyal               | 285                 | Badiyal             | Moderate Risk Area  |          |                     |         |     |            |                     |  |
|                                    |               | 20           | Wadagera      | 45           | Wadagera   |                     |                       |                     |                     | 286                 | Gundloor | Very High Risk Area |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       |                     |                     | 287                 | Shivepur | Very High Risk Area |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       |                     |                     | 288                 | Gonal    | Very High Risk Area |         |     |            |                     |  |
|                                    |               |              |               |              |            |                     |                       |                     |                     | 289                 | Sugoor   | Moderate Risk Area  |         |     |            |                     |  |
| 164                                | Ginal         |              |               |              |            | 290                 | Konganda Simt Wadgera | Moderate Risk Area  |                     |                     |          |                     |         |     |            |                     |  |
|                                    |               |              |               |              |            | 291                 | Bendeembli            | Very High Risk Area |                     |                     |          |                     |         |     |            |                     |  |
| 165                                | Bendeembli    |              |               |              |            | 292                 | Rotnadgi              | Very High Risk Area |                     |                     |          |                     |         |     |            |                     |  |



Map – 29 Lower Bhima Sub-basin -K6

### 3.5.7 Lower Sub-basin -K7:

The K-7 Lower sub-basin is a part of Bhima River which covers an area of 3564 Sq. km. Annual rainfall in the Lower Bhima Sub Basin varies between 242 mm to 1124 mm. The entire area of the Lower Bhima Sub Basin (K-7) is occupied by the Deccan Trap formation represented by nearly horizontal lava flows of basaltic composition. The lower Bhima sub basin flows mainly in the districts of Kalaburgi and Taluks of Yadgir. K-7 Lower Sub basin is severally deficit in rainfall and drought prone. In the year 2020 only basin faced and experienced flood situation due to heavy to very heavy rainfall. As there are no flood hazard villages are being found in Lower sub-basin **Map – 30**.



**Map – 30 Lower Sub-basin -K7**



### 3.5.8 Tunga Bhadra Sub-basin -K8:

The Tungabhadra River is a sacred river in southern India that flows through the state of Karnataka to Andhra Pradesh. The Tunga Bhadra sub basin spreads in the 9 districts of Karnataka which are Ballari, Raichur, Koppala, Gadag, Haveri, Shivamogga, Chikkamagaluru, Uttarakannada and Davanagere districts and it's one of the largest basin of krishna river basin and play an important role in irrigation and drinking water of these districts.

Tunga Bhadra is formed by the confluence of two rivers, the Tunga River and the Bhadra River, which flow down the eastern slope of the Western Ghats in the state of Karnataka at an altitude of about 1,196 m. More than one hundred, tributaries, streams, creeks, rivulets and the like contribute to each of these two rivers. The journey of Thunga and the Bhadra is 147 km and 171 km respectively, till they join at Kudali, at an elevation of about 610 metres near Holehonnur, about 15 km from Shimoga; Thungabhadra meanders through the plains to a distance of 531 km and mingles with the Krishna at Gondimalla, near the famous Alampur in Mahaboobnagar District of Andhra Pradesh. Varada flowing through Shimoga, Uttara Kannada and Haveri Districts and Hagaribommanahalli in Chitradurga and Bellary Districts in Karnataka. Many rivulets and streams join these tributaries.

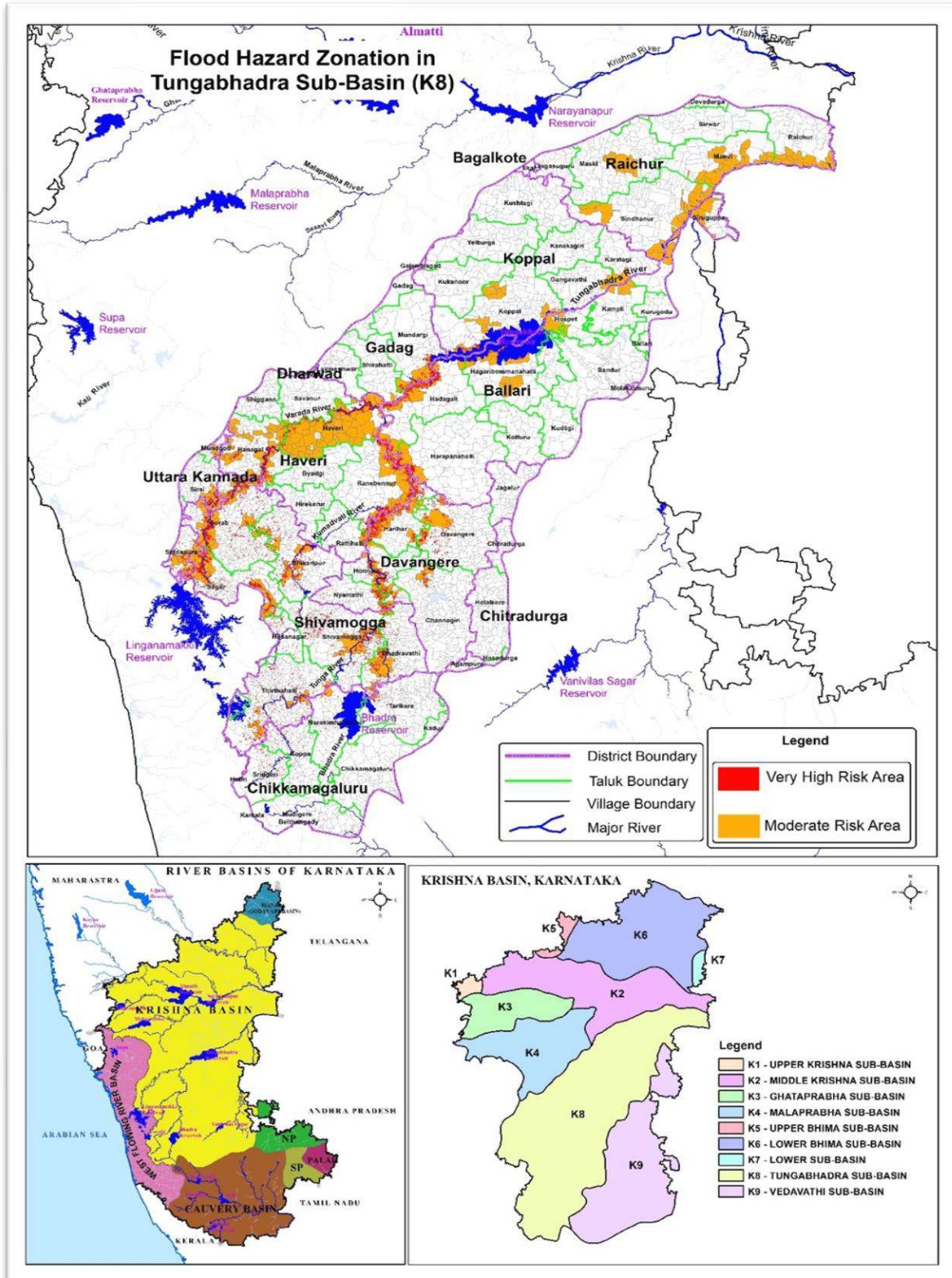
About 15 km downstream from Shimoga at Gajanur across the River Tunga a dam is constructed. At Lakkavalli about 15 km upstream of Bhadravati across the Bhadra a dam is constructed. Both are multipurpose dams and irrigate lands in Shimoga, Chikkamagalur, Davanagere and Haveri. TungaBhadra dam is constructed across river Tungabhadra, a tributary of River Krishna near the town of Hosapete in Karnataka. It is considered as a multipurpose dam or project. Its storage capacity is 135 Tmcft. Owing to siltation the capacity has been reduced by about 30 Tmcft. If there is seasonal and late rains, the dam distributes the estimated quantity of 235 Tmcft. The dam is filled as when the water is let into the canals during the rainy season.

During the monsoon the basin received huge inflow from streams all along the river basin and flow in full capacity and filled the reservoirs. The release of water from upper streams with associated with heavy downpour in monsoon cause flood like situation in the basin and cause huge socio economic loss. From the flood hazard zonation map of the Tunga Bhadra sub basin (8) its identified about 594 villages are under flood prone, the very high risk area in 278 villages and followed by 316 villages are under moderate risk area. The flood hazard zonation map of Tunga Bhadra sub basin -K8 is shown in **Map -31** and the flood risk villages are given in **Table – 19**.

## Tunga Bhadra Sub-basin -K8: Flood Prone Districts

| Sl.No.       | District Name  | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------|----------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|              |                |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1            | Davangere      | 7             | 6             | 46                     | 57              | 30            | 87             |
| 2            | Ballari        | 6             | 13            | 33                     | 29              | 24            | 53             |
| 3            | Koppal         | 3             | 6             | 19                     | 6               | 21            | 27             |
| 4            | Raichur        | 4             | 13            | 35                     | 38              | 39            | 77             |
| 5            | Gadag          | 2             | 2             | 6                      | 10              | –             | 10             |
| 6            | Haveri         | 5             | 10            | 87                     | 62              | 105           | 167            |
| 7            | Shivamogga     | 6             | 24            | 74                     | 65              | 75            | 140            |
| 8            | Chikkamagaluru | 2             | 2             | 3                      | 1               | 2             | 3              |
| 9            | Uttara Kannada | 3             | 4             | 11                     | 10              | 20            | 30             |
| <b>Total</b> |                | <b>38</b>     | <b>80</b>     | <b>314</b>             | <b>278</b>      | <b>316</b>    | <b>594</b>     |





Map – 31 Tunga Bhadra sub basin -K8

Table – 19 List of Flood prone Villages in Tunga Bhadra sub basin -K8

| Tungabhadra Sub-Basin (K8)         |               |              |            |              |                 |           |                      |        |                      |                     |
|------------------------------------|---------------|--------------|------------|--------------|-----------------|-----------|----------------------|--------|----------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |                 |           |                      |        |                      |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name      | GP Sl.No. | Gram Panchayat Name  | Sl.No. | Village Name         | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6               | 7         | 8                    | 9      | 10                   | 11                  |
| 1                                  | Davangere     | 1            | Channagiri | 1            | Basavapatna (1) | 1         | Kanivebilachi        | 1      | Haronahalli          | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 2         | Kamsagara            | 2      | Hirekurubarahalli    | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 3         | Chiradoni            | 3      | Uduva                | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 4         | Navilehal            | 4      | Chiradoni            | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 5         | Tyavanagi            | 5      | Kulumenahalli        | Moderate Risk Area  |
|                                    |               | 2            | Davangere  | 2            | Davangere       | 6         | Kanagondanahalli     | 6      | Basavapura           | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 7         | Kanagondanahalli     | 7      | Thyavanige           | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 8         | Kanagondanahalli     | 8      | Jadaganahalli        | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 9         | Kanagondanahalli     | 9      | Kanagondanahalli     | Very High Risk Area |
|                                    |               |              |            |              |                 | 10        | Kanagondanahalli     | 10     | Balluru              | Very High Risk Area |
|                                    |               |              |            |              |                 | 11        | Kanagondanahalli     | 11     | Vaderahalli          | Very High Risk Area |
|                                    |               |              |            |              |                 | 12        | Mudahadadi           | 12     | Mudahadadi           | Very High Risk Area |
|                                    |               |              |            |              |                 | 13        | Mudahadadi           | 13     | Jarikatte            | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 14        | Davanagere (M Corp.) | 14     | Davanagere (M Corp.) | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 15        | Kakkargolla          | 15     | Kodihalli            | Moderate Risk Area  |
|                                    |               | 3            | Harihar    | 3            | Harihara        | 16        | Kadlebalu            | 16     | Malagondanahalli     | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 17        | Kadlebalu            | 17     | Mahajenahalli        | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 18        | Rajanahalli          | 18     | Rajanahalli          | Very High Risk Area |
|                                    |               |              |            |              |                 | 19        | Rajanahalli          | 19     | Halasabalu           | Very High Risk Area |
|                                    |               |              |            |              |                 | 20        | Amaravathi (CT)      | 20     | Amaravathi (CT)      | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 21        | Harihar (CMC + OG)   | 21     | Harihar (CMC + OG)   | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 22        | Haralapura (CT)      | 22     | Haralapura (CT)      | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 23        | Guttur               | 23     | Bakkapura            | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 24        | Guttur               | 24     | Guttur (OG)          | Very High Risk Area |
|                                    |               |              |            |              |                 | 25        | Guttur               | 25     | Dheetur              | Very High Risk Area |
|                                    |               |              |            |              |                 | 26        | Sarathi              | 26     | Pamenahalli          | Very High Risk Area |
|                                    |               |              |            |              |                 | 27        | Sarathi              | 27     | Sarathi              | Very High Risk Area |
|                                    |               |              |            |              |                 | 28        | Sarathi              | 28     | Chikkabidre          | Very High Risk Area |
|                                    |               |              |            |              |                 | 29        | Kokkanur             | 29     | Muginagondi          | Very High Risk Area |
|                                    |               |              |            |              |                 | 30        | Kokkanur             | 30     | Baggadanahalu        | Very High Risk Area |
|                                    |               |              |            |              |                 | 31        | Kokkanur             | 31     | Kokkanur             | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 32        | Haralahalli          | 32     | Guladahalli          | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 33        | Devarabelakere       | 33     | Budihalu             | Very High Risk Area |
|                                    |               |              |            |              |                 | 34        | Ukkadagathi          | 34     | Govinahalu           | Very High Risk Area |
|                                    |               |              |            |              |                 | 35        | Ukkadagathi          | 35     | Nandigudi            | Very High Risk Area |
|                                    |               | 4            | Malebennur | 4            | Malebennur      | 36        | Vasana               | 36     | Hindasaghatte        | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 37        | Vasana               | 37     | Vasana               | Very High Risk Area |
|                                    |               |              |            |              |                 | 38        | Vasana               | 38     | Palya                | Very High Risk Area |
|                                    |               |              |            |              |                 | 39        | Kunibelakere         | 39     | Kunibelakere         | Very High Risk Area |
|                                    |               |              |            |              |                 | 40        | Kadaranayakanahalli  | 40     | Kadaranayakanahalli  | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 41        | Holesirigere         | 41     | Sirigere             | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 42        | Yalehole             | 42     | Malalahalli          | Very High Risk Area |
|                                    |               |              |            |              |                 | 43        | Yalehole             | 43     | Yalehole             | Very High Risk Area |
|                                    |               |              |            |              |                 | 44        | Ukkadagathi          | 44     | Huliginahole         | Very High Risk Area |
|                                    |               |              |            |              |                 | 45        | Ukkadagathi          | 45     | Ukkadagathi          | Very High Risk Area |
|                                    |               | 5            | Nyamati    | 6            | Govinakovi (2)  | 46        | Nandigavi            | 46     | Nandigavi            | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 47        | Nandigavi            | 47     | Dhulehole            | Very High Risk Area |
|                                    |               |              |            |              |                 | 48        | Nandigavi            | 48     | Bilasanur            | Very High Risk Area |
|                                    |               |              |            |              |                 | 49        | Kammaraghatte        | 49     | Kammaraghatte        | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 50        | Masadi               | 50     | Devarahonnali        | Very High Risk Area |
|                                    |               | 5            | Honnali    | 5            | Honnali         | 51        | Gollarahalli         | 51     | Gollarahalli         | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 52        | Belimallur           | 52     | Belimallur           | Very High Risk Area |
|                                    |               |              |            |              |                 | 53        | Kotemallur           | 53     | Kotemallur           | Very High Risk Area |
|                                    |               |              |            |              |                 | 54        | Hiregonigere         | 54     | Konanathale          | Very High Risk Area |
|                                    |               |              |            |              |                 | 55        | Haralahalli          | 55     | Haralahalli          | Very High Risk Area |
|                                    |               |              |            |              |                 | 56        | Didagur              | 56     | Didagur              | Very High Risk Area |
|                                    |               |              |            |              |                 | 57        | Bidaragadde          | 57     | Bidaragadde          | Very High Risk Area |
|                                    |               |              |            |              |                 | 58        | H. Kadadakatte       | 58     | Holemadapura         | Very High Risk Area |
|                                    |               |              |            |              |                 | 59        | H. Kadadakatte       | 59     | Devanayakanahalli    | Moderate Risk Area  |
|                                    |               |              |            |              |                 | 60        | H. Kadadakatte       | 60     | Konayakanahalli      | Very High Risk Area |
|                                    |               |              |            |              |                 | 61        | Hanumasagara         | 61     | Balleshwara          | Very High Risk Area |
|                                    |               |              |            |              |                 | 62        | Hanumasagara         | 62     | Holeharalahalli      | Very High Risk Area |

| Tungabhadra Sub-Basin (K8)         |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
|------------------------------------|---------------|---------------------|--------------------|---------------------|--------------------|---------------------|------------------------|---------------------|-------------------|---------------------|---------------|---------------------|-------------|----|-------------|---------------------|
| List of Flood Hazard Risk Villages |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No.        | Taluk Name         | Hobli Sl.No.        | Hobli Name         | GP Sl.No.           | Gram Panchayat Name    | Sl.No.              | Village Name      | Flood Hazard Class  |               |                     |             |    |             |                     |
| 1                                  | 2             | 3                   | 4                  | 5                   | 6                  | 7                   | 8                      | 9                   | 10                | 11                  |               |                     |             |    |             |                     |
|                                    |               | 6                   | Honnali            |                     |                    | 35                  | Lingapura              | 63                  | Hanagavadi        | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 64                  | Lingapura         | Moderate Risk Area  |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 36                  | Hosahalli              | 65                  | Huralihalli       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 66                  | Bommenahalli      | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 37                  | Kulagatte              | 67                  | Kulagatte         | Moderate Risk Area  |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 68                  | Mavinakote        | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 38                  | Rampura                | 69                  | Bullapura         | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 70                  | Iyanoor           | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 39                  | Sasvehalli             | 71                  | Sasavehalli       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 72                  | Rampura           | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 40                  | Rampura                | 73                  | Hottypura         | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 74                  | Hirebasur         | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 41                  | Biragondanahalli       | 75                  | Beeragondanahalli | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 76                  | Chikkabasur       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               | 42                  | Benakanahalli      |                     |                    | 77                  | Tavaragopagondanahalli | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 78                  | Malali                 | Very High Risk Area |                   |                     |               |                     |             |    |             |                     |
|                                    |               | 7                   | Nyamati            |                     |                    | 43                  | T. Gopagondanahalli    | 79                  | Thaggehalli       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 80                  | Chilur            | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 45                  | Chi. Kadadakatte       | 81                  | Goravarakatte     | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 82                  | Kotehalu          | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 83                  | Marigondanahalli  | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 84                  | Achuthapura       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 46                  | Govinakovi             | 85                  | Sevalal Nagar     | Moderate Risk Area  |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 86                  | Kuruva            | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    |                     |                        | 87                  | Govinakovi        | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 2                   | Ballari                | 8                   | Hadagali          | 7                   | Hadagali      | 47                  | Makarabbi   | 88 | Kotihal     | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 48                  | Birabbi     | 89 | Angoor      | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 49                  | Magala      | 90 | Magala      | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 91                  | Rangapura   | 91 | Rangapura   | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 92                  | Thimalapura | 92 | Thimalapura | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 50                  | Navali      | 93 | Nowli       | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   |                     |               | 94                  | Kotanakal   | 94 | Kotanakal   | Very High Risk Area |
|                                    |               |                     |                    |                     |                    |                     |                        |                     |                   | 8                   | Hirehadagalli | 51                  | Kombali     | 95 | Kombli      | Moderate Risk Area  |
| 52                                 | Kalwi West    |                     |                    | 96                  | Kalvi West         |                     |                        |                     |                   |                     |               | Moderate Risk Area  |             |    |             |                     |
| 97                                 | Harivi        |                     |                    | 97                  | Harivi             |                     |                        |                     |                   |                     |               | Very High Risk Area |             |    |             |                     |
| 53                                 | Kuruvaththi   | 98                  | Harivi Basapura    | Very High Risk Area |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 99                                 | Kuravathi     | 99                  | Kuravathi          | Very High Risk Area |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 54                                 | Mylara        | 100                 | Mylar              | Moderate Risk Area  |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 55                                 | Makarabbi     | 101                 | Makarabbi          | Very High Risk Area |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 102                                | Byalhunsu     | 102                 | Byalhunsu          | Very High Risk Area |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 9                                  | Hospet        | 9                   | Hospet             | 56                  | Hospet (CMC)       | 103                 | Hospet (CMC)           | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 57                  | Hosuru             | 104                 | Hosur                  | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 58                  | Hampi              | 105                 | Narasapura             | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               | 10                  | Hagaribommanahalli | 10                  | Kamalapura         | 106                 | Kalghatta              | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 11                  | Hagaribommanahalli | 60                  | Vallabhapura           | 107                 | Chintrapalli      | Moderate Risk Area  |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 61                  | Hagaribommanahalli | 108                 | Hagaribommanahalli     | Moderate Risk Area  |                   |                     |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 12                  | Hampa Sagara       | 62                  | Hampasagara            | 109                 | Hampasagara       | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 110                 | Enigi                  | 110                 | Enigi             | Very High Risk Area |               |                     |             |    |             |                     |
|                                    |               |                     |                    | 13                  | Tambarahalli       | 63                  | Bachigondanahalli      | 111                 | Bachigondanahalli | Moderate Risk Area  |               |                     |             |    |             |                     |
|                                    |               |                     |                    |                     |                    | 64                  | Marabbihal             | 112                 | Ankasamudra       | Very High Risk Area |               |                     |             |    |             |                     |
| 113                                | Marabbihal    | Very High Risk Area |                    |                     |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 65                                 | Bannigola     | 114                 | Basarakodu         |                     |                    | Very High Risk Area |                        |                     |                   |                     |               |                     |             |    |             |                     |
|                                    |               | 115                 | Seeganahalli       |                     |                    | Moderate Risk Area  |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 66                                 | Thambrahalli  | 116                 | Bannigola          |                     |                    | Moderate Risk Area  |                        |                     |                   |                     |               |                     |             |    |             |                     |
| 67                                 | Muthkur       | 117                 | Thambrahalli       | Very High Risk Area |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
|                                    |               | 118                 | Kithanur           | Moderate Risk Area  |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |
|                                    |               | 119                 | Rameswara Bandi    | Moderate Risk Area  |                    |                     |                        |                     |                   |                     |               |                     |             |    |             |                     |

| Tungabhadra Sub-Basin (K8)         |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
|------------------------------------|------------------|---------------------|---------------|--------------|------------|-----------|---------------------|---------------------|-----------------|---------------------|---------------------|---------------------|---------------|-----|--------------|---------------------|
| List of Flood Hazard Risk Villages |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| Dist. Sl.No.                       | District Name    | Taluk Sl.No.        | Taluk Name    | Hobli Sl.No. | Hobli Name | GP Sl.No. | Gram Panchayat Name | Sl.No.              | Village Name    | Flood Hazard Class  |                     |                     |               |     |              |                     |
| 1                                  | 2                | 3                   | 4             | 5            | 6          | 7         | 8                   | 9                   | 10              | 11                  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               | 14           | Kogali     | 68        | Malavi              | 120                 | Malvi           | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 121       | Haregondanahalli    | Moderate Risk Area  |                 |                     |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 15        | Siruguppa           | 69                  | Desanooru       | 122                 | Dasanur             | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 70                  | Kududhurahal    | 123                 | Kududarahal         | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            | 16        | Hachcholli          | 71                  | Hachcholi       | 124                 | Seedaragadda        | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 125                 |                 | Halekota            | Very High Risk Area |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 126                 |                 | Honnarahalli        | Very High Risk Area |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 127                 |                 | Chikka Bellary      | Very High Risk Area |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 128                 | Hatchholli      | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 129                 | Matur           | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 17        | Tekkalakote         | 72                  | Nadavi          | 130                 | Nittur              | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 73                  | Kenchanagudda   | 131                 | Herakal             | Very High Risk Area |               |     |              |                     |
|                                    |                  | 132                 | Kenchanagudda |              |            |           |                     | Very High Risk Area |                 |                     |                     |                     |               |     |              |                     |
|                                    |                  | 133                 | Duggavatti    |              |            |           |                     | Moderate Risk Area  |                 |                     |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 18        | Telagi              | 74                  | Duggavathi      | 134                 | Kadathi             | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 75                  | Kadathi         | 135                 | Nittur              | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 76                  | Nittur          | 136                 | Halavagal           | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 77                  | Halavagalu      | 137                 | Muddapura No.2      | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 78                  | Sanapura        | 138                 | Sanapura            | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            | 19        | Kampli              | 139                 | Ittigi          | Moderate Risk Area  |                     |                     |               |     |              |                     |
| 79                                 | No. 10 Muddapura |                     |               |              |            |           |                     | 140                 | Belugoduhall    | Moderate Risk Area  |                     |                     |               |     |              |                     |
| 80                                 | Chikka Jantkal   |                     |               |              |            |           |                     | 141                 | Ayodhya         | Moderate Risk Area  |                     |                     |               |     |              |                     |
| 81                                 | Danapur          |                     |               |              |            |           |                     | 142                 | Danapur         | Moderate Risk Area  |                     |                     |               |     |              |                     |
| 143                                | Hebbal           |                     |               |              |            |           |                     | Moderate Risk Area  |                 |                     |                     |                     |               |     |              |                     |
| 3                                  | Koppal           |                     | 14            | Gangavathi   | 20         | Marali    | 82                  | Hiresindogi         | 144             | Budihal             | Moderate Risk Area  |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           | 83                  | Gondabal            | 145             | Muddaballi          | Moderate Risk Area  |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 21        | Koppal              | 84                  | Ojanahalli      | 146                 | Naregal             | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 147                 | Chilwadgi       | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 85                  | Madinur         | 148                 | Madinur             | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 149                 | Devlapur        | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 86                  | Kalakera        | 150                 | Kalkera             | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 151                 | Tigari          | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 87                  | Mattur          | 152                 | Hunkuntiakkapur     | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 153                 | Mattur          | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 88                  | Bochanahalli    | 154                 | Nilogipur           | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 155                 | Bochanahalli    | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 22        | Alawandi            | 156                 | Belur           | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 157                 | Dombarahalli    | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 90                  | Hiresindogi     | 158                 | Hiresindogi         | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 91                  | Kolur           | 159                 | Chiksindogi         | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 92                  | Munirabad Dam   | 160                 | Hulgi               | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 93                  | Hitnal          | 161                 | Kampasagar          | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 94                  | Bandiharlapur   | 162                 | Narayanpet          | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 95                  | Shivapur        | 163                 | Mohammad Nagar      | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               | 23           | Hitnal     | 164       | Shivapur            | Moderate Risk Area  |                 |                     |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 96        | Kinnal              | 165                 | Kinhal          | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 97        | Mustur              | 166                 | Mustur          | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 98        | Baragur             | 167                 | Kuntoji         | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            | 168       | Yedival             | Very High Risk Area |                 |                     |                     |                     |               |     |              |                     |
| 4                                  | Raichur          |                     |               |              |            | 26        | Manvi               | 99                  | Chikkakottnikal | 169                 | Pannur Jagir        | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 170                 | Nalgamdinni     | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 171                 | Chikkotankal    | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 172                 | Chikalparvi     | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 173                 | Buddinni        | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 174                 | Rangdhal        | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 175                 | Madlapur        | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 176                 | Katarki         | Very High Risk Area |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 101                 | Sadapur         | 177                 | Daddal              | Very High Risk Area |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 102                 | Madlapur        | 178                 | Burhanpur           | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 103                 | Manvi [R]       | 179                 | Rabbankal           | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 104                 | Potnal          | 180                 | Manvi [R]           | Moderate Risk Area  |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     | 181                 | Kharabadinni    | Moderate Risk Area  |                     |                     |               |     |              |                     |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     | 27                  | Hire Katankal | 182 | Jukur        | Very High Risk Area |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 183 | Tammapur     | Very High Risk Area |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 184 | Kambalanetti | Very High Risk Area |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 185 | Walkam Dinni | Very High Risk Area |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 186 | Pannuru      | Very High Risk Area |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 187 | Korvi        | Moderate Risk Area  |
|                                    |                  |                     |               |              |            |           |                     |                     |                 |                     |                     |                     |               | 188 | Arnalli      | Very High Risk Area |
| 189                                | Rajoli           | Very High Risk Area |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 190                                | Advi Khanapur    | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 191                                | Sunkeshwara      | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 192                                | Bailmarchad      | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 193                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 194                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 195                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 196                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 197                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 198                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 199                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |
| 200                                | Sunkeshwar       | Moderate Risk Area  |               |              |            |           |                     |                     |                 |                     |                     |                     |               |     |              |                     |

| Tungabhadra Sub-Basin (K8)         |               |              |            |              |             |           |                     |        |                         |                     |
|------------------------------------|---------------|--------------|------------|--------------|-------------|-----------|---------------------|--------|-------------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |             |           |                     |        |                         |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name  | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name            | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6           | 7         | 8                   | 9      | 10                      | 11                  |
|                                    |               | 18           | Raichur    | 29           | Gilasuguru  | 110       | Talamari            | 193    | Talmari                 | Very High Risk Area |
|                                    |               |              |            |              |             | 111       | Ganadhal            | 194    | Chickmanchal            | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 195    | Bullapur                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 196    | Gandhal                 | Moderate Risk Area  |
|                                    |               |              |            |              |             | 112       | Nadigaddi Malkapura | 197    | Gangwar                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 198    | Naddigaddimalkapur      | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 199    | Gunderveli              | Very High Risk Area |
|                                    |               |              |            |              |             | 113       | Gillesugur          | 200    | Tungabhadra             | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 201    | Gillesugur              | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 202    | Dugnoor                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 203    | Karebudur               | Moderate Risk Area  |
|                                    |               |              |            |              |             | 114       | Bichali             | 204    | Bichal                  | Very High Risk Area |
|                                    |               |              |            |              |             | 115       | Heerapura           | 205    | Kataknur                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 206    | Hanmapur                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 207    | Gatbichal               | Moderate Risk Area  |
|                                    |               |              |            |              |             | 116       | Talamari            | 208    | Mirzapur                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 117       | Bichali             | 209    | Yedlapur                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 118       | Idapanur            | 210    | Meerapur                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 119       | Poorthipli          | 211    | Turkandona              | Moderate Risk Area  |
|                                    |               | 19           | Sindhanur  | 30           | Badarli     | 120       | Dhadesugur          | 212    | Uppal                   | Very High Risk Area |
|                                    |               |              |            |              |             | 121       | Badarli             | 213    | Puldinni                | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 214    | Vengalapur - (D)        | Moderate Risk Area  |
|                                    |               |              |            | 31           | Hadganhal   | 122       | Vala Ballary        | 215    | Badarli                 | Moderate Risk Area  |
|                                    |               |              |            |              |             | 123       | Hedaginala          | 216    | Giniwar                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 217    | Walbellary              | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 218    | Hedginhal               | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 219    | Pulmeswardinni          | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 220    | Chitralli               | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 221    | Chintamandoddi          | Very High Risk Area |
|                                    |               |              |            | 32           | Huda        | 124       | Mukkunda            | 222    | Ayyanur                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 223    | Singapur                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 224    | Arihalli(Simth Mukunda) | Moderate Risk Area  |
|                                    |               |              |            | 33           | Salgundi    | 125       | Dhadesugur          | 225    | Mukunda                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 226    | Kurtkota (D)            | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 227    | Kengal                  | Moderate Risk Area  |
|                                    |               |              |            | 34           | Turvihal    | 126       | Turvihal            | 228    | Dhadesugur              | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 229    | Cincheri                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 230    | Turvihal                | Moderate Risk Area  |
|                                    |               |              |            | 35           | Walkamdinni | 127       | Kalmangi            | 231    | Chikbhergi              | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 232    | Hirebhergi              | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 233    | Hattigudda              | Moderate Risk Area  |
|                                    |               | 20           | Maski      | 36           | Maski       | 128       | Gonwar              | 234    | Gonwar                  | Very High Risk Area |
|                                    |               |              |            |              |             | 129       | Maski               | 235    | Maski                   | Moderate Risk Area  |
|                                    |               |              |            |              |             | 130       | Maraldinni          | 236    | Venkatapur              | Moderate Risk Area  |
|                                    |               |              |            | 37           | Halapur     | 131       | Adavibhavi (Maski)  | 237    | Belladamaradi           | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 238    | Benkanhal               | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 239    | S.Ramal Dinni           | Moderate Risk Area  |
|                                    |               |              |            | 38           | Gudadur     | 132       | Halapura            | 240    | Hire Kadboor            | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 241    | Udbal (Umli)            | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 242    | Kyathanahatti           | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                     | 243    | Sunkanur                | Moderate Risk Area  |
| 5                                  | Gadag         | 21           | Mundargi   | 39           | Mundargi    | 133       | Udabal              | 244    | Chikkkadbur             | Moderate Risk Area  |
|                                    |               |              |            |              |             | 134       | Bidarahalli         | 245    | Vithalapur              | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 246    | Bidarahalli             | Very High Risk Area |
|                                    |               |              |            |              |             | 135       | Hammigi             | 247    | Gumgol                  | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 248    | Hammigi                 | Very High Risk Area |
|                                    |               |              |            |              |             | 136       | Shingalalur         | 249    | Shingatalur             | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 250    | Sheernahalli            | Very High Risk Area |
|                                    |               |              |            |              |             |           |                     | 251    | Gangapur                | Very High Risk Area |
|                                    |               | 22           | Shirahatti | 40           | Shirahatti  | 137       | Korlahalli          | 252    | Korihalli               | Very High Risk Area |
|                                    |               |              |            |              |             | 138       | Itigi               | 253    | Sasarwad                | Very High Risk Area |
|                                    |               |              |            |              |             | 139       | Hebbal              | 254    | Tolali                  | Very High Risk Area |

| Tungabhadra Sub-Basin (K8)         |               |              |            |              |             |           |                      |        |                           |                     |
|------------------------------------|---------------|--------------|------------|--------------|-------------|-----------|----------------------|--------|---------------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |            |              |             |           |                      |        |                           |                     |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name | Hobli SI.No. | Hobli Name  | GP SI.No. | Gram Panchayat Name  | SI.No. | Village Name              | Flood Hazard Class  |
| 1                                  | 2             | 3            | 4          | 5            | 6           | 7         | 8                    | 9      | 10                        | 11                  |
| 6                                  | Haveri        | 23           | Hangal     | 41           | Hangal      | 140       | Gondi                | 255    | Gondi                     | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 256    | Makarvalli                | Very High Risk Area |
|                                    |               |              |            |              |             | 141       | Heerur               | 257    | Balihalli                 | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 258    | Hanumanakoppa             | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 259    | Gadiyankanahalli          | Moderate Risk Area  |
|                                    |               |              |            |              |             | 142       | Mantagi              | 260    | Laxmipur                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 261    | Sagaravalli               | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 262    | Sringeri                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 263    | Hirur                     | Very High Risk Area |
|                                    |               |              |            |              |             | 143       | Sammasagi            | 264    | Savikeri                  | Moderate Risk Area  |
|                                    |               |              |            |              |             | 144       | Gejjihalli           | 265    | Gejjihalli                | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 266    | Chikkeri                  | Moderate Risk Area  |
|                                    |               |              |            |              |             | 145       | Hirekanagi           | 267    | Basavanagara              | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 268    | Shivajinagar              | Moderate Risk Area  |
|                                    |               |              |            |              |             | 146       | Kopparashikoppa      | 269    | Kopparsikoppa             | Moderate Risk Area  |
|                                    |               |              |            |              |             | 147       | Sanvasagi            | 270    | Savasgi                   | Moderate Risk Area  |
|                                    |               |              |            | 42           | Akki Alur   | 148       | Tilavalli            | 271    | Tilavalli                 | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 272    | Honkan                    | Moderate Risk Area  |
|                                    |               |              |            |              |             | 149       | Honkana              | 273    | Lakmapur (Inam)           | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 274    | Byathanal                 | Very High Risk Area |
|                                    |               |              |            |              |             | 150       | Kelavarakoppa        | 275    | Kanneshwar                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 276    | Kusnur                    | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 277    | Wasan                     | Very High Risk Area |
|                                    |               |              |            |              |             | 151       | Kusanur              | 278    | Malagund                  | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 279    | Somapur                   | Very High Risk Area |
|                                    |               |              |            |              |             | 152       | Malagund             | 280    | Basapur (M) Adur          | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 281    | Havanagi                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 282    | Veerapura                 | Moderate Risk Area  |
|                                    |               |              |            |              |             | 153       | Havanagi             | 283    | Hirehullal                | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 284    | Tumarikoppa               | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 285    | Lakmapur (M) Adur         | Very High Risk Area |
|                                    |               |              |            |              |             | 154       | Hirehullal           | 286    | Sheegihalli (Shingahalli) | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 287    | Shingapur                 | Very High Risk Area |
|                                    |               |              |            |              |             | 155       | Sheegihallishingapur | 288    | Adur                      | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 289    | Wardi                     | Moderate Risk Area  |
|                                    |               |              |            | 43           | Bommanhalli | 156       | Adur                 | 290    | Naregal                   | Very High Risk Area |
|                                    |               |              |            |              |             | 157       | Naregal              | 291    | Jakkanaikankoppa          | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 292    | Satenhalli                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 158       | Kanchinegalur        | 293    | Nellibeed                 | Moderate Risk Area  |
|                                    |               |              |            |              |             | 159       | Sanvasagi            | 294    | Hombli                    | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 295    | Bhingapur                 | Moderate Risk Area  |
|                                    |               |              |            |              |             | 160       | Maranabeed           | 296    | Kargudri                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 297    | Ramathirtha               | Moderate Risk Area  |
|                                    |               |              |            |              |             | 161       | Karagudari           | 298    | Belagalapeth              | Moderate Risk Area  |
|                                    |               |              |            |              |             | 162       | Baichavalli          | 299    | Thimmapur (M) Nidasangi   | Moderate Risk Area  |
|                                    |               |              |            |              |             | 163       | Belagalapete         | 300    | Gudagudi                  | Moderate Risk Area  |
|                                    |               |              |            |              |             | 164       | Kopparashikoppa      | 301    | Kudal                     | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 302    | Allapur                   | Moderate Risk Area  |
|                                    |               |              |            |              |             | 165       | Kudal                | 303    | Haranagiri                | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 304    | Harvi                     | Moderate Risk Area  |
|                                    |               |              |            |              |             | 166       | Maranabeed           | 305    | Maranabeed                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 167       | Kopparashikoppa      | 306    | Dasharatkoppa             | Moderate Risk Area  |
|                                    |               |              |            |              |             | 168       | Hullatti             | 307    | Hullatti                  | Moderate Risk Area  |
|                                    |               | 24           | Haveri     | 44           | Haveri      | 169       | Kabbur               | 308    | Benakanahalli             | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 309    | Shiddeshwar Nagar         | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 310    | Kabbur                    | Moderate Risk Area  |
|                                    |               |              |            |              |             | 170       | Kurabagonda          | 311    | Kurabagonda               | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 312    | Kallapur                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 313    | Hirelingadahalli          | Moderate Risk Area  |
|                                    |               |              |            |              |             | 171       | Kulenur              | 314    | Shivajinagar              | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 315    | Timmapur-M-Adur           | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 316    | Najikalakamapur           | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 317    | Kulenur                   | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 318    | Gourapur-M-Adur           | Moderate Risk Area  |
|                                    |               |              |            |              |             | 172       | Hombardi             | 319    | Hombardi                  | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 320    | Chikkalingadahalli        | Moderate Risk Area  |
|                                    |               |              |            |              |             | 173       | Kanakapur            | 321    | Bujruk Kodihalli          | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 322    | Didagur                   | Moderate Risk Area  |
|                                    |               |              |            |              |             | 174       | Sangur               | 323    | Bidaragaddi               | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 324    | Sangur                    | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 325    | Venkatapur                | Very High Risk Area |
|                                    |               |              |            |              |             | 175       | Aladakatti           | 326    | Kerimattihalli            | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 327    | Hosalli-M-Adur            | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 328    | Aladakatti                | Moderate Risk Area  |
|                                    |               |              |            |              |             | 176       | Haveri (CMC)         | 329    | Haveri (CMC)              | Moderate Risk Area  |
|                                    |               |              |            |              |             | 177       | Devihosur            | 330    | Devihosur                 | Moderate Risk Area  |
|                                    |               |              |            |              |             |           |                      | 331    | Benchihalli               | Very High Risk Area |
|                                    |               |              |            |              |             | 178       | Naganur              | 332    | Naganur                   | Very High Risk Area |
|                                    |               |              |            |              |             |           |                      | 333    | Varadahalli               | Very High Risk Area |
|                                    |               |              |            |              |             | 179       | Devagiri             | 334    | Devagiri                  | Very High Risk Area |



| Tungabhadra Sub-Basin (K8)         |               |              |                 |                     |                  |                    |                     |                     |                    |                     |                   |                     |
|------------------------------------|---------------|--------------|-----------------|---------------------|------------------|--------------------|---------------------|---------------------|--------------------|---------------------|-------------------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                 |                     |                  |                    |                     |                     |                    |                     |                   |                     |
| Dist. SI.No.                       | District Name | Taluk SI.No. | Taluk Name      | Hobli SI.No.        | Hobli Name       | GP SI.No.          | Gram Panchayat Name | SI.No.              | Village Name       | Flood Hazard Class  |                   |                     |
| 1                                  | 2             | 3            | 4               | 5                   | 6                | 7                  | 8                   | 9                   | 10                 | 11                  |                   |                     |
|                                    |               |              |                 | 45                  | Guttal           | 180                | Kuragund            | 335                 | Kuragund           | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 336                 | Bharadi            | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 181                | Kancharagatti       | 337                 | Rajivnagar         | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 338                 | Kancharagatti      | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 339                 | Haralahalli        | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 182                | Shivanagar          | 340                 | Shivanagar         | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 183                | Basapur             | 341                 | Basapur            | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 342                 | Bommanakatti       | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 184                | Guttal              | 343                 | Guttal             | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 185                | Hosaritti           | 344                 | Haleritti          | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 345                 | Hosaritti          | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 346                 | Akkur              | Very High Risk Area |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 347                 | Channur            | Very High Risk Area |                   |                     |
|                                    |               |              |                 |                     |                  | 186                | Hanvashi            | 348                 | Shyakar            | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 187                | Negalur             | 349                 | Negalur            | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 188                | Mevundi             | 350                 | Galaganath         | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 351                 | Guilagundi         | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 189                | Marol               | 352                 | Kodabal            | Very High Risk Area |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 353                 | Marol              | Very High Risk Area |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 354                 | Gudur              | Very High Risk Area |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 355                 | Neeralagi-M-Guttal | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 190                | Belavagi            | 356                 | Bailmadapura       | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 191                | Hosakittura         | 357                 | Taredahalli        | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 192                | Mevundi             | 358                 | Meundi             | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  |                    |                     | 359                 | Gudisalkoppa       | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 193                | Halagi              | 360                 | Kerikop            | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 46                 | Karajgi             | 194                 | Nelogall           | 361                 | Nelogal           | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 362                 | Totadayellapur    | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 195                 | Kallihal           | 363                 | Kallihal          | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 364                 | Bujruk Veerapur   | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 365                 | Malapur           | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 196                 | Katenahalli        | 366                 | Katenahalli       | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 367                 | Hanumanahalli     | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 197                 | Kanvalli           | 368                 | Kanavalli         | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 369                 | Timmenhalli       | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 198                 | Budagatti          | 370                 | Budagatti         | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 371                 | Basavanakatti     | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 372                 | Machapur          | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 373                 | Agadi             | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 200                 | Devagiri           | 374                 | Devagiri Yellapur | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     | 201                 | Kolur              | 375                 | Ganajur           | Moderate Risk Area  |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 376                 | Kolur             | Very High Risk Area |
|                                    |               |              |                 |                     |                  |                    |                     | 202                 | Karjagi            | 377                 | Karjagi           | Very High Risk Area |
|                                    |               |              |                 |                     |                  |                    |                     |                     |                    | 378                 | Ramapur           | Very High Risk Area |
|                                    |               |              |                 |                     |                  |                    |                     | 203                 | Yalagachcha        | 379                 | Yalagachi         | Moderate Risk Area  |
|                                    |               | 380          | Agasanamatti    | Very High Risk Area |                  |                    |                     |                     |                    |                     |                   |                     |
|                                    |               | 381          | Shirmapur       | Moderate Risk Area  |                  |                    |                     |                     |                    |                     |                   |                     |
|                                    |               | 382          | Konana Tambigi  | Very High Risk Area |                  |                    |                     |                     |                    |                     |                   |                     |
|                                    |               | 204          | Konanatambagi   | 383                 | Kesaralli        |                    |                     | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 | 384                 | Mannur           |                    |                     | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 | 385                 | Koradur          |                    |                     | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 | 386                 | Handiganur       |                    |                     | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               | 206          | Handiganur      | 387                 | Melmuri          | Moderate Risk Area |                     |                     |                    |                     |                   |                     |
|                                    |               |              |                 | 207                 | Tumminakatti     | 388                | Tumminakatti        | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               | 47           | Kuppelur        | 208                 | Malanaykanahalli | 389                | Kusagatti           | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 390                | Fattepur            | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 391                | Badabasapur         | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               |              |                 | 209                 | Lingadahalli     | 392                | Nitapalli           | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 393                | Kotihal             | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 394                | Holeanveri          | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 | 210                 | Mudenur          | 395                | Mudenur             | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 396                | Nagenahalli         | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 397                | Makanur             | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 | 212                 | Kavalettu        | 398                | Kawalettu (CT)      | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               |              |                 | 213                 | Kodiyal          | 399                | Nalawagal           | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               |              |                 | 48                  | Medleri          | 214                | Kamadod             | 400                 | Yennihosahalli     | Moderate Risk Area  |                   |                     |
|                                    |               |              |                 |                     |                  | 215                | Nadiharalahalli     | 401                 | Waderayanahalli    | Moderate Risk Area  |                   |                     |
|                                    |               | 402          | Hulikatti       |                     |                  |                    |                     | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               | 403          | Nadiharalahalli |                     |                  |                    |                     | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 216          | Irani           |                     |                  | 404                | Airani              | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 217          | Hirebidri       |                     |                  | 405                | Hirebidari          | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 218          | Aremallapur     |                     |                  | 406                | Aremallapur         | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               | 219          | Somalapur       |                     |                  | 407                | Somalapur           | Moderate Risk Area  |                    |                     |                   |                     |
|                                    |               | 220          | Medleri         |                     |                  | 408                | Medleri             | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 409                | Somalapur           | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 221          | Somalapur       |                     |                  | 410                | Konanatambigi       | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 411                | Udagatti            | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 412                | Kudrihal            | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 222          | Haranagiri      |                     |                  | 413                | Haranagiri          | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 414                | Heeladahalli        | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 223          | Belur           |                     |                  | 415                | Belur               | Very High Risk Area |                    |                     |                   |                     |
|                                    |               |              |                 |                     |                  | 416                | Chikka Kuravatti    | Very High Risk Area |                    |                     |                   |                     |
|                                    |               | 224          | Chikkakuravatti |                     |                  | 417                | Chandapur           | Very High Risk Area |                    |                     |                   |                     |

| Tungabhadra Sub-Basin (K8)         |               |              |                |                    |                  |                     |                       |                     |                  |                     |                      |                     |           |                     |
|------------------------------------|---------------|--------------|----------------|--------------------|------------------|---------------------|-----------------------|---------------------|------------------|---------------------|----------------------|---------------------|-----------|---------------------|
| List of Flood Hazard Risk Villages |               |              |                |                    |                  |                     |                       |                     |                  |                     |                      |                     |           |                     |
| Dist. Sl.No.                       | District Name | Taluk Sl.No. | Taluk Name     | Hobli Sl.No.       | Hobli Name       | GP Sl.No.           | Gram Panchayat Name   | Sl.No.              | Village Name     | Flood Hazard Class  |                      |                     |           |                     |
| 1                                  | 2             | 3            | 4              | 5                  | 6                | 7                   | 8                     | 9                   | 10               | 11                  |                      |                     |           |                     |
| 7                                  | Shivamogga    | 26           | Savanur        | 49                 | Savanur          | 225                 | Tevaramellihalli      | 418                 | Halasur          | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               | 27           | Rattihalli     | 50                 | Rattihalli       | 226                 | Hallur                | 419                 | Puradakeri       | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 420                 | Chatnalli        | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 421                 | Kirageri         | Very High Risk Area |                      |                     |           |                     |
|                                    |               | 28           | Bhadravathi    | 51                 | Bhadravathi (1)  | 227                 | Bhadravati (CMC)      | 422                 | Bhadravati (CMC) | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 423                 | Holeneralakere   | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 228                 | Bilaki                | 424                 | Bilaki           | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 425                 | Koppadalu        | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 426                 | Padmenahalli     | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 229                 | Donabagatta           | 427                 | Donabaghatta     | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 230                 | Tadasa           | 428                 | Tadasa               | Very High Risk Area |           |                     |
|                                    |               |              |                |                    |                  | 231                 | Tavaragatta           | 429                 | Nellisara        | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 430                 | Malenahalli      | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 431                 | Malligenahalli   | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 232                 | Kambadal Hosuru       | 432                 | Goneebedu        | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 433                 | Honnehatti       | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 434                 | Hiriyur          | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 435                 | Nanjapura        | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 233                 | Hiriyuru              | 436                 | Veerapura        | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 234                 | Kallahalli       | 437                 | Siriyur              | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 52                  | Hole Honnuru (1)      | 235                 | Sidlipura        | 438                 | Sidlipura            | Very High Risk Area |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 236                 | Bhimaneri        | 439                 | Shiravala            | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 29                  | Sagar                 | 53                  | Sagar            | 237                 | Keladi               | 440                 | Adaranthe | Very High Risk Area |
|                                    |               |              |                |                    |                  |                     |                       |                     |                  |                     |                      | 441                 | Masuru    | Moderate Risk Area  |
|                                    |               | 442          | Yadehalli      | Moderate Risk Area |                  |                     |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               | 238          | Yedehalli      | 443                | Anandapuram      |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 444                | Achapura         |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 445                | Khyra            |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               | 239          | Achapura       | 446                | Tangalavadi      |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 447                | Malanduru        |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 240                | Anandapura       |                     |                       |                     |                  | 448                 | Kannur Sarkari       | Moderate Risk Area  |           |                     |
|                                    |               | 241          | Gowthampura    | 449                | Kannur Inam      |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 450                | Kannur Sarkari   |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 451                | Danandur         |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 452                | Gowthampura      |                     |                       |                     |                  | Very High Risk Area |                      |                     |           |                     |
|                                    |               | 242          | Hirebilagunji  | 453                | Sampalli         |                     |                       |                     |                  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                | 454                | Kudigere         |                     |                       |                     |                  | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                | 243                | Thyagarthi       |                     |                       |                     |                  | 455                 | Thyagarthi           | Very High Risk Area |           |                     |
|                                    |               | 244          | Shiravanthe    | 456                | Baradavalli      |                     |                       |                     |                  | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                | 245                | Talaguppa        |                     |                       |                     |                  | 457                 | Talaguppa            | Very High Risk Area |           |                     |
|                                    |               |              |                | 246                | Kanle            |                     |                       |                     |                  | 458                 | Kanle                | Very High Risk Area |           |                     |
|                                    |               |              |                | 247                | Hirenelluru      |                     |                       |                     |                  | 459                 | Hirenellur           | Very High Risk Area |           |                     |
|                                    |               | 248          | Syduru         | 460                | Sydu             | Moderate Risk Area  |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 461                | Tadagalale       | Very High Risk Area |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 249                | Hirenelluru      | 462                 | Shuntikoppa           | Very High Risk Area |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 463                | Ramapura         | Moderate Risk Area  |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               | 30           | Shikaripur     | 56                 | Shikaripur       | 250                 | Hothana Katte         | 464                 | Chunchinakoppa   | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 251                 | Kappanahalli     | 465                 | Kappanahalli         | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 252                 | Shikarpur (TMC)       | 466                 | Shikarpur (TMC)  | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 253                 | Amatekoppa       | 467                 | Shettihalli          | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 254                 | Esuru            | 468                 | Issuru               | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 255                 | Saluru                | 469                 | Saluru           | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 256                 | Tharlaghatta     | 470                 | Chikkajogihalli      | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 257                 | Goddanakoppa     | 471                 | Mugalagere           | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 258                 | Husuru                | 472                 | Mattikote        | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 473                 | Nimbegondi       | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 474                 | Suragihalli      | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 259                 | Guddada Thumminakatte | 475                 | Harnahalli       | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 260                 | Ambaragoppa      | 476                 | Thumrihosuru         | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 261                 | Udugani          | 477                 | Udugani              | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 262                 | Thadagani             | 478                 | Neralagi         | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 263                 | Haragi           | 479                 | Guddadahosalli       | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 264                 | Belligavi        | 480                 | Shiralakoppa (Rural) | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  | 61                  | Shivamogga (2)        | 265                 | Melinahanasavadi | 481                 | Malooru              | Moderate Risk Area  |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 482                 | Gondichatnahalli | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 266                 | Agasavalli       | 483                 | Echavadi             | Moderate Risk Area  |           |                     |
|                                    |               | 62           | Shivamogga (1) | 484                | Ramenakoppa      | Moderate Risk Area  |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 267                | Shimoga (CMC)    | 485                 | Shimoga (CMC)         | Moderate Risk Area  |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 268                | Melinahanasavadi | 486                 | Melina Hanasavadi     | Moderate Risk Area  |                  |                     |                      |                     |           |                     |
|                                    |               | 63           | Holalur (1)    | 269                | Bedara Hosahalli | 487                 | Hole Hanasavadi       | Very High Risk Area |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 488                | Bedara Hosahalli | Very High Risk Area |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 489                | Madike Chiluru   | Moderate Risk Area  |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               | 270          | Hadonahalli    | 490                | Hadona Halli     | Moderate Risk Area  |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 271                | Pillangere       | 491                 | Pillangere            | Very High Risk Area |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 272                | B.Beeranahalli   | 492                 | Belagalu              | Very High Risk Area |                  |                     |                      |                     |           |                     |
|                                    |               | 64           | Holalur (2)    | 273                | Kudli            | 493                 | Chikkudli             | Very High Risk Area |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 494                | Kudli            | Very High Risk Area |                       |                     |                  |                     |                      |                     |           |                     |
|                                    |               |              |                | 274                | Biluvani         | 495                 | Gerukoppa             | Moderate Risk Area  |                  |                     |                      |                     |           |                     |
|                                    |               | 32           | Sorab          | 65                 | Sorab            | 275                 | Hechhe                | 496                 | Kumsi            | Moderate Risk Area  |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 497                 | Ankaravalli      | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 276                 | Gudavi                | 498                 | Gunjanur         | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  |                     |                       | 499                 | Gudavi           | Very High Risk Area |                      |                     |           |                     |
|                                    |               |              |                |                    |                  | 277                 | Udri                  | 500                 | Hosuru           | Very High Risk Area |                      |                     |           |                     |

| Tungabhadra Sub-Basin (K8)         |                |              |                  |              |                  |           |                     |        |                       |                     |
|------------------------------------|----------------|--------------|------------------|--------------|------------------|-----------|---------------------|--------|-----------------------|---------------------|
| List of Flood Hazard Risk Villages |                |              |                  |              |                  |           |                     |        |                       |                     |
| Dist. SI.No.                       | District Name  | Taluk SI.No. | Taluk Name       | Hobli SI.No. | Hobli Name       | GP SI.No. | Gram Panchayat Name | SI.No. | Village Name          | Flood Hazard Class  |
| 1                                  | 2              | 3            | 4                | 5            | 6                | 7         | 8                   | 9      | 10                    | 11                  |
|                                    |                |              |                  | 66           | Anavatti         | 278       | Katuvalli           | 502    | Kathuvalli            | Very High Risk Area |
|                                    |                |              |                  |              |                  | 279       | Kubturu             | 503    | Bennuru               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 504    | Kubaturu              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 505    | Lakkavalli            | Very High Risk Area |
|                                    |                |              |                  |              |                  | 280       | Agasanahalli        | 506    | Neralige              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 507    | Mallapura             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 508    | Muguru                | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 509    | Agasanahalli          | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 510    | Dwarahalli            | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 511    | Thoravanda            | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 512    | Bommarsikoppa         | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 513    | Mudidoddikoppa (Mudi) | Very High Risk Area |
|                                    |                |              |                  |              |                  | 282       | Mutuguppe           | 514    | Abasi                 | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 515    | Kadasuru              | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 516    | Andavalli             | Very High Risk Area |
|                                    |                |              |                  | 67           | Chandragutti     | 283       | Chandragutti        | 517    | Holemanuru            | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 518    | Chandraguthi          | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 519    | Heche                 | Very High Risk Area |
|                                    |                |              |                  |              |                  | 285       | Nyarshi             | 520    | Chikkamakoppa         | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 521    | Hiremakoppa           | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 522    | Nyarshi               | Very High Risk Area |
|                                    |                |              |                  |              |                  | 286       | Bennuru             | 523    | Pura                  | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 524    | Sambapura             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 525    | Bennuru               | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 526    | Kamaruru              | Very High Risk Area |
|                                    |                |              |                  |              |                  | 287       | Harishi             | 527    | Mangarshikoppa        | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 528    | Chikkalagodu          | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 529    | Hirekalagodu          | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 530    | Edu                   | Moderate Risk Area  |
|                                    |                |              |                  | 68           | Jade             | 288       | Jade                | 531    | Varadikoppa           | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 532    | Chagaturu             | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 533    | Hosakoppa             | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 534    | Jademadapura          | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 535    | Hanaji                | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 536    | Kaliggeri             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 537    | Halekoppa             | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 538    | Bankasana             | Very High Risk Area |
|                                    |                |              |                  |              |                  | 289       | Katuvalli           | 539    | Tumarikoppa           | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 540    | Telagadde             | Very High Risk Area |
|                                    |                |              |                  |              |                  | 290       | Talagadde           | 541    | Mallasamudra          | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 542    | Yadamatha             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 291       | Shakunavalli        | 543    | Thulikoppa            | Very High Risk Area |
|                                    |                |              |                  |              |                  |           |                     | 544    | Sabara                | Moderate Risk Area  |
|                                    |                |              |                  |              |                  |           |                     | 545    | Shakunavalli          | Very High Risk Area |
|                                    |                |              |                  | 69           | Kuppagadde       | 292       | Dyavanahalli        | 546    | Basuru                | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 293       | Katuvalli           | 547    | Haralikoppa           | Very High Risk Area |
|                                    |                |              |                  | 70           | Ulvi             | 294       | Induvalli           | 548    | Kerehalli             | Very High Risk Area |
|                                    |                |              |                  | 71           | Thirthahalli     | 295       | Hosahalli           | 549    | Hirekasavi            | Moderate Risk Area  |
|                                    |                | 33           | Thirthahalli     | 72           | Agumbe           | 296       | Honnethalu          | 550    | Kodu                  | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 297       | Arehalli            | 551    | Kunda                 | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 298       | Heggodu             | 552    | Shiruru               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 299       | Bejjavalli          | 553    | Kesalur               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 300       | Hedduru             | 554    | Arehalli              | Moderate Risk Area  |
|                                    |                |              |                  | 73           | Mandagadde       | 301       | Muttinakoppa        | 555    | Chakkodabylu          | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 302       | Lakkavalli          | 556    | Kudige                | Very High Risk Area |
|                                    |                |              |                  |              |                  | 303       | Kenchekoppa         | 557    | Thuduru               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 304       | Malagi              | 558    | Kangalakoppa          | Very High Risk Area |
|                                    |                |              |                  |              |                  | 305       | Pala                | 559    | Dabbanagadde          | Moderate Risk Area  |
| 8                                  | Chikkamagaluru | 34           | Narasimharajapur | 75           | Narasimharajapur | 306       | Manamane            | 560    | Munduvalli            | Very High Risk Area |
|                                    |                | 35           | Tarikere         | 76           | Lakavalli        | 307       | Kavanchur           | 561    | Hedduru               | Very High Risk Area |
|                                    |                | 36           | Mundgod          | 77           | Pala             | 308       | Shiralagi           | 562    | Muthinakoppa          | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 309       | Manamane            | 563    | Lakkavalli            | Very High Risk Area |
|                                    |                |              |                  |              |                  | 310       | Halageri            | 564    | Malikoppa             | Moderate Risk Area  |
|                                    |                | 37           | Siddapura        | 78           | Siddapura        | 311       | Bhasi               | 565    | Veerapur              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 312       | Banavasi            | 566    | Haraganalli           | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 313       | Guddapur            | 567    | Malgi                 | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 314       | Andagi              | 568    | Ingalki               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 315       | Andagi              | 569    | Malalavalli           | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 316       | Andagi              | 570    | Nejjur                | Very High Risk Area |
|                                    |                |              |                  |              |                  | 317       | Andagi              | 571    | Kavanchur             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 318       | Andagi              | 572    | Arendur               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 319       | Andagi              | 573    | Haralikoppa           | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 320       | Andagi              | 574    | Akkunji               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 321       | Andagi              | 575    | Mugdur                | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 322       | Andagi              | 576    | Balekoppa (Shiralgi)  | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 323       | Andagi              | 577    | Bikkalse              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 324       | Andagi              | 578    | Shiralgi              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 325       | Andagi              | 579    | Manmane               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 326       | Andagi              | 580    | Hasavante             | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 327       | Andagi              | 581    | Husur                 | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 328       | Andagi              | 582    | Mugvalli              | Very High Risk Area |
|                                    |                |              |                  |              |                  | 329       | Andagi              | 583    | Naroor                | Very High Risk Area |
|                                    |                |              |                  |              |                  | 330       | Andagi              | 584    | Bhasi                 | Very High Risk Area |
|                                    |                |              |                  |              |                  | 331       | Andagi              | 585    | Banavasi              | Very High Risk Area |
|                                    |                |              |                  |              |                  | 332       | Andagi              | 586    | Tigani                | Very High Risk Area |
|                                    |                |              |                  |              |                  | 333       | Andagi              | 587    | Kadgod                | Very High Risk Area |
|                                    |                |              |                  |              |                  | 334       | Andagi              | 588    | Kantraji              | Very High Risk Area |
|                                    |                |              |                  |              |                  | 335       | Andagi              | 589    | Ajjarni               | Very High Risk Area |
|                                    |                |              |                  |              |                  | 336       | Andagi              | 590    | Gudnapur              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 337       | Andagi              | 591    | Madrali               | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 338       | Andagi              | 592    | Madrali               | Very High Risk Area |
|                                    |                |              |                  |              |                  | 339       | Andagi              | 593    | Hadalagi              | Moderate Risk Area  |
|                                    |                |              |                  |              |                  | 340       | Andagi              | 594    | Kalkardi              | Moderate Risk Area  |

### 3.5.9 Vedavathi Sub-basin -K9 :

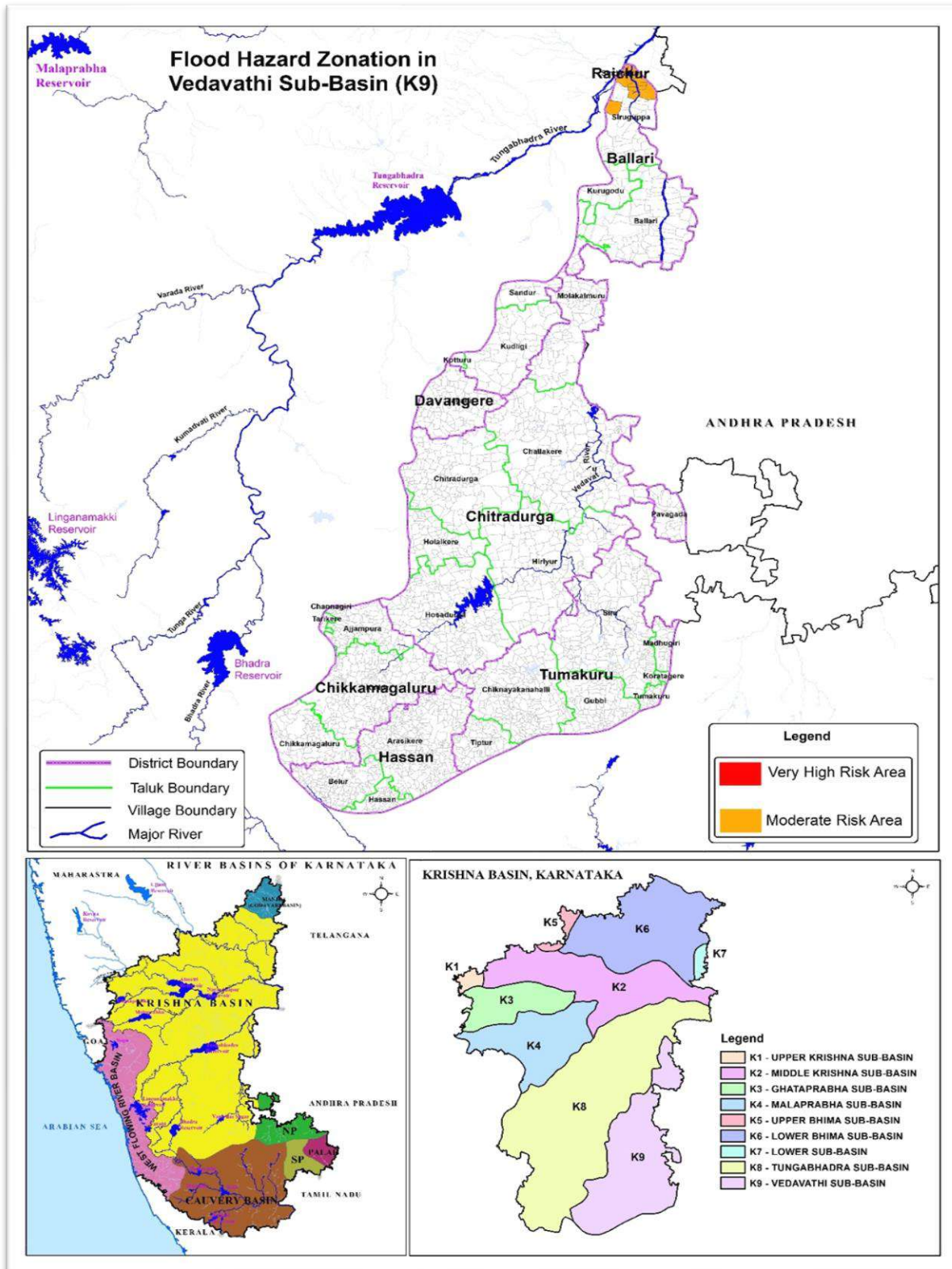
The Vedavathi rises from the Western Ghats and flows through the states of Karnataka and Andhra Pradesh. The Vedavathi is also called the Hagari in parts of Andhra Pradesh. Two rivers, the Veda and Avathi, arise in the eastern part of the Sahyadri Hill range, flow east, and join concert near Pura to form the Vedavathi. The river flows through Kadur Taluk Of Chikkamagalur District. Then it enters Hosadurga Taluk, Hiriyur Taluk and Challakere Taluk of Chitradurga district, respectively. The Vedavathi River is a tributary to the Tungabhadra River, and finally joins the Tungabhadra River at Siddaragonde village in Siruguppa Taluk of Bellary District along its right bank. The total length of the Vedavathi River is 391 km from its origin to its confluence with the Tungabhadra River. It is a seasonal river and flows only in the rainy season and is dry for much of the year. The Vani Vilasa Saagara reservoir constructed across river Vedavathi dates back a century.

The rainfall is un even in this region ranges from 650mm to less than 200 mm. In the last 20 years, the river has flowed in full splendour only during the rainy season. It remains dry in summer due to over exploitation of water resources and unplanned development. Due to cloud burst and heavy rainfall incidents creates flood situation in the basin mainly in Siraguppa taluk in Ballari district and also in districts of Chitradurga and Davanagere districts. About 12 villages are identified as flood prone in vedavathi sub-basin -K9.

The flood hazard risk villages are depicted in the **Map-32** and given in **table -20**.

#### Vedavathi Sub-basin -K9 : Flood Prone Districts

| Sl.No. | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|        |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1      | Ballari       | 1             | 2             | 6                      | 1               | 11            | 12             |



Map – 32 Vedavathi sub basin -K9

**Table – 20 List of Flood prone Villages in Vedavati sub basin –K9**

| Vedavati sub basin –K9             |               |             |            |             |             |          |                     |       |              |                     |
|------------------------------------|---------------|-------------|------------|-------------|-------------|----------|---------------------|-------|--------------|---------------------|
| List of Flood Hazard Risk Villages |               |             |            |             |             |          |                     |       |              |                     |
| Dist. SLNo.                        | District Name | Taluk SLNo. | Taluk Name | Hobli SLNo. | Hobli Name  | GP SLNo. | Gram Panchayat Name | SLNo. | Village Name | Flood Hazard Class  |
| 1                                  | 2             | 3           | 4          | 5           | 6           | 7        | 8                   | 9     | 10           | 11                  |
| 1                                  | Ballari       | 1           | Siruguppa  | 1           | Siruguppa   | 1        | Bagguru             | 1     | Boggur       | Moderate Risk Area  |
|                                    |               |             |            |             |             |          |                     | 2     | Chanakanur   | Moderate Risk Area  |
|                                    |               |             |            |             |             |          |                     | 3     | Karchigamur  | Moderate Risk Area  |
|                                    |               |             |            |             |             |          |                     | 4     | Gajjiginahal | Moderate Risk Area  |
|                                    |               |             |            |             |             | 2        | Raravi              | 5     | Raravi       | Moderate Risk Area  |
|                                    |               |             |            |             |             | 3        | Kuruvalli           | 6     | Tondehal     | Moderate Risk Area  |
|                                    |               |             |            |             |             |          |                     | 7     | T.Rampura    | Moderate Risk Area  |
|                                    |               |             |            |             |             |          |                     | 8     | Kuruvalli    | Moderate Risk Area  |
|                                    |               |             |            |             |             | 4        | Bagewadi            | 9     | Bagawady     | Very High Risk Area |
|                                    |               |             |            |             |             |          |                     | 10    | Kesarakoni   | Moderate Risk Area  |
|                                    |               |             |            |             |             | 5        | Kududhurahal        | 11    | Nagalapura   | Moderate Risk Area  |
|                                    |               |             |            | 2           | Tekkalakote | 6        | Halekote            | 12    | Halekota     | Moderate Risk Area  |

### 3.6 Flood Hazard Zonation of Cauvery Basin

Cauvery (or Kaveri) is the largest river in the state and originates at Talakaveri in Coorg. It is often called the Dakshina Ganga (the Ganges of the South) and considered one of the sacred rivers of India. The tributaries of the Kaveri include: Harangi, Hemavathi (origin in western Ghats joins the river Kaveri near Krishnarajasagar), Lakshmanatirtha, Kabini (originates in Kerala and flows eastward and joins the Kaveri at Tirumakudal, Narasipur), Shimsha, Arkavati, Suvarnavathi or Honnuholé,

Cauvery basin experiences tropical climate. Here, the main climatic feature is the monsoon rain. The north-east monsoon provides the greater portion of the annual precipitation. The highest rainfall in the basin is received along the western border of the basin during the southwest monsoon. The eastern side of the basin gets most of the rain during the northeast monsoon. Depressions in the Bay of Bengal affect the basin in the monsoon, causing cyclones and widespread heavy rains.

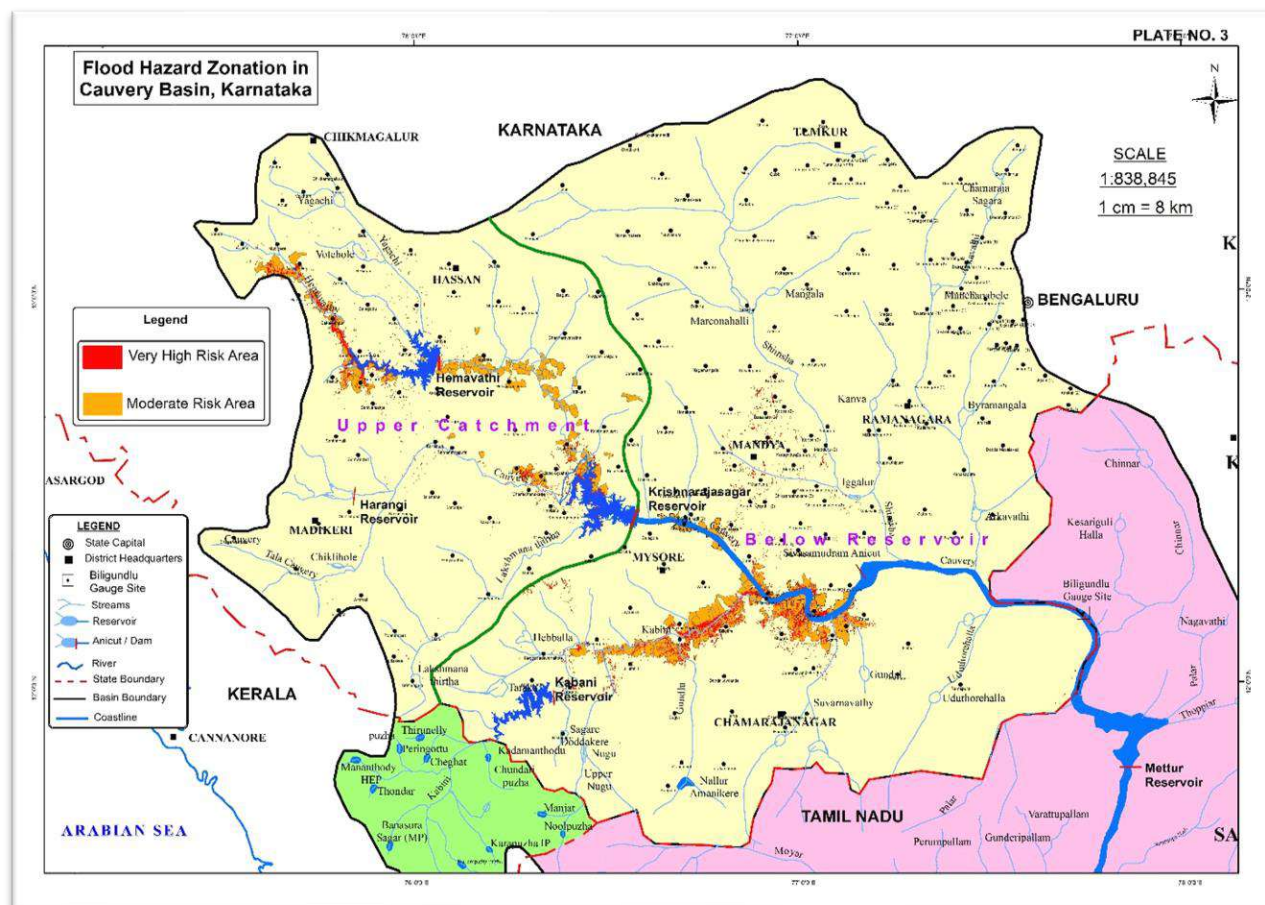
Cauvery basin stands most vulnerable to flood in the country and carries more risk when compared to Godavari and Krishna this is due to heavy rainfall associated with low depression and cyclones and also release of water from upper basin Cauvery basin. The Kabini reservoir fills first in the state and downpours at Wayanad district of Kerala. Harangi and Hemavti flows at full capacity in monsoon season and overflows, has resulted staring at a flood-like situation. The situation is precarious because heavy showers in several districts have coincided with the release of water from dams as many reservoirs in the Cauvery basin and creates worrying scenario for southern Karnataka.



The flood like situation arises mainly in the districts of Kodagu, Hassan, Mysore, Mandya and Chamarajanagara districts its identified that about 124 villages are prone to flood all along the Cauvery basin and delineated 54 villages are under high flood risk area and 70 villages are under moderate flood risk area. it's evident that the recent years of flood create havoc flood situation arise in basin. The flood hazard risk zonation is shown in the **Map-24** and list of villages prone flood is given in **Table – 15**.

### Cauvery Basin: Flood Prone Districts

| Sl.No.       | District Name   | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------|-----------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|              |                 |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1            | Chamarajanagara | 2             | 3             | 7                      | 4               | 7             | 11             |
| 2            | Mysuru          | 5             | 12            | 34                     | 30              | 35            | 65             |
| 3            | Mandya          | 1             | 1             | 2                      | 1               | 2             | 3              |
| 4            | Hassan          | 2             | 5             | 13                     | 16              | 12            | 28             |
| 5            | Chikkamagaluru  | 1             | 2             | 4                      | —               | 11            | 11             |
| 6            | Kodagu          | 1             | 1             | 3                      | 3               | 3             | 6              |
| <b>Total</b> |                 | <b>12</b>     | <b>24</b>     | <b>63</b>              | <b>54</b>       | <b>70</b>     | <b>124</b>     |



Map – 33 Flood Hazard zonation in Cauvery Basin

Table – 21 List of Flood Prone Villages in Cauvery Basin

| Cauvery Basin, Karnataka           |                 |              |            |              |                    |           |                     |        |                         |                     |
|------------------------------------|-----------------|--------------|------------|--------------|--------------------|-----------|---------------------|--------|-------------------------|---------------------|
| List of Flood Hazard Risk Villages |                 |              |            |              |                    |           |                     |        |                         |                     |
| Dist. Sl.No.                       | District Name   | Taluk Sl.No. | Taluk Name | Hobli Sl.No. | Hobli Name         | GP Sl.No. | Gram Panchayat Name | Sl.No. | Village Name            | Flood Hazard Class  |
| 1                                  | 2               | 3            | 4          | 5            | 6                  | 7         | 8                   | 9      | 10                      | 11                  |
| 1                                  | Chamarajanagara | 1            | Kollegala  | 1            | Kollegala          | 1         | Kunthooru           | 1      | Kunthur                 | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 2      | Teramballi              | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 2         | Tagarapura          | 3      | Tagarapura              | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 4      | Hosamalangi             | Very High Risk Area |
|                                    |                 |              |            |              |                    | 3         | Kollegal (CMC)      | 5      | Kollegal (CMC)          | Very High Risk Area |
|                                    |                 |              |            |              |                    | 4         | Siddaianapura       | 6      | Siddaayanapura          | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 5         | Harale              | 7      | Hampapura               | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 8      | Harale                  | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 9      | Dasanapura              | Very High Risk Area |
|                                    |                 |              |            |              |                    | 6         | Madhuvinahalli      | 10     | Madhuvanahalli          | Moderate Risk Area  |
| 2                                  | Mysuru          | 2            | Yelandur   | 3            | Agara ( (Mamballi) | 7         | Agara               | 11     | Kinakahalli             | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 12     | Mirle                   | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 8         | Mirle               | 13     | Shyabalu                | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 9         | Saligrama           | 14     | Saligrama               | Very High Risk Area |
|                                    |                 |              |            |              |                    | 10        | Ankanahalli         | 15     | Ankanahalli             | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 11        | Yadakola            | 16     | Yadakola                | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 17     | Kuppegala               | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 12        | Kalale              | 18     | Kalale                  | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 13        | Devarasanahalli     | 19     | Uppinahalli             | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 14        | Devirammanahalli    | 20     | Karlapura               | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 15        | Heggadahalli        | 21     | Deveerammanahalli       | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 22     | Harathale               | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 23     | Heggadahalli            | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 16        | Nanjangud(Rural)    | 24     | Kongahalli              | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 25     | Nanjangud(Rural)        | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 26     | Byalaru                 | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 17        | Deburu              | 27     | Handhvinahalli          | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 28     | Debur                   | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 29     | Mullur                  | Very High Risk Area |
|                                    |                 |              |            |              |                    | 18        | Horalavadi          | 30     | Horalavadi              | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 31     | Alambur                 | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 32     | Haniyamballi            | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 19        | Nagarle             | 33     | Saragooru               | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 34     | Nagarle                 | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 35     | Kupparavalli            | Very High Risk Area |
|                                    |                 |              |            |              |                    | 20        | Suthuru             | 36     | Jeemaralli              | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 37     | Suthur                  | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 38     | Bilugali                | Very High Risk Area |
|                                    |                 |              |            |              |                    | 21        | Thayuru             | 39     | Gejjiganahalli          | Moderate Risk Area  |
|                                    |                 |              |            |              |                    |           |                     | 40     | Jodihariharapura (Igii) | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 41     | Thayuru                 | Very High Risk Area |
|                                    |                 |              |            |              |                    | 22        | Kempisiddanahundi   | 42     | Hejjige                 | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 43     | Thoremavu               | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 44     | Basavanapura            | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 23        | Hulimavu            | 45     | Bokkahalli              | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 46     | Immavu                  | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 47     | Hulimavu                | Moderate Risk Area  |
|                                    |                 |              |            |              |                    | 24        | Maraluru            | 48     | Yechagalli              | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 49     | Moodahalli              | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 50     | Alathur                 | Very High Risk Area |
|                                    |                 |              |            |              |                    | 25        | Hosakote            | 51     | Hosakote                | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 52     | Hadinaru                | Very High Risk Area |
|                                    |                 |              |            |              |                    |           |                     | 53     | Thumnerale              | Very High Risk Area |

| Cauvery Basin, Karnataka           |               |              |             |              |             |                     |                     |                     |                     |                     |             |                    |
|------------------------------------|---------------|--------------|-------------|--------------|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------------|--------------------|
| List of Flood Hazard Risk Villages |               |              |             |              |             |                     |                     |                     |                     |                     |             |                    |
| Dist. SI.No .                      | District Name | Taluk SI.No. | Taluk Name  | Hobli SI.No. | Hobli Name  | GP SI.No .          | Gram Panchayat Name | SI.No .             | Village Name        | Flood Hazard Class  |             |                    |
| 1                                  | 2             | 3            | 4           | 5            | 6           | 7                   | 8                   | 9                   | 10                  | 11                  |             |                    |
|                                    |               |              |             | 10           | Hullahalli  | 28                  | Nallithalapura      | 54                  | Motha               | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 55                  | Madanahalli         | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             | 29                  | Shiramalli          | 56                  | Shiramalli          | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 57                  | Belale              | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             | 30                  | Kurihundi           | 58                  | Kanenur             | Moderate Risk Area  |             |                    |
|                                    |               |              |             | 31           | Hullahalli  | 59                  | Hullahalli          | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               | 6            | T.Narasipur | 11           | T.Narasipur | 32                  | Kiragasuru          | 60                  | Kiragasuru          | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 61                  | Hunsuru             | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             | 33                  | Hosakote            | 62                  | Hosakote            | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 63                  | Induvalu            | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             | 34                  | Thumbala            | 64                  | Muthathi            | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             | 65                  | Thumbala            | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             | 66                  | Honnuru             | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             | 12           | Muguru      | 35                  | Kotthegala          | 67                  | Kannahalli          | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             | 36                  | Karohatti           | 68                  | Kethahalli          | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             | 37                  | Madapura            | 69                  | Nilasoge            | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 70                  | Hosapura            | Moderate Risk Area  |             |                    |
|                                    |               | 13           | Sosale      | 38           | Sosale      | 71                  | S.K.P.Agrahara      | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             | 39           | Kethupura   | 72                  | Bevinahalli         | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               | 14           | Talakad     | 40           | T.Doddapura | 73                  | Thottavadi          | Very High Risk Area |                     |                     |             |                    |
|                                    |               |              |             |              |             | 74                  | T.Doddapura         | Very High Risk Area |                     |                     |             |                    |
|                                    |               | 7            | Saraguru    | 15           | Saraguru    | 41                  | K.Belthuru          | 75                  | Chakkur             | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 76                  | Moleyur (Kalihundi) | Very High Risk Area |             |                    |
|                                    |               | 3            | Mandya      | 8            | Malavalli   | 16                  | B G Pura (1)        | 42                  | Saraguru            | 77                  | Ballagere   | Moderate Risk Area |
|                                    |               |              |             |              |             |                     |                     | 43                  | Poorigali           | 78                  | Maralahalli | Moderate Risk Area |
| 79                                 | Purigali      |              |             |              |             |                     |                     |                     |                     | Very High Risk Area |             |                    |
| 4                                  | Hassan        | 9            | Belur       | 17           | Arehalli    | 44                  | Thumbudevanhalli    | 80                  | Hosahalli           | Very High Risk Area |             |                    |
|                                    |               | 10           | Sakaleshpur | 18           | Sakaleshpur | 45                  | Byakaravalli        | 81                  | Nallulli            | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 82                  | Shanthapura         | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 83                  | Ibbadi              | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 84                  | Doddasathigala      | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             | 46                  | Anemahal            | 85                  | Chikkasathigala     | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 86                  | Cowdahalli          | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 87                  | Malali              | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 88                  | Sakleshpur (TMC)    | Moderate Risk Area  |             |                    |
|                                    |               | 47           | Malali      | 89           | Hennali     | Very High Risk Area |                     |                     |                     |                     |             |                    |
|                                    |               |              |             | 90           | Baikere     | Very High Risk Area |                     |                     |                     |                     |             |                    |
|                                    |               |              |             | 19           | Hanbalu     | 51                  | Kaymanahalli        | 91                  | Dabbegadde          | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 92                  | Mavinahalli         | Very High Risk Area |             |                    |
|                                    |               | 93           | Madanapura  |              |             |                     |                     | Very High Risk Area |                     |                     |             |                    |
|                                    |               | 94           | Hadige      |              |             |                     |                     | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               | 20           | Hettur      | 52           | Kurubhattur | 95                  | Nidigere            | Very High Risk Area |                     |                     |             |                    |
|                                    |               |              |             |              |             | 96                  | Bellur              | Very High Risk Area |                     |                     |             |                    |
|                                    |               | 21           | Yaslur      | 53           | Uchangi     | 97                  | Chikkakundur        | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             | 54                  | Yasalur             | 98                  | Yeslur              | Moderate Risk Area  |             |                    |
|                                    |               |              |             |              |             |                     |                     | 99                  | Thontalapura        | Very High Risk Area |             |                    |
|                                    |               |              |             |              |             |                     |                     | 100                 | Kerodi              | Moderate Risk Area  |             |                    |
|                                    |               |              |             | 101          | Magalu      |                     |                     | Very High Risk Area |                     |                     |             |                    |
|                                    |               |              |             | 55           | Igoor       | 102                 | Igoor               | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             | 103                 | Doddakallur         | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             | 104                 | Yadakere            | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             | 56           | Kurubhattur | 105                 | Kothanahalli        | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             | 106                 | Hennali             | Very High Risk Area |                     |                     |             |                    |
|                                    |               |              |             |              |             | 107                 | Gowdarabylu         | Moderate Risk Area  |                     |                     |             |                    |
|                                    |               |              |             |              |             |                     |                     |                     |                     |                     |             |                    |

| Cauvery Basin, Karnataka           |                |              |            |              |            |           |                     |        |                |                     |
|------------------------------------|----------------|--------------|------------|--------------|------------|-----------|---------------------|--------|----------------|---------------------|
| List of Flood Hazard Risk Villages |                |              |            |              |            |           |                     |        |                |                     |
| Dist. SI.No.                       | District Name  | Taluk SI.No. | Taluk Name | Hobli SI.No. | Hobli Name | GP SI.No. | Gram Panchayat Name | SI.No. | Village Name   | Flood Hazard Class  |
| 1                                  | 2              | 3            | 4          | 5            | 6          | 7         | 8                   | 9      | 10             | 11                  |
| 5                                  | Chikkamagaluru | 11           | Mudigere   | 22           | Mudigere   | 57        | Daradahalli         | 108    | Kanachuru      | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 109    | Kadidal        | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 110    | Jogannanakere  | Moderate Risk Area  |
|                                    |                |              |            | 23           | Gonibidu   | 58        | Kirugunda           | 111    | Hegravalli     | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 112    | Chakkodige     | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 113    | Udase          | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 114    | Bettadamane    | Moderate Risk Area  |
|                                    |                |              |            |              |            | 59        | Hanthur             | 115    | Uggehali       | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 116    | Hanthuru       | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 117    | Angadi         | Moderate Risk Area  |
|                                    |                |              |            |              |            | 60        | Gonibidu            | 118    | G.Agrahara     | Moderate Risk Area  |
| 6                                  | Kodagu         | 12           | Somwarpet  | 24           | Kodlipet   | 61        | Byadagotta          | 119    | Bembalur       | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 120    | Kerekere       | Moderate Risk Area  |
|                                    |                |              |            |              |            |           |                     | 121    | Honnekodi      | Moderate Risk Area  |
|                                    |                |              |            |              |            | 62        | Bessur              | 122    | Kattepura      | Very High Risk Area |
|                                    |                |              |            |              |            |           |                     | 123    | Janardanahalli | Very High Risk Area |
|                                    |                |              |            |              |            | 63        | Kodlipet            | 124    | Kelakodli      | Very High Risk Area |

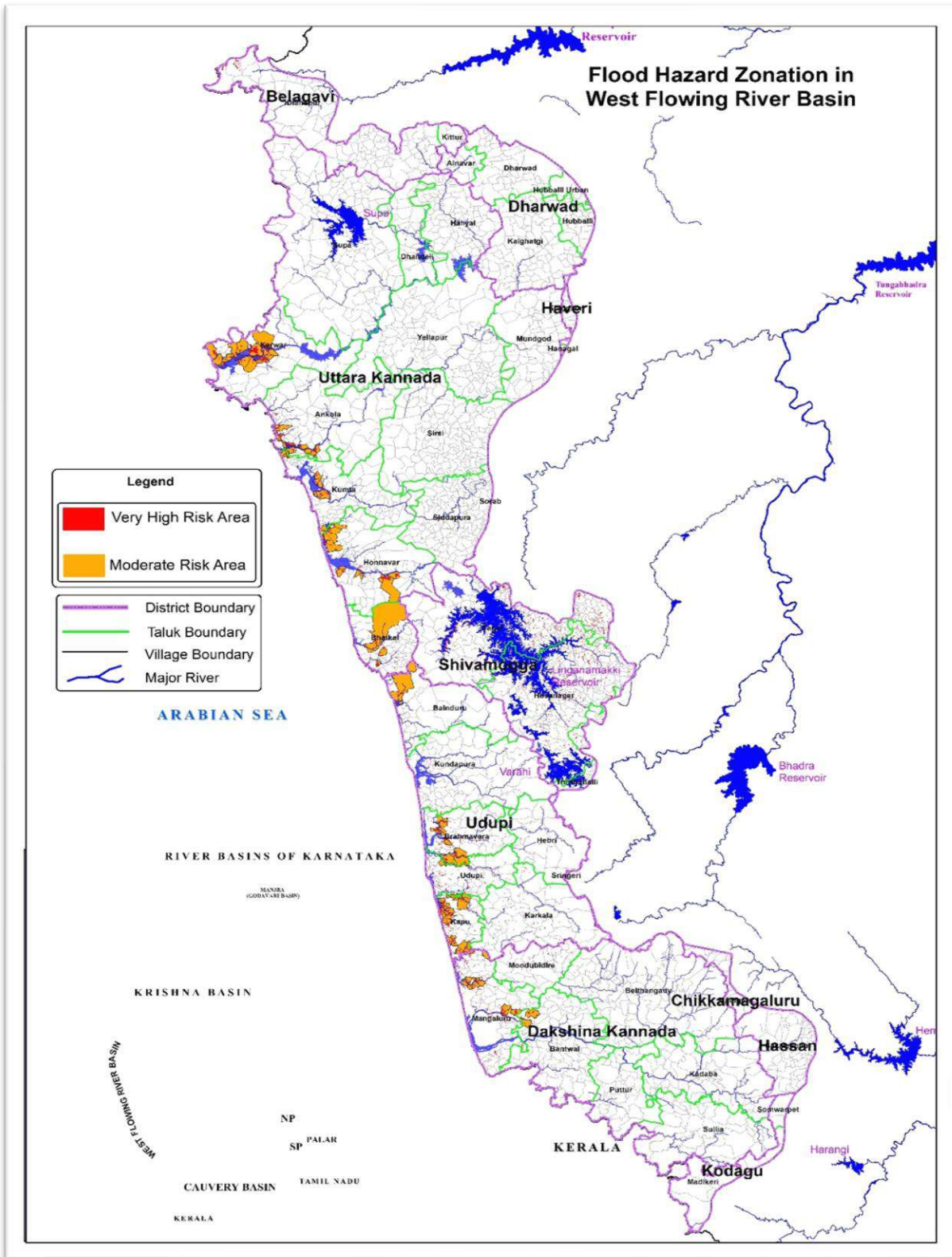
### 3.7 Flood Hazard Zonation of West flowing River

The west flowing rivers originates in Western Ghats region at an elevation ranging from 400 meters to 1,600 meters above the mean sea level. The rivers flows westward and meet the Arabian Sea after a short run ranging from 50 km to 300 kms. The prominent west flowing rivers are Netravati, Kali, Sharavati, Mahadayi, Bedti, Aghanashini, Varahi and Barapole.

Netravati is one of the main river of the Dakshina Kannda districts and flows about 96 km and the river Kali is major west flowing river originates in Uttarakannada districts and flows about 184 km to reach Arabian Sea. Sharavati is an important rivers origin in Ambutirta in Shivamogga districts and flows about 123 kms. The Sharavati hydroelectric project has the major contribution in power generation. The west flowing rivers flows at full capacity during the monsoon season and receives huge amount of water from its tributaries due to heavy downpour in Western Ghats about more than 250 mm in a day. The flood like situation is very common during the monsoon due to overflowing of rivers all along the river basin the villages adjacent river are inundated and cause severe damage of agriculture, horticulture and commercial crops and damage of public infrastructure and property. There are 60 villages are under very high risk area and 36 villages are under moderate risk area are delineated and identified from the historical flood records and shown in the **Map -34** and the flood hazard zonation villages are given in **table-22**.

## West Flowing sub basin : Flood Prone Districts

| Sl.No. | District Name    | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------|------------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|        |                  |               |               |                        | Very High Risk  | Moderate Risk |                |
| 1      | Shivamogga       | 1             | 2             | 2                      | 1               | 1             | 2              |
| 2      | Dakshina Kannada | 2             | 4             | 11                     | 7               | 7             | 14             |
| 3      | Udupi            | 4             | 5             | 17                     | 19              | 3             | 22             |
| 4      | Uttara Kannada   | 5             | 14            | 38                     | 33              | 25            | 58             |
| Total  |                  | 12            | 25            | 68                     | 60              | 36            | 96             |



**Map – 34 Flood hazard zonation of West Flowing sub basin**



Table – 22 List of Flood prone Villages in West Flowing River Basin

| West Flowing River Basin, Karnataka |                  |              |                 |                     |                |                    |                     |        |                  |                     |               |                     |
|-------------------------------------|------------------|--------------|-----------------|---------------------|----------------|--------------------|---------------------|--------|------------------|---------------------|---------------|---------------------|
| List of Flood Hazard Risk Villages  |                  |              |                 |                     |                |                    |                     |        |                  |                     |               |                     |
| Dist. Sl.No.                        | District Name    | Taluk Sl.No. | Taluk Name      | Hobli Sl.No.        | Hobli Name     | GP Sl.No.          | Gram Panchayat Name | Sl.No. | Village Name     | Flood Hazard Class  |               |                     |
| 1                                   | 2                | 3            | 4               | 5                   | 6              | 7                  | 8                   | 9      | 10               | 11                  |               |                     |
| 1                                   | Shivamogga       | 1            | Sagar           | 1                   | Anandapuram    | 1                  | Hirebilagunji       | 1      | Hirebilagunji    | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 | 2                   | Talguppa       | 2                  | Marthuru            | 2      | Marthur          | Very High Risk Area |               |                     |
| 2                                   | Dakshina Kannada | 2            | Bantwal         | 3                   | Pane Mangalore | 3                  | Ammunje             | 3      | Ammunje          | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 4                  | Badagabellur        | 4      | Badaga Bellur    | Moderate Risk Area  |               |                     |
|                                     |                  | 3            | Mangaluru       | 4                   | Gurpur         | 5                  | Gurupura            | 5      | Mulur (CT)       | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 6                  | Ganjimata           | 6      | Tankaulipady     | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 7                  | Kandavara           | 7      | Kandavara        | Very High Risk Area |               |                     |
|                                     |                  |              |                 | 5                   | Mulki          | 8                  | Kemral              | 8      | Koikude          | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 9                  | Attur               | 9      | Attur            | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 10                 | Kateelu             | 10     | Kilenjur         | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 11                 | Aikala              | 11     | Ulipady          | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 12                 | Balkunje            | 12     | Karnire          | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 13                 | Chelairu            | 13     | Madya            | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 14                 | Chelliru (OG)       | 14     | Chelliru (OG)    | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 15                 | Surinje             | 15     | Surinje          | Very High Risk Area |               |                     |
|                                     |                  | 16           | Delanthabettu   | 16                  | Delanthabettu  | Moderate Risk Area |                     |        |                  |                     |               |                     |
|                                     |                  | 3            | Udupi           | 4                   | Udupi          | 7                  | Udupi               | 14     | Manipura         | 17                  | Manipura (CT) | Very High Risk Area |
| 15                                  | Paduvari         |              |                 |                     |                |                    |                     | 18     | Paduvari         | Very High Risk Area |               |                     |
| 5                                   | Bainduru         |              |                 | 8                   | Bainduru       | 16                 | Yadthare            | 19     | Yedthare         | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 17                 | Havanje             | 20     | Havanje          | Moderate Risk Area  |               |                     |
| 6                                   | Brahmavara       |              |                 | 9                   | Brahmavara     | 18                 | Uppoor              | 21     | Uppoor           | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 19                 | Aroor               | 22     | Aroor            | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 20                 | Handadi             | 23     | Matpady          | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 21                 | Pandeshwara         | 24     | Moodahadu        | Very High Risk Area |               |                     |
|                                     |                  |              |                 | 10                  | Kota           | 22                 | Barkur              | 25     | Hosala           | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 23                 | Vaddarse            | 26     | Kavadi           | Very High Risk Area |               |                     |
|                                     |                  |              |                 |                     |                | 27                 | Vaddarse            | 27     | Vaddarse         | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 7                  | Kapu                | 11     | Kapu             | 24                  | Phalimaru     | 28                  |
| 25                                  | Padubidri        |              |                 | 29                  | Nandicoor      |                    |                     |        |                  | Very High Risk Area |               |                     |
| 26                                  | Thenka           |              |                 | 30                  | Padebettu      |                    |                     |        |                  | Very High Risk Area |               |                     |
| 27                                  | Mallar (CT)      |              |                 | 31                  | Tenka          |                    |                     |        |                  | Very High Risk Area |               |                     |
| 32                                  | Mallar (CT)      |              |                 | 32                  | Mallar (CT)    |                    |                     |        |                  | Very High Risk Area |               |                     |
| 33                                  | Majoor           |              |                 | 33                  | Majoor         |                    |                     |        |                  | Very High Risk Area |               |                     |
| 34                                  | Uliargoli        |              |                 | 34                  | Uliargoli      |                    |                     |        |                  | Very High Risk Area |               |                     |
| 35                                  | Innanje          | 35           | Innanje         | Very High Risk Area |                |                    |                     |        |                  |                     |               |                     |
| 36                                  | Pangala          | 36           | Pangala         | Very High Risk Area |                |                    |                     |        |                  |                     |               |                     |
| 37                                  | Belle            | 37           | Belle           | Very High Risk Area |                |                    |                     |        |                  |                     |               |                     |
| 38                                  | Katpaadi         | 38           | Moodabettu (CT) | Very High Risk Area |                |                    |                     |        |                  |                     |               |                     |
| 4                                   | Uttara Kannada   | 8            | Ankola          | 12                  | Ankola         | 31                 | Alageri             | 39     | Ankola (TP + OG) | Moderate Risk Area  |               |                     |
|                                     |                  |              |                 |                     |                | 13                 | Basagod             | 32     | Aragona          | 40                  | Hegre         | Very High Risk Area |
|                                     |                  |              |                 |                     |                |                    |                     | 33     | Honnebailu       | 41                  | Aragon        | Moderate Risk Area  |
|                                     |                  |              |                 |                     |                | 34                 | Shetageri           | 42     | Bilehoingi       | 42                  | Bilehoingi    | Very High Risk Area |
|                                     |                  |              |                 |                     |                |                    |                     | 43     | Shinganmakki     | 43                  | Shinganmakki  | Very High Risk Area |
|                                     |                  |              |                 |                     |                | 35                 | Belambar            | 44     | Kanagil          | 44                  | Kanagil       | Very High Risk Area |
|                                     |                  |              |                 |                     |                |                    |                     | 45     | Hadav            | 45                  | Hadav         | Very High Risk Area |
|                                     |                  |              |                 |                     |                | 36                 | Bobrowada           | 46     | Poojgeri         | 46                  | Poojgeri      | Moderate Risk Area  |
|                                     |                  |              |                 |                     |                |                    |                     | 47     | Belambar         | 47                  | Belambar      | Moderate Risk Area  |
|                                     |                  |              |                 |                     |                | 48                 | Kogre               | 48     | Kogre            | Very High Risk Area |               |                     |
| 49                                  | Bobrowada (CT)   | 49           | Bobrowada (CT)  | Moderate Risk Area  |                |                    |                     |        |                  |                     |               |                     |

| West Flowing River Basin, Karnataka |               |                    |             |                     |                 |                     |                     |                     |                  |                     |
|-------------------------------------|---------------|--------------------|-------------|---------------------|-----------------|---------------------|---------------------|---------------------|------------------|---------------------|
| List of Flood Hazard Risk Villages  |               |                    |             |                     |                 |                     |                     |                     |                  |                     |
| Dist. Sl.No.                        | District Name | Taluk Sl.No.       | Taluk Name  | Hobli Sl.No.        | Hobli Name      | GP Sl.No.           | Gram Panchayat Name | Sl.No.              | Village Name     | Flood Hazard Class  |
| 1                                   | 2             | 3                  | 4           | 5                   | 6               | 7                   | 8                   | 9                   | 10               | 11                  |
|                                     |               |                    |             | 14                  | Blale           | 37                  | Mogata              | 50                  | Andle            | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 |                     |                     | 51                  | Mogta            | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 38                  | Sagadageri          | 52                  | Ulware           | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 39                  | Aragona             | 53                  | Joog             | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 40                  | Belase              | 54                  | Shirur           | Very High Risk Area |
|                                     |               | 9                  | Bhatkal     | 15                  | Susgadi         | 41                  | Yalvadikavur        | 55                  | Purvarga         | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 42                  | Muttalli            | 56                  | Talan            | Moderate Risk Area  |
|                                     |               |                    |             | 16                  | Mavalli         | 43                  | Shirali             | 57                  | Venkatapura (CT) | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 44                  | Koppa               | 58                  | Koppa            | Moderate Risk Area  |
|                                     |               | 10                 | Honnavar    | 17                  | Honnavar        | 45                  | Karki               | 59                  | Karki            | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 46                  | Haladipur           | 60                  | Haldipur         | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 47                  | Navilgona           | 61                  | Navilgone        | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 62                  | Kakurve             | Moderate Risk Area  |                  |                     |
|                                     |               |                    |             | 48                  | Kadatoka        | 63                  | Kadtoka             | Very High Risk Area |                  |                     |
|                                     |               |                    |             | 18                  | Manki           | 49                  | Magoda              | 64                  | Magod            | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 65                  | Birangod            | Very High Risk Area |                  |                     |
|                                     |               |                    |             |                     |                 | 50                  | Balakur             | 66                  | Balkur           | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 51                  | Kelaginur           | 67                  | Kelginoor        | Very High Risk Area |
|                                     |               |                    |             | 52                  | Melina Idagunji | 68                  | Hosapatna           | Very High Risk Area |                  |                     |
|                                     |               |                    |             | 19                  | Mavinakurvei    | 53                  | Kudrigi             | 69                  | Kudrige          | Very High Risk Area |
|                                     |               |                    |             | 11                  | Karwar          | 20                  | Ghadasaya           | 54                  | Keravadi         | 70                  |
|                                     |               | 71                 | Katar       |                     |                 |                     |                     |                     |                  | Very High Risk Area |
|                                     |               | 72                 | Kadiye      |                     |                 |                     |                     | Moderate Risk Area  |                  |                     |
|                                     |               | 55                 | Ghadasai    |                     |                 |                     |                     | 73                  | Bolshitta        | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 74                  | Ulga                | Very High Risk Area |                  |                     |
|                                     |               |                    |             |                     |                 | 75                  | Ghadasai            | Very High Risk Area |                  |                     |
|                                     |               |                    |             |                     |                 | 76                  | Bhaire              | Very High Risk Area |                  |                     |
|                                     |               | 21                 | Kinnar      |                     |                 | 56                  | Vailavada           | 77                  | Siddar           | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 78                  | Wailwada            | Very High Risk Area |                  |                     |
|                                     |               |                    |             |                     |                 | 57                  | Devalamakki         | 79                  | Naitisavar       | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 58                  | Kinnar              | 80                  | Kinnar           | Moderate Risk Area  |
|                                     |               | 22                 | Savantvada  |                     |                 | 59                  | Chittakula          | 81                  | Submerged_River  | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 |                     |                     | 82                  | Kanasgiri        | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 |                     |                     | 83                  | Chitakula(OG)    | Moderate Risk Area  |
|                                     |               |                    |             |                     |                 | 60                  | Asnoti              | 84                  | Madhewada        | Very High Risk Area |
|                                     |               |                    |             |                     |                 | 61                  | Hanakona            | 85                  | Hotegali         | Moderate Risk Area  |
|                                     |               |                    |             | 86                  | Hankon          | Moderate Risk Area  |                     |                     |                  |                     |
| 62                                  | Majali        | 87                 | Majali      | Very High Risk Area |                 |                     |                     |                     |                  |                     |
| 12                                  | Kumta         | 23                 | Gokarna     | 63                  | Hanehalli       | 88                  | Bankikodla          | Very High Risk Area |                  |                     |
|                                     |               |                    |             | 64                  | Nadumaskeri     | 89                  | Harumaskeri         | Very High Risk Area |                  |                     |
|                                     |               | 90                 | Nadumaskeri | Very High Risk Area |                 |                     |                     |                     |                  |                     |
|                                     |               | 24                 | Kujahalli   | 65                  | Devagiri        | 91                  | Horbhag             | Very High Risk Area |                  |                     |
|                                     |               | 25                 | Mirjan      | 66                  | Hegde           | 92                  | Hegde(Part)         | Very High Risk Area |                  |                     |
|                                     |               |                    |             | 93                  | Lukkeri         | Very High Risk Area |                     |                     |                  |                     |
|                                     |               |                    |             | 67                  | Kodakani        | 94                  | Kodkani             | Moderate Risk Area  |                  |                     |
|                                     |               |                    |             | 68                  | Bargi           | 95                  | Paduvani            | Moderate Risk Area  |                  |                     |
| 96                                  | Bargi         | Moderate Risk Area |             |                     |                 |                     |                     |                     |                  |                     |

## Sub Basin wise Flood prone Districts

| Sub Basin           | Sl. No. | District Name | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|---------------------|---------|---------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|                     |         |               |               |               |                        | Very High Risk  | Moderate Risk |                |
| Upper Krishna - K1  | 1       | Belagavi      | 2             | 3             | 26                     | 16              | 19            | 35             |
| Middle Krishna - K2 | 1       | Koppal        | 1             | 1             | 1                      | —               | 1             | 1              |
|                     | 2       | Raichur       | 3             | 8             | 23                     | 49              | 11            | 60             |
|                     | 3       | Belagavi      | 4             | 7             | 48                     | 51              | 14            | 65             |
|                     | 4       | Bagalkote     | 5             | 7             | 32                     | 34              | 25            | 59             |
|                     | 5       | Vijayapura    | 7             | 9             | 32                     | 19              | 33            | 52             |
|                     | 6       | Yadgir        | 4             | 7             | 14                     | 31              | 5             | 36             |
|                     | Total   |               | 24            | 39            | 150                    | 184             | 89            | 273            |
| Ghataprabhs - K3    | 1       | Belagavi      | 4             | 11            | 56                     | 20              | 72            | 92             |
|                     | 2       | Bagalkote     | 5             | 7             | 36                     | 25              | 45            | 70             |
|                     | Total   |               | 9             | 18            | 92                     | 45              | 117           | 162            |
| Mallaprabha - K4    | 1       | Belagavi      | 3             | 3             | 7                      | —               | 9             | 9              |
|                     | 2       | Bagalkote     | 3             | 6             | 31                     | 8               | 55            | 63             |
|                     | 3       | Gadag         | 2             | 5             | 12                     | —               | 16            | 16             |
|                     | 4       | Haveri        | 1             | 1             | 5                      | —               | 9             | 9              |
|                     | 5       | Dharwad       | 5             | 6             | 16                     | —               | 25            | 25             |
|                     | Total   |               | 14            | 21            | 71                     | 8               | 114           | 122            |
| Upper Bhima - K5    | 1       | Belagavi      | 2             | 2             | 7                      | 2               | 13            | 15             |
| Lower Bhima - K6    | 1       | Kalaburagi    | 11            | 31            | 134                    | 89              | 149           | 238            |
|                     | 2       | Bidar         | 2             | 3             | 4                      | —               | 7             | 7              |
|                     | 3       | Vijayapura    | 4             | 5             | 16                     | 16              | 13            | 29             |
|                     | 4       | Yadgir        | 3             | 6             | 10                     | 7               | 11            | 18             |
|                     | Total   |               | 20            | 45            | 164                    | 112             | 180           | 292            |
| Tunghabadra - K8    | 1       | Davangere     | 7             | 6             | 46                     | 57              | 30            | 87             |
|                     | 2       | Ballari       | 6             | 13            | 33                     | 29              | 24            | 53             |
|                     | 3       | Koppal        | 3             | 6             | 19                     | 6               | 21            | 27             |
|                     | 4       | Raichur       | 4             | 13            | 35                     | 38              | 39            | 77             |
|                     | 5       | Gadag         | 2             | 2             | 6                      | 10              | —             | 10             |
|                     | 6       | Haveri        | 5             | 10            | 87                     | 62              | 105           | 167            |

| Sub Basin          | Sl. No. | District Name    | No. of Taluks | No. of Hoblis | No. of Gram Panchayats | No. of Villages |               | Total Villages |
|--------------------|---------|------------------|---------------|---------------|------------------------|-----------------|---------------|----------------|
|                    |         |                  |               |               |                        | Very High Risk  | Moderate Risk |                |
|                    | 7       | Shivamogga       | 6             | 24            | 74                     | 65              | 75            | 140            |
|                    | 8       | Chikkamagaluru   | 2             | 2             | 3                      | 1               | 2             | 3              |
|                    | 9       | Uttara Kannada   | 3             | 4             | 11                     | 10              | 20            | 30             |
|                    | Total   |                  | 38            | 80            | 314                    | 278             | 316           | 594            |
| Vedavati - K9      | 1       | Ballari          | 1             | 2             | 6                      | 1               | 11            | 12             |
| Cauvery Basin      | 1       | Chamarajanagara  | 2             | 3             | 7                      | 4               | 7             | 11             |
|                    | 2       | Mysuru           | 5             | 12            | 34                     | 30              | 35            | 65             |
|                    | 3       | Mandya           | 1             | 1             | 2                      | 1               | 2             | 3              |
|                    | 4       | Hassan           | 2             | 5             | 13                     | 16              | 12            | 28             |
|                    | 5       | Chikkamagaluru   | 1             | 2             | 4                      | —               | 11            | 11             |
|                    | 6       | Kodagu           | 1             | 1             | 3                      | 3               | 3             | 6              |
|                    | Total   |                  | 12            | 24            | 63                     | 54              | 70            | 124            |
| West Flowing River | 1       | Shivamogga       | 1             | 2             | 2                      | 1               | 1             | 2              |
|                    | 2       | Dakshina Kannada | 2             | 4             | 11                     | 7               | 7             | 14             |
|                    | 3       | Udupi            | 4             | 5             | 17                     | 19              | 3             | 22             |
|                    | 4       | Uttara Kannada   | 5             | 14            | 38                     | 33              | 25            | 58             |
|                    | Total   |                  | 12            | 25            | 68                     | 60              | 36            | 96             |

# 04

---

## FLOOD MONITORING, FORECASTING AND EARLY WARNING SYSTEM IN KARNATAKA

---

|                                                                                                                                                                   |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.1 Karnataka State Natural Disaster Monitoring Centre (KSNDMC) .....                                                                                             | 121 |
| 4.2 Flood Alert and Warnings .....                                                                                                                                | 128 |
| 4.3 Urban Flood Model (UFM) for Bangalore City .....                                                                                                              | 129 |
| 4.4 Data Dissemination Mechanism .....                                                                                                                            | 134 |
| 4.5 River Basins Flood Forecasting .....                                                                                                                          | 135 |
| 4.6 Early Warning Dissemination through Centralised Wireless<br>Public Broadcasting at Vulnerable Gramapanchayaths in<br>Karnataka across the Krishna Basin ..... | 145 |
| 4.7 Dam Safety Aspects .....                                                                                                                                      | 151 |
| 4.8 Dams- Emergency Action Plan Strategy .....                                                                                                                    | 155 |





## **FLOOD MONITORING, FORECASTING AND EARLY WARNING SYSTEM IN KARNATAKA**

### **4.1 Karnataka State Natural Disaster Monitoring Centre (KSNDMC)**

The Disaster monitoring mechanism, with a proactive approach, adopted by KSNDMC is a unique model in the country which has enabled the Executives earmarking areas affected by Disasters and notifying them in time. This has greatly supported the activation of response system in planning and implementing mitigation measures. The historical data about the natural disasters in Karnataka shows that series of various types of disasters have struck the State with devastating effects.

The Centre has established a state-of-the-art facility to collect data at very high spatial and temporal resolution, data analysis, information and advisory generation and dissemination to the Stakeholders at near-real time through auto-mode. The necessary computer / web applications were developed indigenously. The reliable, accurate and seamless data is ensured by running the system with least manual intervention. As a result, the time interval between data collection to decision making is almost at near-real time. Based on the near real-time data collected, the KSNDMC identifies and maps the hazard vulnerable areas, prepares reports with advisories and disseminate to all the stakeholders. In Krishna river basin about 3500 such telemetry stations are available at every Grampanchayath level and in Cauvery river basin, Karnataka about 1400 such telemetry stations as well weather station.

The main Objectives of KSNDMC may be classified as below:

- Hazard mapping and vulnerability studies.
- Strengthening of Information Technology for Natural Disasters Management.
- Monitoring and impact assessment of Natural Hazards.
- Human Resource Development mainly by imparting training.
- Natural Disaster Early Warning System.

#### 4.1.1 Telemetric Rain gauge and Weather Stations Network

KSNDMC has established a network of GPRS enabled and solar powered Telemetric Rain Gauges at all the 6,600 Grampanchayaths (25 sq. km each) and 923 Telemetric Weather Stations at all the 850 Hoblis (sub-Tehsil : 200 sq. km each) and 176 Micro-Watersheds in the state. The weather data comprising Temperature (°C), Relative Humidity (%), Wind Speed (m/s), Wind Direction (Degrees), Rainfall amount (mm) and intensity (mm/hr) data has been collected at every 15 minutes through these weather monitoring stations. The density of weather monitoring stations network is highest and first of its kind in the country. Also the temporal resolution of the data collected (96 data points a day / station) through this network of stations is a need of the hour for the researchers to develop simulations and related advisories. The monitoring network is able to capture the highly erratic distribution of rainfall and weather parameters both in terms of space and time, intern its helping the decision makers to take timely decision at micro level.

KSNDMC maintains the database of various natural disasters. The data base for Flood monitoring and management the centre having the historical records of flood events, flood losses and flood memorandum in the state. The centre established dedicated Flood Forecast Cell at art of the centre. The centre collaboration with Satellite Application Centre (SAC) Ahmadabad, ISRO Government of India to provide weather forecast at gram panchayat level for next 3 days. This forecast helps to various government department of revenue, water resource, minor irrigation, agriculture horticulture, panchayat and rural development and other line departments for flood preparation and to the flood prone community for flood preparedness.

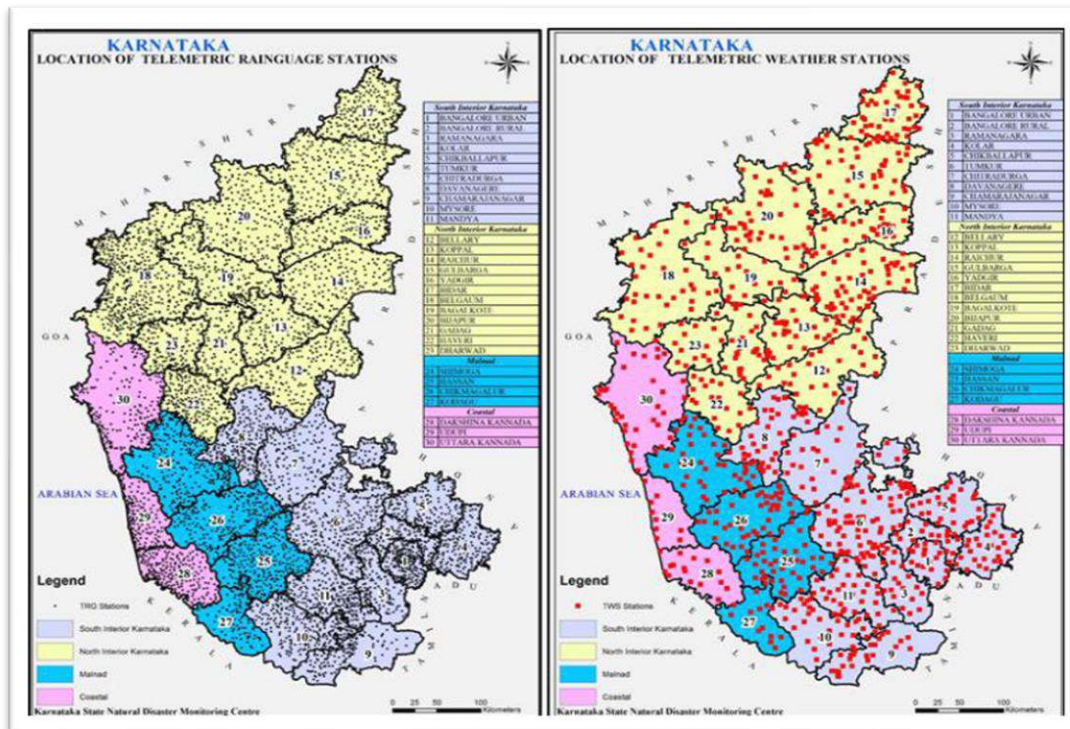
KSNDMC is also operating 24x7 interactive helpdesk “VARUNA MITRA” call centre to disseminate weather forecast and weather advisories to the farmers and general Public. “VARUNA MITRA” is equipped with state-of-the-art technology to provide weather service and answers more than 3000 calls in a day during the flood events and monsoon season from across the state the one who received the information and shares with many with his surrounding and opinion that the weather service is satisfactory.



Telemetric Rain gauge

Telemetric Weather Station

Figure -4 Telemetric Rain gauge and Weather station



Map –35 Telemetric Rain gauge and weather stations network of Karnataka

#### 4.1.2 Weather Forecast

Weather forecast at very high temporal and spatial resolution is yet another critical factor. Different range of forecasts will give us detailed view in assessing the weather severities in the State. Forecast and warning dissemination is extremely important and it must reach users without delay and with sufficient lead-time to permit response actions to take place.

At KSNDMC a unique model of weather forecast advisory services has been designed, developed and operationalised in the state with three different time scales, viz. Short term, Medium term and Long term.

Short Range Weather Forecast Includes forecast for rainfall, temperature, cloud cover, wind speed and direction at Gram Panchayat level for the entire state at 12 hrs format for the following three days. Also the forecast is revised every day. It is generated in collaboration with national agency called Space Applications Centre (SAC), Indian Space Research Organization (ISRO), Govt., of India.

Medium Range Weather Forecast at 24 hrs format for the following 10 days is generated every day and indicated through spatial maps for the State. It is generated by Satish Dhawan Space Centre – Sriharikota (SDSC-SHAR), ISRO, Govt., of India.

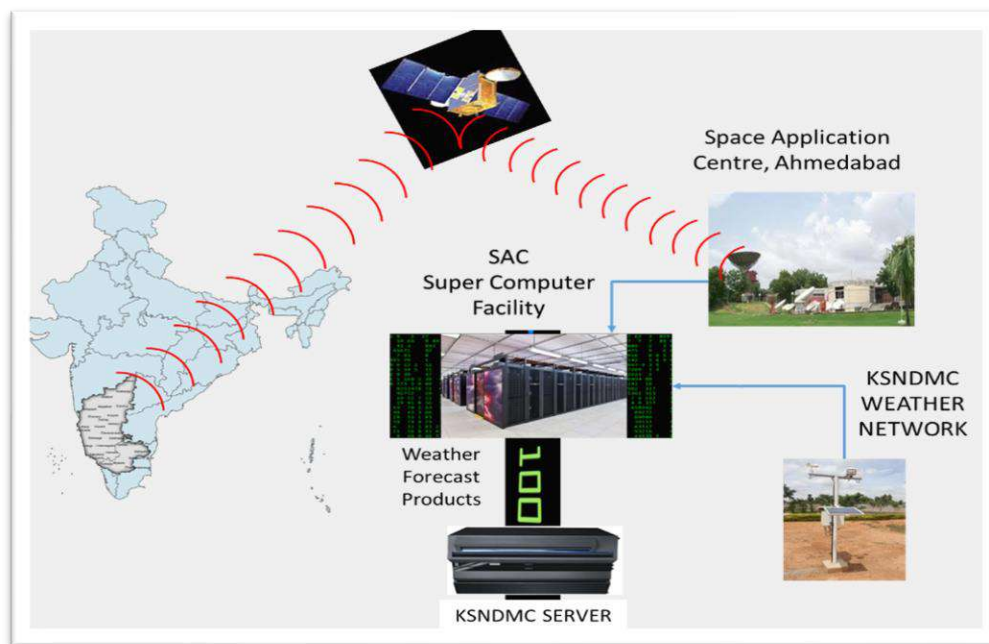
And also for next 5 days forecast at district level from IMD and Cyclone/ Depression/circulations and its impact on each reservoir. Heavy rainfall alerts and IMD-WRF model output images for basin wise will b

Long Range Weather Forecast for weekly cumulative rainfall outlook for two consecutive weeks generated by National Environmental Prediction Centre (NCEP). In addition, long range weather outlook generated by IMD is also made available.

Short range Rainfall / Weather Forecast for Karnataka every day for next three days with 12hrs interval at Grampanchayath level in collaboration with national agency called Space Applications Centre (SAC), Indian Space Research Organization (ISRO) MoES, Govt. of India.

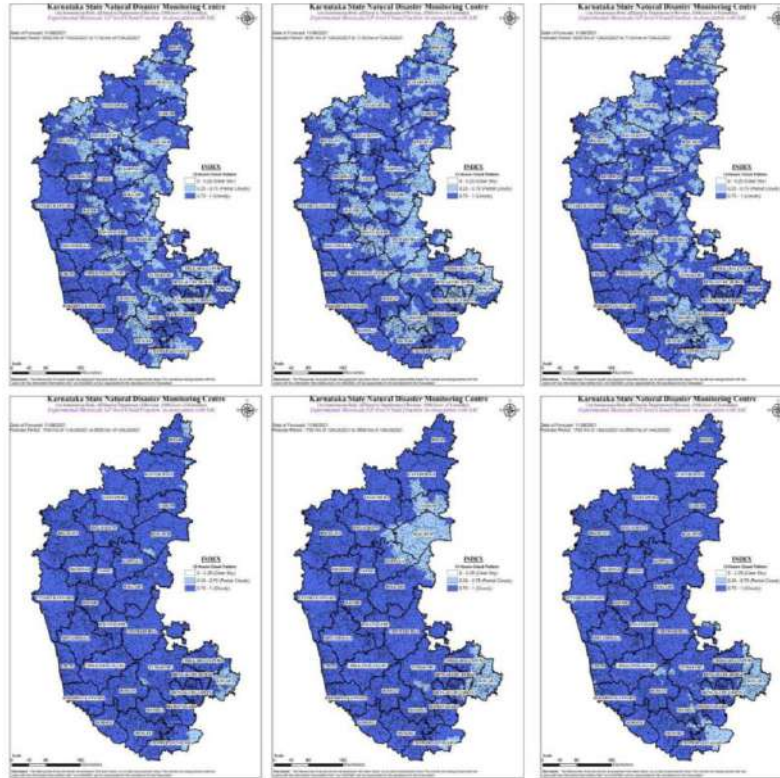
Through the dense ground observational weather network installed by KSNDMC; has been ingested into the weather forecasting model generating at SAC on hourly intervals. The prediction values are available at Grampanchayath level (5X5) with 12 hrs interval for next three days and it has been useful in correcting, validating with actual observations on daily basis at the same scale and improving the Model output over the years.

Weather forecasts are generated regularly with three different time scales, viz. Short term, Medium term and Long term.

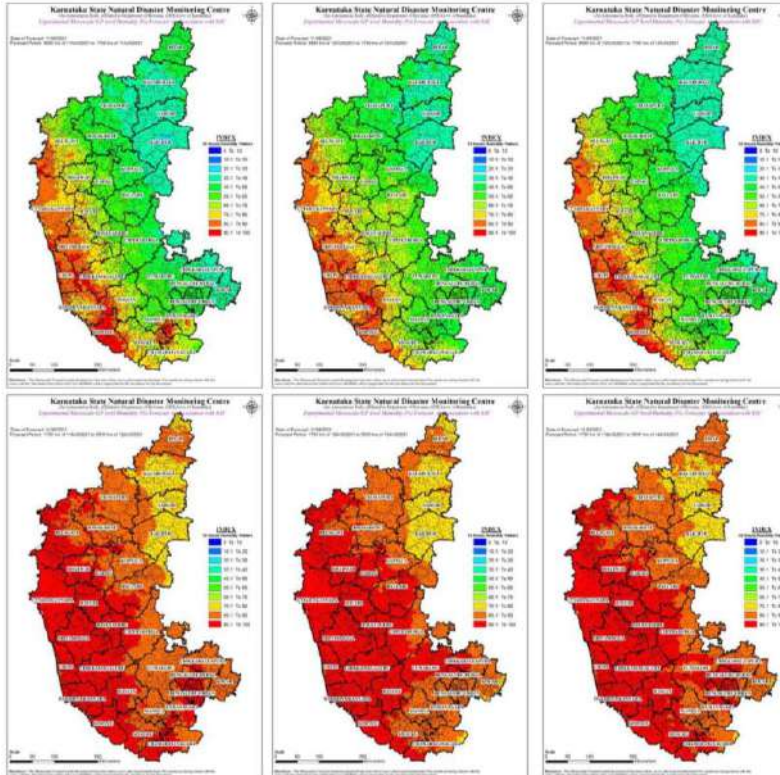


**Figure –5 Rainfall & Weather Forecast at 12 Hrs Intervals at GP Level for the next 3 days in collaboration with SAC, ISRO**



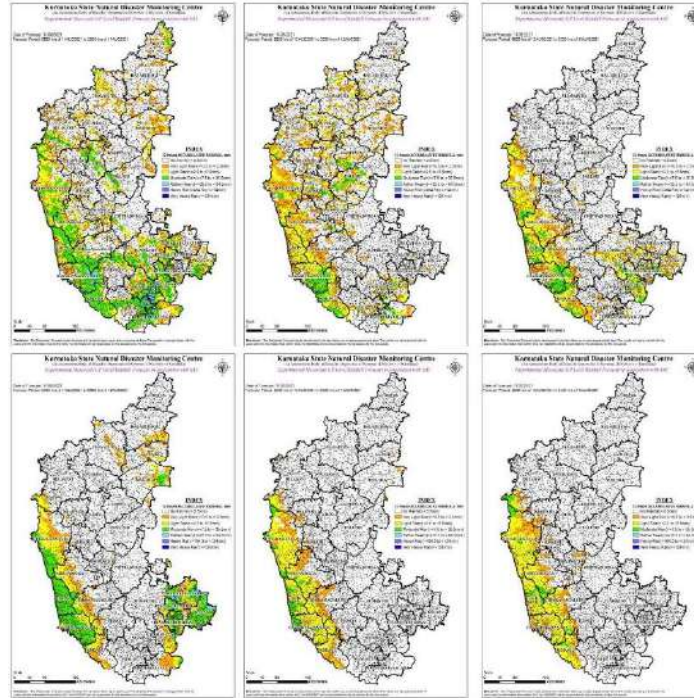


Map - 36 Gram Panchayath level forecast for the next 3 days with 12 hrs interval for Cloudiness

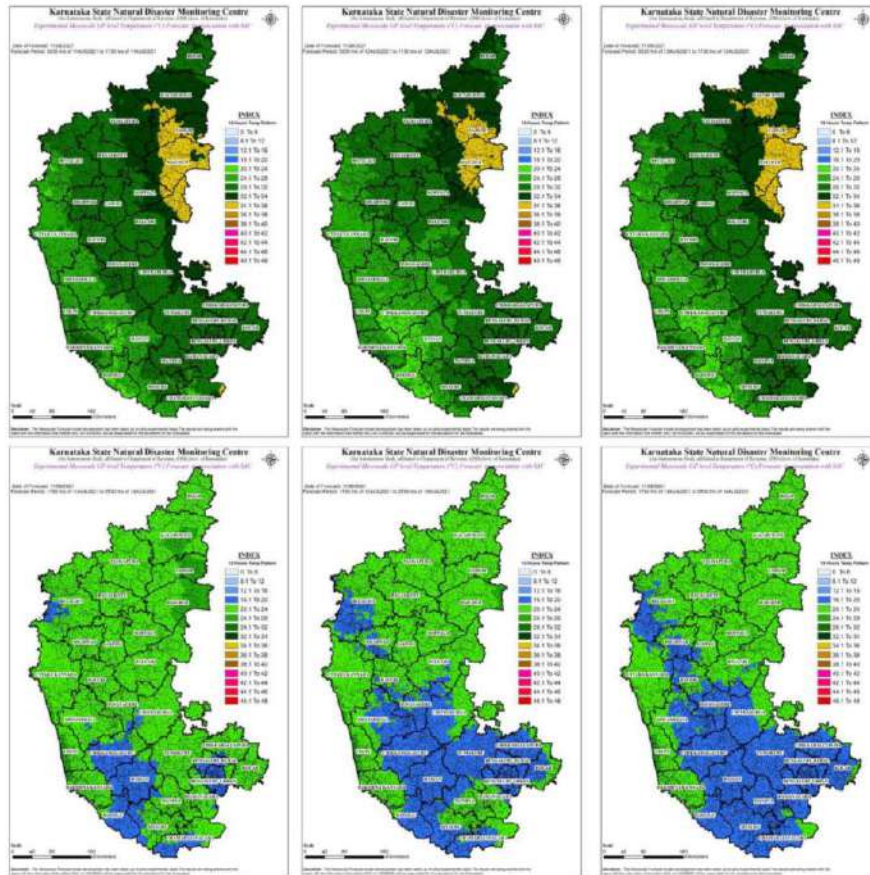


Map - 37 Gram Panchayath level forecast for the next 3 days with 12 hrs interval for Relative Humidity (%)

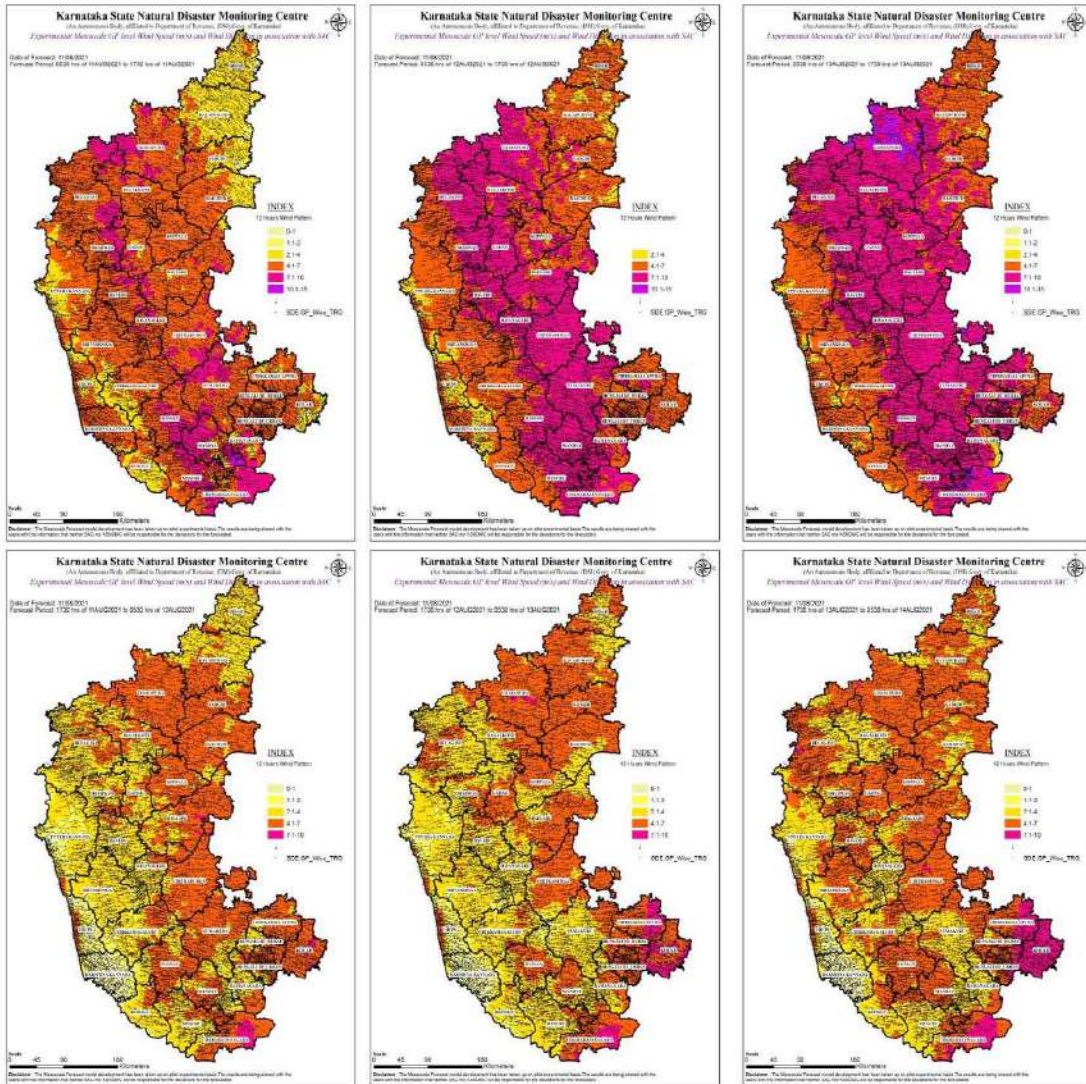




Map - 38 Gram Panchayath level forecast for the next 3 days with 12 hrs interval for Rainfall (mm)



Map – 39 Gram Panchayath level forecast for the next 3 days with 12 hrs interval for Temperature (°C)



Map – 40 Gram Panchayath level forecast for the next 3 days with 12 hrs interval for Wind speed (m/s) & Wind Direction (deg)

## 4.2 Flood Alert and Warnings

A robust early warning system comprises installation of field monitoring sensors – for weather, geological, hydrological parameters; collection of data at real / near-real time, transmission of the data to a central computational/analysis centre; data processing; analysis; alert recognition; simulation through appropriate mathematical models, customized report generation ; dissemination of the alerts/reports/advisories to the users. The system developed and operationalized in Karnataka by KSNDMC has addressed all the above mentioned issues and has been providing solutions to the end users.



The early warning final forecasts are then communicated to the user agencies such as the concerned administrative and engineering authorities of the state/central governments including railways, defence and other agencies connected with flood protection and DM by special messenger/ telegram/wireless/ telephone/fax/e-mail etc. Flood forecasts are also passed on to the All-India Radio (AIR), Door darshan and local newspapers for wide publicity in the affected area.

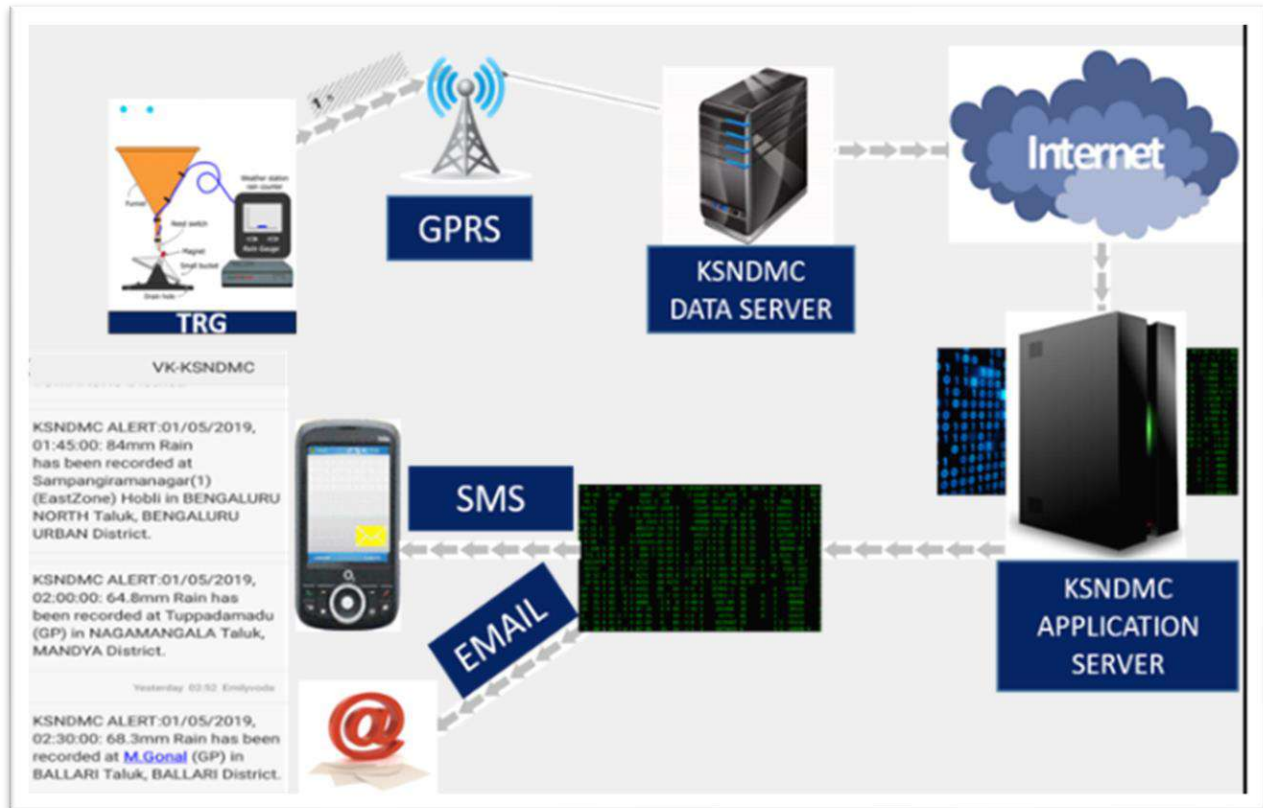


Figure –6 Flood and Alert Dissemination system of KSNDMC

#### 4.3 Urban Flood Model (UFM) for Bangalore City

As a part of the Disaster Monitoring activity, KSNDMC in collaboration with the Indian Institute of Science (IISc), Bengaluru, has taken up a pioneer work under demand driven Project on “Urban Flood Model (UFM) for Bangalore City”, following NDMA guidelines for urban flood management funded by Department of Science and Technology (DST), Govt. of India. The main Objective of the Project is to provide technology driven solution to manage and mitigate the Urban Flood in Bengaluru city. A hydrologic Model has been developed and operationalized for issuing Flood / inundation forecast for Bengaluru city for different rainfall amount and intensity. The Urban flood monitoring system, Hydrological model used, flood forecast, and early warning dissemination network system adopted by KSNDMC is one of its kind in the

country.

The KSNDMC has established a network of 100 Telemetric Rain Gauges, 12 Telemetric Weather Station covering a geographical spread of 740 Sq. Km of city area and 26 Water Level Sensors installed at Storm water drains connected with highly flood vulnerable areas (FVA), to achieve the objective of development of Urban flood monitoring, forecast and early warning system. The data on Temperature, Relative Humidity, Wind Speed, Wind Direction, Rainfall Intensity and amount of Rainfall, Water Level in the Storm Water Drains is being collected at every 15 minutes. The near real- time data collected from the stations are being analysed and flood early warnings are being generated by hydrological model simulations.

Under this Project, KSNDMC has been providing rainfall and flood forecast and early warning to the officers of the Government Agencies in the City through SMS to their mobile phones, Social Media Platforms, and a dedicated web-portal. The information thus provided by KSNDMC has been of great help for the civic authorities in Bengaluru to take necessary action and effectively manage the floods in the City.

In order to disseminate the Flood Early warning and advisories to the stakeholders a mobile App “Bengaluru Megha Sandesha” (BMS) and a dynamic web portal [www.varunamitra.karnataka.gov.in](http://www.varunamitra.karnataka.gov.in) has been developed and operationalized from June 2020. The location specific flood alert on near real time basis has also been tested as SMS push notification which are triggered directly from the water level sensors, installed across the storm water drain as and when the water level crosses the predefined threshold. Also, KSNDMC has a system where in, the SMS on High Intensity Rain Alert (HIRA) and Heavy Rain Alert (HRA) is sent to registered mobile numbers of field officers of various departments in the city. Figure 6 shows the BMS interface for location specific dynamic weather parameters, dynamic rainfall and flood maps, safe route & Figure 7 shows the interface of dynamic web portal Varunamitra.

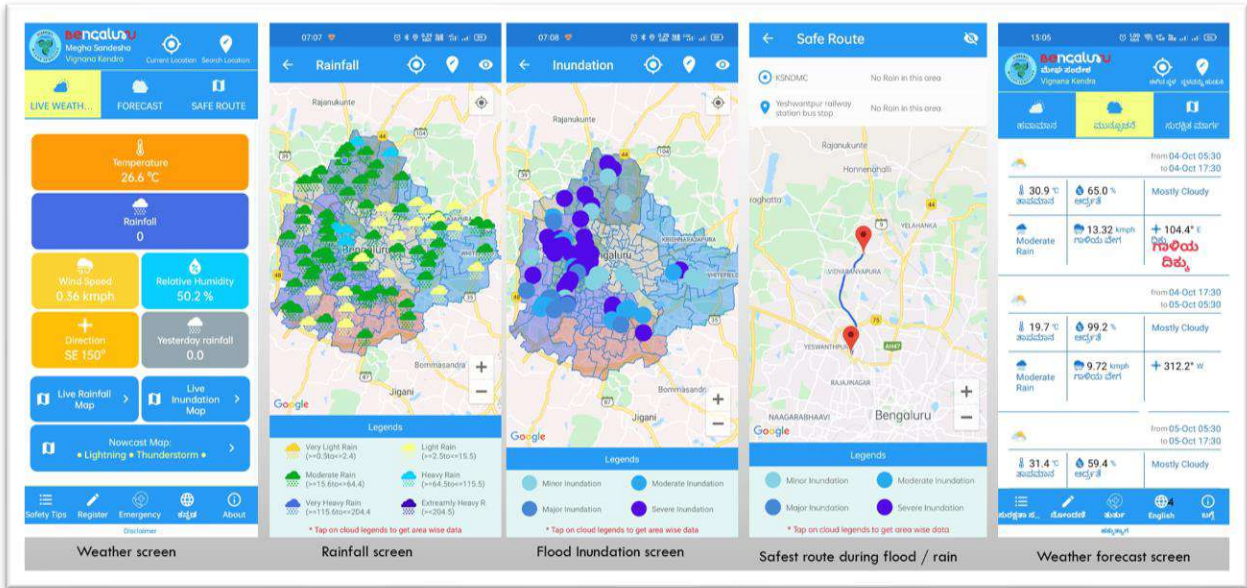


Figure 7: Components of Bengaluru Megha Sandesha flood application

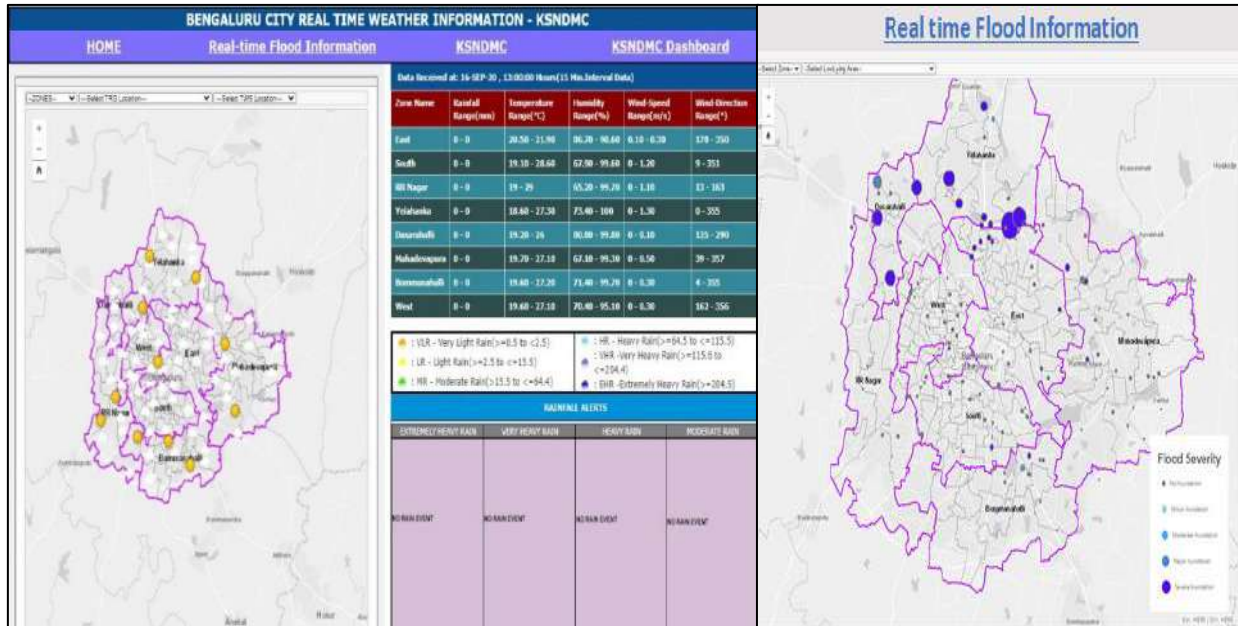


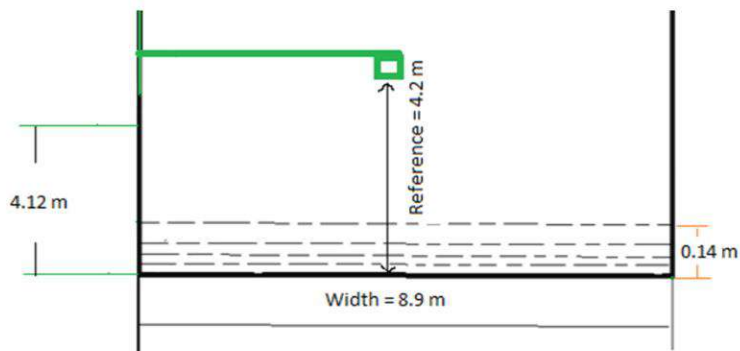
Figure 8: Real Time Rainfall and Flood dashboard in Varunamitra web portal



Figure 9: Water Level Sensors at Doddabidarakallu & Doddabidarakallu

- LAT:13.039616
- LONG:77.484689
- Drain ID: DH213
- Depth & Width: 4.12 m & 8.9 m
- Contact Person:
- Water Level : 0.14 m

Reference  $H_t = 4.2$  m



Cross-section of Drain

Figure 10 Cross-Section of drain Doddabidarakallu



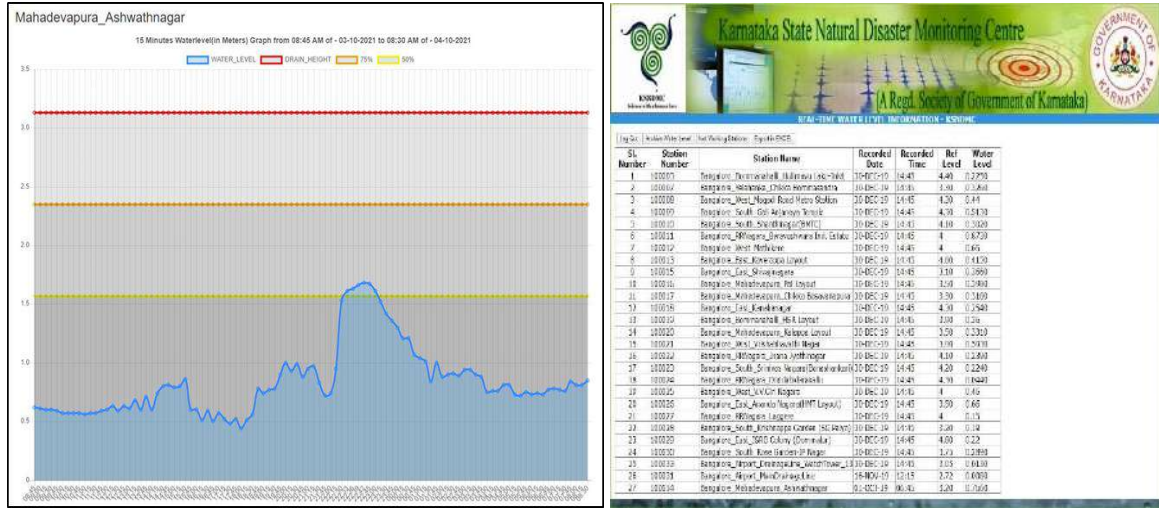


Figure 11: water level sensor data & live data for monitoring and downloading for analyse

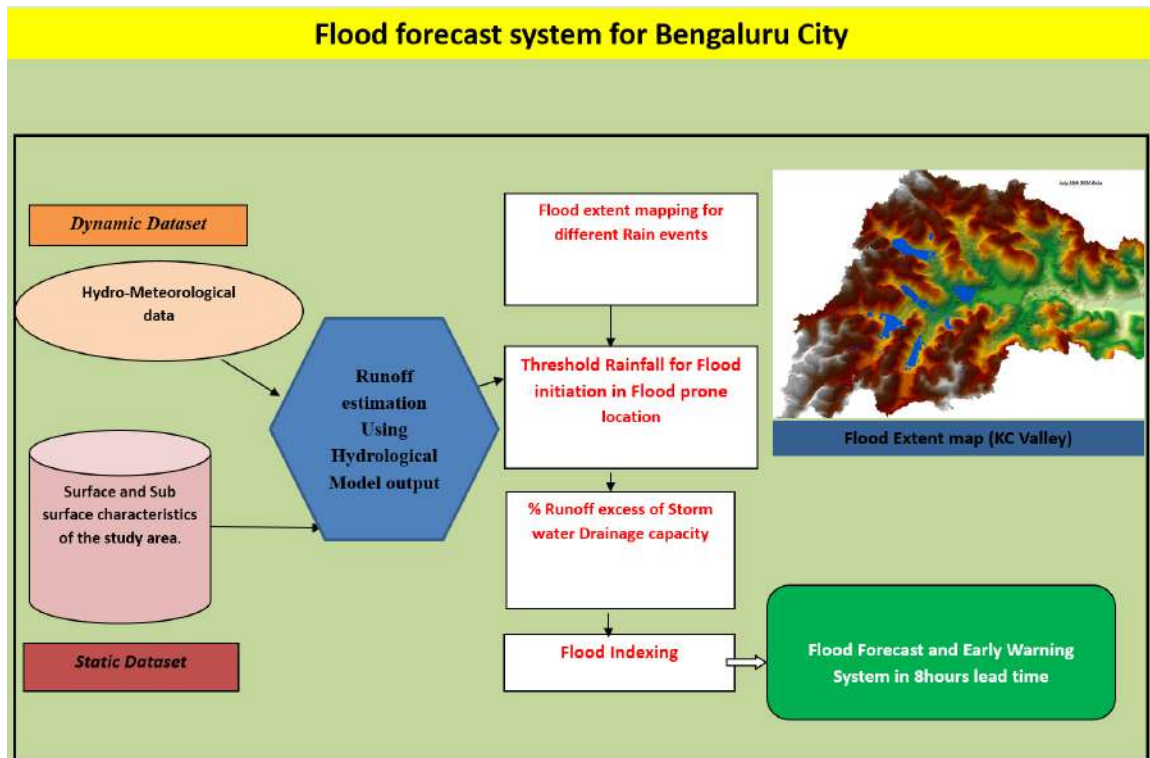


Figure 12: Methodology for Flood forecast and Early Warning System for Bengaluru City

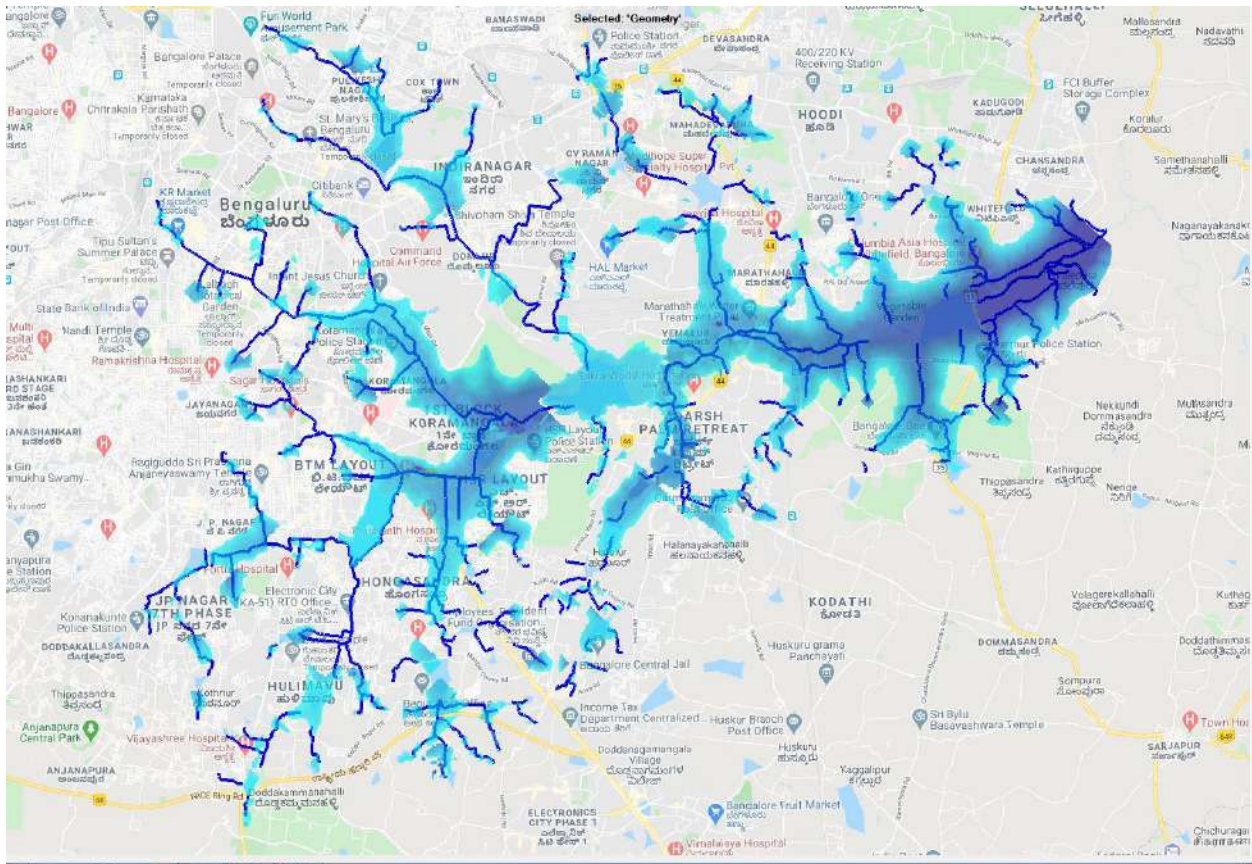


Figure 13: Near real time Flood forecast at SWDs in Bengaluru

#### 4.4 Data Dissemination Mechanism:

High spatial and temporal resolution data thus collected from the ground on various parameters are converted into information. Subsequently, in conjunction with the weather forecast, the meteorological information is used to generate customized weather Advisories and disseminated to the users. This has enabled the stakeholders at all levels to use the inputs in policy planning, implementation and decision making more accurately and in right time.

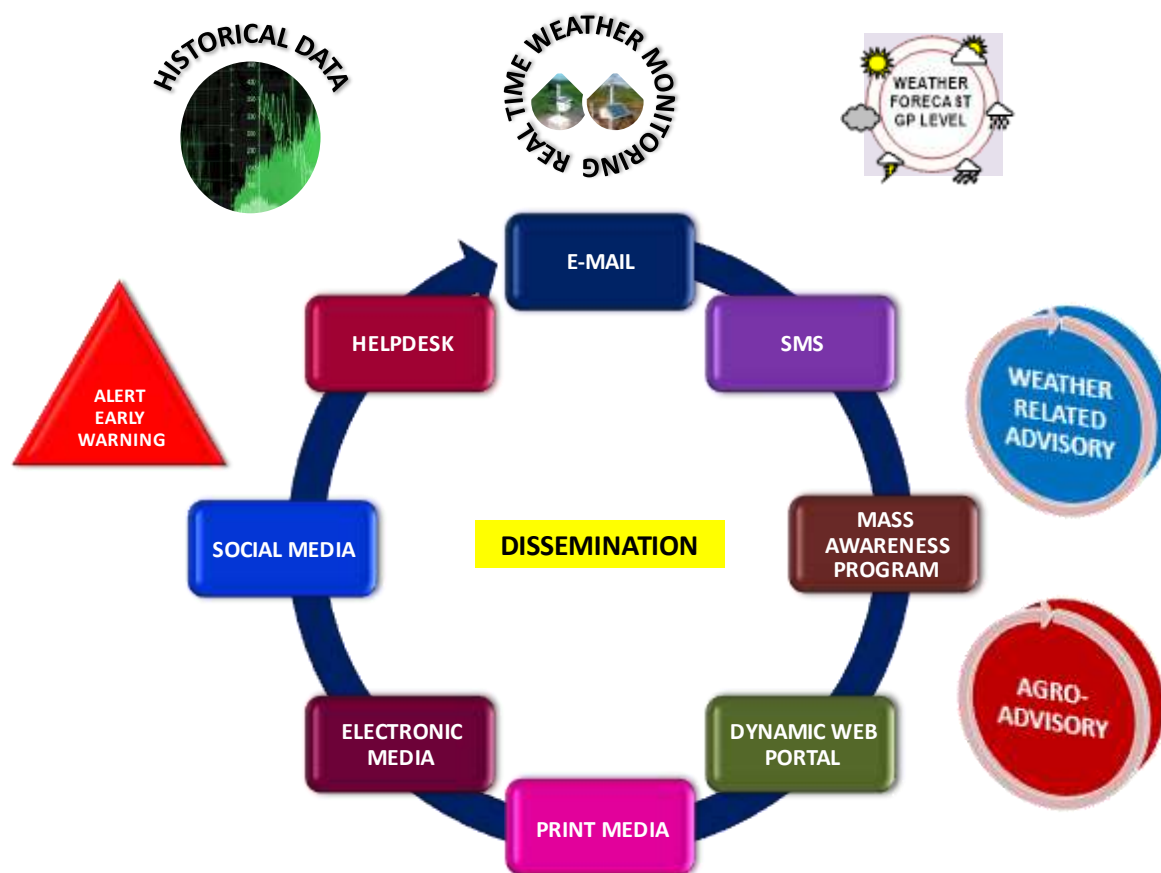


Figure – 14 Dissemination Mechanism of KSNDMC

#### 4.5 River Basins Flood Forecasting

Flood forecasting (FF) enables us to be forewarned as to when the river is going to use its flood plain, to what extent and for how long. The forecast of a flood may be for the water level (stage forecast), discharge (flow forecast) and area likely to be submerged (inundation forecast) at various points/particular stations at a specific time.

The Central Water Commission has categorized various flood situations, for monitoring the floods in the country through its flood forecasting network, into four different categories namely Normal, Above Normal, Severe and Extreme depending upon the river water level with reference to warning level, danger level, and highest flood level.

**NORMAL FLOOD:**

The river is said to be in “NORMAL FLOOD” situation at any flood forecasting sites when the water level of the river is below the warning level.

**Above Normal FLOOD:**

If the water level of the river at flood forecasting site touches or crosses its Warning level but remains below the Danger Level of the site, then the flood situation is called the “ABOVE NORMAL” situation. Yellow colour has been assigned to this category.

**SEVERE FLOOD:**

If the water level of the river at the forecasting site touches or crosses Danger Level but below the Highest Flood Level of the forecasting, then the flood situation is called “SEVERE FLOOD” situation. Orange colour has been assigned to this category. In “Severe Flood Situations” a special “Orange Bulletin” is being issued by the Central Water Commission to the users’ agencies which contains the “special flood message” related to the severe flood and is updated every three hours.

**EXTREME FLOOD:**

The flood situation is said to be “EXTREME” when the water level of the river touches or crosses the “HIGHEST FLOOD LEVEL” recorded at any forecasting site so far. Red colour has been assigned to this category. In “Extreme Flood Situations” a special “Red Bulletin” is being issued by the Central Water Commission to the users’ agencies which contains the “special flood message” related to the extreme flood and is updated every hour.

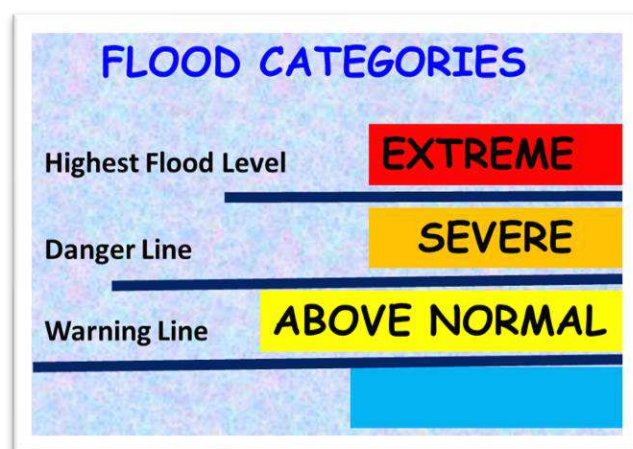
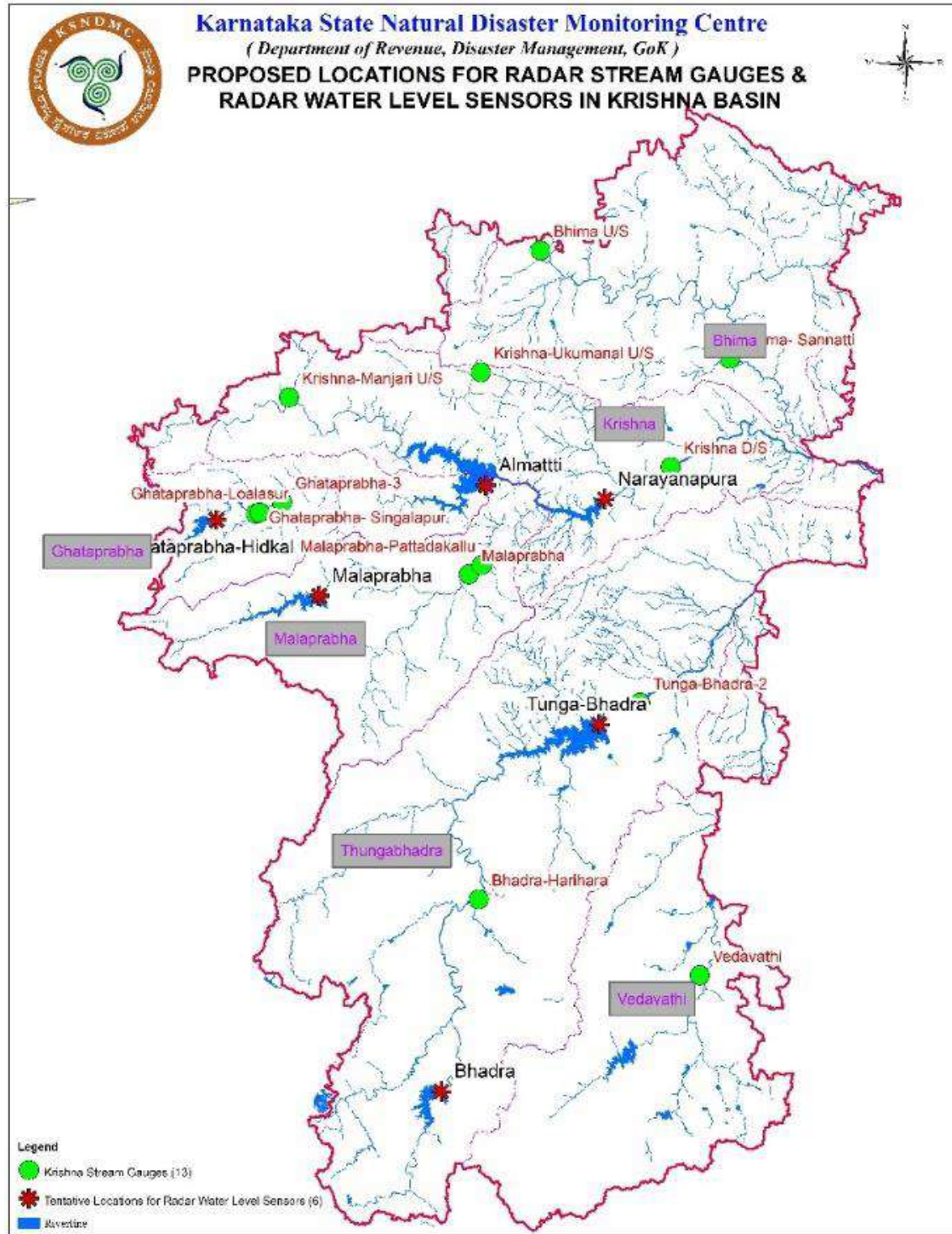


Figure –15 Flood Categories for early warning System in River Basins





Map – 41 Reservoir RADAR Water Level Sensors and Stream Gauges with Velocity Meter across Krishna Basin, Karnataka

**Table- 23 List of RADAR Stream Gauges and Reservoir Level Sensors in Krishna Basin, Karnataka**

| SL No | Name of the Sub-Basin    | District   | Taluk       | Location      | Dams and Bridges                 | Latitude  | Longitude |
|-------|--------------------------|------------|-------------|---------------|----------------------------------|-----------|-----------|
|       | <b>Reservoir</b>         |            |             |               |                                  |           |           |
| 1     | Tunga Bhadra Sub Basin   | Shivamogga | Bhadravathi | Vadiyuru      | Bhadra Dam                       | 13.702027 | 75.635991 |
| 2     | Ghataprabha Sub Basin    | Belagavi   | Hukkeri     | Hidakal       | Hidakal Dam                      | 16.138916 | 74.64388  |
| 3     | Malaprabha Sub Basin     | Belgavi    | Savadatti   | Munavalli     | Renukasagar (Navilutheertha) Dam | 15.821435 | 75.096778 |
| 4     | Middle Krishna sub Basin | Vijayapur  | Nidagundi   | Alamtti       | Almatti Dam                      | 16.3343   | 75.88872  |
| 5     | Middle Krishna sub Basin | Yadagiri   | Surupur     | Narayanapur   | Basavasagar (Narayanapur) Dam    | 16.226884 | 76.342907 |
| 6     | Thungabadra Sub Basin    | Koppala    | Koppala     | Munirabad     | Tungabadra dam (TB dam)          | 15.265336 | 76.33058  |
|       | <b>Stream Gauges</b>     |            |             |               |                                  |           |           |
| 7     | Tunga Bhadra Sub Basin   | Shivamogga | Shivamogga  | Holebenavalli | Tunga Bridge                     | 13.93098  | 75.588764 |
| 8     | Tunga Bhadra Sub Basin   | Davanagere | Harihara    | Ranibennuru   | Harihara Bridge                  | 14.514383 | 75.785163 |
| 9     | Tunga Bhadra Sub Basin   | Ballari    | Hosapete    | Bukkasagar    | Bukkasagar Bridge (TB2)          | 15.359103 | 76.513332 |
| 10    | Bhima Sub Basin          | Kalaburagi | Kalaburagi  | Saradagi      | Saradagi Bridge                  | 17.148825 | 76.777669 |
| 11    | Bhima Sub Basin          | Kalaburagi | Afzalpur    | Mannuru       | Manuru-Bhima                     | 17.299832 | 76.084808 |
| 12    | Middle Krishna Sub Basin | Yadagiri   | Surupur     | Thinthani     | Thinthani Bridge                 | 16.368032 | 76.657025 |
| 13    | Malaprabha Sub Basin     | Bagalakot  | Badami      | Cholechagudda | Cholechagudda Bridge             | 15.875892 | 75.721887 |
| 14    | Middle Krishna Sub Basin | Belagavi   | Chikkodi    | Manjari       | Chikkodi-Krishna-manjari Bridge  | 16.558137 | 74.680075 |
| 15    | Ghataprabha Sub Basin    | Belagavi   | Gokak       | Gokak         | Lolasur Bridge                   | 16.179583 | 74.831966 |



### RADAR Reservoir Level Sensors in Krishna Basin, Karnataka



**1. BHADRA DAM RADAR WATER LEVEL SENSOR**  
Latitude: 13.702027 Longitude: 75.635991

**2. HIDKAL DAM RADAR WATER LEVEL SENSOR**  
Latitude: 16.138916 Longitude: 74.64388

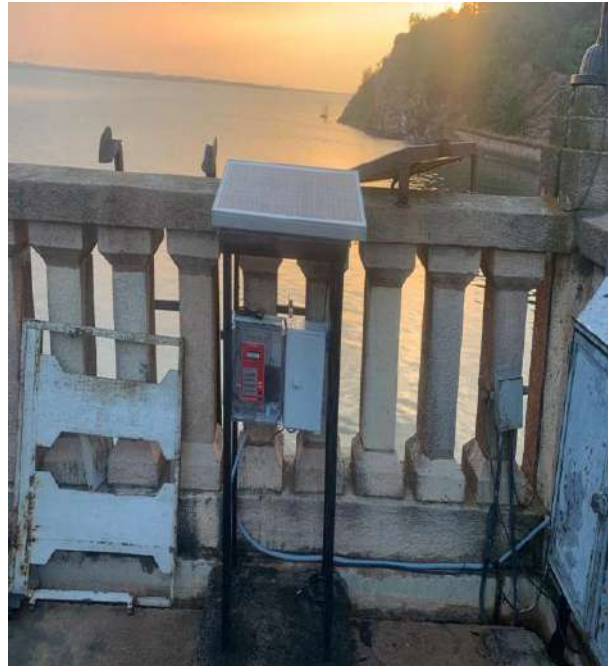


**3. TUNGA BHADRA DAM RADAR WATER LEVEL SENSOR**

**4. ALMATTI DAM RADAR WATER LEVEL SENSOR**

Latitude: 15.265265 Longitude: 76.330565

Latitude: 16.3343 Longitude: 75.88872



5. BASAVA SAGAR DAM RADAR WATER LEVEL SENSOR 6. NAVILUTHEERTHA DAM RADAR WATER LEVEL SENSOR

Latitude: 16.226884 Longitude: 76.342907

Latitude: 15.821435 Longitude: 75.096778

#### RADAR Stream Gauges and Velocity Meters in Krishna Basin, Karnataka



1. Tunga Bridge Latitude: 13.93098 Longitude: 75.588764





2. Harihara Bridge Latitude: 14.514383 Longitude: 75.785163



3. Bukkasagar Bridge Latitude: 15.359103 Longitude: 76.513332



4. Mannur Bridge Latitude: 17.299832 Longitude: 76.084808



5. Saradagi Bridge Latitude: 17.148825 Longitude: 76.777669





6. Lolasur Bridge Latitude: 16.179583 Longitude: 74.831966



7. Chikkodi-Krishna-manjari Latitude: 16.558137 Longitude: 74.680075



8. Thinthani Bridge Latitude: 16.368032 Longitude: 76.657025



9. Cholechagudda Bridge Latitude: 15.875892 Longitude: 75.721887

Figure –16 Reservoir RADAR Water Level Sensors and Stream Gauges with Velocity Meter across Krishna Basin, Karnataka (1 to 9)



#### 4.6 Early Warning Dissemination through Centralised Wireless Public Broadcasting at Vulnerable Gramapanchayaths in Karnataka across the Krishna Basin

An Integrated Public Alert and Warning System is proposed on a pilot study at 100 vulnerable Gramapanchayaths in the Krishna Basin to provide rapid, reliable and effective communication to the public in case of major emergencies such as floods.

Broadcasting information has two functions in Disaster Management, by gathering or receiving information from disaster monitoring network of KSNDMC. Such an exclusive line connected through KSNDMC is preferable to be used for Alerts, Early Warnings and related information on Floods and other natural disasters. Second function is disseminating the disaster information to the common public which are often termed as multicasting system to outdoor receivers with loudspeakers in their own disaster network.

Early warning is the integration of four main elements namely, Risk Knowledge, Monitoring and Forecasting, Dissemination and Response. An effective early warning system needs an effective communication system, and such systems are made of two main components:

- Communication infrastructure hardware, which is reliable and robust, especially during the natural disasters and
- Appropriate and effective interactions among the main players of the early warning process such as the scientific community, stakeholders, decision makers, the public, and the media.

Emergency Public Broadcast system is proposed to be designed for disseminating necessary / precautionary messages through public announcements at 100 vulnerable Gramapanchayaths. The solution to be designed in a 3-tier system where messages can be relayed directly from the State or District or Taluk Headquarters.

The application will be recording, storing, forwarding & broadcasting messaging system which can be scheduled at various timelines along with broadcasting repetitions also. The system also has designed to playback automatic messages using text to speech.

This Broadcasting system application will have login credentials at State, District and Taluk level which will broadcast to their respective vulnerable Gramapanchayaths. The Public Address system with Network Audio unit will be remotely managed and connected to the network on GSM connectivity. The Public

Address system shall have 4 speakers installed above the Grama panchayat office at some height along with amplifier for better geographical reach of the messages in the GP / Panchayath jurisdiction.

The following messages shall be broadcasted:

- Daily Weather reports that include Rainfall, Temperature, Relative Humidity, Wind speed, Wind direction etc.,
- Disaster survival messages on how to safeguard oneself from lightning, Storms, Floods, Urban Floods, Earthquakes, Fire safety, Tsunamis, Landslides, Biological Emergencies etc.,
- Flood & Drought Management and information on assistance to community on such relief system.
- Government Messages to the local community.
- Local customised messages pertaining to the vulnerable 100 Gramapanchayaths or the respective taluks.

This solution may be hosted on a cloud-based infrastructure for secured communication and easy remote accessibility and shall be completely maintained by KSNDMC.

#### **Flood Early Warning will be disseminated through Wireless Public Broadcasting System at Gramapanchayath**

An Integrated Public Alert and Warning System need to be designed to provide rapid, reliable and effective communication to the public in case of major emergencies such as natural disasters.

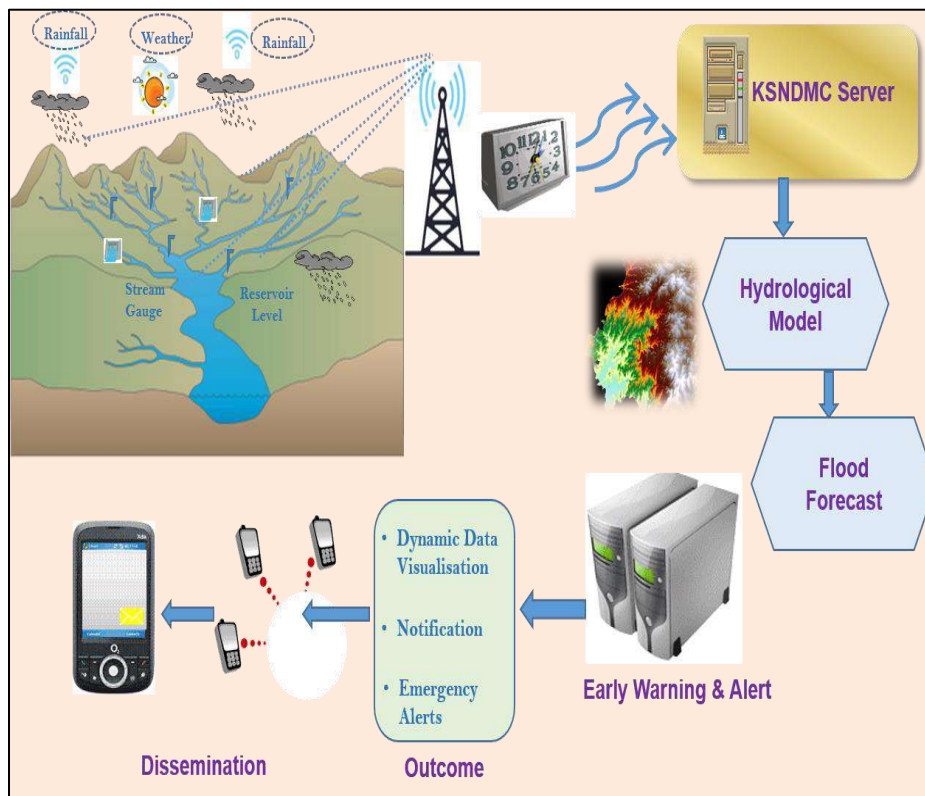
Natural and man-made disasters by their nature whether impending or immediate, quickly capture the attention of a very large majority of the entire population in an affected area. In any disaster situation, common public seek at first not to communicate, but to be informed of the impending disaster, so that they may understand what is happening, or about to happen, and to assess whether and how they and their family and friends may be affected.

Broadcasting information has two functions in Disaster Management. One is gathering or receiving information from disaster monitoring networks connected to Scientific Organisations. An exclusive line connected to such organisations is preferable to be used for Alerts, Early Warnings and related information on Floods, Drought, Hailstorms, Earthquakes, Landslides, Tsunami and other natural Disasters. Second function is disseminating the disaster information to the public. These Systems are often termed as multicasting system broadcasting to outdoor receivers with loudspeakers in their own disaster network.

### Elements of Early Warning:

Early warning is the integration of four main elements:

- **Risk Knowledge:** Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.
- **Monitoring and Predicting / Forecasting:** Systems with monitoring and predicting capabilities provide timely estimates of the potential risk faced by communities, economies and the environment.
- **Disseminating Information:** Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, synthetic and simple to be understood by authorities and public.
- **Response:** Coordination, good governance and appropriate action plans are a key point in effective early warning. Likewise, public awareness and education are critical aspects of disaster mitigation.



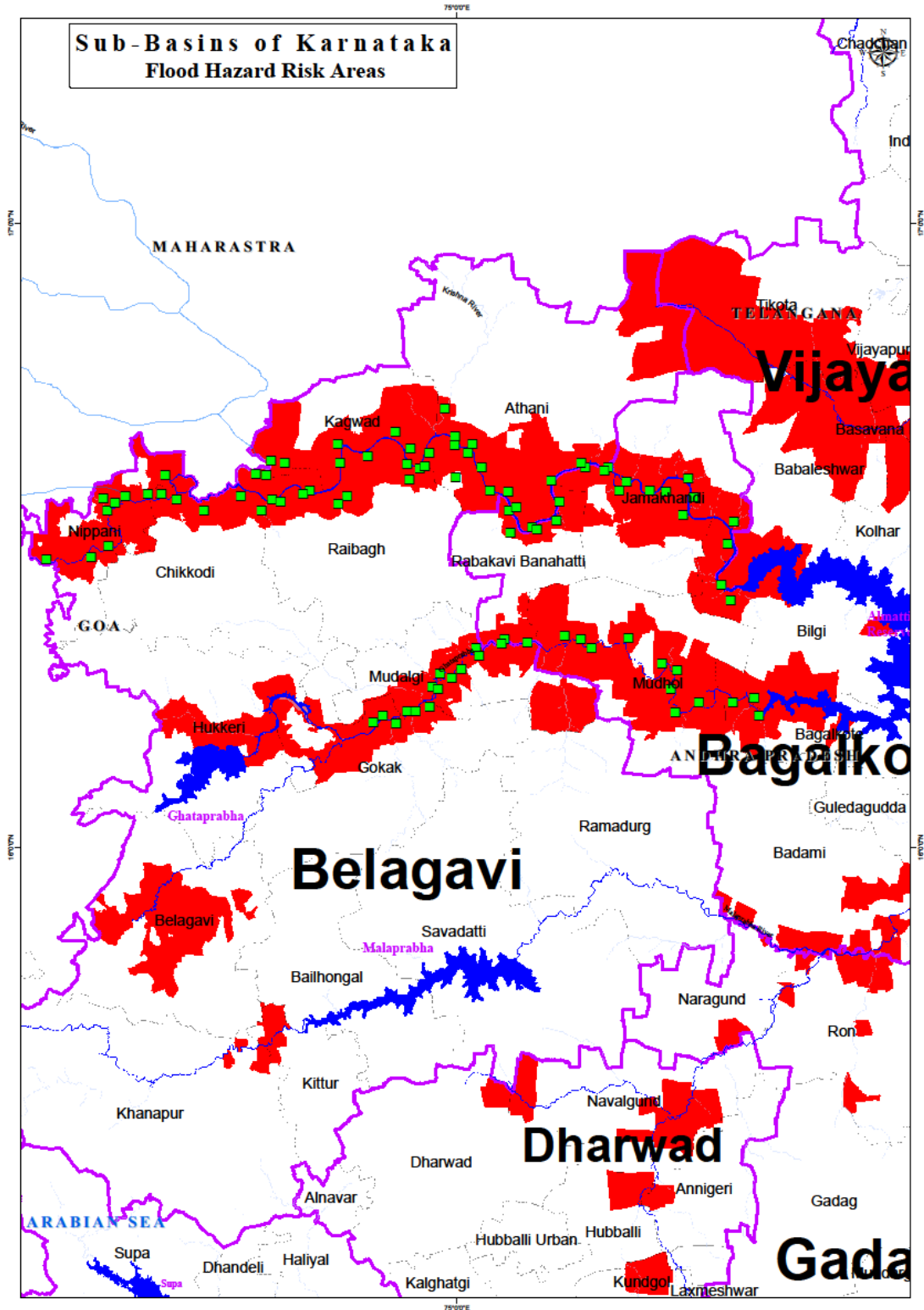
**Figure – 17 Elements of Early Warning System**

The purpose of early warning systems is to detect, forecast, and when necessary, issue alerts related to impending hazard events. In order to fulfil a risk reduction function, early warning needs to be supported

by information about the actual and potential risks that a hazard poses, as well as the measures people can take to prepare for and mitigate its adverse impacts. Early warning information needs to be communicated in people friendly manner in such a way that facilitates decision-making and timely action of response organizations and vulnerable groups. Early warning information comes from different organizations and need to be integrated for an effective Early Warning System.



Figure – 18 Early Warning dissemination at Flood inundation GPs



Map –42 Public Alert and Warning System at 105 vulnerable Gramapanchayaths in the Krishna Basin



The CWC, WRD and the state government will increase the density of the basin-wise network of rain gauge and river gauge stations and establish basin-wise system of FF and early warning.

1. Data collection: Data will be collected using IMD and Bureau of Indian Standards (BIS) approved automatic sensors for rainfall and river flow measurements. A centralised mechanism for collection, archival and distribution of hydrological data from various river basins will be established on priority basis.
2. Data transmission: Data will be transmitted using modern automatic telemetry data transmission techniques e.g. satellite, VSAT, Internet/e-mail, mobile phones etc.
3. Flood forecast and impact assessment models: Computer- based comprehensive catchment scale hydrological and hydrodynamic models interfaced with flood plain inundation mapping tools will be developed.
4. Forecast dissemination: Forecast will be disseminated using computer networks and satellite e.g. Internet, e-mail, VSAT, the terrestrial communication network, connectivity of the National Informatics Centre (NIC) etc.
5. Flood hazard mitigation model: Basin wise flood hazard mitigation models will be developed.
6. Damage assessment and quantification models: Damage assessment and quantification models will be developed on priority.
7. Advisories for flood relief routes: Advisories for facilitating flood relief routes will be formulated and issued.
8. Value addition: Flood forecasts and warnings will be formulated, preferably, in the local language, in a format which is simple and easily understandable by the administrators and common people as well.

## 4.7 Dam Safety Aspects

Dams will be subject to a dam safety programme, both at the national and state levels to ensure that the specialised expertise required for the inspection of all structures is available. Dam safety programmes will be carried out strictly in accordance with the standards and guidelines laid down by the Dam Safety Organisation of the CWC. Dam Safety Review involves review of design flood, spillway capacity, structural soundness of the dam, spillway and appurtenant works and, if required, taking up of remedial measures in the form of augmenting the capacity of spillway by appropriate works or constructing additional spillways, strengthening of the dam, spillway and appurtenant works and completing the same in a fixed time frame.

**Pre-monsoon and post-monsoon inspections of dams will be carried out by experts and subsequent recommendations implemented by the state governments/SDMAs in a fixed time frame to ensure continued service and safety.**

Analysis of the basin characteristics, flood history, flood damages, and the existing databases will give some indication of the type of forecast system that is achievable and affordable the rainfall and stream gauge (hydrometric) data networks satisfactory in sampling rainfall (intensity and spatial distribution) and streamflow response for the river basin. Operating a real-time hydro meteorological network is essential, reliable real-time operational observing networks is critical to the success of a forecast, warning and response programme.

The observation of regional and local meteorological data parameters of precipitation, wind speed, wind direction, surface temperature, relative humidity, and estimation of quantitative precipitation data plays an important role in flood forecasts.

Establishment of dedicated flood forecast cell with highest achievable technical standard the cell expanded activities of flood forecast river forecasts as well for operational water management purposes, by gathering basic stream flow data, calibrate and verify with flood models with various geographical location, river basin characteristics and existing structural flood control measures for effective flood forecast.



Figure –9 a) Stream gauge Telemetric

b) Canal discharge Measurement

### Decision support

Decision support refers to everything from forecasts reaching decision makers such as stake holders of different government organizations, and other line department of a flood-prone community to the operator of a flood-control structure. For decision support to be effective, advanced planning must define prescribed actions linked to forecasted values. Forecast and warning dissemination is extremely important. Forecasts and warnings must reach users without delay and with sufficient lead-time to permit response actions to take place. Dissemination of forecasts and warnings can be achieved through a variety of communication of high-speed telecommunications and internet and through public media.

Historical data like gauge, discharge and rainfall are utilised for the development of techniques for formulation of forecasts on a real-time basis. Forecasts are formulated at the FF stations by predicting river stage/inflow with time of occurrence. After receipt of the hydrological and meteorological data from field formations, the data is processed in FF centers/control rooms to check its consistency and the data is modified, if any inaccuracy is found, before using in forecast formulation.

## a) Inflow Flood Forecasting Stations in Karnataka

| Sl. No | Name of the Inflow FF Station | River       | District    |
|--------|-------------------------------|-------------|-------------|
| 1      | Bhadra                        | Bhadra      | Chikmagalur |
| 2      | Harangi                       | Harangi     | Kodagu      |
| 3      | Hemavathi                     | Hemavathi   | Hassan      |
| 4      | Kabini                        | Kabini      | Mysore      |
| 5      | Krishnarajasagara (KRS)       | Cauvery     | Mandya      |
| 6      | Upper Tunga Project           | Tunga       | Shivamogga  |
| 7      | Hidkal                        | Ghataprabha | Belagavi    |
| 8      | Malaprabha                    | Malaprabha  | Belagavi    |

## b) Details of flood forecasting stations in Krishna &amp; Godavari basin

| Sl. No | Name of FF Station                    | River Basin | State     | Warning Level (m) | Danger Level (m) |
|--------|---------------------------------------|-------------|-----------|-------------------|------------------|
|        | Inflow Forecast Stations (Reservoirs) |             |           | FRL (in m)        |                  |
| 1      | Almatti dam                           | Krishna     | Karnataka | 519.6             |                  |
| 2      | Narayanapura dam                      | Krishna     | Karnataka | 492.25            |                  |
| 3      | Tungabhadra dam                       | Krishna     | Karnataka | 497.74            |                  |
|        | Level forecast stations               |             |           |                   |                  |
| 4      | Deongaon Bridge                       | Krishna     | Karnataka | 402               | 404.5            |

## c) Information on Expansion of FF services in Karnataka

| Proposed Inflow forecast stations (Dams) In Karnataka during Monsoon 2021 |                 |                                       |           |                 |
|---------------------------------------------------------------------------|-----------------|---------------------------------------|-----------|-----------------|
| Sl. No                                                                    | Name of the Dam | Basin                                 | River     | Nearest City    |
| 1                                                                         | Supa            | West flowing River from tapi to tadri | Kali      | Dandelli (Supa) |
| 2                                                                         | Linganamakki    | West flowing River from tapi to tadri | Sharavati | Sagara          |

**d) Proposed Telemetry stations under Cauvery Division, MSO, CWC.**

| <b>Proposed Telemetry stations under Cauvery Division, MSO, CWC,<br/>Bengaluru In Karnataka for Telemetry Installation during 2021</b> |                  |                                        |              |                   |                  |                                        |              |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------|--------------|-------------------|------------------|----------------------------------------|--------------|
| <b>Sl. No</b>                                                                                                                          | <b>Site Name</b> | <b>Telemetry<br/>hourly<br/>(WL+R)</b> | <b>River</b> | <b>Sl.<br/>No</b> | <b>Site Name</b> | <b>Telemetry<br/>hourly<br/>(WL+R)</b> | <b>River</b> |
| <b>1</b>                                                                                                                               | Hidkal           | (WL+R)                                 | Ghataprabha  | <b>7</b>          | Thatihalla       | (WL+R)                                 | Thatihalla   |
| <b>2</b>                                                                                                                               | Malaprabha       | (WL+R)                                 | Malaprabha   | <b>8</b>          | Kaanadi          | (WL+R)                                 | Ghataprabha  |
| <b>3</b>                                                                                                                               | Supa             | (WL+R)                                 | Kali         | <b>9</b>          | Kowad            | (WL+R)                                 | Tamrapani    |
| <b>4</b>                                                                                                                               | Mani             | (WL+R)                                 | Varahi       | <b>10</b>         | Dastikoppa       | (WL+R)                                 | Malaprabha   |
| <b>5</b>                                                                                                                               | Linganamakki     | (WL+R)                                 | Sharavati    | <b>11</b>         | Durganagar       | (WL+R)                                 | Malaprabha   |
| <b>6</b>                                                                                                                               | Gerusoppa        | (WL+R)                                 | Sharavati    |                   |                  |                                        |              |

**Expansion and Modernisation of Flood Forecasting Services**

Expansion and modernisation are a continuous process. The CWC has undertaken various expansion and modernisation schemes to cover more areas and to make forecasting more efficient and reliable. The IMD has also taken up the expansion of its network of Automatic Rain Gauges. The Ministry of Earth Sciences (MOES) is making efforts for the procurement of 12 Doppler Weather Radars (DWRs) for continuous monitoring of evolving extreme weather phenomena including heavy rainfall events along the coastal areas apart from tracking cyclones. Gradually, the DWR network would cover the whole country and in the process all the major river basins as well.

**Coordination among the Central Water Commission, India Meteorological Department and the State**

The state government will, as soon as possible, establish a mechanism wherein representatives of the CWC, IMD, NRSA and the states interact with each other, exchange data on a real-time basis and formulate the flood forecasts and warnings, which are more reliable and understandable by the forecasters, administrators and the public to minimise loss of lives and property on account of floods. The CWC will also forecast the area likely to be inundated corresponding to the expected river water level.



#### 4.8 Dams- Emergency Action Plan Strategy

Design, construction, financial, maintenance and inspection of dams are intended to minimize the risk of dam failures. Situations may develop sometimes leading to dam failures structural or operational – the central water commission facilitates dam safety practices that will help reduce the risk to lives and property from the consequences of potential dam failures. Dams fail catastrophically during extreme weather conditions, a phenomenon that affects the people, infrastructure and the environment. Concerted efforts are required from all departments to protect the lives and the property. Therefore, emergency action plans (AP) for dams as per the guidelines of the CWC and those laid down in the dam safety bill must be adhered to by the WRD and others who are responsible for dam safety.

##### Steps in EAP – Dam safety

- Identify and determine inundation area.
- Prepare inundation maps and flood vulnerable areas.
- Identify situations that could trigger emergency.
- Evaluate warning time.
- Activate DDMA, departments, local bodies and the people for assistance in EAP.
- Communication system- internal and external
- List all the persons and entities in case of dam distress
- Conduct meetings and finalise EAP.
- Submission of the plan to state.
- Make necessary revisions and update annually.

**Table – 24 Status of Emergency Action Plan (EAP) of Dam Rehabilitation and Improvement Project (DRIP) Dams:**

| SL NO. | DAM         | Tier-I Report Completed | Remarks                                                                                 |
|--------|-------------|-------------------------|-----------------------------------------------------------------------------------------|
| 1      | NARAYANPURA | Yes                     | EAP Report resubmitted on dated 13.11.2018 to CWC after duly attending the Observations |
| 2      | BHADRA      | Yes                     | EAP Report Sent back to MD along with CWC Observations on dated 19.02.2018.             |

|    |                 |     |                                                                                          |
|----|-----------------|-----|------------------------------------------------------------------------------------------|
| 3  | HIDKAL          | Yes | Received EAP Report after attending CWC Observations on dated 03.04.2018.                |
| 4  | MALAPRABHA      | Yes | EAP Report resubmitted on dated 13.11.2018 to CWC after duly attending the Observations  |
| 5  | AMARJA          | Yes | Tier-I Report Sent back to ACIWRM along with CWC Observations.                           |
| 6  | MASKINALA       | Yes | EAP Report submitted to CWC on dated 21.03.2019.                                         |
| 7  | HATTIKUNI       | No  | Tier-I Report under preparation                                                          |
| 8  | H.B. HALLI      | Yes | EAP Sent to CWC after attending Observations.                                            |
| 9  | UPPER MULLAMARI | No  | Tier-I Report under preparation                                                          |
| 10 | LOWER MULLAMARI | No  | Tier-I Report under preparation                                                          |
| 11 | KARANJA         | Yes | Tier-I Report Sent back to CWC after attending the Observations on dated 16.03.2019.     |
| 12 | BENNETHORA      | Yes | Tier-I Report Sent back to ACIWRM along with CWC Observations on dated 25.09.2018.       |
| 13 | CHANDRAMPALLI   | No  | Tier-I Report under preparation                                                          |
| 14 | HEMAVATHY       | Yes | Tier-I Report submitted to CWC duly attending the observations made on dated 13.08.2018. |
| 15 | VOTEHOLE        | Yes | EAP Report Sent back to MD along with CWC Observations on dated 28.07.2018.              |
| 16 | MALAGHATTA      | Yes | EAP Report under preparation                                                             |
| 17 | KRS             | No  | Tier-I Report under preparation                                                          |

# 05

---

## **DISASTER MANAGEMENT ACT REGULATION AND ENFORCEMENT FOR FLOOD MANAGEMENT**

---

|                                                                                        |     |
|----------------------------------------------------------------------------------------|-----|
| 5.1 Disaster Management Act 2005 .....                                                 | 159 |
| 5.2 Flood Plain Zoning .....                                                           | 159 |
| 5.3 Pre-requisites for the Enforcement of Flood Plain Zoning .....                     | 160 |
| 5.4 Regulation of Land use in Flood Prone Areas .....                                  | 160 |
| 5.5 Flood Plain Zoning Regulations .....                                               | 161 |
| 5.6 Legal Framework for Making Infrastructure Flood Resilient .....                    | 162 |
| 5.7 Survey of Flood Prone Areas .....                                                  | 162 |
| 5.8 Wetlands: Conservation and Restoration .....                                       | 163 |
| 5.9 Watershed Management including Catchment Area<br>Treatment and Afforestation ..... | 163 |
| 5.10 Coordination and Enforcement .....                                                | 164 |



## **DISASTER MANAGEMENT ACT REGULATION AND ENFORCEMENT FOR FLOOD MANAGEMENT**

### **5.1 Disaster Management Act 2005**

The Karnataka State Disaster Management Authority and all district disaster management authorities have been formulating and revising disaster management plans at the state and district levels respectively. It may be seen that these plans have been prepared and revised after series of consultation workshops, survey and data collection on different hazards and secondary data from concerned departments at state, district and sub-district level. Component flood preparedness, mitigation and response is already integrated into these plans.

Section 23 of DM Act 2005 mandates every State to have a plan for disaster management known as the State Disaster management Plan.

Section 31 mandates every district to have a plan for disaster management. The plan will include the areas in the district which are vulnerable to different forms of disasters. The plan should list down the measures to be taken to prevent and mitigate disasters.

Section 32 mandates different authorities like local bodies, district level organisations located at district level to prepare disaster management plan. Section 40 specifies that every department of the State Government shall prepare a departmental disaster management plan.

### **5.2 Flood Plain Zoning**

The basic concept of flood plain zoning is to regulate land use in the flood plains to restrict the damage caused by floods. Flood plain zoning, therefore, aims at determining the locations and the extent of areas for developmental activities in such a fashion that the damage is reduced to a minimum. It, therefore, envisages laying down limitations on development of both the unprotected as well as protected areas. In the unprotected areas, boundaries of areas in which developmental activities will be banned, are to be established to prevent indiscriminate growth. In the protected areas, only such developmental activities can be allowed, which will not involve heavy damage in case the protective measures fail. Zoning cannot remedy existing situations, although, it will definitely help in minimising flood damage in new developments.

Flood plain zoning is not only necessary in the case of floods by rivers but it is also useful in reducing the damage caused by drainage congestion particularly in urban areas where, on grounds of economy and other considerations, urban drainage is not designed for the worst conditions and presupposes some



damage during storms whose magnitude frequently exceeds that for which the drainage system is designed.

### 5.3 Pre-requisites for the Enforcement of Flood Plain Zoning

The basic requirements to be taken care of before implementing flood plain zoning are as follows:

- a) Broad demarcation of areas vulnerable to floods.
- b) Preparation of large-scale maps (1:10,000/1:15,000) of area vulnerable to floods with contours at an interval of 0.3 m or 0.5 m.
- c) Marking of reference river gauges with respect to which, the areas likely to be inundated for different magnitudes of floods will be determined.
- d) Demarcation of areas liable to inundation by floods of different frequencies, e.g., like once in two, five, ten, twenty years and so on. Similarly, demarcation of areas likely to be affected on account of accumulation of rainwater for different frequencies of rainfall like 5, 10, 25 and 50.
- e) Marking of likely submersion areas for different flood stages or accumulation of rainwater on the maps.

### 5.4 Regulation of Land Use in Flood Prone Areas

There can be different considerations for such regulations. For example, the area likely to be affected by floods up to a 10-year frequency should be kept reserved only for gardens, parks, playgrounds, etc. Residential or public buildings, or any commercial buildings, industries, and public utilities should be prohibited in this zone. In area liable to flooding in a 25-year frequency flood, residential buildings could be permitted with certain stipulation of construction on stilts (columns), minimum plinth levels, prohibition for construction of basements and minimum levels of approach roads, etc. In urban areas there should be double storied buildings. Ground floors could be utilised for schools and other non-residential purposes.

**Categorisation and Prioritisation of Structures in Flood Plains Zoning** In the regulation of land use in flood plains, different types of buildings and utility services can be grouped under three priorities from the point of view of the damage likely to occur and the flood plain zone in which they are to be located:

**Priority 1:** Defence installations, industries, public utilities like hospitals, electricity installations, water supply, telephone exchanges, aerodromes, railway stations, commercial centres, etc. -Buildings should be located in such a fashion that they are above the levels corresponding to a 100- year frequency or the

maximum observed flood levels. Similarly they should also be above the levels corresponding to a 50-year rainfall and the likely submersion due to drainage congestion.

**Priority 2:** Public institutions, government offices, universities, public libraries and residential areas. - Buildings should be above a level corresponding to a 25-year flood or a 10-year rainfall with stipulation that all buildings in vulnerable zones should be constructed on columns or stilts as indicated above.

**Priority 3:** Parks and playgrounds. -Infrastructure such as playgrounds and parks can be located in areas vulnerable to frequent floods. Since every city needs some open areas and gardens, by restricting building activity in a vulnerable area, it will be possible to develop parks and play grounds, which would provide a proper environment for the growth of the city.

On the same analogy, certain areas on either side of the existing and proposed drains (including rural drains) should be declared as green belts where no building or other activity should be allowed. This will not only facilitate improvement of these drains in future for taking discharges on account of growing urbanisation, but will also help in minimising the damage due to drainage congestion whenever rainfall of higher frequency than designed is experienced. These green belts, at suitable locations, can also be developed as parks and gardens.

## 5.5 Flood Plain Zoning Regulations

The state government will enact and enforce appropriate laws for implementing flood plain zoning regulations.

### Encroachment into the Waterways and Natural Drainage Lines

The possibility of removing buildings/ structures obstructing existing natural drainage lines will be seriously considered by state government/Concerned Departments. In any case, and with immediate effect, unplanned growth will be restricted by state government/ Concerned Departments so that the construction of structures obstructing natural drainage or resulting in increased flood hazard is not allowed.

### Bye-laws for Buildings in Flood Prone Areas

The following provisions will be incorporated by the state government/ Concerned Departments /local bodies in the building bye-laws for buildings in flood prone areas:

- a) Plinth levels of all buildings should be 0.6 m above the drainage/flood submersion lines.

**b)** In the areas liable to floods, all the buildings should preferably be double and multiple storeys. Wherever there are single storey buildings, a stairway will invariably be provided to the roofs so that temporary shelter can be taken there. The roof levels of the single storey buildings and the first floor level in double-storey buildings will be above 100-year flood levels so that the human beings and movable property can be temporarily sheltered there during periods of danger on account of floods. Concerned Departments should frame building codes.

### **5.6 Legal Framework for Making Infrastructure Flood Resilient**

The infrastructural activities by the different organisations, such as Public Works Department in the flood prone areas need to be carried out duly considering the requirements for making them flood resilient. While constructing railway lines and roads, care is sometimes not taken in aligning, locating and designing with respect to height and width of embankments and providing adequate waterway i.e bridges, culverts, vents and causeways for passage of storm water. It may be mentioned here that flood levels are likely to increase with development taking place in the catchment such as reduction in vegetative cover, deforestation, paving of areas for settlements etc. as well as due to the afflux caused by obstruction to the flow due to inadequate size of bridges, culverts, vents and causeways. The result is increased vulnerability of the area to flooding and drainage congestion, submergence of roads and railway embankments and breaches in them.

An appropriate legal framework will be developed by the state governments/ Concerned Departments so as to make it mandatory for obtaining clearance for the plans for construction of the infrastructure in flood prone areas from states' irrigation/flood control/water resources departments with respect to their safety against floods and effects thereof on the vulnerability of the area to floods and drainage congestion, who will process the cases in a fixed time frame. The Concerned Departments to formulate framework.

### **5.7 Survey of Flood Prone Areas**

One of the main requirements for implementation of flood plain zoning measure is the availability of survey maps, on a suitably large scale, to enable proper zoning of vulnerable areas and preparation of flood risk maps. The CWC had initiated, in 1978, a programme for surveying areas prone to floods under the central sector through the Survey of India (SOI) as a pilot scheme, to assist the state governments in preparing flood risk maps.

The Indian Space Research Organisation (ISRO) has formulated, for the Eleventh Five-Year Plan period, a programme for DMS services wherein "creation of digital, thematic and cartographic data base for hazard

zonation and risk assessment and realization of national data base for emergency management have been identified as one of the programme elements. Under this programme, ISRO and NRSA have planned to cover about 1 lakh sq km (10 million ha) every year for development of close contour information of ground using the Airborne Laser Terrain Mapping (ALTM) system thereby envisaging to cover all the priority flood prone areas in a period of five years. Phasing of the area to be surveyed will be done by them in consultation with the CWC so that the most vulnerable areas are covered first.

### **5.8 Wetlands: Conservation and Restoration**

Wetlands provide effective flood moderation by being available to accommodate the flood water. The existing wetlands should be revived and maintained properly. The flow of fresh water into these wetlands must be ensured.

The reclamation of the existing wetlands/ natural depressions will be prohibited by state governments/Concerned Departments and they will formulate an action plan for using them for flood moderation. Concerned with Forest, Ecology and Environment Department. CRZ is purely in the domain of Environment Department. SDMA will play advisory role.

### **5.9 Watershed Management including Catchment Area Treatment and Afforestation**

Watershed management though not very effective in the case of large floods, helps in the moderation of small and medium floods. It is also very effective in the overall land and water management. It also leads to reduction in soil erosion and overall reduction in sediment load of the rivers. A watershed is identified as the ideal geophysical unit for planning and executing development programmes aimed at achieving rational utilisation of all-natural resources for sustainable development with least damage to the environment. It is essential to ensure efficient utilisation of rainfall and safe disposal of runoff and the watershed approach is best suited to meet this goal. The watershed approach can help enhance local and regional economic viability of the FM objective in ways that are environmentally sound and consistent with watershed objectives. The watershed approach strengthens teamwork between the public and private sectors at the state and local levels to achieve the greatest environmental improvements with the resources available. This emphasis gives those people who depend on water resources for their health, livelihood or quality of life, a meaningful role in the management of the resources. Through such active and broad involvement, the watershed approach can help in developing a sense of community, reduce conflicts, increase commitment to the actions necessary to meet the goals of the society and, ultimately, improve the likelihood of sustaining long-term environmental improvements.

### 5.10 Coordination and Enforcement

It is important that an appropriate techno-legal regime is put in place for the regulation of developmental activities in the flood plains, preventing blocking and encroachment of waterways, prohibiting reclamation, conservation and restoration of existing wetlands and depressions etc. Provisions are required in the bye-laws of ULBs and PRIs to ensure that buildings and the infrastructure in flood plains are flood resilient.

The state governments will put in place mechanisms for the enforcement of the acts, laws and rules made by them and identify the officers who will be responsible for their implementation and make them accountable for any lapses/violations.



# 06

---

## **FLOOD RISK REDUCTION, ASSESSMENT, ROLES AND RESPONSIBILITY IN FLOOD MANAGEMENT**

---

|                                                             |     |
|-------------------------------------------------------------|-----|
| 6.1 Introduction .....                                      | 167 |
| 6.2 Risk Components .....                                   | 168 |
| 6.3 Assessing the Risk .....                                | 169 |
| 6.4 Strategic Flood Risk Management .....                   | 169 |
| 6.5 Flood Risk Reduction and Roles and Responsibility ..... | 172 |



## **FLOOD RISK REDUCTION, ASSESSMENT, ROLES AND RESPONSIBILITY IN FLOOD MANAGEMENT**

### **6.1 Introduction**

In recent years, water topics mainly flood have received great attention on the international agenda. Flood action plan has not been fully achieved in in a compartmentalized fashion. The challenge is to recognize the importance of the impacts of natural water related hazards within the framework of sustainable development. Communities and regions can no longer afford to simply respond to and recover from these disasters. An integrated approach to flood disaster management will reduce the losses and break the cycle of event-disaster.

A paradigm shift is required in perceptions, attitudes and practices in order to move from the current model of post disaster response and recovery to one of Investing in the holistic Flood management process. The long-tried approach of providing aid after a disaster needs to be altered to increasing investments in flood mitigation management approaches before the occurrence of the next extreme event. Flood management is an end-to-end process for recognizing and effectively combating the risk associated with floods through a suite of planned actions. The process involves a number of activities that occur throughout the cycle:

- Pre-disaster - preventative measures and preparedness;
- During the flood - disaster relief, response and mitigate actions; and
- Post disaster - rehabilitation, reconstruction, economic recovery, and
- efforts to assess and fine-tune
- Preventative measures.

Effective planning measures require an understanding of the factors that contribute to losses due to flooding. Typically, multiple actions must be taken to proactively manage the risk. A multiple mitigation approach would consider measures such as:

- Preventing or restricting new or inappropriate development or activities in the flood plain;
- Removal of certain structures from the floodway; flood proofing of structures in the flood plain; Introduction of structural measures such as levees, dams and constructed channels; controlling land use practices within the basin; and applying flood forecasting and warning systems linked with response mechanisms.
- Establishing a flood forecasting programme enhances all other flood mitigation measures. Forecasts provide the necessary lead-time for a wide variety of actions to be taken by the community.

- Actions can reduce loss of life and economic losses by evacuating families, personal effects, produce, livestock and machinery, and by taking short-term efforts to increase the capacity of structural measures such as sandbagging operations and flood control operations at dams even in what are considered areas with low possibilities of flooding.
- Complacency can set in and investments in forecasting and other mitigation efforts may be curtailed. Long-term investments and policies are needed so that the community will be prepared to respond to the relatively rare event when, not if, it happens. Social and economic aspects are also very important and must be considered to effectively mitigate the impacts resulting from floods.
- There is a need to build resilience to floods within the society. This is, in part, achieved through the recognition that the level of risk to society is highly linked to indifference and poverty, with this association being mutually reinforcing.

Before planning a flood management Action plan and program, it is essential to identify risks caused by floods. The risks are composed of three elements – hazard, exposure, and vulnerability (WMO, 2006).

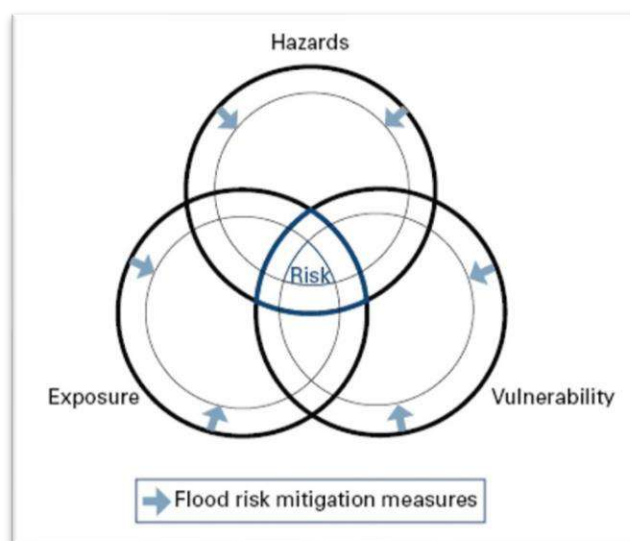
## 6.2 Risk Components:

Planning for the mitigation of loss of life and damage by choosing the proper methods to reduce losses incurred by floods requires that an evaluation of the level of the flood risk in a given area be carried out. The risk level is contained in information on the impact of a flood of defined probability on people, the environment and property, i.e. it describes the potential losses that the flood may cause. Flood risk can be characterized in many ways, but, as mentioned previously, three elements are crucial – hazard, exposure, and vulnerability, which are sometimes represented as an equation:

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} \times \text{Exposure}$$

It is important to distinguish between these three factors as they require different sets of actions and policies in order to reduce disaster risk. This risk formula (and its numerous variations) is used differently depending on the context. The hazard is defined as a flash flood magnitude which is defined by probability of occurrence. This information can be translated to inundation maps showing the areas at risk as well as depths of inundation and related water velocities. Vulnerability is composed of several components, including physical, social, economic and environmental. Vulnerability is often considered the most difficult component of risk to assess and evaluate because there are many different ways to interpret vulnerability. The exposure describes human activity and environment in the hazard zone (who and what are

endangered by floods). The third parameter that characterizes the general notion of risk is the vulnerability of a given region to flood damage. Presently, various definitions of this parameter are applied depending on the needs. One of these concerns the susceptibility of a region to flood losses, which is defined via the geophysical, economic and societal attributes of a region.



**Figure – 20 Flood Risk Characterization (WMO, 2006)**

### 6.3 Assessing the Risk:

In assessing hazard and exposure, a flood hazard map can show the likelihood of a flood happening in a certain place at a certain time and its properties in the areas at risk. Apart from the lines marking out the range of floods, risk maps often include information on the depth and velocity of the water, information on possible riverbank erosion, and on landslide terrains. Flood risk maps are generally developed using historical information, meteorological data and hydrological data and analysis of potential breakdowns of hydro-technological sites. These maps are based on model analyses or historical floods. In order to deal with the differences between riverine floods and flash floods.

### 6.4 Strategic flood risk management:

Flood risk management has multiple goals relating to multiple time and space scales. Achieving these relies on the development and implementation of appropriate portfolios of measure, a process that is complicated by the changing nature of the flooding system (through climate, geomorphologic and socio-economic influences). Flood risk management therefore embeds a continuous process of adaptation that is distinct from the implement and maintain. It involves collaborative action across governments, the

public sector, voluntary organizations and individuals. The main objectives of flood risk management are mainly focused on manage the flood risk in a consistent and effective way, the vulnerability of the community to flooding is understood and reduced and returns to its normal routine as soon as possible following a flood. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of flood risk during the next iteration of the cycle. There are several phases in flood risk reduction and management and actions are usually divided into two main categories Structural measures, which relate to any physical construction to reduce or avoid possible impacts of hazards and Non-structural measures, which relate to knowledge, policies, laws, public awareness raising, training and education.

Pro-active FRM by regulating the measures that assess and reduce the possible future flood risks. Flood risk reduction has been officially defined by the UN Office for Disaster Risk Reduction (UNDRR) as a systematic approach to identify, assess and reduce the risks of disasters (figure 5). A set of themes have been introduced in Hyogo and Sendai frameworks as well as IFRC reports that defines inclusion of risk reduction activities and strategies in legislative documents. Such themes include the provision of early warning system (EWS), provision of community education and public awareness, improving building codes, land use planning, land tenure and informal settlement, provision of risk-sharing and insurance, and improving public participation in DRR activities (IFRC and UNDP, 2014).



Figure – 21 Proactive Flood Risk Management Cycle



Flood Risk Management (FRM) recognizes that there is seldom a single solution to managing flood challenges. Instead, portfolios of FRM measures and instruments are utilized the criteria for assessing FRM strategies are no longer solely economic, but involve consideration of a much broader set of outcomes, including social justice and ecosystem health. Equally, an increasing recognition of non-stationarity within the flood system (that is, climate, geomorphologic and socioeconomic change) forces an explicit consideration of a full range of plausible ways in which flood risk may shift in the future. This continuous process of adaptation is distinct from the 'implement and maintain' philosophy of a traditional flood defence approach. Implementing FRM places a high demand on its stakeholders. It involves the collective action of a range of different government authorities and those outside government, including the public.

The risk assessment therefore presents the decision-maker with an appropriate understanding of the relationship between the actions proposed to be taken and the resultant reductions in risk, benefits gained and opportunities sacrificed. The overarching motivation for FRM is to support the broader aim of sustainable development Flood risk management sits at the intersection of many other management considerations, and as such is in a pivotal position to be a positive force in promoting desired societal, environmental and economy outcomes. When developing FRM plans and judging the success of those plans, achieving sustainability involves much more than simply the ability to maintain the long-term integrity of structures and other measures taken to control floods. It also requires that steps be taken to ensure the long-term health of the associated ecosystems, societies and economies.

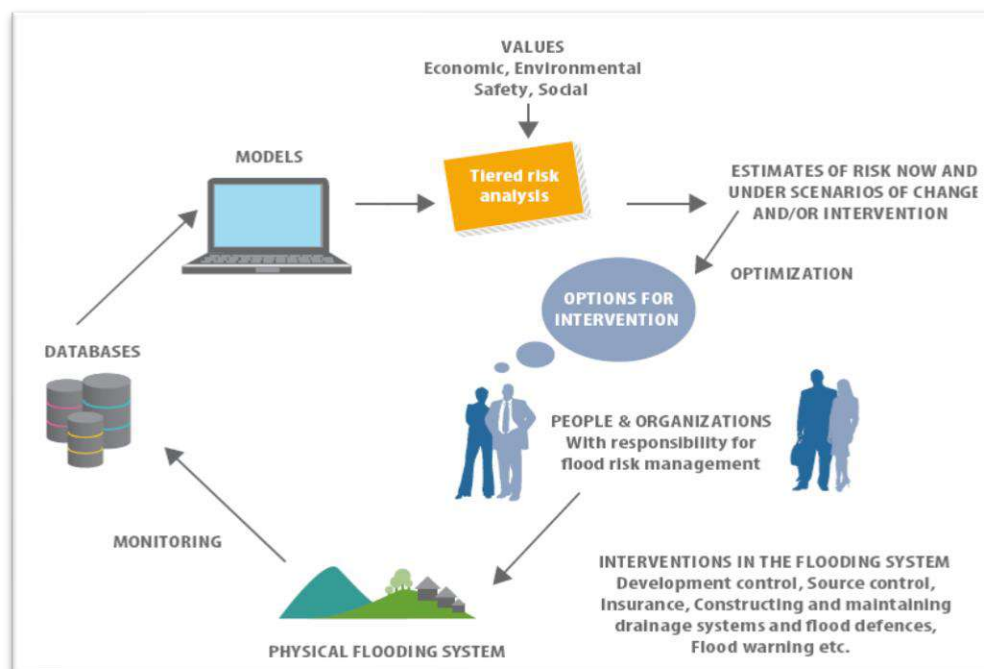


Figure – 22 Flood risk management process of acting, monitoring, reviewing and adapting

## 6.5 Flood Risk Reduction and roles and Responsibility

The DM Act 2005 and the National Policy 2009 had made a paradigm shift towards proactive disaster management by laying emphasis on long-term Disaster Risk Reduction (DRR). The global frameworks – Hyogo (2005-15) and Sendai (2015-30) – signify calibrated shift towards internalisation of DRR and making DRM an integral part of development initiatives. The DMP explicitly and implicitly incorporates the coherence among the major post-2015 global initiatives, the corresponding national efforts, new initiatives of the government, an emphasis on social inclusion and the mainstreaming of DRR, i.e., making DRR an integral feature of development. all these constitute the five main pillars of SDMP

### Six Thematic Areas for DRM:

1. *Understanding Risk*
2. *Inter-Agency Coordination*
3. *Investing in DRR – Structural Measures*
4. *Investing in DRR – Non-Structural Measures*
5. *Capacity Development*
6. *Climate Change Risk Management*

## 1. Understanding Risk

This Thematic Area for DRM focuses on understanding disaster risk, the Priority-1 in the Sendai Framework and integrates into it numerous actions needed for strengthening disaster resilience. The major themes for action are: a) Observation Networks, Information Systems, Research, Forecasting, b) Zoning/ Mapping, c) Monitoring and Warning Systems, d) Hazard Risk and Vulnerability Assessment (HRVA), and e) Dissemination of Warnings, Data, and Information. Having adequate systems to provide warnings, disseminate information, and carry out meaningful monitoring of hazards are crucial to disaster risk reduction, and improving resilience. They are also an integral part of improving the understanding of risk.

## 2. Inter-Agency Coordination

Inter-agency coordination is a key component of strengthening the disaster risk governance - Priority- 2 of the Sendai Framework. The major themes for action required for improving the top-level interagency coordination are: a) Overall disaster governance b) Response c) Providing warnings, information, and data and d) Non-structural measures. The State ministries and agencies mentioned are those vested with hazard-specific responsibilities by the Govt. of Karnataka or those expected to play major roles in the thematic areas given in the matrix.

## 3. Investing In DRR – Structural Measures

Undertaking necessary structural measures is one of the thematic areas for DRM and enhancing resilience. These consist of various physical infrastructure and facilities required to help communities cope with disasters. The implementation of these measures is essential to enhance disaster preparedness, a component of Priority-4 of the Sendai Framework. It is also an important component of investing in disaster risk reduction for resilience, which is Priority-3 of Sendai Framework.

## 4. Investing In DRR – Non-Structural Measures

Sets of appropriate laws, mechanisms, and techno-legal regimes are crucial components in strengthening the disaster risk governance to manage disaster risk, which is Priority-2 of the Sendai Framework. These non-structural measures comprising of laws, norms, rules, guidelines, and techno legal regime (e.g., building codes) provide the legal regime empowers the authorities to mainstream disaster risk reduction

and disaster resilience into development activities. The state government will have to set up necessary institutional support for enforcement, monitoring, and compliance.

In the Flood Risk Reduction the roles and responsibility of State agencies, Local Government, organizations, Government Departments, Centres, Nodal agency and NGO's are given in annexure -1 and for urban flood is given in annexure – II.

**Table – 25 Actions and Responsibilities of State agencies, organization in Food Risk Reduction**

**FLOOD RISK REDUCTION**

| <b>Flood</b>   |                                                                                          | <b>Understanding Disaster Risk</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sl. No.</b> | <b>Sub-Thematic Area for DRR</b>                                                         | <b>State Agencies and their Responsibilities</b>                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                |                                                                                          | <b>State Agencies</b>                                              | <b>Responsibility</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1              | <b>Observation Networks, Information Systems, Monitoring, Forecasting, Early Warning</b> | <b>Karnataka State Natural Disaster Monitoring Center (KSNDMC)</b> | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>• KSNDMC will coordinate with National &amp; State level Agencies towards Monitoring, Forecasting, and Early Warning.</li> <li>• KSNDMC is having Weather Observation Network with TWS at Hobli level and TRG at GP level. These stations need to be maintained and upgraded periodically to ensure quality data.</li> <li>• A Network of Doppler Weather Radars (DWR) need to be installed in the State to strengthen the Weather Monitoring Network and improve the existing Weather Forecasting mechanism.</li> <li>• The DWR data and the ground level Weather data will enable KSNDMC to generate Flood / Inundation forecast, Early Warning for a given location.</li> <li>• A Hydrological model to be developed to generate the forecast &amp; early warning towards flood / inundation</li> </ul> |
|                |                                                                                          | <b>Indian Metrological Department (IMD), Bengaluru</b>             | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>• In co-ordination with state agencies in warning against severe weather phenomena like tropical cyclones, heavy rains and cloud burst which cause destruction of life and property.</li> <li>• To provide meteorological statistics required for agriculture, water resource management, industries, oil</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Flood   |                                                              | Understanding Disaster Risk                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|--------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                    | State Agencies and their Responsibilities                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|         |                                                              | State Agencies                                             | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|         |                                                              |                                                            | <p>exploration and other nation-building activities.</p> <ul style="list-style-type: none"> <li>• IMD-Bengaluru shall issue rainfall forecast and warning.</li> <li>• Issue rainfall and flood warning report in this regard through print, electronic and social media</li> </ul>                                                                                                                                                                                                                                                                                                                                        |
|         |                                                              | Water Resource Department                                  | <p><b>Recurring/ Regular</b></p> <ul style="list-style-type: none"> <li>• On receiving heavy rainfall warning the WRD shall assess the situation and issue flood warning if necessary</li> <li>• WRD shall keep alert the nodal officers of every irrigation division and control rooms of district administrations and police.</li> <li>• Nodal officer shall be designated who will closely monitor the water level and discharge from dams along with rainfall during emergency situation</li> <li>• WRD to install automated River flow gauging and Reservoir monitoring systems (inflow, outflow levels).</li> </ul> |
| 2       | <i>Zoning, mapping, and classification flood prone areas</i> | KSNDMC                                                     | <p>Recurring/ Regular</p> <ul style="list-style-type: none"> <li>• KSNDMC in collaboration with concerned departments / agencies to carry out survey of flood prone areas and to generate flood zonation maps.</li> <li>• The LiDAR Survey to be carried out in river courses of Krishna &amp; Cauvery to generate high resolution DEM to demarcate the flood prone areas.</li> </ul>                                                                                                                                                                                                                                     |
|         |                                                              | Karnataka State Remote Sensing Application Center (KSRSAC) | <ul style="list-style-type: none"> <li>• Prepare flood plain zoning mapping using using Remote Sensing, GIS and GPS Tools</li> <li>• Providing support in Remote Sensing &amp; GIS Activities in the State as a Nodal Agency</li> <li>• Development of Customized Software for Resource Development and Management</li> <li>• Acquire and maintain a library of Spatial Database for the Karnataka State</li> <li>• Prepare vulnerability maps</li> </ul>                                                                                                                                                                 |

| Flood   |                                                                         | Understanding Disaster Risk                         |                                                                                                                                                                                                                                                                                                        |
|---------|-------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                               | State Agencies and their Responsibilities           |                                                                                                                                                                                                                                                                                                        |
|         |                                                                         | State Agencies                                      | Responsibility                                                                                                                                                                                                                                                                                         |
|         |                                                                         |                                                     | <ul style="list-style-type: none"> <li>Identify and classify flood prone areas</li> </ul>                                                                                                                                                                                                              |
| 3       | <i>Studies and monitoring of rivers flowing from neighboring states</i> | Central Water Commission (CWC)                      | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>A Co-ordination mechanism to be setup with the neighboring States and CWC to monitor, coordinate and advise the release of water from the Reservoirs to avert any possible floods in the State.</li> </ul>                            |
|         |                                                                         | Water Resource Department                           | <ul style="list-style-type: none"> <li>Keep information updates on rivers and reservoir levels</li> <li>Use river studies for flood management</li> </ul>                                                                                                                                              |
| 4       | <i>Research and Development</i>                                         | <i>Karnataka Engineering Research Station(KERS)</i> | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Undertake research studies on flood prone areas, flood plain zoning and bye laws</li> </ul>                                                                                                                                           |
|         |                                                                         | <i>WALMI- Darward</i>                               | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Advises Government on legal, policy, organisational and procedural changes; organizes demonstrations in collaboration with other organizations, conducts special studies and brings out publications.</li> </ul>                      |
|         |                                                                         | <i>KSNDMC</i>                                       | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>To take up and coordinate R&amp;D Projects towards Flood mitigation and management in collaboration with Universities/ Knowledge centres.</li> </ul>                                                                                  |
| 5       | Hazard Risk Vulnerability and Capacity Assessment (HRVCA)               | KSNDMC                                              | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>KSNDMC to carry out HRVCA and generate micro &amp; macro level flood hazard vulnerability map for different river basins in the State.</li> <li>Capacity assessment shall include sector &amp; community specific aspects.</li> </ul> |
|         |                                                                         | KSDMA                                               | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Undertake HRVCA as part of preparing and periodic revision of State and District DM plans</li> </ul>                                                                                                                                  |
|         |                                                                         | WRD                                                 | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Undertake HRVCA in association with CWC and other agencies</li> <li>Undertake HRVCA along all the flood plains of rivers in the state and produce flood models</li> </ul>                                                             |



| Flood   |                                                  | Understanding Disaster Risk               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|--------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                        | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|         |                                                  | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 6       | Monitoring, Forecasting and Warning Systems      | IMD-Bengaluru                             | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Support, cooperation for data collection and updates</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|         |                                                  | KSNDMC                                    | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Information dissemination among the departments and agencies responsible for managing flood situations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 7       | Dissemination of warnings, data, and information | KSNDMC                                    | <ul style="list-style-type: none"> <li>To develop a Network between KSNDMC, SEOC &amp; DEOC for dissemination of information and early warning.</li> <li>To establish Early Warning Dissemination System with last mile connectivity in flood prone areas.</li> <li>To engage Community radio and HAM Radio operators for the dissemination of Early Warning forecast and related advisories for Flood risk mitigation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|         |                                                  | SEOC                                      | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Co-ordination to be setup between SEOC, DEOC and all government line departments and grama panchayath and NGOs</li> <li>SEOC &amp; DEOC will pursue SOPs towards flood management.</li> <li>Inter-state data and information sharing where applicable</li> <li>Coordination and cooperation with the central agencies</li> <li>Dissemination of warnings to all, down to the last mile – remote, rural or urban; Regular updates to people in areas at risk</li> <li>Warnings using all types of options, types of technologies, and media</li> <li>Monitoring compliance by various network operators and service providers</li> <li>Strengthening the SEOC infrastructure &amp; man power.</li> <li>Ensure facilities and infrastructure for the implementation of adequate access to communities at risk</li> </ul> |

## Inter-Agency Coordination

| Flood Inter-Agency Coordination |                             |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|-----------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                         | Sub-Thematic Area for DRR   | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 |                             | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1                               | Overall disaster governance | Revenue Department(DM)                    | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Co-ordinate all aspects of disaster risk management and mainstreaming DRR</li> <li>Ensuring coherence and mutual reinforcement of DRR, CCA and development</li> <li>Work in coordination with all line departments in overall DM</li> <li>Maintain IDRN information base for resource identification and deployment.</li> <li>Periodically review and upgrade plans, resources and build capacities for all stake holders.</li> </ul> |
|                                 |                             | KSDMA                                     | <b>Recurring/ Regular</b> <p>Preparation and implementation of DM plans and ensure the functioning of agencies with DM tasks</p> <ul style="list-style-type: none"> <li>KSDMA to coordinate and ensure the periodical upgradation of DM plan at State / Department / District level and mainstreaming the DRR into the departmental programs and schemes.</li> </ul>                                                                                                                                   |
| 2                               | Response                    | Revenue Department (DM)                   | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Activate Incident Response Teams at all level</li> <li>Provide necessary resources in terms of material, manpower and monetary support</li> <li>Coordinate with central agencies for the necessary support process, mobilization of necessary resources during and after the Flood.</li> </ul>                                                                                                                                        |
|                                 |                             | State crisis Committee                    | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Organising and coordinating the immediate response towards rescue, relief &amp; rehabilitation</li> </ul>                                                                                                                                                                                                                                                                                                                             |
|                                 |                             | KSDMA                                     | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>KSDMA in consultation with Revenue Department(DM) to coordinate, guide</li> </ul>                                                                                                                                                                                                                                                                                                                                                     |

|   |                             |                    |                                                                                                                                                                                                                            |
|---|-----------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                             |                    | and command the Rescue, Relief & Rehabilitation                                                                                                                                                                            |
|   |                             | KSNDMC             | <ul style="list-style-type: none"> <li>KSNDMC and / or KRSAC to engage UAV's / Drones to map the flood affected areas and to assess the extent of damage.</li> </ul>                                                       |
| 3 | Warnings, Information, Data | SEOC               | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Coordinating the dissemination of warnings to all, down to the last mile – remote, rural or urban; Regular updates to people in areas at Risk.</li> </ul> |
| 4 | Non-structural measures     | Revenue Dept. (DM) | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Ensure among state agencies for updating norms/ codes and their implementation, enforcement and monitoring.</li> </ul>                                    |
|   |                             | WRD                | <ul style="list-style-type: none"> <li>WRD in coordination with concerned departments to take up Non-structural measures to minimize the flood &amp; its impacts.</li> </ul>                                               |

#### INVESTING IN DRR – STRUCTURAL MEASURES

| Flood INVESTING IN DRR – STRUCTURAL MEASURES |                                                                       |                                                    |                                                                                                                                                                                                                                                                    |
|----------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                      | Sub-Thematic Area for DRR                                             | State Agencies and their Responsibilities          |                                                                                                                                                                                                                                                                    |
|                                              |                                                                       | State Agencies                                     | Responsibility                                                                                                                                                                                                                                                     |
| 1                                            | Flood control measures such as construction of embankments and levees | PWD                                                | <ul style="list-style-type: none"> <li>Identification suitable sites for temporary shelters for people and livestock evacuated from localities at risk</li> <li>Construction of multi-purpose shelters in villages/ habitations prone to floods.</li> </ul>        |
|                                              |                                                                       | WRD                                                | <ul style="list-style-type: none"> <li>Proper monitoring and maintenance of river embankments</li> <li>WRD to identify suitable sites for construction of check dams / barrages / diversion canals and water harvesting structures.</li> </ul>                     |
|                                              |                                                                       | Panchayat Raj Engineering Dept.                    | <ul style="list-style-type: none"> <li>Identify sites for flood resistant constructions through MGNREGA etc., programmes</li> </ul>                                                                                                                                |
| 2                                            | Social Housing Schemes                                                | Dept's of Housing, RDPD, PWD, Slum Clearance Board | <ul style="list-style-type: none"> <li>Promote Cost-effective and flood resistant building technologies.</li> <li>Housing department to identify safe places for implementing the social housing schemes and also to implement suitable building codes.</li> </ul> |

| Flood INVESTING IN DRR – STRUCTURAL MEASURES |                                                                     |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------|---------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                      | Sub-Thematic Area for DRR                                           | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                              |                                                                     | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                              |                                                                     |                                           | <ul style="list-style-type: none"> <li>Ensure that flood-resistant features are incorporated in the planning and execution of social housing schemes in flood prone areas</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 3                                            | Multi-purpose Flood Shelters                                        | PWD/ PRED                                 | <ul style="list-style-type: none"> <li>Identify safe places for erecting temporary shelters for the affected community and livestock with necessary basic amenities and resources.</li> <li>Ensure availability of shelters, undertake proper maintenance, and make arrangements to support the people shifted to temporary shelters.</li> </ul>                                                                                                                                                                                                                                                                         |
| 4                                            | Waterways and drainage systems for roads, highways, and expressways | Public Work Department                    | <ul style="list-style-type: none"> <li>PWD, UDD &amp; RDPR to assess the vulnerability and take up necessary action for strengthening the roads, highways, and expressways by implementing the DRR measures as per the DM plan.</li> <li>To ensure trouble free road communication</li> <li>To ensure appropriate designs of structures in areas of operation such as roads, bridges &amp; buildings</li> <li>Primary agency for maintenance of public infrastructure identifies safer places, assess physical damage, identify safer routes, and provide necessary reconstruction and rehabilitation support</li> </ul> |
|                                              |                                                                     | Urban Development Department.             | <ul style="list-style-type: none"> <li>UDD is the main agency to ensure repair and maintenance in the urban areas. Implementing disaster resistant building codes and designs</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5                                            | Enhancing the safety of dams and reservoirs                         | WRD, , Dam safety monitoring cell         | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Carry out measures to increase safety, reduce risks from flooding</li> <li>Undertake pre- and post-monsoon inspections of dams and reservoirs.</li> <li>WRD to co-ordinate periodical review &amp; updation of structural &amp; non-structural measures towards the Dam safety.</li> <li>Monitor the implementation of safety enhancements in accordance with norms</li> </ul>                                                                                                                                                                          |
| 6                                            | Desilting/ dredging of rivers to improve flow; drainage             | WRD                                       | <ul style="list-style-type: none"> <li>To assess the carrying capacities of the drainage system and also to take necessary measures to desilt the drainages periodically.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Flood INVESTING IN DRR – STRUCTURAL MEASURES |                                                                                                                       |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                      | Sub-Thematic Area for DRR                                                                                             | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              |                                                                                                                       | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                              | improvement; floodwater diversion through existing or new channels                                                    | UDD                                       | <ul style="list-style-type: none"> <li>Desilting of storm water drains, raj kaluve and tanks periodically</li> <li>Clear the encroachments to minimise the flood events.</li> </ul>                                                                                                                                                                                                                                                                                                |
| 7                                            | Hazard resistant construction, strengthening, and retrofitting of all lifeline structures and critical infrastructure | PWD                                       | <ul style="list-style-type: none"> <li>Formulate guidelines for safe construction of public works</li> <li>Take precautionary steps for the protection of lifeline structures against possible loss and damage during flood</li> <li>To assess the high flood levels, flood frequency and accordingly design the critical infrastructure (school buildings / Anganwadi kendras) and also while strengthening the existing critical infrastructure through retrofitting.</li> </ul> |
|                                              |                                                                                                                       | WRD                                       | <ul style="list-style-type: none"> <li>Procure/ prepare HRV analysis for water resource management and flood protection.</li> <li>Based on HRV analysis department specific contingency action plan.</li> </ul>                                                                                                                                                                                                                                                                    |
|                                              |                                                                                                                       | KRIDL                                     | <ul style="list-style-type: none"> <li>Undertake rural development construction works, design and strengthen critical infrastructures by retrofitting.</li> </ul>                                                                                                                                                                                                                                                                                                                  |

| Flood INVESTING IN DRR – NON-STRUCTURAL MEASURES |                                                                                                                                                                                          |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                          | Sub-Thematic Area for DRR                                                                                                                                                                | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                  |                                                                                                                                                                                          | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1                                                | Regulation and enforcement of laws, norms, regulations, guidelines including:<br>-Regulation for reservoir management<br>-Integrated Water Resources Management (IWRM)<br>-Risk Transfer | Revenue Department (DM)                   | <ul style="list-style-type: none"> <li>Revenue Department (DM) to propose providing incentives in the form of Insurance premiums for implementing DRR measures by adopting building codes / by laws for construction activities by the agencies and community in hazard prone areas as a risk transfer mechanism.</li> <li>Implementing land-use regulation for low lying areas as per flood control norms.</li> <li>Regulation of inhabitation of low-lying areas along the rivers, nallas and drains.</li> </ul> |
|                                                  |                                                                                                                                                                                          | WRD                                       | <ul style="list-style-type: none"> <li>Adoption of revised reservoir operation manuals.</li> <li>Implementing flood management action</li> </ul>                                                                                                                                                                                                                                                                                                                                                                   |

| Flood INVESTING IN DRR – NON-STRUCTURAL MEASURES |                                                                              |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                          | Sub-Thematic Area for DRR                                                    | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                  |                                                                              | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                  |                                                                              |                                           | plan. <ul style="list-style-type: none"> <li>Review and modification of operation manuals for all major dams/reservoirs.</li> <li>Prevention and removal of encroachment into the waterways and natural drainage systems.</li> <li>Promote institutional mechanisms for sharing forecasts, warnings, data, and information.</li> <li>Regulatory framework for flood plain zoning and flood inundation management.</li> </ul> |
|                                                  |                                                                              | KSDMA                                     | <ul style="list-style-type: none"> <li>KSDMA to propose policy plans for clearing encroachments, buffer zone demarcation and implementation, catchment and backwater management.</li> </ul>                                                                                                                                                                                                                                  |
| 2                                                | Regulations to promote flood resilient buildings and infrastructure          | KSDMA                                     | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>KSDMA to develop regulation mechanism based on the policy plans to ensure the implementation of building codes.</li> </ul>                                                                                                                                                                                                                                  |
|                                                  |                                                                              | PWD                                       | <ul style="list-style-type: none"> <li>Formulate guideline for safe construction of public work in flood affected areas.</li> </ul>                                                                                                                                                                                                                                                                                          |
|                                                  |                                                                              | WRD                                       | <ul style="list-style-type: none"> <li>Revise and implement the relevant rules in flood prone areas.</li> </ul>                                                                                                                                                                                                                                                                                                              |
| 3                                                | Wetland conservation and restoration, Catchment Area Treatment/Afforestation | Forest & Ecology department               | <ul style="list-style-type: none"> <li>Forest &amp; Ecology department to take up special drive for afforestation along the river coarse for the breach / erosion of river banks.</li> </ul>                                                                                                                                                                                                                                 |
|                                                  |                                                                              | WRD                                       | <ul style="list-style-type: none"> <li>Discourage reclamation of wetlands, natural depressions.</li> <li>Action plan managing wetlands and natural drainage systems for flood moderation.</li> <li>Implementation of watershed management including catchment area treatment and afforestation Programmes.</li> </ul>                                                                                                        |
| 4                                                | Public Private Partnerships                                                  | Revenue Dept. (DM) and Corporate bodies   | <ul style="list-style-type: none"> <li>Promote private participation in disaster management projects.</li> <li>Implementation of flood warning system.</li> </ul>                                                                                                                                                                                                                                                            |
|                                                  |                                                                              | Revenue Dept. (DM) and Corporate bodies   | <ul style="list-style-type: none"> <li>Promote private participation in disaster management projects.</li> <li>Implementation of flood warning system.</li> </ul>                                                                                                                                                                                                                                                            |



## CAPACITY DEVELOPMENT

| Flood CAPACITY DEVELOPMENT |                           |                                           |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|---------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                    | Sub-Thematic Area for DRR | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                            |
|                            |                           | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                             |
| 1                          | Training                  | ATI-CDM                                   | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Conducting and coordinating training to all government officials involved in the planning and implementation of preparedness, mitigation response and relief work.</li> </ul>                                                                                                                                                             |
|                            |                           | SIRD                                      | <ul style="list-style-type: none"> <li>Conduct Training Programmes for the Elected Representatives, Officers, Staff of Panchayat Raj Institutions and NGOs.</li> </ul>                                                                                                                                                                                                                                     |
|                            |                           | Police Training Academies                 | <ul style="list-style-type: none"> <li>Conduct training to police officers in disaster management- crowd management, evacuation, rescue and relief operations.</li> <li>Conduct search and rescue training to local volunteers.</li> </ul>                                                                                                                                                                 |
|                            |                           | KSF&ES                                    | <ul style="list-style-type: none"> <li>Conduct training to fire officers in disaster management evacuation and rescue operations.</li> </ul>                                                                                                                                                                                                                                                               |
|                            |                           | SDRF, NDRF                                | <ul style="list-style-type: none"> <li>Conduct training to SDRF and NDRF personals in disaster management- evacuation and rescue operations.</li> <li>Community training programmes to prepare volunteers for rescue, relief, first aid response.</li> <li>To identify and prepare a list of Ex-service men, Swimmers &amp; Divers in the local community to be engaged during the Flood event.</li> </ul> |
|                            |                           | Animal Husbandry                          | <ul style="list-style-type: none"> <li>Training and orientation programs for State Govt. staff, professionals for veterinary care and support to disaster-affected animals.</li> </ul>                                                                                                                                                                                                                     |
|                            |                           | Health Dept.                              | <ul style="list-style-type: none"> <li>Conduct training and awareness camps to Health officials and community personals in disaster management.</li> <li>Training volunteers on emergency preparedness programs such as first aid and preventive measure against diseases in disaster prone areas.</li> </ul>                                                                                              |

| Flood CAPACITY DEVELOPMENT |                                        |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                    | Sub-Thematic Area for DRR              | State Agencies and their Responsibilities                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                            |                                        | State Agencies                                                                                                                                                                      | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2                          | Curriculum Development                 | SDMA,ATI-CDM, Engineering Training Institutes, Education Dept. Universities, Research institutes, State Boards of Education, Professional Bodies/ Councils, Medical Education Dept. | <ul style="list-style-type: none"> <li>Update curriculum for undergraduate engineering courses to include topics relevant for Flood Risk Management.</li> <li>Introduction of Crisis Management, Emergency Medical Response/Recovery and Trauma Management at Diploma/UG/ PG levels for Health Professionals.</li> <li>Improving curriculum periodically using new technologies.</li> <li>KSDMA to constitute an Expert Committee to include Flood Risk Management / DRR component in School &amp; College curriculum.</li> </ul>                                                                                                                                                                                                                                  |
| 3                          | Awareness Generation                   | KSDMA in co-ordination with Revenue Dept., (DM), SDMA, ATI-CDM, KSNDMC, IRD, WRD, SDRF, KSF&ES, Civil defence, Police, RD&PR, NGO's                                                 | <ul style="list-style-type: none"> <li>To extensively conduct Community awareness programmes in Flood prone areas towards Flood DRR through mass media (print &amp; electronic, FM, community radio) audio visual jingles, street plays, palm plates / booklets.</li> <li>Carry out Mass Media Campaigns</li> <li>Promote Culture of Disaster Risk Prevention, Mitigation, and Better Risk Management</li> <li>Promote attitude and behaviour change in the awareness campaigns/IEC</li> <li>Promote use of Insurance/ Risk Transfer</li> <li>Promote Community Radio</li> <li>Strengthening network of Civil Society Organizations for awareness generation about DRR and DM</li> <li>Information on care and protection of disaster-affected animals.</li> </ul> |
| 4                          | Mock Drills/ Exercises                 | KSDMA in coordination with RD,SDRF, SLSDA, KSF&ES, Police, Home guards & Civil defence, Coast guard                                                                                 | <ul style="list-style-type: none"> <li>Joint planning and execution of emergency drills</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5                          | Vocational Training/ Skill Development | KSDMA                                                                                                                                                                               | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Conduct training programmes</li> <li>Develop a team of Trainer-of-Trainers for</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Flood CAPACITY DEVELOPMENT |                                                               |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                    | Sub-Thematic Area for DRR                                     | State Agencies and their Responsibilities                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                            |                                                               | State Agencies                                                                                                                          | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                            |                                                               |                                                                                                                                         | <p>different trades relevant to flood-resistant construction.</p> <ul style="list-style-type: none"> <li>KSDMA in co-ordination with KSDMA, RD, SDRF, SLSDA, KSF&amp;ES, Police, Home guards &amp; Civil defence, Coast guard to periodically conduct sector specific mock drills / capacity building programmes for officers and community volunteers in flood prone areas.</li> <li>Ex-service men, Swimmers &amp; Divers in the local community to be engaged in the mock drill during the Flood event.</li> </ul>                                                                                    |
| 6                          | Empowering women, marginalised, and persons with disabilities | KSDMA, Women & Child Development Dept, Department of Social welfare, Dept. for the Empowerment of Differently Abled and Senior Citizens | <p><b>Recurring/ Regular</b></p> <ul style="list-style-type: none"> <li>Incorporating gender sensitive and equitable approaches in capacity development covering all aspects of disaster management at the state, district, and local levels.</li> <li>KSDMA in co-ordination with Concerned Departments / Agencies to incorporate Gender / Community specific DRR measures in planning and implementing the Programmes / Schemes.</li> <li>SHG's / NGO's to be engaged in creating awareness about Gender / Community specific DRR measures</li> </ul>                                                  |
| 7                          | Community-Based Disaster Management                           | CDM-ATI, KSNDMC, KSDMA                                                                                                                  | <p><b>Recurring/ Regular</b></p> <ul style="list-style-type: none"> <li>Strengthen ability of communities to manage and cope with disasters based on a multi-hazard approach</li> <li>Strengthen ability of communities to manage and cope with disasters based on a multi-hazard approach</li> <li>Training for panchayat, SHG, NCC, NSS, Youth, local community organizations.</li> <li>NCC, NSS Cadets at local level, SHG's / NGO's to be engaged for DRR / DM measures.</li> <li>RD&amp;PR in co-ordination with KSDMA &amp; KSNDMC to conduct DM / DRR based activities at local level.</li> </ul> |

## CLIMATE CHANGE RISK MANAGEMENT

| Flood CLIMATE CHANGE RISK MANAGEMENT |                                                                         |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------|-------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                              | Sub-Thematic Area for DRR                                               | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                      |                                                                         | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 1                                    | Research, Forecasting / Early Warning, Data Management, Zoning, Mapping | KSNDMC, KSRSAC, SDC, EMPRI                | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>KSNDMC / EMPRI in co-ordination with Universities / Research Centres to take up studies on Climate Change &amp; Flood Risk.</li> <li>Support National Risk Reduction efforts related to GACC</li> <li>Coordination with central agencies</li> <li>Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation</li> <li>Document state-specific GACC impacts and coping mechanisms</li> </ul> |
|                                      |                                                                         | KSNDMC, CDM-ATI, KSRSAC                   | <ul style="list-style-type: none"> <li>Promote state-specific studies on enhanced risks (economic, social, etc.) under different GACC impact scenarios.</li> <li>Promote research studies with State specific contexts on GACC and consequent changes in hazards.</li> </ul>                                                                                                                                                                                                                      |
| 2                                    | Hazard Risk Vulnerability and Capacity Assessment (HRVCA)               | KSNDMC, CDM-ATI                           | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Undertake HRVCA as part of preparing and periodic revision of DM plans.</li> <li>Develop strategies for structural and non-structural measures based on HRVCA.</li> <li>Assess GACC risks of vulnerable and marginalized sections.</li> </ul>                                                                                                                                                                                    |
| 3                                    | Climate Change Adaptation (CCA)                                         | KSDMA                                     | <ul style="list-style-type: none"> <li>KSDMA in co-ordination with KSNDMC, EMPRI and other concerned Agencies to take up Sector specific Climate Change Adaption Programmes.</li> </ul>                                                                                                                                                                                                                                                                                                           |
|                                      |                                                                         | EMPRI                                     | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Sensitization and awareness creation.</li> <li>Support national CCA efforts.</li> <li>Sponsor and promote state-specific efforts and local efforts for GACC Mitigation and Adaptation.</li> <li>Develop local adaptation strategies and pilot projects.</li> <li>Sponsor and promote state-specific efforts and local efforts.</li> <li>Implementation of GACC adaptation programs.</li> </ul>                                   |

| Flood CLIMATE CHANGE RISK MANAGEMENT |                           |                                           |                                                                                                                                                                                                                               |
|--------------------------------------|---------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                              | Sub-Thematic Area for DRR | State Agencies and their Responsibilities |                                                                                                                                                                                                                               |
|                                      |                           | State Agencies                            | Responsibility                                                                                                                                                                                                                |
|                                      |                           |                                           | <ul style="list-style-type: none"> <li>Promote appropriate combinations of Green and Blue infrastructure approach.</li> <li>Integrate adaptive measures in social protection programmes for the vulnerable groups.</li> </ul> |

Source: KSDMP and NDMP

### Urban Flood Risk Reduction

| Flood Understanding Disaster Risk |                                          |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                           | Sub-Thematic Area for DRR                | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                   |                                          | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1                                 | Mapping/ Zoning                          | KSNDMC<br>KRSAC<br>ULBs                   | <ul style="list-style-type: none"> <li>Prepare and update urban flood hazard maps in all ULBs .</li> <li>Flood hazard assessment will be made on the basis of rainfall intensities and duration and land use changes.</li> <li>Control and supervision of land use in floodplain.</li> <li>Develop city wide and ward level flood plain vulnerability map .</li> <li>Coordinate with the state agencies and implement recommendations.</li> <li>Prepare and update urban flood hazard maps in all ULBs.</li> </ul> |
| 2                                 | Estimation of Possible Inundation levels | KSNDMC<br>KRSAC<br>ULBs                   | <ul style="list-style-type: none"> <li>The magnitudes of inundation levels will be stimulated on GIS based inundation model.</li> <li>Incorporating drainage capacities to estimate depth, duration and extent of inundation by using an integrated city specific framework.</li> <li>Convert the real time data or forecasted information into flood hazard maps.</li> <li>Develop land use planning based on multi-hazard disaster risk assessment.</li> </ul>                                                   |
| 3                                 | Estimation of Flood Damages              | KRSAC<br>ULBs                             | <ul style="list-style-type: none"> <li>Information system will have to be developed using high resolution satellite images.</li> <li>Prepare data base on flood vulnerable population.</li> <li>Prepare resource information for urban</li> </ul>                                                                                                                                                                                                                                                                  |

| Flood   |                                                                                                 | Understanding Disaster Risk                              |                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                                                       | State Agencies and their Responsibilities                |                                                                                                                                                                                                                                                                                                                                                                                                 |
|         |                                                                                                 | State Agencies                                           | Responsibility                                                                                                                                                                                                                                                                                                                                                                                  |
|         |                                                                                                 |                                                          | flood management.                                                                                                                                                                                                                                                                                                                                                                               |
| 4       | Ward level Risk Reduction and Vulnerability Assessment                                          | KSNDMC, KRSAC, City Corporations and Town Municipalities | <ul style="list-style-type: none"> <li>Develop city wide and ward level flood plain vulnerability map.</li> <li>Prepare and update urban flood hazard maps in all wards.</li> <li>Ward level information system will have to be developed using high resolution satellite images.</li> </ul>                                                                                                    |
| 5       | Maximize real-time hydro-meteorological network to cover all urban centres                      | KSDMA, KSNDMC, ULBs                                      | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Coordinate with the concerned Departments and Agencies and implement the flood mitigation measures.</li> <li>State Urban Flood Disaster Management Information System.</li> </ul>                                                                                                                                              |
|         |                                                                                                 | ULBs                                                     | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Place land-use planning maps in public domain.</li> <li>Undertake adequate studies, evaluations, and planning taking into account land use constraints to prevent flooding.</li> </ul>                                                                                                                                         |
|         |                                                                                                 | KRSAC, KSNDMC                                            | The magnitudes of inundation levels due to various scenarios and causes will be simulated on GIS-based inundation model.                                                                                                                                                                                                                                                                        |
| 6       | Establish Automatic Rain Gauge Stations, Automatic Weather Stations for 24X7 weather monitoring | KSNDMC                                                   | <ul style="list-style-type: none"> <li>KSNDMC to install and maintain the Automatic Weather Monitoring Stations Network.</li> <li>Set up EOCs by the ULBs connected to KSNDMC &amp; SEOC.</li> <li>Install rain gauge stations as per norms.</li> <li>Disseminate rainfall and urban flood information to all urban local bodies and other concerned officials for flood mitigation.</li> </ul> |
| 7       | Establishment of local networks for real-time rainfall data                                     | KSNDMC, ULBs                                             | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Coordinate with KSNDMC MOES (IMD) in setting up and maintenance of local networks at identified places.</li> </ul>                                                                                                                                                                                                             |
| 8       | Establishment of DWR network                                                                    | KSDMA, KSNDMC                                            | <ul style="list-style-type: none"> <li>KSNDMC to co-ordinate and establish DWR network</li> </ul>                                                                                                                                                                                                                                                                                               |
| 9       | Information Systems, Monitoring,                                                                | KSDMA, KSNDMC                                            | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Assist ULBs to setup Monitoring, Forecasting and Early Warning Systems.</li> </ul>                                                                                                                                                                                                                                             |



| Flood   |                                                           | Understanding Disaster Risk               |                                                                                                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                 | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                |
|         |                                                           | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                 |
|         | Forecasting, Early Warning                                | ULBs                                      | <ul style="list-style-type: none"> <li>• Setup Monitoring, Forecasting and Early Warning Systems</li> <li>• Facilities, exclusively setup by the ULBs, will be operated and maintained by them</li> </ul>                                                                                                                      |
| 10      | Marking of HFL and documentation                          | WRD, ULBs                                 | <ul style="list-style-type: none"> <li>• Marking of High Flood Level (HFL) / Full Tank Level (FTL)</li> </ul>                                                                                                                                                                                                                  |
| 11      | Hazard Risk Vulnerability and Capacity Assessment (HRVCA) | KSDMA, KSNDMC, ULBs<br>ATI-CDM            | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>• Undertake HRVCA as part of preparing and periodic revision of state and district DM plans</li> <li>• Constitute/ strengthen the mechanisms for consultation with experts and stakeholders</li> <li>• Promote studies, documentation and research</li> </ul> |

## INTER-AGENCY COORDINATION

| Flood   |                             | Understanding Disaster Risk                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|-----------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR   | State Agencies and their Responsibilities           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|         |                             | State Agencies                                      | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1       | Overall disaster governance | KSDMA<br>ULBs, KUWSD                                | Recurring/ Regular <ul style="list-style-type: none"> <li>Co-ordinate all aspects of Disaster Risk Management and mainstreaming DRR.</li> <li>Preparation and implementation of DM plans and ensure the functioning of agencies with DM tasks.</li> <li>Maintain IDRN information base for resource identification and deployment.</li> <li>Ensuring coherence and mutual reinforcement of DRR, CCA and development.</li> <li>Work in coordination with all line departments in overall DM.</li> </ul> |
| 2       | Response                    | Revenue Dept., (DM), KSDMA                          | <ul style="list-style-type: none"> <li>Organising and coordinating immediate response.</li> <li>Coordinate with central agencies.</li> <li>KSDMA in consultation with Revenue Department(DM) to coordinate, guide and command the Rescue, Relief &amp; Rehabilitation.</li> </ul>                                                                                                                                                                                                                      |
|         |                             | ULBs                                                | <ul style="list-style-type: none"> <li>To create Task force on Urban Flood Management in respective ULBs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                   |
|         |                             | Dept., (DM), KSDMA, SDRF, KSFES, Police             | <ul style="list-style-type: none"> <li>Organising and coordinating the immediate response towards Search, Rescue, Evacuation, Emergency Relief Response &amp; Rehabilitation.</li> <li>Provide necessary resources in terms of material, manpower and monetary support.</li> <li>Coordinate with the concerned Departments for necessary support.</li> <li>Mobilize necessary resources from Govt., private, CSOs, NGOs &amp; community for response activities.</li> </ul>                            |
| 3       | Warnings, Information, Data | Revenue Dept., (DM), KSDMA, SEOC, KSNDMC            | <ul style="list-style-type: none"> <li>Effective coordination and seamless communication among State and District agencies to ensure quick, clear, effective dissemination of Warnings, Information and Data.</li> <li>Dissemination of Warnings to the last mile.</li> </ul>                                                                                                                                                                                                                          |
| 4       | Non-structural measures     | Revenue Dept., (DM), KSDMA, ULBs, KUWSD, PWD, KPTCL | <ul style="list-style-type: none"> <li>Coordination among District/Urban agencies for ensuring updated norms/ codes and their implementation, enforcement and monitoring.</li> <li>Coordination among State and District/Urban agencies for               <ol style="list-style-type: none"> <li>revised/ updated rules, norms</li> <li>adoption of new/updated standards,</li> <li>enact/amend laws, regulations and</li> <li>adopt/ review policies</li> </ol> </li> </ul>                           |

## INVESTING IN DRR– STRUCTURAL MEASURES

| Flood   |                                                                                                                       | Investing in DRR – Structural Measures                   |                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                                                                             | State Agencies and their Responsibilities                |                                                                                                                                                                                                                                                                                                                                                                                                                |
|         |                                                                                                                       | State Agencies                                           | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1       | Civil Works                                                                                                           | PWD ULBs                                                 | <ul style="list-style-type: none"> <li>All road re-levelling works or strengthening/ overlay works to be carried out by milling the existing layers of the road so that the road levels will not be allowed to increase.</li> <li>Ensure protection of Water Bodies and its restoration/ revival.</li> <li>Scientific Solid Waste Management.</li> <li>Remove encroachments and take strict action.</li> </ul> |
|         |                                                                                                                       | KUWSD                                                    | <ul style="list-style-type: none"> <li>Upgrade and manage the existing Drainage and Storm Water Systems</li> <li>Protection of Water Bodies.</li> <li>Drain inlet points along the roads to be positioned and cleaned regularly.</li> </ul>                                                                                                                                                                    |
|         |                                                                                                                       | PWD, Dept of Transport, BMRCL, Railways, NHAI, ULBs      | <ul style="list-style-type: none"> <li>Bus and Metro Terminals, Railway stations and Airports to be made flood-proof by providing efficient drainage for a much higher rainfall intensity.</li> </ul>                                                                                                                                                                                                          |
| 2       | Establishment of Emergency Operation Centres                                                                          | SEOC, DEOCs, ULBs                                        | <ul style="list-style-type: none"> <li>Ensure round the clock operations of SEOCs during the Flood season with adequate manpower/resources.</li> <li>Respective ULBs to set up EOCs and ensure round the clock operations.</li> </ul>                                                                                                                                                                          |
| 3       | Hazard resistant construction, strengthening, and retrofitting of all lifeline structures and critical infrastructure | ULBs, PWD and other concerned Depts. Housing Departments | <ul style="list-style-type: none"> <li>Regulate and implement building bye-laws and flood plain zoning regulations</li> <li>Retrofit lifeline buildings and critical infrastructure</li> <li>Collaboration with technical agencies and implementation</li> <li>Construct Flood Resistant Housing</li> </ul>                                                                                                    |

## INVESTING IN DRR – NON-STRUCTURAL MEASURES

| Flood   |                                                                         | Investing in DRR – Non Structural Measures |                                                                                                                                  |
|---------|-------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR                                               | State Agencies and their Responsibilities  |                                                                                                                                  |
|         |                                                                         | State Agencies                             | Responsibility                                                                                                                   |
| 1       | Preparation of comprehensive Urban Storm Drainage Design Manual (USDDM) | KUWSD                                      | <ul style="list-style-type: none"> <li>State will consider current standard practices and specific location rainfall.</li> </ul> |

| Flood Investing in DRR – Non Structural Measures |                                                                |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------|----------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                          | Sub-Thematic Area for DRR                                      | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                  |                                                                | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                  |                                                                | ULBs                                      | <ul style="list-style-type: none"> <li>Take initiatives and collaborate with State agencies to prepare and implement the USDDM in all ULBs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 |
| 2                                                | Preparation of Storm Water Drainage System Inventory           |                                           | <ul style="list-style-type: none"> <li>Promote storm water drainage information system based on best technologies available integrating spatial and non-spatial data.</li> <li>Coordinate with ULBs in preparing the inventory.</li> </ul>                                                                                                                                                                                                                                                                             |
| 3                                                | Operation and Maintenance of Drainage Systems                  | KUWSD                                     | <ul style="list-style-type: none"> <li>Provide guidelines and carry out monitoring and evaluation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4                                                | Environmental Impact Assessment                                | KSPCB<br>Dept. of Forest & Ecology        | <ul style="list-style-type: none"> <li>Issue guidelines for making storm water drainage and solid waste concerns a part of all EIA norms in all ULBs.</li> <li>Minimize loss of ecologically important areas and natural wetlands.</li> </ul>                                                                                                                                                                                                                                                                          |
|                                                  |                                                                | ULBs                                      | <ul style="list-style-type: none"> <li>Ensure strict compliance with the guidelines and land-use planning consistent with proper storm water and solid waste management.</li> </ul>                                                                                                                                                                                                                                                                                                                                    |
| 5                                                | Techno-Legal Regime<br>Land use planning<br>City/Town Planning | Dept of Revenue,<br>KSDMA<br>ULBs         | <ul style="list-style-type: none"> <li>Coordinate for compliance with Techno-Legal Regime by all the ULBs.</li> <li>Protect natural water tanks from encroachment in all ULBs.</li> <li>Promote and Implement Rain Water Harvesting In Towns And Cities.</li> </ul>                                                                                                                                                                                                                                                    |
|                                                  | Risk Transfer                                                  | DTCP KUWSD                                | <ul style="list-style-type: none"> <li>Technical guidance and support to strengthen Land-use &amp; Flood Plain planning.</li> <li>Incorporate the topography and specific terrain elements such as hilly, coastal, etc. in the land use plan to minimize flooding allowing free flow of storm water along the natural contours.</li> <li>Incorporate Water Sensitive Urban Design (WSUD) considerations into land use &amp; flood plain planning.</li> <li>Construct detention ponds to retain storm water.</li> </ul> |
| 6                                                | Constitution of Urban Flooding Cell for Integrated UFDM        | KSDMA, ULBs<br>SDMA                       | <ul style="list-style-type: none"> <li>Lead role in the establishment of the technical umbrella at the state level</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                  |                                                                |                                           | <ul style="list-style-type: none"> <li>Constitute Urban Flooding Cell at district level and a DM Cell to be constituted at the ULB level for managing urban flooding at local level.</li> </ul>                                                                                                                                                                                                                                                                                                                        |
| 7                                                | Public Private Partnerships                                    | Revenue Dept. (DM), Corporate Bodies      | <ul style="list-style-type: none"> <li>Revenue Dept (DM) to support and implement regulations.</li> <li>Jointly prepared PPP based urban flood</li> </ul>                                                                                                                                                                                                                                                                                                                                                              |

| Flood Investing in DRR – Non Structural Measures |                           |                                           |                                                                                                                                        |
|--------------------------------------------------|---------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                          | Sub-Thematic Area for DRR | State Agencies and their Responsibilities |                                                                                                                                        |
|                                                  |                           | State Agencies                            | Responsibility                                                                                                                         |
|                                                  |                           |                                           | management projects <ul style="list-style-type: none"> <li>Promote private participation in disaster management facilities.</li> </ul> |

## CAPACITY DEVELOPMENT

| Flood Investing in DRR – CAPACITY DEVELOPMENT |                           |                                           |                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------|---------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                       | Sub-Thematic Area for DRR | State Agencies and their Responsibilities |                                                                                                                                                                                                                                                                                                                                                      |
|                                               |                           | State Agencies                            | Responsibility                                                                                                                                                                                                                                                                                                                                       |
| 1                                             | Education and Training    | ATI-CDM                                   | <ul style="list-style-type: none"> <li>Conducting and coordinating training to all levels of Government officials involved in DM.</li> </ul>                                                                                                                                                                                                         |
|                                               |                           | SIUD                                      | <ul style="list-style-type: none"> <li>Upgrade skills of stake holders to identify and meet continuous challenges arising in urban development and management.</li> <li>Provide guidance in planning and designing cities and its infrastructure through knowledge-based skill set specific to their regional needs.</li> </ul>                      |
|                                               |                           | SIRD                                      | <ul style="list-style-type: none"> <li>Conduct Training Programmes for the Elected Representatives, officers, staff of Panchayat Raj Institutions and NGOs.</li> </ul>                                                                                                                                                                               |
|                                               |                           | Police Training Academies                 | <ul style="list-style-type: none"> <li>Conduct training to police officers in Disaster Management- Crowd Management, Evacuation, Rescue and Relief Operations.</li> <li>Conduct Search and Rescue training to local volunteers.</li> </ul>                                                                                                           |
|                                               |                           | KSF&ES                                    | <ul style="list-style-type: none"> <li>Conduct training to Fire Officers, Civil Defense, NGOs and Community Volunteers in DM.</li> <li>Upgrade equipment handling skills of F&amp;ES for UFD.</li> </ul>                                                                                                                                             |
|                                               |                           | SDRF, NDRF                                | <ul style="list-style-type: none"> <li>Conduct training to SDRF and NDRF personals – Search, rescue, evacuation and ERR.</li> <li>Community training programs to prepare volunteers for DM.</li> <li>To identify and prepare a list of Ex-service men, Swimmers &amp; Divers in the local community to be engaged during the Flood event.</li> </ul> |
|                                               |                           | Health Department                         | <ul style="list-style-type: none"> <li>Conduct training and awareness camps to Health officials and community personals in Disaster Management.</li> <li>Training volunteers on emergency preparedness programs such as first aid and preventive measure against diseases.</li> </ul>                                                                |

| Flood Investing in DRR – CAPACITY DEVELOPMENT |                                                               |                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No.                                       | Sub-Thematic Area for DRR                                     | State Agencies and their Responsibilities                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                               |                                                               | State Agencies                                                                                                                        | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                               |                                                               | Animal husbandry and veterinary services                                                                                              | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Enlist professionals for veterinary care and support to disaster-affected animals</li> <li>Training volunteers, Shepherds, Cowherds etc., for assisting the veterinary professionals during the disaster.</li> </ul>                                                                                                                                                                                                                                                                           |
|                                               |                                                               | Education Department                                                                                                                  | <ul style="list-style-type: none"> <li>Introduce UFDm modules in school curricula.</li> <li>State Government will encourage their school boards to develop similar content in their school curriculum.</li> <li>Orientation on urban disasters in schools.</li> </ul>                                                                                                                                                                                                                                                                                           |
| 2                                             | Awareness Generation                                          | Revenue Department (DM), SDMA, ATI-CDM, KSNDMC, SDRF, KSFE&S, Civil defense, Police, Home guards, Information & public relation dept. | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Carry out mass media campaigns in all ULBs</li> <li>Promote Culture of Disaster Risk Prevention, Mitigation, and Better Risk Management.</li> <li>Promote Attitude and Behavioral Change Communication through awareness campaigns/ IEC</li> <li>Promote use of Insurance/ Risk Transfer</li> <li>Promote Community Radio</li> <li>Strengthening network of Civil Society Organizations for awareness generation about DRR and DM</li> <li>Encourage narrowcasting and broadcasting</li> </ul> |
| 3                                             | Documentation                                                 | SDMA, KSNDMC, ULBs and all line departments                                                                                           | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Ensure accurate documentation of all aspects of disaster events for creating good historical records for future research and Risk Management planning.</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| 4                                             | Empowering women, marginalized, and persons with disabilities | Dept. of Women and Child Development                                                                                                  | <ul style="list-style-type: none"> <li>Incorporating gender sensitive and equitable approaches in capacity development covering all aspects of disaster management.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |
| 5                                             | Community-Based Disaster Management                           | SIUD and SIRD                                                                                                                         | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Promotion and Support to Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach.</li> <li>Training for RWA, SHG, NCC, NSS, Scouts &amp; Guides, Youth, Ward Committees, local</li> </ul>                                                                                                                                                                                                                                                     |



| Flood   |                           | Investing in DRR – CAPACITY DEVELOPMENT                                                               |                                                                                                                                                      |
|---------|---------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sl. No. | Sub-Thematic Area for DRR | State Agencies and their Responsibilities                                                             |                                                                                                                                                      |
|         |                           | State Agencies                                                                                        | Responsibility                                                                                                                                       |
|         |                           |                                                                                                       | community organizations.                                                                                                                             |
| 6       | Mock Drills/<br>Exercises | SDRF, KSFE&S, Civil Defense, Police, Home guards, Information & public relation dept., Youth & Sports | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Promoting the planning and execution of emergency drills and simulation.</li> </ul> |

Source: KSDMP and NDMP

| CLIMATE CHANGE RISK MANAGEMENT |                                                                         |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|-------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flood                          |                                                                         | Investing in DRR – Non Structural Measures |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Sl. No.                        | Sub-Thematic Area for DRR                                               | State Agencies and their Responsibilities  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                |                                                                         | State Agencies                             | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1                              | Research, Forecasting / Early Warning, Data Management, Zoning, Mapping | KSNDMC, KRSRAC, EMPRI                      | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>KSNDMC / EMPRI in co-ordination with Universities / Research Centres to take up studies on Climate Change &amp; Flood Risk.</li> <li>Support national risk reduction efforts related to GACC.</li> <li>Coordination with central agencies.</li> <li>Sponsor and promote state-specific efforts and local efforts for GACC Mitigation and Adaptation.</li> <li>Document state-specific GACC impacts and coping mechanisms.</li> </ul>                                                                                                                                      |
|                                |                                                                         | KSNDMC, CDM-ATI, KRSRAC                    | <ul style="list-style-type: none"> <li>Promote state-specific studies on enhanced risks (economic, social, etc.) under different GACC impact scenarios.</li> <li>Promote research studies with State specific contexts on GACC and consequent changes in hazards.</li> </ul>                                                                                                                                                                                                                                                                                                                                                               |
| 2                              | Hazard Risk Vulnerability and Capacity Assessment (HRVCA)               | KSNDMC, CDM-ATI                            | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Undertake HRVCA as part of preparing and periodic revision of DM plans.</li> <li>Develop strategies for structural and non-structural measures based on HRVCA.</li> <li>Assess GACC risks of vulnerable and marginalized sections.</li> </ul>                                                                                                                                                                                                                                                                                                                             |
| 3                              | Climate Change Adaptation (CCA)                                         | KSDMA                                      | <ul style="list-style-type: none"> <li>KSDMA in co-ordination with KSNDMC, EMPRI and other concerned Agencies to take up Sector specific Climate Change Adaption Programs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                |                                                                         | Dept. of Forest & Ecology, EMPRI           | <b>Recurring/ Regular</b> <ul style="list-style-type: none"> <li>Sensitization and awareness creation.</li> <li>Support national CCA efforts.</li> <li>Sponsor &amp; promote state-specific local efforts for GACC Mitigation &amp; Adaptation.</li> <li>Develop local adaptation strategies and pilot projects.</li> <li>Sponsor and promote state-specific efforts and local efforts.</li> <li>Implementation of GACC adaptation programs.</li> <li>Promote appropriate combinations of Green and Blue infrastructure Approach.</li> <li>Integrate adaptive measures in social protection programs for the vulnerable groups.</li> </ul> |

# 07

---

## **SOCIAL ASPECTS, INSTITUTIONAL FRAMEWORK AND FINANCIAL ARRANGEMENTS FOR FLOOD REDUCTION AND RESPONSE**

---

|                                                                                     |     |
|-------------------------------------------------------------------------------------|-----|
| 7.1 Social Aspects of Flood Reduction and Response .....                            | 199 |
| 7.2 Valuation of Losses .....                                                       | 200 |
| 7.3 Insurance .....                                                                 | 201 |
| 7.4 Response Strategies .....                                                       | 201 |
| 7.5 Disaster Management Act .....                                                   | 203 |
| 7.6 Constitutional Provisions .....                                                 | 204 |
| 7.7 The Primary Responsibility for Flood Control .....                              | 204 |
| 7.8 Role of State Government Department/Agencies .....                              | 206 |
| 7.9 Voluntary, Bilateral and Multilateral Agencies .....                            | 213 |
| 7.10 District Disaster Management Authority .....                                   | 216 |
| 7.11 Intra-State Multi-Sectoral Coordination .....                                  | 217 |
| 7.12 Financial Arrangement for Flood Relief,<br>Reconstruction and Mitigation ..... | 218 |



## **Social Aspects, Institutional Framework and Financial Arrangements for Flood Reduction and Response**

Different social groups have different needs when a Flood occurs. Generally, marginalized groups have less social power and fewer economic resources and physical capacity to anticipate, survive and recover from the effects of massive floods. There is an intrinsic relationship between poverty and vulnerability. In addition, the elderly, the disabled and children are particularly vulnerable, and gender is especially important to flood risk reduction.

### **7.1 Social Aspects of Flood reduction and Response**

**Poverty:** is a key dimension of any initiative in flood disaster risk management. Poverty affects people's capacity to protect themselves and their assets, as well as their ability to live in areas having less exposure to risk. Disaster vulnerability and poverty are mutually reinforcing. Factors such as low income, poor housing and public services, lack of social security and insurance coverage force the poor to behave in ways that expose them to greater risk. Creating diverse income-generating opportunities is an essential element of successful flood disaster risk management. While simple access to resources such as land is important, ignoring the full dynamics of a successful local economy can be disastrous.

Karnataka is one of the progressive states in the country accounts for about 6% of India's national income and contribute 8% of GDP. Per capita income and economic performance is consistently above the national average. Over 12.9 million or 21% people in Karnataka live below the poverty line. In 2011, 21.2% of Karnataka's population lived in poverty lower than 22% nationwide. A larger proportion of SC and ST population is 33.2% and 31.5%, respectively. The state's strong industrial base, rich mineral resources, but poverty number are very high.

Out of 12 district in northern Karnataka all districts possess higher poverty than state average and frequent drought and flood hit districts. Agriculture is stagnant or slightly shrinking. Even if the state is facing drought only 33 per cent of the land is under irrigation. There is scope for irrigation to increase and proper utilization of excess water during the flood years and by adopting sustainable integrated water resource and effective flood management in the state.

**Gender issues:** Women and children, being the most vulnerable groups of the society, tend to be most affected by natural disasters. There is a strong link between the well-being of children and that of women.

Improving the situation of women is the best way to advance the survival and recovery of children. Women often die disproportionately in disasters, if they do not receive timely warnings or other information about hazards and risks, or are prevented from acting on them. Their mobility in disasters may be restricted or otherwise affected due to cultural and social constraints.

The need to stimulate community involvement and empowerment of women at all stages of disaster management programmes is an integral part of reducing community vulnerability to natural disasters.

Even though Karnataka is ranked seventh in India for gender equality as per the SDG index, it leaves much to be desired when it comes to women's representation in decision-making process is a basic requirement of their safety during flood and disaster situation. Women, girls, boys and men belonging to different age and socio-economic strata have distinct vulnerabilities, and this shapes the way they experience disaster, and also their ability to recover from it.

## **7.2 Valuation of losses:**

It is important to assess disaster impacts to help governments adjust their financial planning scenarios and economic growth rate projections to offset or reflect the social, economic and environmental impacts of shocks caused by disasters. Such assessments also help to further our understanding of the importance of mitigation measures. First, it is possible that economic decisions are sometimes made in a manner that stresses short-term benefits and costs. If, however, a long-term perspective is taken, the benefits of preventing, minimizing or responding to water related hazards are clear. Second, it is usually difficult to include environmental and social impacts to economic calculations, even if the importance of those impacts is recognized. There is still a need for standardization of the assessment of economic, social and environmental losses for comparative purposes, and for an approach that reflects the reality on the community level.

Conceptually it is important to note the difference between flood damages and flood losses. The term "flood damage" is related to the physical damage of public and private assets such as infrastructure, houses, vehicles, etc., resultant of contact with flood waters. The term "flood loss" has a much broader meaning and depicts also secondary or tertiary losses, as well as intangible losses such as losses to human life and others. To arrive at realistic estimates about the impact of a flood, only considering flood damages,



i.e. direct tangible losses, would usually not do justice to the purpose of assessment, and would probably arrive at misleading messages to policy makers about the true impact and consequences of a flood event.

Most commonly the following distinction is applied direct losses: Those losses resulting from direct contact with flood water, to buildings and infrastructure Indirect losses: Losses resulting from the event but not from its direct impact, for example, transport disruption, business losses that can't be made up, losses of family income etc. In both loss categories, there are two clear sub-categories of loss: Tangible losses: Loss of things that have a monetary (replacement) value, for example, buildings, heritage items, memorabilia etc. livestock, infrastructure etc. Intangible losses: Loss of things that cannot be bought and sold, for example, lives and injuries.

### **7.3 Insurance:**

Risk sharing and risk transfer at national, community and household levels can also help to reduce overall losses, improve resiliency and contribute to expeditious recovery. Insurance can be one tool to improve the situation of individuals by compensation. It helps spread the risk of disaster across society. Lending institutions can also play a different role by encouraging implementation of mitigation measures. Mitigation efforts are a form of protecting against future potential losses. Lowering risk can help lower the rates for insurance, thereby making it more affordable for the people. Rates should reflect the mitigation measures undertaken by the community and individuals (e.g., implementation of flood plain development policy and plans, flood proofing, forecasting and warning systems, and real-time monitoring).

Flood insurance has four main roles (i) Reimbursing those who suffer damage, (ii) Spreading the costs of flooding across communities; and for individuals through time (iii) Reducing the costs to the government of post-event recovery since the insured will receive insurance funds and (iv) Promoting a change of behaviour with regard to exposure to flood risk, by giving a signal of the hazard that people face and providing incentives for "good behaviour".

### **7.4 Response Strategies:**

There is a growing realization that various flood mitigation measures must be combined in ways that are appropriate to effectively address local situations. A balance between structural and non-structural measures to manage floods and reduce losses is required, where the emphasis is shifting from large

structural solutions to innovative measures in flood proofing and improved building codes to non-structural flood measures such as land use regulation, flood plain management, compensation schemes, insurance schemes and the improved participation of local communities prone to flood hazards.

The value of community-based forecasting systems is recognized in reducing loss of life and decreasing economic losses, as they make use of local empirical knowledge as well as increase local capacity for reducing communal vulnerability to floods. The flood disaster management process should also be coordinated with efforts made in closely related fields. For example, the disaster mitigation process should consider human health impacts during flooding (e.g. cholera, e-coli, malaria), thereby more effectively addressing health issue that arise during flooding.

### **Community level:**

Community-based disaster management is essential for numerous reasons. First, communities are the ones who suffer the most. Second, community-based organizations act faster in responding to disaster before the arrival of external help. Third, local management leads to securing local support and ownership. Community involvement is also needed in planning for flood management, because in many cases there is a missing link between the disaster response actually needed and what is provided. In general, after the disaster has struck, responses are provided and managed at different levels in the form of relocation and zoning strategies, infrastructure rehabilitation, and restructuring of early warning systems.

Community-level organization, management and empowerment are essential to mitigate the effects of disasters. Community structures need to be formalized, and their role and capacities in disaster management strengthened. Reduction in future losses will depend on the ability of all levels to work together on preventative measures, to act jointly in the face of disasters, and to be able to draw on contingency plans.

### **Regional level:**

A special challenge is posed to flood management and disaster reduction and response in shared river basins. More regional cooperation is needed. The exchange of relevant data and information related to hydrological data, hydrological forecasts, weather forecasts, reservoir operation as well as major changes in land use and water use management are important steps to improving flood disaster reduction and

response. Regional collaboration is also a distinct possibility to foster data exchange, to develop common communication and forecast methodologies, and to exchange expertise.

### **Public Awareness and Communication:**

Communities should not be passive recipients of information. There is a need to encourage people to help themselves, and communities must be provided with the mechanisms and tools to do so. Communities need to be active in the information dissemination system. They require technology adapted to local needs and conditions and get educate and aware of possible flood mitigation and Improve their local empirical knowledge of flooding. There is a need to distinguish between information, education, and communication.

It is very important to link indigenous knowledge of basin response to forecasted or observed weather conditions. An effective public awareness programme can contribute a great deal to reducing disaster-related losses. When developing such a programme, it is important that the seriousness of the risk is accurately perceived and that information be communicated with the appropriate level of urgency. Also risk communication should be viewed as a continuous process, where the contents of the message should be continuously reviewed and improved. Finally, the messages should be kept as simple as possible.

## **7.5 Disaster management Act**

Sections 30 (2) (xix) of the DM Act mandates the DDMA for collaboration with stakeholder agencies including NGOs for the purpose of improving the effectiveness of DM. Similarly the Act mandates NGOs to act in an equitable and non-discriminatory manner for the purpose of assisting or protecting the disaster affected communities or for providing relief to the affected communities or while dealing with any effects of threatening disaster situations and has fixed the responsibility to monitor this on DDMA's vide section 34 (I).

Section 30 (2) (xix) of the DM Act stipulates that the DDMA shall “advise, assist and coordinate the activities of the Departments of the Government at the district level, statutory bodies and other governmental and non-governmental organizations in the district engaged in the disaster management” and Section 24 (I) lays down that the DDMA shall “ensure that the non-governmental organizations carry out their activities in an equitable and non-discriminatory manner”. The Act also directs the State Government under Section 38 (2) (a) to coordinate “actions of different departments of the Government

of the State, the State Authority, District Authorities, local authority and other non-governmental organizations”.

## 7.6 Constitutional Provisions

The subject of flood control, unlike irrigation, does not figure as such in any of the three legislative lists included in the Constitution of India. However, Drainage and Embankments, are the two measures specifically mentioned in entry 17 of List II (State List), reproduced below:

‘Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provision of entry 56 of List I (Union List).’

Entry 56 of List I (Union List) reads as follows:

‘Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest.’

## 7.7 The primary responsibility for flood control thus lies with the state:

### KSDMA and Revenue Department (DM), GoK

The KSDMA has the overall responsibility and powers to manage all types of Disasters in the State. It formulates State specific DM policies, plans and guidelines as per the National Disaster Management Policy. The Revenue Department (DM), GoK headed by the Secretary is the overall incharge of Disaster Management in the State. The Department functions as a coordinating and implementing agency for all the departments, district administrations, GoI and its agencies. The department works under the guidance of KSDMA. The department ensures the preparation and implementation of DDMP and SDMP by the DDMA. It is the Nodal Department to prepare Memoranda of loss and damage assessment and seek the required funds for relief and recovery from the GoI and Central agencies. It directs the district administrations, PSUs, UDAs, PRIs, ULBs, Industries, MaH units, Institutions, School and Colleges etc., to be prepared for disaster management by having a comprehensive disaster action plan comprising preparedness, prevention, response and recovery.

**DDMAs shall:**

- Prepare inventory of all research and academic institutions, NGOs and other stakeholders located in each district.
- Facilitate their membership within the technical committee(s)
- Establish Partnerships with line departments and external stakeholders
- Coordinate periodic meetings
- Support NGOs for community mobilization

**Table – 26 Institutional Arrangement for Preparedness**

| Departments/Agencies                                                                                                                                           | Preparedness Phase/Indicative Task                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 23 departments of GoK, DDMA, Coast Guard including Technical and Research Organizations, NGOs, SDRF, ULBs, PRIs, KPTCL, KPC, BSNL, AIC, KSNDMC, KRSAC, IMD | <ul style="list-style-type: none"> <li>• Vulnerability Assessment</li> <li>• Dissemination of Warning</li> <li>• Emergency Response Activities</li> <li>• Coordination</li> <li>• Maintenance of Essential Services</li> <li>• Stocking of Essential Commodities</li> <li>• Medicines</li> <li>• Drinking Water</li> <li>• Shelter/Camps</li> <li>• Mock Drills</li> <li>• Training Plan</li> </ul> |

**Table – 27 Institutional Arrangement for Mitigation**

| Departments/Agencies                                                                                                                                                                                                                                             | Mitigation Phase/Indicative Task                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 23 departments of GoK, DDMA, NGOs, ULBs, PRIs, KPTCL, KPC, BSNL, AIC (PWD, Irrigation, Housing Department, Factories and Boilers, Water supply, Health, Animal Husbandry have special role in mitigation, IISc, NITK, All Engineering Colleges, NIMHANS etc. | <ul style="list-style-type: none"> <li>• Structural and Non- Structural Mitigation</li> <li>• Short &amp; Long term Mitigation Building bye-laws, awareness, education, planning, HRV, repairs and retro-fitting of all vulnerable structures coming under respective departments</li> </ul> |

**Table – 28 Institutional Arrangement for Response**

| Departments/Agencies                                                                                                                                                                                                                                                                                                        | Response Phase/Indicative Task                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 23 departments of GoK, DDMA, IRS, EoC, SoC, NGOs, CBOs, SDRF, ULBs, PRIs, KPTCL, KPC, NIMHANS, BSNL, AIC (Police, Fire Service, Civil Defence, Home Guards, Para-Military Forces, Government and Private Hospitals have special role) IMD, CWC, KSNDMC, SEOC, Red cross society, MHA have special role in early warning | <ul style="list-style-type: none"> <li>• Search and Rescue</li> <li>• Evacuation Plan</li> <li>• Activate Control Rooms</li> <li>• Search and Rescue Team</li> <li>• Early warning and Communication</li> <li>• Identification of Nodal Officer</li> <li>• Rapid Damage Assessment</li> <li>• Relief</li> <li>• Rehabilitation</li> <li>• Reconstruction</li> </ul> |

## 7.8 Role of State Government Department/Agencies in Disaster Management

Revenue Department/KSDMA/DDMAs will take all appropriate measures for transparency in the relief operations. Affected people shall be apprised of the nature and quantum of relief admissible to them. Proper formats will be developed to acknowledge the receipt of relief materials and their further distribution. All



Relevant Department under the overall supervision of the DC and ADC will carry out damage and loss assessment in the first few weeks following the disasters.

**Table –29 Flood Damage Assessment**

| SL.No | Types of assessment               | Objectives                                                                                                                                 |
|-------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Rapid assessment                  | To determine the nature and get an overview extent of damage so that Rescue and Relief measures can be planned and prioritised Immediately |
| 2     | Detailed assessment               | To determine as precisely as possible the extent of damage so that Relief measures are undertaken in the affected areas                    |
| 3     | Individual levels loss assessment | To get details of specific losses and damages to life, livestock, housing, land – to enable restoration planning and provide compensation. |

### **KSNDMC**

Karnataka State Natural Disaster Monitoring Center (KSNDMC), a Registered Society affiliated to Department of Revenue (Disaster Management), Government of Karnataka is the nodal agency in the State to monitor the Natural Disasters in Karnataka. The Center has the mandate to achieve following objectives.

- Hazard mapping and vulnerability studies.
- Strengthening the application of Information Technology for Monitoring & Mitigating Natural Disasters.
- Monitoring and assessing the impact assessment of Natural Hazards.
- Human Resource Development mainly by imparting training to the Stakeholders.
- Developing Natural Disaster Early Warning System.

## Distinct Role of KSNDMC

KSNDMC has been established in 1988

- It monitors natural disasters viz Flood, Hailstorm, Storm Surge, Cyclone, Earthquake and Landslide in the State
- Governing Body of the KSNDMC is headed by the Chief Secretary, GoK with ACS & Development Commissioner as Vice President – Members comprising line departments and scientific organizations.
- The Master Control Facility of KSNDMC is established in 10 acres land at Major Sandeep Unnikrishnan Road, Near Atturu Layout, Yelahanka, Bengaluru. The Center has state-of-the-art facility to collect data at very high spatial and temporal resolution, data analysis, information and advisory generation and dissemination to the Stakeholders at near-real time through auto-mode. The necessary computer applications were developed indigenously.
- The Centre is operational 24hrs x 7days x 365 days providing information, reports, advisories to the Executives of GoK from State-level to Grampanchayath-level, Communities, Educational and Research Organizations.
- KSNDMC has been serving as a common platform to the various response players in the field of Natural Disaster Management by providing timely proactive Science and Technology based inputs.
- The Centre provides inputs to the farming community, Agriculture and Horticulture based sector, Fisherman, Transport Sector, Power and Electricity sector, State and District level Disaster Management Authorities in Karnataka through state of the art Information and Communication system developed by the Centre.
- KSNDMC had been continuously issuing locations specific weather forecast and alert to the stakeholders viz., district and taluk administration, SDRF, Civil Defence, Fire and Emergency Battalions, working in Kodagu district and adjoining areas.
- More than 2460 high intensity and heavy to very heavy rainfall alerts were issued to the officers of the area during 2<sup>nd</sup> week of August. These real time alerts helped the ground force to take actions accordingly.

- The state emergency operation centre was issuing necessary guidelines, support for mobilising material and manpower resources for carrying out rescue, relief and rehabilitation process.
- The ICT tools were used extensively at all levels.

### **State Executive Committee**

All state Government will appoint experts in FM in the faculty of their administrative training institutes, which will collaborate with the NFMI in organising the training of personnel in the field of FM.

Every state government will constitute a State Executive Committee (SEC) to assist the SDMA in the performance of its functions. The SEC will be headed by the chief secretary to the state government and coordinate and monitor the implementation of the national policy, the national plan and the state plan. It will also provide information to the NDMA relating to different aspects of DM.

### **State Flood Control Technical Advisory Committee**

Flood being a state subject, FM schemes are planned and executed by the State. The role of the central government is advisory, catalytic and promotional in nature. The state has to investigate, plan, construct, maintain and operate all flood works.

### **Water Resources Department**

The nodal organization is the Water Resources Department for the works and projects related to water management in the state. The Water Resources Department consists of four major corporations-KBJNL, KNNL CNNL and VJNL and they have been established in 1994, 1998 2003 and 2016 respectively. These four corporations are unique establishment of the state of Karnataka as these are envisaged as Special Purpose Vehicle for speedy implementation of irrigation projects and to enable the Government to borrow funds from external sources.

### **Central Water Commission (CWC)**

The Central Water Commission (CWC) provides flood forecasting and warning. The flood forecasting network of the CWC covers all the major flood-prone inter-state river basins in the country. Flood forecasting and warning system is used for alerting the likely damage and enables the people to move and also to remove the moveable property to safer places.

### **Bureau of Indian Standards (BIS)**

The Bureau of Indian Standards (BIS) provides standards for construction in seismic zones, popularly known as Building Codes. The building construction in urban and suburban areas is regulated by the Town and Country Planning Acts and Building Regulations.

### **Interest Group/Voluntary Groups:**

These are also NGOs, which are multi-purpose in nature having varied interests, such as the Rotary Club and Lion Club. Such interest groups are very active help to disaster victims in the times of need. They could also play a major role in resource mobilization for relief aid and rehabilitation purpose.

### **Association of Local Occupation groups:**

Such association are formed on the basis of common occupational backgrounds, and could include groups such as doctors' association, traders' association and Army wives' associations, officers & employees association etc. such groups, just like other interest groups, could play a major role in resource mobilization, and provision of specialized services to the victims in any emergency situation.

### **Geological Survey of India**

Geological Survey of India located at Chandigarh is responsible for coordinating and understanding geological studies for landslide hazard mitigation and for carrying out landslide hazard zonation, monitoring landslides and avalanches and studying the factors responsible for sliding and suggesting precautionary and preventive measures.

### **Building Material & Technology Promotion Council (BMPTC)**

As part of Ministry of Housing & Urban Poverty Alleviation BMPTC is knowledge and demonstration hub for providing simple solutions aimed at common man in the field of sustainable building materials, appropriate and disaster resistant construction.

### **CFTRI and DFRL**

These central institutions have come to the relief of affected in the form of readymade/package food materials and are located in Mysuru city

### **Religious Bodies**

Religious bodies such as Suttur matt, ISCON will come to the immediate rescue and relief of the disaster victims. These bodies have a large and dedicated following in their communities. They also have control over the local places of worship, which are usually built on high and safe ground, and can serve as ideal shelters for the disaster victims. Besides, they often have infrastructure and resources to feed mass gathering, which facilitate disaster relief work. District-wise inventory of all such facilities shall be prepared by respective DDMA.

### **Educational Institutions**

The education institutions such as schools and colleges play an important role in disaster management. Their prime responsibility is to spread awareness on natural disasters, provide preventive action needed to minimize damage due to disasters as well as ensure immediate relief and rescue. Besides, these institutions have large buildings at local level, which could be used as shelters for the victims in the times of disaster.

### **Indian Red Cross Society**

In India, we have Red Cross Society at the national, state and district levels. This is not just an agency, but also a movement for providing relief to the people when they are in dire need of it. Being apolitical organization it is the image of the Red Cross that makes, it one of the most acceptable institutions in the area of providing relief to the people in distress

### **Media**

Recently, the print, electronic new and social media have great impact on the people in India. Media also have the capacity to facilitate effective natural disaster management in urban and rural areas. The suggestive, informative and analytical role of the media must form a key component of disaster education. It is the most potent way of educating the community on disaster prevention, mitigation and rehabilitation.

### **India Meteorological Department**

The IMD established in 1875, is responsible for the National Meteorological Service and the principal government agency in all matters relating to meteorology, seismology and allied subjects. The IMD is mandated as follows:

- To take meteorological observations and to provide current and forecast meteorological information for optimum operation of weather-sensitive activities like agriculture, irrigation, shipping, aviation, offshore oil explorations, etc.
- To warn against severe weather phenomena like tropical cyclones, north-westerly dust storms, heavy rains and snow, cold and heat waves, etc., which cause destruction of life and property.
- To provide meteorological statistics required for agriculture, water resource management, industries, oil exploration and other nation building activities.
- To conduct and promote research in meteorology and allied disciplines.
- To detect and locate earthquakes and to evaluate seismicity in different parts of the country for development projects.

### **River Basin Organisations-Interstate Coordination**

FM being a state subject, state government has been dealing with it separately and in its own best interests. It has been felt that FM needs to be dealt with in a comprehensive way especially on rivers that are interstate in nature.

Monitoring (South) Organisation was setup in April 1995 as one of the Regional Offices of Central Water Commission with headquarter at Bangalore. The organisation is headed by a Chief Engineer, who is assisted by three Director level officers – Director (Monitoring), Director (Appraisal) and Superintending Engineer (Hydrological Observation & Coordination Circle) – with their sub-ordinate formations. The Organisation deals with Hydrological Observations, Flood Forecasting, Water Quality Monitoring, Appraisal and Monitoring of Major/Medium projects.

The Hydrological Observations, Flood Forecasting and Water Quality Monitoring activities are carried out in the river basins of Cauvery (in Karnataka and Kerala), Krishna (Malaprabha, Ghatprabha and Tungabhadra sub-basins) and West flowing rivers (spread across parts of Maharashtra and Goa).

### **Revenue Department (Disaster Management)**

- Coordination with Govt. of India and District Administration
- Overall control & supervision
- Damage assessment, finalization of reports and declaration of L1/L2/L3 disasters
- Mobilization of finance and other resources



## Home Department

- Requisition, deployment and providing necessary logistic support to the armed forces
- Provide maps for air dropping, etc.

## 7.9 Voluntary, Bilateral and Multilateral Agencies

Participation of the community is crucial in Disaster Management. However, preparing the community for appropriate response within a limited time and motivating it for adopting long-term mitigation measures would require a very sustained, intimate and a flexible approach. This is a challenge which can be effectively addressed through involvement of NGOs and CBOs (Community Based Organizations) due to their close linkages with the community, their outreach and flexibility in procedural matters.

### NGOs & CBOs

Local NGOs and CBOs, due to their proximity to the community, can act as a vital link between government and the community particularly during emergencies. They are in a better position to appreciate the area and time specific problems of the people and their flexibility in approach makes them more acceptable in the community. These organizations work generally in the fields of health, education, livelihood, micro-finance, infrastructure, animal husbandry, social reforms, etc.

Indian Red Cross Society and other international NGOs have considerable experience and expertise in emergency management. These organizations, apart from their resources and expertise, have a network of NGOs whom they can harness during emergencies. They could also play a vital role in information dissemination because of their existing global network.

**Table – 30 The NGOs can be used through following actions:**

| No. | Issues                             | Action Points                                                                                                                                                                                        |
|-----|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Geographic spread of NGOs          | Develop a database of NGOs at all levels working on disaster management focusing on geographic outreach and thematic capacities of the organizations.<br><b>(Action: DDMA with the help of NGOs)</b> |
| 2.  | Volume of support provided by NGOs | Compile statistics on quantum of support provided by NGOs at all levels, both international and national. <b>(Action: DDMA)</b>                                                                      |

| No. | Issues                                                        | Action Points                                                                                                                                                                                                                                                                                  |
|-----|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.  | <b>Coordination</b>                                           | Establishing inter agency mechanisms for coordination and networking activities (information and knowledge management, training and capacity building, collaborative advocacy, quality and accountability) at all levels.<br><b>(Action: DDMA)</b>                                             |
| 4.  | <b>Accessibility</b>                                          | Establish protocols for cooperation and ensure access to the affected areas with support from government agencies at respective levels like NDRF and SDRF that have good logistics base to reach inaccessible areas.<br><b>(Action: DDMA, NGOs, CBOs)</b>                                      |
| 5.  | <b>Hazard and vulnerability based planning</b>                | Conduct community centric hazard and vulnerability analysis at all levels, and develop disaster management plans in accordance.<br><b>(Action: DDMA, NGOs)</b>                                                                                                                                 |
| 6.  | <b>Community participation</b>                                | Ensure community participation in assessment, planning, implementation and monitoring of activities at all levels.<br><b>(Action: DDMA, NGOs, CBOs)</b>                                                                                                                                        |
| 7.  | <b>Mainstreaming of Disability Issues in DM</b>               | Support the most vulnerable groups through mitigation activities as well as disaster preparedness and response, with a particular focus on the special needs of the Persons with Disabilities (PWDs).<br><b>(Action: DDMA, NGOs)</b>                                                           |
| 8.  | <b>Gender Mainstreaming</b>                                   | Make women's as well as men's concerns and experiences an integral dimension in the design, implementation, monitoring and evaluation of policies and programs such that inequalities between men and women are not perpetuated through the routine operations of DM.<br><b>(Action: DDMA)</b> |
| 9.  | <b>Focus on most vulnerable rather than only on Epicentre</b> | National level: Advocate with all actors to reach out to gap areas<br>State level: Coordinate among actors to identify gap areas<br>District and Local level: Ensure targeting with equity and outreach to all excluded areas.                                                                 |

| No. | Issues                                 | Action Points                                                                                                                                                                                                                                                                                      |
|-----|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |                                        | <b>(Action: District NGO Task Forces in DM)</b>                                                                                                                                                                                                                                                    |
| 10. | <b>Rural-urban diversity</b>           | Develop the capacities of NGOs or specialized civil society agencies at all levels to manage urban as well as rural disasters and accordingly make investments.<br><b>(Action: DDMA)</b>                                                                                                           |
| 11  | <b>Adherence to standards</b>          | National level: Develop minimum standards for India<br>State level: Develop minimum standards for the state<br>District and Local level: Develop capacities for adherence to minimum standards through collective and coordinated efforts of all stakeholders<br><b>(Action: DDMA, NGOs, CBOs)</b> |
| 12. | <b>Transparency and accountability</b> | Develop an agreed framework of accountability for all levels and mechanisms to bring in transparency.<br><b>(Action: DDMA)</b>                                                                                                                                                                     |
| 13. | <b>Do No Harm</b>                      | Advocacy at all levels on Do No Harm through disaster response and development interventions.<br><b>(Action: District NGO Task Forces in DM)</b>                                                                                                                                                   |
| 14. | <b>Exit strategy</b>                   | Ensure that the NGO programmes have an exit strategy to link with long term recovery/rehab/development programs of other NGOs or the government.<br><b>(Action: District NGO Task Forces in DM)</b>                                                                                                |

## Bilateral Organizations

Bilateral agencies play a major role in disaster management and work through government as well as NGOs and other partner agencies. They provide resources for preparedness, research, networking and institution development, relief, reconstruction and rehabilitation. They can assist in making suggestions for possible changes in policies by sharing of disaster management applications in other parts of the world. In addition they can provide technical expertise and give support by mobilizing advanced rescue and evacuation teams from other countries during the time of extreme emergencies. These organizations

carry out responsibilities in coordination with the Government of the affected country, other donor Government, international organizations, UN agencies and NGOs.

### **Corporate Bodies**

So far the role of corporate sector has been limited to relief and reconstruction activities following emergencies. Some business centers and corporate houses have special cells to take up relief activities.

- The corporate sector can play an active role in preparedness and planning through raising community awareness in their project areas on various aspects of disaster preparedness
- Providing specialized equipment's (earthmoving equipment's, boats, etc. for disaster response
- The corporate sector will be encouraged to develop a fund at the state and district levels for preparedness and post-disaster activities.
- Mobilization and creation of contingency fund for relief and recovery activities
- Provision of technical know-how to manage disasters (especially industrial accidents, fire etc.)

### **7.10 District Disaster Management Authority**

At the cutting edge level, the District Disaster Management Authority (DDMA) headed by the District Magistrate, with the elected representative of the local authority as the co-chairperson, will act as the planning, coordinating and implementing body for DM and take all necessary measures for the purposes of DM in the district in accordance with the guidelines laid down by the NDMA and SDMA. It will, inter-alia prepare the district DM plan including the response plan for the district, coordinate and monitor the implementation of the national policy, the state policy, the national plan, the state plan and the district plan and ensure that the guidelines for prevention, mitigation, preparedness and response measures laid down by the NDMA and the SDMA are followed by all departments of the government at the district level and the local authorities in the district.

### **Local Authorities**

These include Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs), such as municipal corporations, municipalities, district and cantonment boards and town planning authorities for control and management of civic services

PRIs and ULBs will ensure capacity building of their officers and employees in DM, carry out relief, rehabilitation and reconstruction activities in the affected areas and will prepare DM plans in consonance with the guidelines of the NDMA, SDMA and DDMA.

### **State Disaster Response Force (SDRF)**

For the purpose of a specialised response to a threatening disaster situation or disasters both natural and man-made, the DM Act, 2005 has mandated the creation of a NDRF.

To augment their capacities, all state governments/SDMAs will organise, from within their armed police force, adequate personnel for the constitution of State Disaster Response Force (SDRF) with appropriate disaster response capabilities. Under the aegis of the NDMA, the states will raise the SDRF

### **7.11 Intra-state Multi-sectoral Coordination**

While the state irrigation/water resources/flood control departments are responsible for planning, implementation and operation and maintenance of structural measures of FM in the state, civil authorities at the district/taluka/block/village level are responsible for search, rescue and relief. Further, the activities of one department, such as the construction of roads by the PWD, or railway lines by the Ministry of Railways (MOR), urbanisation/ industrialisation regulated by the ULBs and town and country planning organisations etc., can affect the vulnerability of an area to floods and drainage congestion. The floods in the Krishna basin in 2005 are a case in point. It is therefore important that a mechanism is established for ensuring coordination among the various departments of state Government. In most of the flood prone states, State Flood Control Advisory Committees have been constituted with representatives of the various departments of the state Government and central organisations concerned, where the FM schemes proposed by the state irrigation/water resources/ flood control departments are considered and approved. There is no multi-disciplinary authority wherein the schemes of other departments for construction of irrigation works, roads, railway lines and development of residential, commercial and industrial estates etc., are considered with respect to their impact on the vulnerability of the areas to floods/drainage congestion and approved for implementation.

Therefore, the state governments/SDMAs will establish appropriate multi-disciplinary mechanisms, whose clearance of the proposals of various departments with respect to the FM angle will be mandatory, before the works are sanctioned by them and taken up for implementation by the departments concerned. The mechanisms will be empowered to make recommendations for making the works flood safe as well as ensuring that they do not lead to increase in vulnerability of the areas to floods and drainage congestion.

### 7.12 Financial Arrangement for Flood relief, reconstruction and Mitigation

The overwhelming expenditure on disaster management in India, more specifically for post-disaster response, relief and rehabilitation, are incurred by the State Governments and district administration and almost the entire budgetary allocations for the same are met from the allocations made to the States annually for the five year fiscal cycle on the basis of the recommendations made by the Finance Commissions constituted under article 280 of the Constitution of India. In fact, the entire system of financing disaster management in India has evolved around the recommendations of the successive Finance Commissions. The recommendations of the Finance Commissions have been based on the overriding principle that financial assistance to the States shall be limited to providing immediate gratuitous relief to the victims of natural calamities and to restore the public utilities so that the affected persons are able to restart their economic activities again. This relief centric approach did not encourage strategic thinking on the total financial requirement of the States for holistic management of disasters, quantification of resource gaps and how such gaps can be met over time by various innovative financial instruments for risk management.

The Disaster Management Act 2005 has ushered a complete paradigm shift in disaster management in India. As per DM Act 2005, financial assistance in wake of notified disasters is provided through State Disaster Response Fund (SDRF) and National Disaster Response Fund (NDRF). These funds have been created under the legal framework of Section 46 and 48 (1) (a) of the Disaster Management Act, 2005 respectively. The allocations to SDRF and NDRF are as per Finance Commission recommendation.



The immediate relief is provided in accordance with the guidelines on constitution and administration of State Disaster Response Fund and National Disaster Response Fund issued by Ministry of Home Affairs, Disaster Management Division vide OM No 33-5/2015-NDM-1, dated 30<sup>th</sup> July 2015, copy of guidelines enclosed. The quantum of relief paid is in accordance with items and norms of assistance approved by Ministry of Home Affairs, Govt. of India.

In the event of a calamity of severe nature, when the State's SDRF is insufficient, additional central assistance is sought from NDRF through submission of memorandum and following other laid down procedure.

The MHA will follow the following procedure to release financial assistance to the affected state government:

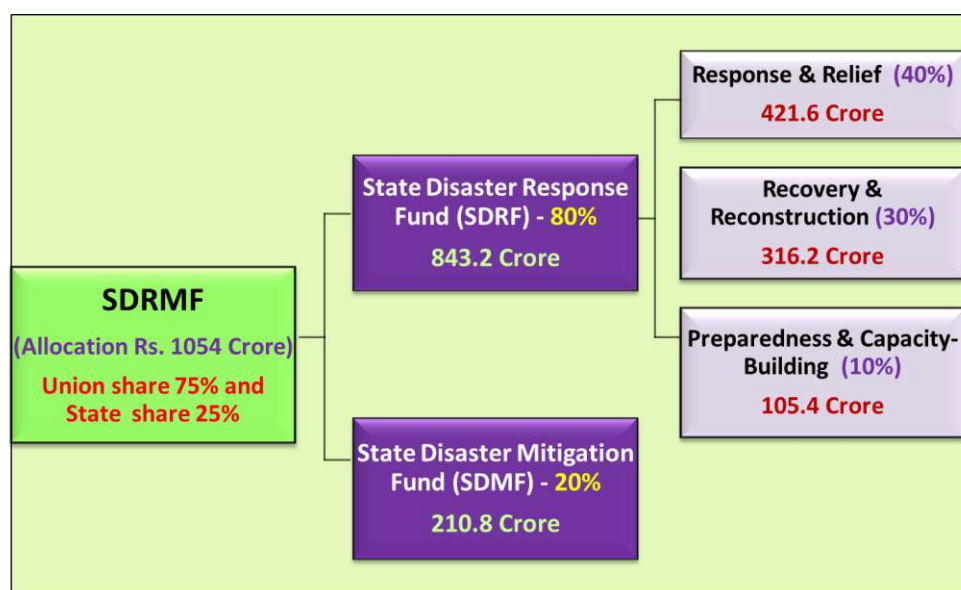
- The memorandum of the State government will be examined to assess the likely requirement of funds as per the items and norms of expenditure under SDRF/NDRF. If a preliminary examination reveals that there are adequate funds in the SDRF with the state for providing relief as per norms, the state will be advised accordingly
- If a preliminary examination reveals that the state is in need of assistance, an Inter-Ministerial Central Team will be deputed to the disaster affected area for an on-the spot assessment
- The report of the Central team will be examined by the NEC through its sub-committee, which will assess the extent of relief expenditure which can be made available through the NDRF, as per the norms of NDRF and SDRF, and make recommendations for the same
- The High Level Committee will consider the recommendations of the Sub-Committee of NEC and approve the quantum of immediate assistance to be released from the National Disaster Response Fund.

### **15<sup>th</sup> Finance Commission's award pertaining to disaster-related grants**

The 15<sup>th</sup> Finance Commission has made a *departure from response to mitigation aspect* and recommended setting up of National and State Disaster Risk Management Fund (SDRMF). The recommendations of the commission related to financing of relief expenditure have been accepted by Govt. of India. The coverage of funds recommended by the commission for financing of relief expenditure goes beyond the disaster response funds that already exist at the national (NDRF-National Disaster Response Fund) and state (SDRF-State Disaster Response Fund) levels.

National Disaster Risk Management Fund (NDRMF) and **State Disaster Risk Management Fund (SDRMF)** have been created. The allocation for SDRMF for the year 2021-22 for Karnataka is **Rs.1054 crores**.

#### SDRMF BREAK UP:



The fund is divided into SDRF (80%) and SDMF (20%). The response fund is further apportioned into three windows, namely Response and Relief, Recovery and Reconstruction and Capacity building in the ratio of 50:37.5:12.5. Expenditure for each funding will be governed by specific guidelines issued for each window by the Ministry of Home Affairs.

#### STATE DISASTER MITIGATION FUND (SDMF):

NDMA is finalizing guidelines for administration of State Disaster Mitigation Fund and National Disaster Mitigation Fund.

#### Broad contour of SDMF guidelines:

- As per the recommendations of the 15th Financial Commission, Mitigation funds have been created separately at the national and state levels, in the form of a National Disaster Mitigation Fund (NDMF) and State Disaster Mitigation Fund (SDMF) are setup. The Mitigation funds aim to support those local level and community-based interventions, which reduce disaster risks and promote environmental-friendly settlements and livelihood practices, and not large-scale

infrastructure interventions.

- **Mitigation: Concept, Strategy and Scope**

Mitigation refers to proactive measures aimed at reducing the impact of a potential disaster, while Preparedness means taking specific measures just before a disaster strikes. Mitigation measures are also implemented in course of recovery and reconstruction programmes, so that the infrastructure and assets are in a better position to withstand future disasters (“Build Back Better”).

- Mitigation measures can be grouped as Structural and Non-structural. Structural measures consist of engineering interventions such constructions of small dams, dykes, etc. to contain flooding, or strengthening and retrofitting of existing structures to withstand the impact of a disaster. Non-structural measures typically include promoting environmental measures such as shelter belt plantations and mangroves; policy measures such as regulations, zoning, and enforcement of building codes; research and development for disaster risk reduction; and financial measures such as tax incentives etc. However, effective mitigation measures would involve a combination of structural and non-structural measures, multi-hazard risk assessment, life cycle analysis, and coherence with the overall developmental program of the region.

## OTHER FUNDING SOURCES

### 1. Public Funded Schemes

The primary mechanism for funding DRR related schemes and projects in Karnataka are through Public Funded Schemes at Central and State level. Various nodal Ministries play a key role in disaster management as far as specific disasters are concerned. These nodal Ministries as well as other Ministries and Departments have dedicated schemes, aimed at disaster prevention, mitigation, capacity building, etc. within their particular domain. Existing examples include the scheme of MHA for Strengthening of Fire and Emergency Services, Financial assistance to ATIs and other Training institutions for disaster management, Integrated Coastal Zone Management programme of MOEFCC, and flood management and flood forecasting programmes of MOJS. The Department of Space (DOS) has a Disaster Management Support Programme and MOES has a project on Tsunami and Storm Surge Warning System. NDMA is implementing an important World Bank funded project for National Cyclone Risk Mitigation Project.

Apart from this, many of the schemes, which are implemented by various ministries/ departments, have embedded DRR components, as for example, those implemented by the MOEFCC. There are many other

programmes that improve societal resilience, which is a critical component of DRR, such as the National Rural Health Mission (NRHM), Mahatma Gandhi Employment Guarantee Scheme, and the Urban Development's Urban Renewal Mission.

## **2. Flexi Funds as a part of Centrally Sponsored Schemes**

As per Department of Expenditure, Ministry of Finance, the NITI Aayog has issued instructions for rationalization of Centrally Sponsored Schemes (CSS), vide OM No. O —11013/02/2015-CSS & CMC dated August 17, 2016. As per para 6 of the said OM, flexi-funds available in each CSS has been revised to 25% for States, and 30% for UTs, of the overall annual allocation on under each scheme. The flexi -fund component within the CSS can be used to achieve the following objectives:

- a) To provide flexibility to States to meet local needs and requirements within the overall objective of any given Scheme at the sub-head level.
- b) To pilot innovation to improve efficiency within the overall objective of any given Scheme at the sub-head level.
- c) To undertake mitigation/restoration activities in case of natural calamities, or to satisfy local requirements in areas affected by internal security disturbances.

## **3. Externally Aided Projects**

Besides the funds which are available through public funded schemes, efforts have also been made by the centre to mobilize the resources from external funding agencies for vulnerabilities assessment, capacity development, institutional strengthening of response mechanism and mitigation measures etc. The Central Government would continue to support states for reconstruction and rehabilitation on in the aftermath of major disasters through aid from World Bank and other such external funding agencies.

## **4. Insurance and Risk Transfer**

Pradhan Mantri Fasal Bima Yojana (PMFBY) the government sponsored crop insurance and Weather Based Insurance provides risk cover to farmers.

**5. CSR Fund:**

Contribution for disaster management is allowed under item no (xii) of Schedule VII of the Companies Act, 2013, hence CSR fund can be tapped for flood management and mitigation.

The Ministries of Finance, Agriculture and Water Resources, the state government and the insurance companies will jointly take up studies for a graded system of insurance premium according to flood risk in flood prone areas. The MOWR in consultation with the state government will explore the possibility of introducing schemes where insurance of structures, buildings and crops in flood plains is made compulsory. Consultations on the proposal will be held with all the players and stakeholders and the scheme implemented in a few selected areas on experimental basis. Once successful, the scheme will be implemented on a larger scale. The value of such scheme cannot be over-stated.





# 08

---

## **FLOOD ACTION PLAN: PREPAREDNESS AND RESPONSE**

---

|                                                                  |     |
|------------------------------------------------------------------|-----|
| 8.1 District Flood Preparation and Evaluation Matrix .....       | 229 |
| 8.2 Standard Operation Procedure (SOP):                          |     |
| Department Wise Response to Disaster (Flood) .....               | 233 |
| 8.3 Checklist for Southwest Monsoon Preparedness .....           | 247 |
| 8.4 Tasks and responsibility matrix for South West Monsoon ..... | 249 |
| 8.5 Standard Operation Procedure (SOP) for                       |     |
| Community Task Forces .....                                      | 256 |
| 8.6 The GP and ULBs Flood Preparedness Plan .....                | 258 |
| 8.7 Flood Response .....                                         | 325 |



## **FLOOD ACTION PLAN: PREPAREDNESS AND RESPONSE**

### **Flood Preparedness**

#### **Introduction**

Karnataka Government has taken a number of initiatives in the field of flood management and appointed many committees/working groups/task forces from time to time to look into the problem of floods and suggest remedial measures for their management. It has also issued a number of policy statements in this regard. Some of the important committees/ working groups/task forces/plans appointed are listed as follows:

#### **Karnataka Preparedness**

- Review meetings & field visits
- Integrated dam management
- Gram panchayat DM plans
- Flood preparedness matrix

#### **Preparedness and Action**

- Prepositioning NDRF & SDRF teams
- Procurement of rescue equipment's and material
- Flood Forecast cell
- WhatsApp groups
- Human Resources training
- Pre-positioning 4 IAF helicopters and other resources

#### **Flood Preparedness and Response measures At Districts**

1. The State Government has been proactive in flood preparedness amid COVID 19. Additional Chief Secretary and Development Commissioner is reviewing flood preparedness every week in the Weather Watch Committee meeting.
2. Based on the lessons learnt in the past three years, we had Gram Panchayat Level Flood Preparedness Plan (micro-level plan) in the vulnerable Gram Panchayats of 13 districts which were implemented for the first time during 2020, wherein community participation and utilisation of the local resource was encouraged and engaged. The GP Flood preparedness plan, the development would be initiated and executed by the Gram Panchayat Disaster Management Committee headed by the president of Gram Panchayat, wherein 6 teams have been proposed for crucial tasks at the village level, i.e., early

warning dissemination, search rescue & evacuation, first aid & medical team, managing relief shelter, animal protection team and damage assessment team. It is required to update these Plans and activate the Gram Panchayat Disaster Management Committee for the year 2021-22.

3. **Integrated Dam management:** to effectively coordinate with Maharashtra and Kerala. Water releases from reservoirs are regulated taking into account rainfall forecast, possible inflows to the reservoirs, carrying capacity of the river downstream. This will reduce flooding of downstream villages along the banks of the river. Information on Dam water release and alerts to be shared well in advance to all villages along the river banks before release of water from reservoirs in frequent intervals. KSNDMC will provide basin wise rainfall and run-off generated to the dam authorities as a decision support system for further release. Adequate buffer has been maintained in each dam to prevent flooding of the downstream area in case of heavy discharge from reservoirs in the upper catchment area.
4. We have created two **WhatsApp groups** exclusively for flood management for BBMP and State. These groups comprise Senior Officers to cutting edge officers for quick decision making. Hon'ble Revenue Minister has been personally sending alerts to DC's and BBMP Chief Commissioner.
5. A **flood forecast cell** has been constituted with subject experts at KSNDMC with responsibilities of providing the synoptic analysis of weather condition in the State and accordingly issue customised weather forecast, Basin-wise heavy rainfall warnings, special advisories, alerts and early warnings for extreme weather events and Generating location specific flood forecast for Bengaluru city.
6. Four NDRF teams will be pre-deployed in Kodagu, Raichuru, Belagavi and Dakshina Kannada districts and kept in readiness to face eventuality across the State. We will also be sending our trained SDRF team to other flood-prone districts as and when required.

**Flood Preparedness and Response:** The following measures have to be undertaken by the Districts to ensure adequate preparedness and response to the Monsoon 2021. The respective districts need to ensure filling up of Flood evaluation Matrix (8.1), Check list (8.3) and Flood Preparedness plan for GP and ULBs (8.6) and submit back to Revenue Department (DM) along with implementation measures under 8.2, 8.4 & 8.5.

#### 8.1 District Flood Preparation and Evaluation Matrix

#### 8.2 Standard Operation Procedure (SOP): Department Wise Response to Disaster (Flood)

#### 8.3 Checklist for Southwest Monsoon Preparedness

#### 8.4 Tasks and responsibility matrix for South West Monsoon

#### 8.5 Standard Operation Procedure (SOP) for Community Task Forces

#### 8.6 The Grampanchayth and ULBs Flood preparedness

#### 8.1 DISTRICT FLOOD PREPARATION AND EVALUATION MATRIX

| 1. Vulnerability Assessment:                                                                                                                  |                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Number of Villages that are identified as vulnerable to flood and landslide                                                                   | If answered = 1, If no: 0<br>(Number of villages indicate the severity of the problem)                                   |
| Total number of the population estimated to be vulnerable to flood?                                                                           | If answered = 1, if no: 0<br>(Number of population indicates the severity of the problem)                                |
| Number of identified population 1. Pregnant women, 2. Disabled, 3. Migrants and 4. Children in the vulnerable population                      | If all vulnerable identified 4, if any three identified 3, if two identified: 2, anyone identified: 1, not identified: 0 |
| Have you Identified Vulnerable critical infrastructure i.e roads, connectivity (mobile network) drainage, water supply, schools etc. (Yes/No) | If yes: 1, If no: 0                                                                                                      |
| Have you prepared a detailed vulnerability points on the district map (Yes/No)                                                                | If yes:1, If no: 0                                                                                                       |
| <b>Total Score – 8</b>                                                                                                                        | Good: 6 - 8, Average: 3-5, Poor: 0-3                                                                                     |

| <b>2. Early warning and early Evacuation:</b>                                                                                                                        |                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Have you formulated a team for early warning to monitor rainfall, water levels in the dams, thunderstorm, lightening and to disseminate alerts and warning? (yes/No) | If Yes: 1, If No: 0                       |
| Narrate the mechanism established for communicating the early warnings?                                                                                              | Narrative: 0 - 5 Marks                    |
| Have you developed determinants (Water level, rainfall etc.) for the evacuation in consultation with nodal agencies?                                                 | If Yes answer 1; If No: 0                 |
| Have you planned any early evacuation of the villages or specific pockets in your districts?                                                                         | If Yes answer 1; If No: 0                 |
| Have you appointment nodal officers for the vulnerable gram panchayats?                                                                                              | If Yes answer 1; If No: 1                 |
| <b>Total Score – 9</b>                                                                                                                                               | <b>Good: 7-9 , Average: 4-6 Poor: 0-3</b> |

| <b>3. Search, Rescue &amp; Evacuation Plan</b>                                                                                                                                           |                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Have you evolved any plan for search, rescue and evacuation in the district inclusive of the road map, transportation plan etc.? (Yes/No)                                                | If Yes: 1, If No: 0                         |
| Have you established Coordination mechanism to facilitate search, rescue and evacuation among police, fire and emergency, local teams and external forces like NDRF, army etc.? (Yes/No) | If Yes: 1, If No: 0                         |
| Explain the status of the inventory and procurement of search, rescue equipment?                                                                                                         | Good: 3, Satisfactory: 2, Poor: 1           |
| Narrate how are you prepared for mass casualty management (Ambulances & other transport arrangements, Hospital identification, facilities at hospitals)?                                 | Good: 3, Satisfactory: 2, Poor: 1           |
| Any mock drills conducted amid COVID 19 for the flood preparedness?                                                                                                                      | If yes: 1, If no: 0                         |
| <b>Total Score – 9</b>                                                                                                                                                                   | <b>Good: 7 - 9, Average: 4-6, Poor: 0-3</b> |



| 4. Preparedness for the Emergency Relief Response & Emergency operation Centre                                                                       |                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| What is the status of DDMA meetings?                                                                                                                 | Good: 3, Satisfactory: 2, Poor: 1              |
| Narrate the arrangements for uninterrupted essential services? ( Road, Electricity, clearing of drains/ channels/ debris removal, tree pruning, etc. | Good: 3, Satisfactory: 2, Poor: 1              |
| Narrate your plans for the management of drinking water (source of the water and water supply) in case of emergency?                                 | Good: 3, Satisfactory: 2, Poor: 1              |
| Narrate the arrangements for stocking of essential commodities (food grain, kerosene oil, salt, edible oil etc.,) including medicine?                | Good: 3, Satisfactory: 2, Poor: 1              |
| What is the status of Emergency Operation Centre/Control Room (District level, taluka level, corporation, and municipality)?                         | Good: 3, Satisfactory: 2, Poor: 1              |
| <b>Total Score - 15</b>                                                                                                                              | <b>Good: 11 - 15, Average: 6-10, Poor: 0-5</b> |
| 5. Status of Shelter Management:                                                                                                                     |                                                |
| Number of Shelters Identified                                                                                                                        | If Yes: 1, If No: 0                            |
| Adequate facility to ensure Water, Sanitation (temporary toilets, waste management, vector control etc.,) and Hygiene in the shelter place (Yes/No)  | Good: 3, Satisfactory: 2, Poor: 1              |
| Identified and made necessary arrangements for Food and nutrition in the shelter (yes/no)                                                            | If Yes: 1, If No: 0                            |
| Identified and Stock held of non-food items: clothes, buckets, mugs etc., (yes/no)                                                                   | If Yes: 1, If No: 0                            |
| Health teams identified for Shelters: RCH, MCH, Communicable diseases, psychological first aid and psychosocial care and COVID care                  | If Yes: 1, If No: 0                            |
| <b>Total Score - 7</b>                                                                                                                               | <b>Good: 5-7, Average: 3-4 , Poor: 0-2</b>     |

| <b>6. Animal Protection and Carcass Management</b>                                                                                |                                                |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Narrate comprehensive plan made for early evacuation of cattle?                                                                   | Good: 3, Satisfactory: 2, Poor: 1              |
| Identification of community cattle shed with the provision of fodder? (yes/no)                                                    | If Yes: 1, If No: 0                            |
| Identification medicine stock and veterinary team? (yes/no)                                                                       | If Yes: 1, If No: 0                            |
| Mobile team for the search, rescue and evacuation of the cattle. (yes/no)                                                         | If Yes: 1, If No: 0                            |
| Carcass management plan (yes/no)                                                                                                  | If Yes: 1, If No: 0                            |
| <b>Total Score - 7</b>                                                                                                            | <b>Good: 5-7, Average: 3-4, Poor: 0-2</b>      |
| <b>7. Damage Assessment</b>                                                                                                       |                                                |
| Give narration about the mechanism established for the Rapid Damage Assessment in case of flood or landslide?                     | Good: 3, Satisfactory: 2, Poor: 1              |
| Details of measures taken by Gram Panchayat about Disaster Management plan?                                                       | Good: 3, Satisfactory: 2, Poor: 1              |
| Narrate how are you involving the community, NGOs and other stakeholders?                                                         | Good: 3, Satisfactory: 2, Poor: 1              |
| Details of the status of capacity building training undertaken for the disaster preparedness including volunteers training etc.,? | Good: 3, Satisfactory: 2, Poor: 1              |
| Narrate how you are creating awareness on individual disaster preparedness and family disaster preparedness?                      | Good: 3, Satisfactory: 2, Poor: 1              |
| <b>Total Score - 15</b>                                                                                                           | <b>Good: 11 - 15, Average: 6-10, Poor: 0-5</b> |

**8. Challenges if any**

**9. Suggestions if any**

**Total Score – 70, Good: 50-71, Average: 25-49 and Poor: 0-24**

## 8.2 STANDARD OPERATING PROCEDURES (SOP):

### Department Wise Response to Disaster (Flood)

#### DISTRICT CONTROL ROOM

- a. Vulnerability Map of the District.
- b. Resource Inventory, Capacity Analysis.
- c. List of Cut off Areas with Safe Route Map for Communication.
- d. List of Storage Facilities, Dealers of Food.
- e. Control Room Setup/Assignment of Control Room Duty.
- f. Pre-Positioning of Staff for Site Operation Centres.
- g. Arrangement of Alternative Communication/Generator Sets Etc.
- h. Arrangement of Vehicles/Boats for Evacuation.
- i. Dissemination of Warning/ Coordination with District Control Room.
- j. Maintain Law & order.
- k. Undertake search & rescue works well as orderly evacuation to safer places.
- l. Undertake firefighting, if occurs.
- m. Protection of supply & convoys and assist in orderly distribution of relief assistance.

#### Advance Preparedness

- a. Formation of team & delegation or areas.
- b. Skill up gradation trainings for the officers and Supporting staff & wardens/ Post wardens.
- c. Mock drills according to plans.
- d. Equipment/ machines upgraded & are in working condition.
- e. Conduct Community capacity building programme at District/Sub-Divn/ panchayath and school level.
- f. Emergency Control Rooms Operational.
- g. Adequate warning mechanism for evacuation.
- h. Identification of alternative routes.
- i. Important telephone/ Contact details available.
- j. Unsocial elements/ ground identified.
- k. Identification of sensitive areas and patrolling.
- l. Patrolling on important building/ highways.
- m. Support to administrative on training to volunteers.
- n. Keeping close contact with administration.

**1) REVENUE DEPARTMENT**

- a. Establish linkages with District Control Rooms.
- b. Close Contact with Armed Forces for specialized assistance/ equipment's for search and rescue.
- c. Establish Radio Communication through joint Control Rooms (JCR) to assist evacuation, information dissemination and checking rumours.
- d. Evacuation of people & immediate reporting to higher authority.
- e. Assist seriously injured persons to go to treatment centres.
- f. Maintain law and order.
- g. Assist fire brigade personal in their efforts.
- h. Assist and encourage the community in road clearing operation.
- i. Traffic management and patrolling as required.
- j. Salvage operation.
- k. Provide security in transit and relief camps, affected areas, lifeline, infrastructures & services, ensure, identified are cordoned off.
- l. Provide security arrangement for visiting VVIPs and VIPs.
- m. Assist administration to take necessary actions against hoarders, block marketers and those manipulating relief materials.
- n. Identified and register the names of the dead and disposal persons.
- o. Assist administration in supply and distribution of relief materials.
- p. Deploy police personnel near relief godowns.
- q. Escort relief carrier vehicle and personnel.
- r. Regular reporting to higher authority about the situation including expenditure statement etc.
- s. In post-disaster phase, sit with the teams, discuss problems, suggest remedies, collect feedback etc., to upgrade mitigation as well as action plans.
- t. Taking up Rapid Visual Screening (RVS) and other necessary assessment, non-destructive test & retrofitting of roads and bridges.
- u. List of safe alternative routes.
- v. Important/ contact details available.
- w. Training of masons on retrofitting and building bye-laws.
- x. Keeping close contact with administration.
- y. Pre-contact arrangement with suppliers for requisite equipment/stores.
- z. Generate awareness on community level preparedness.

## 2) HEALTH & FAMILY WELFARE DEPARTMENT

To provide immediate medical, health and public hygiene service. To check outbreak of epidemics and provide onsite OT and Trauma service.

### Advance preparedness

- a. Identify likely diseases associated with disasters.
- b. Setting of quick response teams with team leader and supporting staff (identify by name & allocation)
- c. Skill up gradation training for the officers/supporting staff & volunteers.
- d. Plan for emergence accommodation for staff & other officers from outside area.
- e. Equipment/machines etc., upgraded & are in working condition.
- f. Emergence fuel stored, vehicles including it is batteries inspected & are in working condition.
- g. List of safe alternative routes.
- h. Important/contact details available.
- i. Keeping close contact with administration.
- j. Determine the quantity, Type of medicines, medical support, equipment etc. that will be required per day/district Sub D Division/Block village, including relief camps etc., in case of and emergency.
- k. Maintain inventory including portable equipment's at different locations.

### Post Disaster Management

- a. Establish linkages with District Control Room.
- b. Close contact with administration.
- c. Large stock of surgical packs be sterilized to last for one week, at least & keep in a safer place.
- d. Arrange for emergency supplies of anorthic drugs.
- e. Acquisition of medical/equipment etc., as per the pre-contact with the suppliers.
- f. Ensure stock of equipment and drugs, which are needed and/or request HQ on priority basis, to supply to the hospital immediately,
- g. Arrangement of alternative power/energy source as planned, to operate hospital centres and ensure adequate sanitary condition.
- h. All valuable equipment/instruments and medicines should be packed in protective covering and stored in a safer place authority as planned and establish communication links.
- i. Ensure storage of safe drinking water and encourage water saving in the hospital.

- j. Ensure emergency admission procedures with adequate record keeping & establish public information centre to let the people know about the type of job done and the necessary relief aid/new schemes etc.
- k. Ensure availability of staff and teams of doctors and assistants visiting disasters sites.
- l. Assist volunteers/village leader/police personnel in rescue & evacuation and/of disposal of carcass as well get as will as get insurance benefit.
- m. Assist administration for setting up transit and camps, feeding centre and ensure adequate sanitary condition.
- n. All valuable equipment/instrument and medicines should be packed in protective covering and stored in a safer place.
- o. Regular reporting to higher authority about the situation including expenditure statement etc.
- p. In post operation phase, sit with the teams, review situation, discuss problem, suggest remedies, collect feedback etc., to upgrade mitigation as well action plans.

### 3) WATER RESOURCES

- a. Communication establishment with District and Block Control Rooms and departmental offices within the district.
- b. An Officer to be appointed as Nodal Officer.
- c. Activation of flood monitoring mechanism.
- d. Methods/ communication arrangement of alerting officers on various sites established.
- e. Mechanism evolved for forewarning settlements in the downstream/ evacuation/coordination with other dam authorities
- f. Identification of materials required for response operations.
- g. Repairs/under construction activity is well secured.
- h. Water level gauges marked.
- i. Inlet and outlet to tanks are cleared.
- j. Watch and ward of weak embankments & stock piling of repair materials at vulnerable points. Guarding of weak embankments. All staff informed about the disasters, likely damages and effects.

### 4) ELECTRICITY DEPARTMENT

Restoration of power supply and making provision of power/electricity to hospitals, lifeline building, feeding centre.



**Advance Preparedness**

- a. Clear definition of individual domain- who will do what?
- b. Skill up-gradation training for the officers/supporting staffs.
- c. Identify hazard prone zones. Formation of team & delegation of areas.
- d. Plan for Emergency accommodation for officers & staff from outside area.
- e. Equipment/machines etc. are in working condition.
- f. Emergency fuel stored, vehicles including its batteries inspection & are in working condition.
- g. List of alternative safe routes.
- h. Important telephone/contact details available/
- i. Pre-contact with suppliers (equipment).
- j. Arrange disaster management tool kit, at each Sub-station, comprising cable cutters, pulley, blocks, jungle knives axes, crowbars, ropes back saw spanners and tents for crews.
- k. Generate awareness on community level preparedness.

**Post Disaster Management**

- a. Establish linkages with District control Rooms.
- b. Deployment team with necessary equipment logistic support and authority as planned and establish communication links.
- c. Switch of the power supply immediately avoid further damaged to life and property during the time the disaster.
- d. Immediately undertake inspection of power grids, barrage, high tension lines, tower, substations, transformers, insulators, poles, and other, high equipment and review extent of damage undertake restoration works.
- e. Restore power supply and ensure uninterrupted power to all vital installation facilities and sites(relief camps, feeding centre, go down)
- f. Recruit casual labours on an emergency basis for clearing damaged poles and salvage of important equipment and accessories.
- g. Requisition off equipment etc. as per the pre-contact with the suppliers.
- h. Arrangement of alternative power/energy sources, as planned to operate hospital centres and lifeline buildings (DM & Collector/ office/Dist. EOCs/police stations/BSNL Building etc.,
- i. Regular reporting to higher authorities about the situation including expenditure statement etc.
- j. In post operation phase, sit with the team, review situation, discuss problems, and suggest remedies, collect feedback etc. to upgrade mitigation as well as action plans.

## 5) AGRICULTURE DEPARTMENT

Assist in assessment of damage to agriculture & farming community and help them to restart their agriculture/farming operations.

### Advance preparedness

- a. Identify hazard prone zones.
- b. Skill up gradation training for the officers/supporting staff & volunteers.
- c. Formation of team & delegation of areas,
- d. Plan for emergency accommodation for agriculture staff & other officers from outside area.
- e. Equipment/machines etc. upgraded & are in working condition.
- f. List of alternative safe routes.
- g. Important telephone/contact details available.
- h. Keeping close contact with administration.
- i. Encourage & ensure crop insurance by farmers,
- j. Determine the quantity type of seed/plants/medicines/tools and equipment etc. which will be required per district/Sub-divn./block/village in case of an emergency.
- k. Ensure people/farmer take the advantage of new schemes, technology and facilities provided by the government,
- l. List of possible storage godowns,
- m. Per-contact with suppliers(seed/plants/medicines/manure/tools/equipment's),
- n. Estimate & maintain register of type of agriculture practices, amount of cultivated area, insured crops etc. keep it updating.
- o. Monitors pest & disease control.
- p. Generate awareness on community level preparedness.

### Post Disaster Management

- a. Establish linkages with District control Room.
- b. Ensure available of staff and teams (extension officers and other) visiting /stationed respective disaster sites with necessary equipment, medicines, logistic support and authority as planned and establish communication links.
- c. Assess the extent of damage to soil, crop, plantation ,micro-irrigation systems, storage facilities and the required intervention ( estimate the requirement of seed , fertilizers, pesticides, labour, tools and equipment's etc.)

- d. Ensure stock of seed /plants /medicines/ manure/tools/equipment, which are needed and to supply immediately.
- e. Requisition of seed /plants/medicines/manure/tools/equipment, etc. as per the pre-contact with the suppliers.
- f. Clearance of debris, if any, due to land side and flash flood and assist community in developing agriculture land.
- g. Organize transport, storage and distribution of the relief aid with adequate record keeping procedure.
- h. Establish contact with water testing laboratories/office.
- i. Restore the agriculture operations (including soil conditions)
- j. Crop protection.
- k. Restore agriculture produce.
- l. Arrangement of alternative power/energy sources, as planned, to operate agriculture.
- m. Establish public information centre to let the people know about the type of job done and the necessary relief aid /new schemes etc.
- n. Monitor pest and disease control.
- o. Assist community /farmers getting insurance benefit.
- p. All valuable equipment /instrument /seed/manure/fertilizers and medicines etc should be packed in protective coverings and stored in a safe place.
- q. Regular reporting to higher authorities about the situation including expenditure statement etc.
- r. In post operation phase, sit with the teams, review situation, discuss problems, suggest remedies, collect feedback etc, to upgrade mitigation as we action.

## 6) FOREST DEPARTMENT

### Advance Preparedness

- a. Publishing for public knowledge details of forest cover, use of land under the forest dept. the rate depletion and list causes.
- b. Keep saws (both for power manual) and other tree cutting and road clearing equipment in working conditions.
- c. Provision of seeding to the community and encouraging plantation activities, promoting nurseries for providing seeding in case of destruction of tree during natural disasters.

- d. IES activities for greater awareness regarding the role of trees and forest for protection during emergency and also to minimize environmental impact which result as a result of deforestation like climate change, soil erosion etc.
- e. Increasing involvement of the community NGO's and CBOs in plantation, protection and other forest protection, rejuvenation and restoration activities.
- f. Plan for reducing the incidence, and minimize the impact of forest fire.

#### **Post Disaster Management**

- a. Assist in road clearness,
- b. Provider of tree cutting equipment,
- c. Unites for tree cutting and disposal to be put under the control DM & Collector, SDM during emergency, Provider of building materials such as bamboos etc. for construction of shelters,
- d. Take up plantation to make good the damage caused to tree cover.

### **7) INFORMATION AND PUBLIC RELATIONS DEPARTMENT**

#### **Advance Preparedness and Post Disaster Management**

- a. Creation of public awareness regarding various types of disaster through media propagation.
- b. Dissemination of information to public others concerned regarding do's and don'ts various disaster.
- c. Regular visioning with the media response activities.
- d. Setting up of a control room to provide authentic information to public regarding impending emergencies.
- e. Daily press briefing at fixed times at district level to provide official version.
- f. Keep the public information about the latest of the emergency situation (area affected, lives lost etc).
- g. Keep the public informed about various post disaster assistances and recovery programme.

### **8) FOOD AND CIVIL SUPPLIES DEPARTMENT**

To meet the shortage of supply of food and Action against black marketers, hoarders, etc.

#### **Advance Preparedness**

- a. Identify hazard prone zones. Formation of team & DELEGATION OF AREA.

- b. Determine the quantity & type of suppliers required in a disaster (e.g. dry food ready to eat food ,essential commodities, toiletries , blankets etc) & tie up suppliers.
- c. Identify stored facilities, location & capacity wise.
- d. Maintain a list of suppliers of different commodities in the state & outside the state
- e. Plan for emergency accommodation for officers & staff from outside area.
- f. Emergency fuel stored,
- g. Vehicles including its batteries inspected & area in working condition.
- h. List of alternative safe routes.
- i. Important telephone/contact detail available.
- j. Pre-contact with suppliers.
- k. Post Disaster management.
- l. Arrange and dispatch supplies to affected areas as per the requisition.
- m. Arrangement distribution of commodities to the affected people.
- n. Take action against black marketers, hoarders etc and maintain price line.
- o. Regular reporting to higher authorities about the situation including expenditure statement etc.
- p. In post operation phases, sit with the teams, review situation, discuss problems suggest remedies, collect feedback etc to upgrade mitigation as well as action plans.

## 9) ANIMAL HUSBANDRY DEPARTMENT

Disposal of dead cattle and others animals to prevent outbreak of health and sanitation problems. Management of livestock in emergency. Assist Police and Civil Defence & police in disposal of dead bodies claimed/ unclaimed, after observing all formalities.

### Advance preparedness

- a. Skill up gradation training for the officers/ supporting staff & volunteers.
- b. Formation of teams & delegation of area.
- c. Plan for emergency accommodation for veterinary staff & other officers from outside area.
- d. Equipment/ machines etc are in working condition.
- e. Emergency fuel stored, vehicles including its batteries inspected & are in working condition.
- f. List of alternative safe routes.
- g. Important telephone/contact details available.
- h. Keeping close contact with administration.

- i. Determine the quantity, type of fodder/ medicines etc which will be required per day/ district/ subdivn/block/ village, including relief camps etc in case of an emergency.
- j. List of possible shelters (camps) for animals.
- k. Pre-contact with suppliers (fodders/medicines/equipments).
- l. Maintain livestock update.
- m. Identify hazard prone zones.
- n. Monitor disease control.
- o. Encourage formers for insurance of their livestock.

#### **10) PWD (R & B)**

To clear road, replace collapsed bridges by temporary bridging equipment or making temporary arrangement. Assist concerned authority to repair damaged air-stripes, helipads. Providing engineering support to search and Rescue Team(SRT). Providing support of heavy equipment i.e., Earth Movers, Bulldozers etc.. Assist District machinery to provide temporary shelters/tents.

#### **Advance Preparedness**

- a. Formation of teams & delegation of areas.
- b. Skill up gradation training for the officers and supporting staffs.
- c. Mock drills according to plans.
- d. Identify weak structures/weak points vulnerable to earthquake/landslide.
- e. Inspect all roads, bridge, including under water inspection of foundation and piers. A full checks should be made on all concrete and steel work.
- f. Equipment/machines etc. up-gradation & are in working condition procurement of tent age equipment.
- g. Emergency fuel stored, vehicle including its batteries inspected are in working condition.
- h. Preparation of possible helipads, in from its longitude/ latitude to District Control Rooms.

#### **PWD (Engineering & Water supply)**

To provide immediate supply of clean drinking water in the disaster affected areas and in the relief camps and hospital etc.

#### **Advance preparedness**

- a. Identified hazard prone zones. Maintain a list of weak points/ disaster prone area.



- b. Skill up gradation training for the officers/ supporting staff & volunteers.
- c. Formation of teams & delegation of area.
- d. Plan for emergency accommodation for veterinary staff & other officers from outside area.
- e. Equipment /machines etc upgraded & are in working condition.
- f. Emergency fuel stored, vehicles including its batteries inspected & are in working condition.
- g. List of alternative safe routes.
- h. Important telephone/contact details available.
- i. Mitigation undertaken as per the plan.
- j. Keeping close contact with administration.
- k. Pre-contact with suppliers (tools/equipment).
- l. Generate awareness on community level preparedness.

#### **Post Disaster Management**

- a. Establish linkage with district control room.
- b. Close contact with administration.
- c. Deployment of teams and with necessary equipment's/tools, logistic support & authority as planned and establish communication links.
- d. Immediately undertake inspection of intake structures, pumping stations, water sources, treatment plants, storage tanks (hospital etc.) sewerage lines and of other equipment's and review extent of damage.
- e. Undertake chlorination bacteriological analysis, determination of chlorine residue & restoration of water work. Daily determination of the chlorine residual in public water to avoid the presence of Escherichia coli & other contamination in public water supply.
- f. Recruit casual labours on and emergency basic for cleaning damaged pipes blocked sewerage and salvage of important equipment and accessories.
- g. Check the condition contamination level of private water sources including water from streams, well , tube well etc if any and use scientific methods of determination of make in edible/ use of worthy.
- h. Restore and ensure uninterrupted water supply to all vital installation, facilities and sites (life line building, relief camps, feeding centres, godowns hospital etc).
- i. Assist health authorities to identify appropriate sources of potable water.
- j. Encourage public for economic use water.

- k. Make provision to acquire tankers and establish other temporary means of distributing water on and emergency basis.
- l. Requisition of equipment's etc as per the pre-contact with the suppliers.
- m. A minimum level of stock should be maintained for emergencies and should include extra length of pipes, connections, joint, hydrants and disinfectant/ bleaching powder. Adequate tools should be on hand to carry out emergency repairs.
- n. Arrangement of alternative power/energy sources, as planned to operate PHE centres.
- o. Cover and guard the pumps/motors with adequate protection so that it is not damaged or stolen.
- p. Regular reporting to higher authorities about the situation including expenditure statement etc.

### 11) FIRE SERVICE DEPARTMENT

Damage assessment, All time preparedness to attend fire call other accident etc.. Search and rescue team /that training to update the practical knowledge. Conduct capacity building programme with the local people to participation in mock drill programme.

#### Advance preparedness

- a. Formation of Search and Rescue Team and determination of areas.
- b. Skill of gradation for the officers and firemen.
- c. Participation in mock drill programme.
- d. Acquisition of equipment /modern vehicles to face the emergent situation.
- e. Warning mechanism for evacuation.
- f. During /Post Disaster Management.
- g. Establishment Dist. Control Room.
- h. Immediate response to attend fire calls /other emergent like situation /accident.
- i. Evacuation of people/ search & rescue.
- j. Damage Assessment and submission of report.

### 12. FISHERIES DEPARTMENT PREVENTION ACTIVITIES:

#### Advance preparedness

- a) Registration of boats and fishermen.
- b) Building community awareness on weather phenomena and warning system especially on Do's and Don'ts on receipt of weather related warnings.
- c) Certifying the usability of all boats and notifying their carrying capacities.

- d) Capacity building of traditional fishermen and improvisation of traditional boats which can be used during emergencies.
- e) Train up young fishermen in search & rescue operation and hire their services during emergency.

#### **Post Disaster Management**

- a) Ensure warning dissemination to fishing communities living in vulnerable pockets.
- b) Ensure mobilizing boats during emergencies and for payment of wages to boatmen hired during emergencies.
- c) Support in mobilization and additional deployment of boats during emergencies.
- d) Assist in providing lifesaving items like life jackets, hand radios, etc.
- e) Provide compensations and advice to affected individuals, community.
- f) Assess the losses of fisheries and aquaculture assets and the needs of persons and communities affected by emergency.

#### **13) DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)**

- a. Share information and coordination with the Revenue Department (DM), Govt. of Karnataka on daily basis.
- b. Immediate strengthening of DEOC on emergent situation/ receipt dissemination of important messages among the important line dept. and to act as per IRS (Incident Response System) provision.
- c. See that Sub Divisional Disaster Management Task Force has been formed under the leadership of concerning SDM.
- d. See that Sub- Divisional Disaster Management Task Force has been sent by the SDM to the spot of incident for quick response on the event of any disaster /emergent situation.
- e. Formation of District Disaster Response Force involving all line dept./NGO's etc and their movement at the time of need.
- f. Periodical meeting of DDMA/DDRF.
- g. Arrangement of Awareness programme, Training programme, Evacuation, Mock drill programme from dist. Level to GP level.
- h. Arrangement of Shelter House.
- i. Acquisition of Disaster Management related equipment.
- j. Damage Assessment /finalization of report.
- k. Financial mobilization as per SDRF/ FC etc.

**Information Management**

- The objective of information management is to provide the right information to the right person at the right time in the right format. During emergency response activities, all participating agencies, persona affected and the wider community needs information. Dissemination of critical information required during emergencies through use of display boards, etc can minimize confusion can be voided through regular press briefings.

**Media Liaison**

- Media management during a disaster is an important aspect. The DDMA will ensure that up-to – date and accurate information is made available.
- A media centre should be established with the involvement of PRO in the district affected.
- The office of the DDMA will also establish a media centre attached to the State EOC to be operated by the Team leader Media Team and regular media briefing should be arranged as per the SOP for media briefing.

**Post – operational Debriefing**

- The DDMA/DM & Collector is responsible for convening a debriefing conference as soon as practicable after cessation of response activities. All agencies that participated in those activities will be represented with a view to assessing the adequacy of the response and to recommend any changes to the relevant (plans).

## 8.3 CHECKLIST FOR SOUTHWEST MONSOON PREPAREDNESS

| Sl. No. | Activity                                                                                                                                                                                                            | Remarks (Yes/No) |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1       | Updating of list of low lying/flood prone areas and maps                                                                                                                                                            |                  |
| 2       | Flood preparedness awareness and training to the community volunteers                                                                                                                                               |                  |
| 3       | District and Sub-division level WhatsApp group for sharing warnings, damage reports and awareness information - Link with control rooms and key officials for sharing of information/ warnings                      |                  |
| 4       | Training to disaster management teams on operation of equipment's (boats etc.), search, rescue and first aid and allocation of areas, sharing their mobile numbers to key officials                                 |                  |
| 5       | Refresher training to trained students and Aapda mitra volunteers who have already trained in flood management, The details of the trained person should be publicized                                              |                  |
| 6       | Development of database of trained persons and publication in the website and DDMPs                                                                                                                                 |                  |
| 7       | Coordination with NDRF, SDRF, Civil Defence, Society and local NGOs for their immediate response.                                                                                                                   |                  |
| 8       | Confirmation of damage assessment teams, assignment of areas. The tehsildar may be the informer for any damage to the SDMs and provide preliminary damage report of his area within 3 hours of any disaster / event |                  |
| 9       | Identification of official for submission of daily situation report (morning-9 am and afternoon 2pm)                                                                                                                |                  |
| 10      | Functioning of 24x7 emergency operation centre, clear instruction on command / control / coordination and communication                                                                                             |                  |
| 11      | Checking of equipment's, if defunct, contact for immediate repairing                                                                                                                                                |                  |
| 12      | Coordination with KSNDMC for getting daily rainfall data and Forecast                                                                                                                                               |                  |
| 13      | Check functioning of satellite phones on periodically and ensure full charge                                                                                                                                        |                  |
| 14      | Identification of persons for operation of equipment's                                                                                                                                                              |                  |
| 15      | Identification of safe shelters/ relief camps, ensure arrangement of water, electricity, relief materials, identification of camp officer                                                                           |                  |

| Sl. No. | Activity                                                                                                                                                                                                                          | Remarks (Yes/No) |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 16      | Maintenance of essential service- responsibility to be given to the line departments such as Power, RDPR, PWD, WR,/telecommunication etc., for maintenance of services before monsoon and immediate restoration after any damage. |                  |
| 17      | Cleaning of drains, sewerages in urban areas                                                                                                                                                                                      |                  |
| 18      | WR Department should share water level of the rivers periodically to the control rooms and during flood time the frequency of recording should be on one hourly basis                                                             |                  |
| 19      | WR Department should complete restoration of vulnerable embankment before monsoon                                                                                                                                                 |                  |
| 20      | During monsoon the official department should keep close vigil to condition of embankment periodically and intimate the status to the DC                                                                                          |                  |
| 21      | Deployment of local volunteers/officials in upper catchment areas to provide flow of flood water to DC/local authority during heavy rainfall (where there is no water resource offices available)                                 |                  |
| 22      | Stocking of essential commodities - coordination with food dept. for stocking of adequate food and essential commodities                                                                                                          |                  |
| 23      | Medicines - Health dept. to ensure adequate medicines that required during flood                                                                                                                                                  |                  |
| 24      | Drinking Water - RDPR dept. to ensure supply of drinking water                                                                                                                                                                    |                  |
| 25      | Submission of updated Flood Matrix to Revenue Dept. (DM)                                                                                                                                                                          |                  |
| 26      | Submission of updated district flood management plan to Revenue Dept. (DM)                                                                                                                                                        |                  |
| 26      | Pre-contract - local authority may undergo pre-contract with local suppliers for supplying essential food/ flood rescue items immediately                                                                                         |                  |
| 27      | Updating of KSDMIS portal on daily basis                                                                                                                                                                                          |                  |
| 28      | Organizing mock drill in flood prone areas by involving trained volunteers & community                                                                                                                                            |                  |
| 29      | Use of SDRF as per the norms only                                                                                                                                                                                                 |                  |

(Deputy Commissioner)



## 8.4 TASKS AND RESPONSIBILITY MATRIX FOR SOUTH WEST MONSOON

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Responsibility                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Control Room and Communication:</b></p> <ul style="list-style-type: none"> <li>To ensure District Emergency Operation Centre are operational and manned 24/7. In case of emergency, DEOC to be upgraded to integrated command centre by deploying officers from line department for situation assessment and quick decision making.</li> <li>Taluk Emergency Operation Centre (TEOC) to be activated and manned 24/7.</li> <li>Crowd source information using social media such as WhatsApp, Twitter, etc., for situational awareness.</li> <li>Control room number and Dedicated WhatsApp number to be circulated be public for incidence reporting.</li> <li>Identification of vulnerable area for flooding (urban/riverine flooding) and landslides.</li> <li>Update Database of contact numbers of all concerned officers.</li> <li>VHF communication to be strengthened/ upgraded especially in communication shadow region.</li> <li>Checking the readiness of equipment and communication systems.</li> <li>Conduct meeting with all mobile/telecom service providers in the district. Service providers to be directed to prepare contingency plan to restore communication at the shortest possible time during emergency.</li> <li>Updation of human resource, equipment and other resources pertaining to Disaster Management in Indian Disaster Resource Network (IDRN).</li> </ul> | <ul style="list-style-type: none"> <li>Deputy Commissioner and Chairman District Disaster Management Authority (DDMA). Adequate funds have been allocated for strengthening DEOC.</li> <li>Members of DDMA</li> <li>ADC, AC and Tahsildars.</li> <li>District Disaster Management Professionals.</li> <li>BSNL and other mobile service providers.</li> </ul> |

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Responsibility                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Warning/alert dissemination:</b> <ul style="list-style-type: none"> <li>• KSNDMC is the nodal agency in Karnataka to provide all weather related information such as alerts/warning to public all stake holders and other weather related data to all districts. KSNDMC alerts high intensity rainfall using information/forecast from IMD and other sources.</li> <li>• There is 24/7 interactive call centre “Varuna Mitra” which provides forecast details to general public. KSNDMC has developed Sidilu App for thunderstorm alert.</li> <li>• KSNDMC Flood forecasting cell to provide district specific flood alerts with actionable points.</li> <li>• KSNDMC to disseminate timely alerts and warning related to heavy rainfall to SEOC, DEOC and TEOC through email and SMS</li> <li>• KSNDMC mandated to provide urban flood forecast for BBMP.</li> <li>• Real time hydrograph is provided by Central Water Commission for each reservoir. Flood forecasting network is available at <a href="http://ffs.india-water.gov.in">ffs.india-water.gov.in</a>. Moreover, IMD in coordination with CWC will be providing outflow forecast for each reservoir.</li> <li>• Separate WhatsApp groups have been formed for Krishna, Bhīma and Cauvery basin for real time dissemination of alerts and outflows.</li> </ul> | <ul style="list-style-type: none"> <li>• KSNDMC.</li> <li>• IMD</li> <li>• CWC</li> <li>• INCOIS</li> <li>• SEOC</li> <li>• DEOC</li> <li>• Water Resource Department</li> <li>• District Information Centre</li> </ul> |
| <b>Search and Rescue (SAR):</b> <ul style="list-style-type: none"> <li>• Fire and Emergency Personnel and SDRF to be kept on alert equipped with required search and rescue equipment.</li> <li>• Services of Civil Defence, home guards, Apada Mitra trained Volunteers to be utilized for SAR operations.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Deputy Commissioner.</li> <li>• Superintendent of Police.</li> </ul>                                                                                                           |

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Responsibility                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Identify swimmers, volunteers from the community for SAR activities.</li> <li>Quick Response Team to be constituted comprising of personnel from Fire and Emergency, Civil Defence, Home Guards and volunteers, etc.</li> <li>If necessary teams be pre-emptively deployed to vulnerable areas.</li> <li>Inventory of SAR equipment such as inflatable boat, cutters, ropes, etc. be maintained.</li> <li>State has requested 4 NDRF teams to be pre-deployed in vulnerable districts.</li> <li>Similarly SDRF shall also be pre-deployed if required.</li> </ul> | <ul style="list-style-type: none"> <li>District Fire Officer, Home Guards and Civil Defence.</li> <li>SDRF and NDRF (on request)</li> <li>Revenue Department (DM)</li> </ul> |
| <b>Relief and Rehabilitation:</b> <ul style="list-style-type: none"> <li>Identify safe shelters /Kalaji Kendras in advance in vulnerable villages factoring prevailing COVID 19 situation.</li> <li>Triage and CCC to be opened adjacent to Kalaji Kendras.</li> <li>Essential commodities such as pulse, oil, rice etc., to be adequately stocked in depots.</li> <li>Transportation arrangements to be made if situation warrants evacuation.</li> <li>Providing timely financial assistance as per SDRF/NDRF norms to affected victims.</li> </ul>                                                    | <ul style="list-style-type: none"> <li>DDMA.</li> <li>RDPR</li> <li>Food and Civil Services.</li> <li>Transport.</li> </ul>                                                  |
| <b>Desilting/Clearing of Drains/Channels:</b> <ul style="list-style-type: none"> <li>Cleaning and desilting of channels/canal/drainages to ensure unrestricted flow of water to be undertaken before monsoon.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>PWD</li> <li>Panchayat Raj Engineering</li> </ul>                                                                                     |

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Responsibility                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Clearing of blockages in culverts to ensure smooth flow of water</li> <li>• Identifying and strengthening of vulnerable points along the embankments of rivers/lakes/irrigation tanks/channels to prevent breaches.</li> <li>• Drains to be adequately covered with footpath/concrete slabs. Ensure there are no <b>missing slabs</b>. Damaged cover to be replaced immediately.</li> <li>• Works related flood mitigation such as flood walls to be expedited and completed before monsoon.</li> <li>• Stock sufficient sand bags which can be used as temporary fill/block in case of breach and prevent soil erosion.</li> <li>• Inventory of dewater water pump/diesel pump set to be maintained at taluk level. If need pump sets be installed in areas vulnerable to inundation.</li> </ul> | <ul style="list-style-type: none"> <li>• Municipal Commissioners/Chief Officers.</li> <li>• Minor/Major Irrigation</li> </ul>                                                                           |
| <b>Debris Removal:</b> <ul style="list-style-type: none"> <li>• Clearing of roads due to mudslide/rockslide (especially in Western Ghats and other hilly region).</li> <li>• Clearing fallen trees</li> <li>• Database of contact details of JCBs and other heavy earth moving equipment to be maintained.</li> <li>• NHAI to identify vulnerable zones, especially where vertical cuts are made along NH, necessary reinforcement to be constructed to prevent mudslide/landslide.</li> </ul>                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• PWD</li> <li>• Panchayat Raj Engineering</li> <li>• Forest Department</li> <li>• NHAI</li> <li>• Other department as desired by Deputy Commissioner</li> </ul> |
| <b>Tree Pruning</b> <ul style="list-style-type: none"> <li>• Pruning of trees.</li> <li>• Cutting of dead trees as per the protocol.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Forest Department</li> <li>• DISCOMs</li> <li>• Municipal Commissioners</li> </ul>                                                                             |

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Responsibility                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Tree trimming wherever there is fouling of tree branches with transmission lines</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>DISCOMs.</li> </ul>                                                                                                |
| <b>Electricity Supply:</b> <ul style="list-style-type: none"> <li>Pole to pole inspection to identify and rectify any defects in the insulators, air breaking switches of lines and earthening system.</li> <li>Rectification of weak links in the entire network that is vulnerable to break down during the monsoon.</li> <li>Check distribution transformers for optimum level of oil, breathers and earthening system.</li> <li>Develop database of inventory of equipment along with human resource.</li> <li>Quick response team in place to attend any power outage/emergency and restore power supply in quick time.</li> </ul>                                                          |                                                                                                                                                           |
| <b>Health:</b> <ul style="list-style-type: none"> <li>To open triage and CCC centre near relief camps in event of floods/landslides.</li> <li>Adequate stock of medicines, disinfectants, vaccines, inoculation and chlorination equipment to deal with any outbreak of epidemic during south west monsoon.</li> <li>Sufficient anti snake venom to maintain at PHCs.</li> <li>Quick response team comprising of doctors, paramedics and ambulance to be formed wherever necessary.</li> <li>Fogging to be carried out regularly to prevent breeding of mosquito.</li> <li>Prevent stagnation of water.</li> <li>Extensive awareness through ICT to be conducted to sensitize public.</li> </ul> | <ul style="list-style-type: none"> <li>District Health Officer</li> <li>AYUSH</li> <li>Municipal Commissioner.</li> <li>Tahsildar.</li> <li>EO</li> </ul> |

| Task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Responsibility                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Animal Husbandry</b> <ul style="list-style-type: none"> <li>• Conducting regular survey to check for outbreak of disease.</li> <li>• Regular de-worming of all susceptible livestock.</li> <li>• Quick response team to be formed to tackle any outbreak.</li> <li>• Stocking adequate medicines.</li> <li>• Identifying safe shelters in flood prone areas.</li> <li>• Carcass disposal.</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• JD/DD Veterinary Department.</li> </ul>                                                                                  |
| <b>Coastal Specific Precautions:</b> <ul style="list-style-type: none"> <li>• Sea during south west monsoon to be rough, communities and tourist to be warned not to venture into the sea.</li> <li>• As per the convention during South West Monsoon, fishing is banned.</li> <li>• Water based recreational activity at the coast to be suspended during monsoon.</li> <li>• Popular beaches be manned by police to dissuade tourist from swimming or venturing into sea.</li> </ul>                                                                                                       | <ul style="list-style-type: none"> <li>• Revenue Department.</li> <li>• Ports and Fisheries.</li> <li>• Police.</li> <li>• District Information Centre</li> </ul> |
| <b>Malnad/Coastal (Kodagu, Chikkamagaluru, Hassan, Shivamogga, Udupi, Dakshina Kannada and Uttara Kannada):</b> <ul style="list-style-type: none"> <li>• District administration to identify habitations which are marked as vulnerable to landslides/mudflows by GSI and other competent authority.</li> <li>• A team of experts to visit the vulnerable habitation to inspect the status of cracks, slop stability.</li> <li>• Based on the report of the teams, if need be vulnerable habitation to be temporarily shifted to safe locations until South West Monsoon is over.</li> </ul> | <ul style="list-style-type: none"> <li>• AC, Tahsildar.</li> <li>• PDO.</li> <li>• KSNDMC, GSI, Geologist.</li> </ul>                                             |
| <b>Management of dead bodies after disasters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• DHO, THO</li> <li>• Revenue/RDPR</li> </ul>                                                                              |

| Task                                                                                                                                                                                                                                                                                                                                                                                                               | Responsibility                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>List of mortuary in the district, forensic experts, documentation and record keeping and labelling. Prepare inventory of transportation and storage equipment. Ensure availability of protective equipment for those dealing with dead bodies.</li> <li>Precautions to be taken for infectious disease spreading from dead bodies.</li> </ul>                               |                                                                                                                                                                                                           |
| <b>Preparation of Vulnerability maps and customized maps on GIS platform for decision support system. Processing of high resolution satellite imagery</b>                                                                                                                                                                                                                                                          | K-GIS, KSRAC                                                                                                                                                                                              |
| <p><b>Inter-State Coordination for flood control due to releases from Dams/reservoirs:</b></p> <p>Chief Engineer, Water Resources Department, to be in constant touch with dam authorities of adjoining State (Maharashtra, Telangana, Tamil Nadu and Kerala) as per the defined communication protocol regarding the releases water from Dams. All stakeholders to be given prior intimation before releases.</p> | <ul style="list-style-type: none"> <li>Regional Commissioner of concerned Division.</li> <li>Deputy Commissioners of Concerned districts.</li> <li>Chief Engineer, Water Resources Department.</li> </ul> |



## 8.5 Standard Operation Procedure (SOP) for Community Task Forces

| Task Force Group     | Primary                                                                                                                                                                                                                                                                    | Secondary                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Search and Rescue    | <ul style="list-style-type: none"> <li>To trace and locate people who are physically trapped and distressed, people in the buildings and houses etc.</li> <li>To move out these people to the safe locations identified in advance and to organize further care</li> </ul> | <ul style="list-style-type: none"> <li>Administering primary health care to rescued victims</li> <li>Assisting the sanitation group in carcass disposal and the cremation of dead bodies</li> <li>Coordination with the evacuation team to shift rescued persons to safe shelters in case of recurring heavy rains</li> </ul>                                                                                                 |
| First Aid and Health | <ul style="list-style-type: none"> <li>To provide primary health care to the ill or injured until more advanced care is provided and the patient is transported to a hospital</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>Assisting the sanitation team to inoculate against water borne and other diseases</li> <li>Assisting the communication team to disseminate precautionary information on post-disaster health hazards and remedies</li> </ul>                                                                                                                                                           |
| Water                | <ul style="list-style-type: none"> <li>Restoring and maintaining the water supply and minimum quality and quantity parameters</li> </ul>                                                                                                                                   | <ul style="list-style-type: none"> <li>Assisting the sanitation team in ensure that there is enough water stored in buckets at latrines and for bathing</li> <li>Assisting the sanitation team in deciding the location for the construction of latrines away from ground water sources</li> <li>Assisting the shelter group to ensure that there is sufficient water stored in the water tank in the safe shelter</li> </ul> |

| Task Force Group          | Primary                                                                                                                                                                                                                                                                                                                                                                                                                  | Secondary                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sanitation                | <ul style="list-style-type: none"> <li>To ensure that the minimum basic facilities such as temporary toilets and common bathing units are constructed near the relief camp, that these facilities and the surroundings are kept clean, garbage disposed, dead bodies cremated and that normal drainage systems function smoothly.</li> </ul>                                                                             | <ul style="list-style-type: none"> <li>Assisting the shelter team to ensure that water spouts and water harvesting tanks at the safe shelter are clean and functional</li> <li>Assisting the relief group to ensure that containers for storing water are clean, narrow necked and covered</li> </ul>                                                                                    |
| Relief Coordination       | <ul style="list-style-type: none"> <li>To establishing contact with the District Control Room and organizing the distribution of assistance in terms of food, water, medicines and so on, in a fair and equitable manner</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>coordinating with the shelter group in the distribution of material for the construction of temporary shelters</li> <li>Assisting the shelter group to ensure that the safe shelter is well stocked in terms of dry food, water and so on in order to cater for the needs of evacuees after a cyclone or flood warning has been issued</li> </ul> |
| Warning and communication | <p>To ensure that:</p> <p>(a) the warning of the impending disaster reaches every single household, thereby allowing people to take timely action to protect their lives and property</p> <p>(b) accurate information is provided regularly as events unfold</p> <p>(c) information flows quickly and reliably upwards to District level and downwards from District level to Community/Neighbourhood/Village Level.</p> | <ul style="list-style-type: none"> <li>Assisting the relief group in disseminating information about the quantity and type of ration to be distributed for each distribution cycle</li> <li>Assisting the sanitation group in raising awareness about water borne diseases and vaccination programs</li> </ul>                                                                           |

| Task Force Group                            | Primary                                                                                                                                                                                             | Secondary                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evacuation and Temporary Shelter Management | To construct/identify maintain and make repairs to the flood shelter, to evacuate people on receipt of a warning and to make all the necessary arrangements to accommodate evacuees during a Flood. | <ul style="list-style-type: none"> <li>Assisting the communities in accessing compensation</li> <li>Assisting the relief group in stocking up dry food, medicines, water and temporary shelter materials</li> <li>Assisting the sanitation group in the construction of latrines, soak pits and drainage channels</li> </ul> |

**8.6 The GP and ULBs Flood preparedness plan identifies vulnerable areas, resources (human resource and equipment) available and relief shelters etc. The template for the Gram Panchayath / ULBs Disaster Management Plan is Given Below:**

#### **8.6.1 TEMPLATE FOR GRAMAPANCHAYATH (GP) LEVEL FLOOD MANAGEMENT PLAN**

#### **CHAPTER I: GRAM PANCHAYAT PROFILE**

- GP Name:**
- No. of villages:**
- Village Names:**
- Bordering Villages of GP:**
- Approaches (Roads and shadow roads to the village: Maps prepared by NRDMS, KRSAC)**
- Land use pattern: Maps prepared by NRDMS, KRSAC**
- Rainfall Details: (Monthly normal)**

| Jan | Feb | Mar | Apr | May | June | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|
|     |     |     |     |     |      |     |     |     |     |     |     |

#### **1. Demographic Details of GP (Village wise):**

| Sl. No | Details           | Village 1 | Village 2 | Village 3 | Total |
|--------|-------------------|-----------|-----------|-----------|-------|
| 1      | No. of households |           |           |           |       |
| 2      | Males             |           |           |           |       |

|            |                                                   |  |  |  |  |
|------------|---------------------------------------------------|--|--|--|--|
| 3          | Females                                           |  |  |  |  |
| 4          | Pregnant Mothers                                  |  |  |  |  |
| 5          | Infants                                           |  |  |  |  |
| 6          | Under five's                                      |  |  |  |  |
| 7          | Children between 6 – 14                           |  |  |  |  |
| 8          | Widow                                             |  |  |  |  |
| 9          | Single/Divorced women                             |  |  |  |  |
| 10         | Elderly (above 60 years)                          |  |  |  |  |
| <b>II</b>  | <b>Migrant Population</b>                         |  |  |  |  |
| <b>I</b>   | <b>Total Population</b>                           |  |  |  |  |
| 1          | Males                                             |  |  |  |  |
| 2          | Females                                           |  |  |  |  |
| 3          | Pregnant Mothers                                  |  |  |  |  |
| 4          | Infants                                           |  |  |  |  |
| 5          | Under five's                                      |  |  |  |  |
| 6          | Children between 6 – 14                           |  |  |  |  |
| 7          | Elderly (above 60 years)                          |  |  |  |  |
| <b>III</b> | <b>Physically and Mentally Challenged Persons</b> |  |  |  |  |
| 1          | Locomotor Disability                              |  |  |  |  |
| 2          | Visual Impairment                                 |  |  |  |  |
| 3          | Hearing Impairment                                |  |  |  |  |
| 4          | Intellectual Disability                           |  |  |  |  |
| <b>IV</b>  | <b>Total Number of Families</b>                   |  |  |  |  |
| 1          | Total Antyodaya Cardholders                       |  |  |  |  |
| 2          | Total BPL Cardholders                             |  |  |  |  |
| 3          | Total APL Cardholders                             |  |  |  |  |
| 4          | Total Primitive Tribes Families                   |  |  |  |  |
| 5          | Total Schedule Caste                              |  |  |  |  |

|           |                                     |  |  |  |  |
|-----------|-------------------------------------|--|--|--|--|
| 6         | Schedule Tribe Families             |  |  |  |  |
| 7         | Total Other Backward class families |  |  |  |  |
| <b>VI</b> | <b>Total Houses</b>                 |  |  |  |  |
| 1         | Total Thatched Houses               |  |  |  |  |
| 2         | Total Tiled Houses                  |  |  |  |  |
| 3         | Total Asbestos Houses               |  |  |  |  |
| 4         | Total RCC Houses                    |  |  |  |  |

## 2. LIVESTOCK RESOURCES (VILLAGE WISE):

| Sl. No | Live Stocks       | Village 1 | Village 2 | Village 3 | Total |
|--------|-------------------|-----------|-----------|-----------|-------|
| 1      | Cows              |           |           |           |       |
| 2      | Buffalos          |           |           |           |       |
| 3      | Bullock           |           |           |           |       |
| 4      | Sheep's and Goats |           |           |           |       |
| 5      | Poultry           |           |           |           |       |
| 6      | Others            |           |           |           |       |

## 3. AGRICULTURE RESOURCES

| Sl. No | Agriculture                      | Cropping Season | Village 1<br>(area in ha) | Village 2<br>(area in ha) | Village 3<br>(area in ha) | Total areas in ha |
|--------|----------------------------------|-----------------|---------------------------|---------------------------|---------------------------|-------------------|
| I      | Agriculture Pattern              |                 |                           |                           |                           |                   |
| 1      | Rainfed                          |                 |                           |                           |                           |                   |
| 2      | Irrigated                        |                 |                           |                           |                           |                   |
| II     | Horticulture and Vegetables crop |                 |                           |                           |                           |                   |
| 1      | Plantation (Perrinial)           |                 |                           |                           |                           |                   |
| 2      | Vegetable                        |                 |                           |                           |                           |                   |

**4. LIVELIHOOD ACTIVITIES**

| Sl. No. | Occupation Pattern                                   | Village 1<br>(Number of families) | Village 2<br>(Number of families) | Total<br>(Number of families) |
|---------|------------------------------------------------------|-----------------------------------|-----------------------------------|-------------------------------|
| I       | Person Engaged in Primary Activities                 |                                   |                                   |                               |
| 1       | Agriculture                                          |                                   |                                   |                               |
| 2       | Livestock (Animal Husbandry)                         |                                   |                                   |                               |
| 3       | Fisheries                                            |                                   |                                   |                               |
| 4       | Mining                                               |                                   |                                   |                               |
| 5       | Plantation/Horticulture                              |                                   |                                   |                               |
| 6       | Orchids/Jasmine (floriculture) and allied activities |                                   |                                   |                               |
| 7       | Any other/Shops etc                                  |                                   |                                   |                               |
| II      | Persons engaged in secondary activities              |                                   |                                   |                               |
| 1       | Manufacturing Units                                  |                                   |                                   |                               |
| a       | Handlooms/Power looms                                |                                   |                                   |                               |
| 2       | Processing Units                                     |                                   |                                   |                               |
| 3       | Service Repair and Household Industry (Papad etc)    |                                   |                                   |                               |
| 4       | Construction Industry                                |                                   |                                   |                               |
| 5       | Trade and Commerce                                   |                                   |                                   |                               |
| 6       | Tourism                                              |                                   |                                   |                               |
| 7       | Transport Storage and Communication                  |                                   |                                   |                               |
| II      | <b>Tertiary Activities</b>                           |                                   |                                   |                               |
| 1       | Service Sector (call centers)                        |                                   |                                   |                               |
| 2       | Any other                                            |                                   |                                   |                               |

## 5. CRITICAL INFRASTRUCTURE RESOURCES

| Sl.No      | Particulars                                                               | Village 1 | Village 2 | Village 3 | Total |
|------------|---------------------------------------------------------------------------|-----------|-----------|-----------|-------|
| <b>I</b>   | <b>Education</b>                                                          |           |           |           |       |
| 1          | Anganwadi                                                                 |           |           |           |       |
| 2          | Primary School                                                            |           |           |           |       |
| 3          | High School                                                               |           |           |           |       |
| 4          | Pre-university College                                                    |           |           |           |       |
| 5          | First Grade College                                                       |           |           |           |       |
| 6          | ITI/ Vocational Courses                                                   |           |           |           |       |
| <b>II</b>  | <b>Health</b>                                                             |           |           |           |       |
| 1          | Sub Center                                                                |           |           |           |       |
| 2          | Primary Health Center                                                     |           |           |           |       |
| 3          | Community Health Center                                                   |           |           |           |       |
| 4          | Poly Clinic – Private                                                     |           |           |           |       |
| 5          | Nursing Home – Private                                                    |           |           |           |       |
| 4          | Hospital – Private                                                        |           |           |           |       |
| <b>III</b> | <b>Water Source</b>                                                       |           |           |           |       |
| 1          | Ground water/Surface Water (if surface, specify, river, pond, canals etc) |           |           |           |       |
| 2          | No. of Borewell (Government/ Private)                                     |           |           |           |       |
| 3          | Open Well (Government/ Private)                                           |           |           |           |       |
| <b>IV</b>  | <b>Water Supply</b>                                                       |           |           |           |       |
| 1          | Mini Water Supply Scheme                                                  |           |           |           |       |
| 2          | Piped Water Supply Scheme (Spring Water)                                  |           |           |           |       |
| 3          | Multi Village Water Supply Scheme (Jack well)                             |           |           |           |       |
| 4          | RO Plant                                                                  |           |           |           |       |
| <b>V</b>   | <b>Waste Management</b>                                                   |           |           |           |       |
| 1          | Solid Waste Management Units (Yes/No)                                     |           |           |           |       |



| Sl.No       | Particulars                               | Village 1      | Village 2 | Village 3 | Total |
|-------------|-------------------------------------------|----------------|-----------|-----------|-------|
| 2           | Liquid Waste Management Units<br>(Yes/No) |                |           |           |       |
| <b>VI</b>   | <b>Market/Shop (Numbers)</b>              |                |           |           |       |
| 1           | PDS                                       |                |           |           |       |
| 2           | Grocery Shop                              |                |           |           |       |
| 3           | Medicine                                  |                |           |           |       |
| 4           | Kerosene                                  |                |           |           |       |
| 5           | Dry Food                                  |                |           |           |       |
| 6           | Rice/Floor Mill                           |                |           |           |       |
| 7           | Hotels                                    |                |           |           |       |
| <b>VII</b>  | <b>Other Infrastructure</b>               | <b>Numbers</b> |           |           |       |
| 1           | Community Hall                            |                |           |           |       |
| 2           | Temples                                   |                |           |           |       |
| 3           | Mosque                                    |                |           |           |       |
| 4           | Church                                    |                |           |           |       |
| 5           | Prayer hall/Bhajana Mandir                |                |           |           |       |
| 6           | Youth Club Building                       |                |           |           |       |
| 7           | Others                                    |                |           |           |       |
| <b>VIII</b> | <b>Others</b>                             |                |           |           |       |
| 1           | Community Cattle Shed (Goshala)           |                |           |           |       |
| 2           | Burial Ground                             |                |           |           |       |
| 4           | Animal Carcass Disposal Area              |                |           |           |       |

## CHAPTER II: HAZARD, RISK, VULNERABILITY AND CAPACITY ASSESSMENT

## 1. Disaster History:

| Sl. No | Disaster/<br>Hazard | Month and Year of | Details of villages affected |              |                           |                     | People Affected                    |        |         | House Damaged |           |
|--------|---------------------|-------------------|------------------------------|--------------|---------------------------|---------------------|------------------------------------|--------|---------|---------------|-----------|
|        |                     |                   | No. of villages affected     | Village name | Name of the area affected | Area affected in ha | No. of people affected (evacuated) | Deaths | Injured | Completely    | Partially |
| 1      | Flood               |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |
| 2      | Landslides          |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |
|        |                     |                   |                              |              |                           |                     |                                    |        |         |               |           |

## 2. Vulnerability Analysis:

| Sl. No | Name of the Hazard | Vulnerable Village | Vulnerable areas in the village | Vulnerable Groups             |         |
|--------|--------------------|--------------------|---------------------------------|-------------------------------|---------|
| 1      | Flood              |                    |                                 | Total Families:               |         |
|        |                    |                    |                                 | Total number of population:   |         |
|        |                    |                    |                                 | Males                         | Females |
|        |                    |                    |                                 | Old age:                      |         |
|        |                    |                    |                                 | Infants:                      |         |
|        |                    |                    |                                 | Children below 5 years        |         |
|        |                    |                    |                                 | Children 6 years to 14 years: |         |
|        |                    |                    |                                 | Pregnant Mothers:             |         |
|        |                    |                    |                                 | Disabled:                     |         |

| Sl. No. | Name of the Hazard | Vulnerable Village | Vulnerable areas in the village | Vulnerable Groups       |
|---------|--------------------|--------------------|---------------------------------|-------------------------|
|         |                    |                    |                                 | Migrant Population:     |
|         |                    |                    |                                 | Below Poverty Level:    |
|         |                    |                    |                                 | Scheduled Caste/tribes: |
|         |                    |                    |                                 | Primitive Tribes:       |

| Sl. No. | Name of the Hazard | Vulnerable Village | Vulnerable areas in the village | Vulnerable Groups             |
|---------|--------------------|--------------------|---------------------------------|-------------------------------|
| 2       | Landslide          |                    |                                 | Total Families:               |
|         |                    |                    |                                 | Total number of population:   |
|         |                    |                    |                                 | Males Females                 |
|         |                    |                    |                                 | Old age:                      |
|         |                    |                    |                                 | Infants:                      |
|         |                    |                    |                                 | Children below 5 years        |
|         |                    |                    |                                 | Children 6 years to 14 years: |
|         |                    |                    |                                 | Pregnant Mothers:             |
|         |                    |                    |                                 | Disabled:                     |
|         |                    |                    |                                 | Migrant Population:           |
|         |                    |                    |                                 | Below Poverty Level:          |
|         |                    |                    |                                 | Scheduled Caste/tribes:       |
|         |                    |                    |                                 | Primitive Tribes:             |

**3. COMMUNITY RESOURCE/ CAPACITY ASSESSMENT:**

| Health Facility                         |           |                 |            |                 |             |                 |
|-----------------------------------------|-----------|-----------------|------------|-----------------|-------------|-----------------|
| Name/Type of the Institute              | Village 1 |                 | Distance   |                 | Remarks     |                 |
|                                         | Location  | Contact Number  | Location   | Contact Number  | Location    | Contact Number  |
| Sub-Centre                              |           |                 |            |                 |             |                 |
| PHC                                     |           |                 |            |                 |             |                 |
| CHC                                     |           |                 |            |                 |             |                 |
| Private Clinic                          |           |                 |            |                 |             |                 |
| Nursing Home                            |           |                 |            |                 |             |                 |
| Hospital                                |           |                 |            |                 |             |                 |
| <b>AMBULATORY CARE AND MEDICAL SHOP</b> |           |                 |            |                 |             |                 |
| Details                                 | Village I |                 | Village II |                 | Village III |                 |
|                                         | Name      | Contact Details | Name       | Contact Details | Name        | Contact Details |
| Ambulance other than 108                |           |                 |            |                 |             |                 |
| Medical Shop                            |           |                 |            |                 |             |                 |
| <b>HUMAN RESOURCE</b>                   |           |                 |            |                 |             |                 |
| Skilled                                 | Village I |                 | Village II |                 | Village III |                 |
|                                         | Name      | Contact Details | Name       | Contact Details | Name        | Contact Details |
| Doctor                                  |           |                 |            |                 |             |                 |
| Specialist Doctor                       |           |                 |            |                 |             |                 |
| AYUSH Doctor                            |           |                 |            |                 |             |                 |
| Staff Nurse                             |           |                 |            |                 |             |                 |

|                                |  |  |  |  |  |  |
|--------------------------------|--|--|--|--|--|--|
| Allied Health Staff            |  |  |  |  |  |  |
| Paramedical Staff (Specify)    |  |  |  |  |  |  |
| Junior Health Assistant Male   |  |  |  |  |  |  |
| Junior Health Assistant Female |  |  |  |  |  |  |
| ASHA                           |  |  |  |  |  |  |
| Private Doctor                 |  |  |  |  |  |  |
| Private AYUSH Doctor           |  |  |  |  |  |  |

| Veterinary Health Facility                 |                                   |                                  |                                   |         |
|--------------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|---------|
| Name/Type of the Institute                 | Location                          | Distance                         | Contact Number                    | Remarks |
| Government Veterinary Clinic               |                                   |                                  |                                   |         |
| <b>HUMAN RESOURCE</b>                      |                                   |                                  |                                   |         |
| Skilled                                    | Name                              | Contact                          | Remarks                           |         |
| Doctor                                     |                                   |                                  |                                   |         |
| Trained Veterinary Assistant               |                                   |                                  |                                   |         |
| Public Distribution System and Market/Shop |                                   |                                  |                                   |         |
| Details                                    | Village I                         | Village II                       | Village III                       |         |
|                                            | If Yes, Location and Phone Number | If Yes Location and Phone Number | If Yes, Location and Phone Number |         |
| PDS                                        |                                   |                                  |                                   |         |
| Petrol Pump                                |                                   |                                  |                                   |         |

|                       |                            |                             |                              |
|-----------------------|----------------------------|-----------------------------|------------------------------|
| Kerosene Depot        |                            |                             |                              |
| Gas Agency            |                            |                             |                              |
| Rice Mill             |                            |                             |                              |
| Bazar day details     |                            |                             |                              |
| <b>Others</b>         | <b>Village I (Numbers)</b> | <b>Village II (Numbers)</b> | <b>Village III (Numbers)</b> |
| Vegetable/Fruit Shops |                            |                             |                              |
| Hotels                |                            |                             |                              |
| Liquor Shops          |                            |                             |                              |
| Garments              |                            |                             |                              |
| General Stores        |                            |                             |                              |

| Village wise Education  |             |               |                                           |                              |                 |
|-------------------------|-------------|---------------|-------------------------------------------|------------------------------|-----------------|
| Infrastructures Details | No of Rooms | No of Toilets | Easy Connectivity to the Shelter (Yes/No) | Safety of the Shelter Yes/No | Contact Details |
| <b>Village I</b>        |             |               |                                           |                              |                 |
| Anganwadi I             |             |               |                                           |                              |                 |
| Anganavadi II           |             |               |                                           |                              |                 |
| Anganawadi III          |             |               |                                           |                              |                 |
| Anganawadi IV           |             |               |                                           |                              |                 |
| Primary School          |             |               |                                           |                              |                 |
| Primary School          |             |               |                                           |                              |                 |
| High School             |             |               |                                           |                              |                 |
| Pre-University College  |             |               |                                           |                              |                 |
| Others                  |             |               |                                           |                              |                 |

| Village wise Power and Communication                      |                                            |                                            |                                            |
|-----------------------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|
| Electricity                                               | Yes/No                                     | Contact Number                             | Remarks                                    |
| <b>Village I</b>                                          |                                            |                                            |                                            |
| Electric Sub Station                                      |                                            |                                            |                                            |
| Electricity Available in Village                          |                                            |                                            |                                            |
| Street Light Facility                                     |                                            |                                            |                                            |
| Generator (Public)                                        |                                            |                                            |                                            |
| Generator (Private)                                       |                                            |                                            |                                            |
| Solar Power                                               |                                            |                                            |                                            |
| <b>ELECTRICITY CHALLENGES:</b>                            |                                            |                                            |                                            |
| Communication                                             | Yes/No                                     | Contact Number                             | Remarks                                    |
| Telephone Exchange                                        |                                            |                                            |                                            |
| <b>COMMUNICATION CHALLENGES:</b>                          |                                            |                                            |                                            |
| Public Announcement System                                |                                            |                                            |                                            |
| Loud Speakers                                             | Village I (Contact Person name and Number) | Village I (Contact Person name and Number) | Village I (Contact Person name and Number) |
| Loud Speakers (Temple, Masjid and other religious places) |                                            |                                            |                                            |
| Gram Panchayat                                            |                                            |                                            |                                            |
| Sound System Private                                      |                                            |                                            |                                            |
| Tent House                                                |                                            |                                            |                                            |
| Others                                                    |                                            |                                            |                                            |
|                                                           |                                            |                                            |                                            |



| PANCHAYAT'S TRADITIONAL APPROACH AND CHALLENGES IN NARROW CASTING: |                                                                     |                                                                      |                                                                       |
|--------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------|
| Nationalised Banks and Co-operative Banks                          |                                                                     |                                                                      |                                                                       |
| Name of the Bank                                                   | Village 1 (Contact Person and Number)                               | Village 1 (Contact Person and Number)                                | Village 1 (Contact Person and Number)                                 |
|                                                                    |                                                                     |                                                                      |                                                                       |
|                                                                    |                                                                     |                                                                      |                                                                       |
|                                                                    |                                                                     |                                                                      |                                                                       |
|                                                                    |                                                                     |                                                                      |                                                                       |
|                                                                    |                                                                     |                                                                      |                                                                       |
| <b>WASTE – DISPOSAL</b>                                            |                                                                     |                                                                      |                                                                       |
| Details                                                            | Village I (If yes, Location and Contact Person and Contact Details) | Village II (If yes, Location and Contact Person and Contact Details) | Village III (If yes, Location and Contact Person and Contact Details) |
| Solid Waste Disposal Area                                          |                                                                     |                                                                      |                                                                       |
| Dumpsters                                                          |                                                                     |                                                                      |                                                                       |
| Liquid Waste Disposal                                              |                                                                     |                                                                      |                                                                       |
| <b>BURIAL GROUND</b>                                               |                                                                     |                                                                      |                                                                       |
| Details                                                            | Village I (If yes, Location and Contact Person and Contact Details) | Village II (If yes, Location and Contact Person and Contact Details) | Village III (If yes, Location and Contact Person and Contact Details) |
| Burial Ground                                                      |                                                                     |                                                                      |                                                                       |
| Carcass Disposal Area                                              |                                                                     |                                                                      |                                                                       |

| PUBLIC PLACE FOR RECREATION |                                                                     |                                                                      |                                                                       |                          |
|-----------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------|
| Details                     | Village I (If yes, Location and Contact Person and Contact Details) | Village II (If yes, Location and Contact Person and Contact Details) | Village III (If yes, Location and Contact Person and Contact Details) |                          |
| Community Hall              |                                                                     |                                                                      |                                                                       |                          |
| Library                     |                                                                     |                                                                      |                                                                       |                          |
| Panchayat Ghar              |                                                                     |                                                                      |                                                                       |                          |
| Sports Ground               |                                                                     |                                                                      |                                                                       |                          |
| Parks                       |                                                                     |                                                                      |                                                                       |                          |
| Place of village meeting    |                                                                     |                                                                      |                                                                       |                          |
| PLACES OF WORSHIP           |                                                                     |                                                                      |                                                                       |                          |
| Details                     | Village I (If yes, Location and Contact Person and Contact Details) | Village II (If yes, Location and Contact Person and Contact Details) | Village III (If yes, Location and Contact Person and Contact Details) |                          |
| Temple                      |                                                                     |                                                                      |                                                                       |                          |
| Mosque                      |                                                                     |                                                                      |                                                                       |                          |
| Church                      |                                                                     |                                                                      |                                                                       |                          |
| Prayer Hall                 |                                                                     |                                                                      |                                                                       |                          |
| Others                      |                                                                     |                                                                      |                                                                       |                          |
| CONNECTIVITY                |                                                                     |                                                                      |                                                                       |                          |
| Type of Road                | From                                                                | To                                                                   | Condition: Good/Bad                                                   | Alternative Road: Yes/No |
| National Highway            |                                                                     |                                                                      |                                                                       |                          |
| State Highway               |                                                                     |                                                                      |                                                                       |                          |

|                                    |                 |                        |                          |                      |                     |
|------------------------------------|-----------------|------------------------|--------------------------|----------------------|---------------------|
| Pucca Road                         |                 |                        |                          |                      |                     |
| Kucchha Road                       |                 |                        |                          |                      |                     |
| Shadow Road                        |                 |                        |                          |                      |                     |
| Any other Specify                  |                 |                        |                          |                      |                     |
| <b>OTHER INFRASTRUCTURE</b>        |                 |                        |                          |                      |                     |
| <b>Other Infrastructure</b>        | <b>Yes</b>      | <b>No</b>              | <b>Condition: Yes/No</b> | <b>Remarks</b>       |                     |
| Bus Stand                          |                 |                        |                          |                      |                     |
| Rickshaw/Van/Car Stand             |                 |                        |                          |                      |                     |
| Transport                          | Yes             | No                     | Numbers if Yes           |                      |                     |
| Bus                                |                 |                        |                          |                      |                     |
| Mini Bus                           |                 |                        |                          |                      |                     |
| Truck                              |                 |                        |                          |                      |                     |
| Jeep                               |                 |                        |                          |                      |                     |
| Own Car                            |                 |                        |                          |                      |                     |
| Own Jeep                           |                 |                        |                          |                      |                     |
| Own Bike                           |                 |                        |                          |                      |                     |
| Tractors                           |                 |                        |                          |                      |                     |
| <b>SAFE SHELTERS DURING HAZARD</b> |                 |                        |                          |                      |                     |
| <b>Shelter Identified</b>          | <b>Location</b> | <b>Contact Details</b> | <b>Capacity</b>          | <b>No of Toilets</b> | <b>Water Source</b> |
| <b>Village I</b>                   |                 |                        |                          |                      |                     |
| Shelter I                          |                 |                        |                          |                      |                     |
| Shelter II                         |                 |                        |                          |                      |                     |
| Shelter III                        |                 |                        |                          |                      |                     |

**HUMAN RESOURCES – VILLAGE WISE**

|                   |             |                       |                     |
|-------------------|-------------|-----------------------|---------------------|
| <b>Profession</b> | <b>Name</b> | <b>Contact Number</b> | <b>Village Name</b> |
| Doctor – MBBS     |             |                       |                     |

| Profession                      | Name | Contact Number | Village Name |
|---------------------------------|------|----------------|--------------|
| Specialist Doctor               |      |                |              |
| Doctor AYUSH                    |      |                |              |
| Nurse                           |      |                |              |
| ANM                             |      |                |              |
| Pharmacist                      |      |                |              |
| Para Medical Staff              |      |                |              |
| Allied Health Staff             |      |                |              |
| Anganwadi Worker                |      |                |              |
| Veterinary Doctor               |      |                |              |
| Carpenter                       |      |                |              |
| Mason                           |      |                |              |
| Motor mechanic                  |      |                |              |
| Electrician                     |      |                |              |
| Electronic Mechanic             |      |                |              |
| Boat drivers                    |      |                |              |
| Boater                          |      |                |              |
| Heavy Vehicle Diver             |      |                |              |
| Swimmer                         |      |                |              |
| Retired army/police/fire person |      |                |              |
| Postman                         |      |                |              |
| Home Guard                      |      |                |              |
| First Medical Responder         |      |                |              |

**EQUIPMENT'S VILLAGE WISE**

| Available Resources | Contact Name of Person | Contact Number of Person | Quantity |
|---------------------|------------------------|--------------------------|----------|
| JCB (Backhoe)       |                        |                          |          |
| Dumper              |                        |                          |          |
| Crain               |                        |                          |          |

| Available Resources             | Contact Name of Person | Contact Number of Person | Quantity |
|---------------------------------|------------------------|--------------------------|----------|
| Loader                          |                        |                          |          |
| Tractor and Trolley             |                        |                          |          |
| Wood cutter                     |                        |                          |          |
| Tree Cutter                     |                        |                          |          |
| RCC Cutter                      |                        |                          |          |
| Gas Cutter                      |                        |                          |          |
| Rope                            |                        |                          |          |
| Chain                           |                        |                          |          |
| Heavy Hammer                    |                        |                          |          |
| Crow Bar                        |                        |                          |          |
| Hand Saw                        |                        |                          |          |
| Heavy Axe                       |                        |                          |          |
| Heavy Jack                      |                        |                          |          |
| Shovels                         |                        |                          |          |
| Short Ladder                    |                        |                          |          |
| Generator                       |                        |                          |          |
| Lands and Torches               |                        |                          |          |
| Tarpaulin                       |                        |                          |          |
| Cooking Vessels for 100 members |                        |                          |          |
| Gas Geyser                      |                        |                          |          |
| Four wheeler                    |                        |                          |          |
| Others                          |                        |                          |          |

## 8.7 Mitigation and Preparedness Plan

### CONSTITUTION OF GRAM PANCHAYAT DISASTER MANAGEMENT COMMITTEE (GPDMC):

To carry out disaster management activities i.e. Gram Panchayat Disaster Management Plan, training and awareness activities, identification of resources and search & rescue activity at village level conducted by Village Disaster Management Committee.

GPDMC conducts a community-based risk assessment, analysis and develop risk mitigation plans to increase communities' preparedness.

#### Key GPDMC functions in Disaster Risk Reduction:

- Village level hazard mapping.
- Conduction of GP disaster risk assessment.
- Analysis of disaster risk based on the assessment and prioritize the key activities to be undertaken to undertake disaster risk mitigation measures.
- Identification and prioritization of critical community infrastructure needed for the disaster risk mitigation measures.
- Formulation of project implementation committees.
- Coordination with UDMCs and sharing of information needed to plan Community Based Disaster Management activities

#### Preparedness Function of GPDMC:

- Share community Disaster Risk Management Plan (DRMPs) with all members of the Community.
- Conduct disaster preparedness training with GPDMC members.
- Raise community awareness on what to do before, during, and after a disaster.
- Monitor disaster threats, conduct drills, and draw lessons to improve the plan.
- Expand membership and involvement in disaster risk management committees and activities.

#### Emergency Functions of GPDMC:

- Issue warnings in case of emergencies.
- Manage evacuations at village level.
- Organize search and rescue with community participation at village level.

- Conduct Damage Assessment at village level and report damages and needs to government and disaster management agencies for assistance as per Government designed reporting formats and criteria.
- Coordinate, plan, and implement emergency relief delivery operations with DDMA, civil defence and other local agencies.

#### Recovery functions of GPDMC:

- Ensure that risk reduction measures are integrated during construction and rehabilitation of critical community infrastructures.
- Evaluate the performance of VDMC capacity and effectiveness to promote community safety.
- Coordinate with DDMA for the implementation of different recovery measures.

The following is the VDMC members:-

| S.No | Name | Designation                           | Role             | Contact Numbers |
|------|------|---------------------------------------|------------------|-----------------|
| 1    |      | President                             | Chairman         |                 |
|      |      | PDO                                   | Co – Chairman    |                 |
| 2    |      | Village Accountant                    | Member Secretary |                 |
| 3    |      | Vice President                        | Member           |                 |
| 4    |      | GP Member 1                           | Member           |                 |
| 5    |      | GP Member 2                           | Member           |                 |
| 6    |      | SHG Member                            | Member           |                 |
| 7    |      | Medical Officer                       | Member           |                 |
| 8    |      | School Head<br>Master/Mistress        | Member           |                 |
| 9    |      | Assistant Superintendent<br>of Police | Member           |                 |
| 10   |      | Agriculture Assistant                 | Member           |                 |

The teams: The teams are to be formed at GP level and their SOPs shall be listed down here.



## 1. Early Warning Team

### Composition of the team:

| S.No | Name | Designation        | Contact Numbers |
|------|------|--------------------|-----------------|
| 1    |      | GP President       |                 |
| 2    |      | GP Vice President  |                 |
| 3    |      | Local GP Member 1  |                 |
| 4    |      | Local GP Member 2  |                 |
| 5    |      | Local GP Member 3  |                 |
| 6    |      | PDO                |                 |
| 7    |      | Village Accountant |                 |
| 8    |      | Bill Collector     |                 |
| 9    |      | Social Worker/SHG  |                 |

### Roles of the Evacuation, Search and Response Team:

- Coordination for the alert with District Emergency Operation Center.
- Dissemination of the alert and warning to specified location (last mile connectivity)
- Communication with shelter team
- Communicate the information with other teams.
- Assistance to Police and F&E
- Transportation and emergency medical response for the victims and responders
- Head count mechanism
- Directing the rescue community to the shelters.
- Deploying rescue boats and rescue kits.
- Evacuating of cattle and livestock.
- Update contact details of local resources/ offices, etc.
- Identifying safe evacuation routes, places, assembly points in and around the village.
- Search people who trapped in buildings and rescue them.
- Transport victims to safe location.
- Contact DEOC / SEOC / KSNDMC (Varuna Mitra - 9243345433) for updated information on Weather Forecast and probable Flood situation.
- On issue of warning all GPDMC members move to the designated shelter & carry out assigned roles & responsibilities, co-ordination of implementing the preparedness measures

## 2. Evacuation, Search and Rescue Team

Fire and Emergency services, SDRF, and NDRF available in the district in case of emergency situation. Community will be first responder: GP level search and rescue teams to be formed. The member of this should include physically strong men and women in the age group of 18-35 years, team also shall include Ex-army, Rtd. Paramilitary personnel, Rtd. Police and Rtd. Fire and emergency personnel in the team. Gram Panchayat Member of the village shall also be part of the team. The Evacuation and Rescue team shall coordinate with the Taluk and District administration for any support government.

### Composition of the Team:

| S.No | Name | Designation                           | Contact Numbers |
|------|------|---------------------------------------|-----------------|
| 1    |      | GP President                          |                 |
| 2    |      | GP Vice President                     |                 |
|      |      | Local GP Member                       |                 |
| 3    |      | ASI-Police                            |                 |
| 4    |      | Local Home Guards                     |                 |
| 5    |      | Ex-Army, Rtd. Paramilitary, Ex-Police |                 |
| 6    |      | Expert swimmers, Experts drivers      |                 |
| 7    |      | Electrician                           |                 |
| 8    |      | Boatman                               |                 |
| 9    |      | Trained volunteers                    |                 |

### Roles of the Evacuation, Search and Rescue Team:

- Keeping information about the more vulnerable group and the area in which they work and live. Update the information regularly.
- Identify safe routes to reach the vulnerable population and plan their evacuation.
- Keeping transport ready for use to evacuate people
- Informing concerned officials for road repair and get it done in liaison with officials.
- Prepare a rescue kit which contains a rope, iron hooks or tow belongings, rafts/boats, container to bail out the water, torches, transistor, a first aid kit, life jackets, tyres and other floatable objects.
- Identify earthmoving equipment such as JCBs, excavators, etc at the nearest location.

- Keeping some tools handy such as cutting saw and blades, crowbar, hammer, nails etc to cut the fallen trees and to rescue people stuck under falls houses or debris.
  - Identify highlands for evacuating cattle and livestock which had enough fodder for about a week.
  - Carry out a mock drill for evacuation to get a fair idea of the kind of problems that need to be tackled at such times.
  - Help the vulnerable people to get into their respective shelters with minimum important belongings (important documents).
  - Arrange to shift of acute cases to the nearest PHC
- 3. Medical and First Aid Team:** The medical and first aid team should comprise of Medical Officer, Elected Representatives, Para Medical staff and local trained volunteers. This team is meant to provide the first and other health services in the emergency relief response phase.

**Composition of the Team:**

| S.No | Name | Designation                         | Contact Numbers |
|------|------|-------------------------------------|-----------------|
| 1    |      | GP President                        |                 |
| 2    |      | GP Vice President                   |                 |
| 3    |      | PHC Doctor                          |                 |
| 4    |      | Local Doctors                       |                 |
| 5    |      | Nurses                              |                 |
| 6    |      | Junior Health Asst. Male and female |                 |
| 7    |      | ASHA Workers                        |                 |
| 8    |      | SHG members                         |                 |
| 9    |      | Trained volunteers                  |                 |

**Roles of the Medical and First Aid Team:**

- Maintain list of pregnant women, infants, people with special medical needs, etc.
- Keeping First-Aid box with disinfectants, antiseptics, ORS, etc.
- Updated contact number of emergency services i.e. Ambulance, near hospital public & private.
- Moving medicine stocks and first aid kits to the shelters or safe places.
- Looking after the medical needs of the evacuees.
- Attending to injuries of the rescued people.
- Informing the relief group about medical supplies which are running low.

- Helping doctors and paramedics shift the sick & injured to hospitals.
  - Isolating cases with infectious diseases and prevent them from spreading after giving due primary care.
  - Providing preventive medication if there is a danger of epidemic outbreak like cholera, dysentery, malaria.
  - All COVID 19 precautionary measures to be adhered in all phases of disaster.
  - Communicable Disease Identification
  - Non-Communicable diseases
  - Reproductive and Child Health
  - Maternal Health
  - Psycho-social care
  - Psychological first aid
4. **Shelter Management team (Water Sanitation and Hygiene (WASH), Nutrition and Food Security):** This team will play crucial role in the emergency relief response in terms of providing the Water, Sanitation, Hygiene Services, Food and Nutrition, Non – Food items and Shelter facilities in the disaster affected areas.

**THE TEAM COMPOSITION:**

| S.No | Name | Designation                               | Contact Numbers |
|------|------|-------------------------------------------|-----------------|
| 1    |      | GP President                              |                 |
| 2    |      | GP Vice President                         |                 |
| 3    |      | GP Member                                 |                 |
|      |      | PHC Doctor                                |                 |
| 4    |      | PDO                                       |                 |
| 5    |      | Village Account                           |                 |
| 6    |      | School Head Master                        |                 |
| 7    |      | Junior Health Assistant (male and female) |                 |
| 8    |      | Anganwadi teacher                         |                 |
| 9    |      | Water Man                                 |                 |

| S.No | Name | Designation                | Contact Numbers |
|------|------|----------------------------|-----------------|
| 10   |      | ASHA Worker                |                 |
| 11   |      | Hostel Cooks/Mid meal cook |                 |
| 12   |      | Swatchagrahis              |                 |

**Roles of the Shelter Management team (Water Sanitation and Hygiene (WASH), Nutrition and Food Security):**

- Identify safe shelter in village, open spaces for tents installation and nearby areas in case of evacuate the people from village.
- Shelter identifications in the safe places based on hazard and vulnerability
- Safety:
  - ✓ Road connectivity, communication
  - ✓ Safety of the building
  - ✓ Non-schools as much as possible
  - ✓ Space – 3.5 sqm/person
  - ✓ Power Supply
  - ✓ Water Supply - 15 litres per person
  - ✓ Toilets (1: 25 toilets), frequently cleaning of toilets in light of COVID 19
  - ✓ Bathroom facility with hot water
  - ✓ Kitchen facility – Community Kitchen
- Stocks of food, drinking water, utensil and medicines and stocks made available
- Arrangement of sufficient space to house the evacuee family
- Strict hygiene conditions (WASH)
  - ✓ Water Quality and Quantity
  - ✓ Water supply 15 lts/person
  - ✓ Hot water for drinking and bathing
  - ✓ Drainage
  - ✓ Toilet for 1: 25
  - ✓ Vector control
  - ✓ Solid Waste Management
  - ✓ Hygiene promotion (hand washing, cough hygiene)
  - ✓ Personal protective equipment (face mask for all, hand gloves, head cap and foot wear for cooks, volunteers, food servers, sanitation workers)

- ✓ Disinfectants
- ✓ MHM – Sanitary pads
- ✓ Oils, comb, mirrors
- ✓ Laundry
- Special care provisions for the more vulnerable group.
- Every evacuee's name registration and identification slips
- Safety and protection
- Nutrition:
  - ✓ To provide food within nutritional limits for temporary maintenance
  - ✓ Water: plain water, beverage (like tea, coffee) milk
  - ✓ Calories: cereal products, breads, roti, chapatti, ragi, jowar
  - ✓ Protein: egg, sprouted grams, milk and milk products, legumes
  - ✓ Thiamine: Guava, Gooseberry, Orange
  - ✓ Salt: it is needed to conserve water in the body, thus prevent dehydration
- 5. **Animal Protection and Carcass Disposal Team:** Team shall work in coordination with the villagers to safeguard the livestock.

**Team Composition:**

| S.No | Name | Designation                      | Contact Numbers |
|------|------|----------------------------------|-----------------|
| 1    |      | GP Members                       |                 |
| 2    |      | Veterinary Doctor/Assistant      |                 |
| 3    |      | Milk Cooperative Society Members |                 |
| 4    |      | Social Workers                   |                 |
| 5    |      | Self Help Groups                 |                 |

**Roles of Animal Protection and Carcass Disposal Team:**

- Identification of space for carcass disposal.
- Stocking kerosene and fuel for disposal of carcass.
- Maintaining storage of sackcloth to cover dead bodies of animals.
- Proper spray of disinfectants (eg: DDT) to keep the air clean
- 6. **Damage & Need Assessment Team:** The team will facilitate the villagers on damage and need assessment.

**COMPOSITION OF THE TEAM:**

| S.No | Name | Designation            | Contact Numbers |
|------|------|------------------------|-----------------|
| 1    |      | Revenue Inspector      |                 |
| 2    |      | PDO                    |                 |
| 3    |      | Village Accountant     |                 |
| 4    |      | Agriculture Assistant  |                 |
| 5    |      | Horticulture Assistant |                 |

**Roles of the Damage and Need Assessment Team:**

- Help in forecasting damages including lives lost and losses to property and assets such as houses, livestock, agriculture, plantation, etc.
- Sensitizing families of village to keep their important documents safe, and in emergency kit.



## CHAPTER IV: RESPONSE PLAN

| Flood/Landslide Response Plan: |                 |           |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   |
|--------------------------------|-----------------|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Elements at Risk               |                 |           |        | Response Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                   |
| Area                           | People/Families | Structure | Others | Response and Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Responders<br>(Contact details of the teams head) |
|                                |                 |           |        | <p><b>Early Warning:</b> Early warning will be issued through GP, which will be based on the alert and warnings issued by the DDMA. A warning will be disseminated to early warning and dissemination team by GP.</p> <p><b>Dissemination:</b> Messages will be disseminated through narrowcasting i.e loudspeakers, mouth to mouth message and also mobile, whatsapp group or Wireless.</p> <p><b>Early Evacuation:</b> Roads and alternative roads are identified; the evacuation team will take a lead to evacuation. Vehicles for transportation and drivers are identified in the plan.</p> <p><b>Search, Rescue and Evacuation:</b> Search, Rescue</p> |                                                   |

| Flood/Landslide Response Plan: |                 |           |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   |
|--------------------------------|-----------------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Elements at Risk               |                 |           |        | Response Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                   |
| Area                           | People/Families | Structure | Others | Response and Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Responders<br>(Contact details of the teams head) |
|                                |                 |           |        | and Evacuation team will assist the Police, Fire and Emergency and NDRF teams in search, rescue and evacuation. Equipment essential for the search, rescue and evacuations are identified in the village and will be utilised for the same. First aid and Health team will assist and communicate with the respective centers in the health emergency. Special attention will be paid for the women, children, disabled, senior citizens, pregnant mother, chronically ill in the search, rescue and evacuation. |                                                   |
|                                |                 |           |        | <b>Relief and Temporary Shelter:</b> Relief Camps and Emergency Shelters are identified in the plan are as follows:<br>1. (No of inmates)<br>2.(No of inmates)                                                                                                                                                                                                                                                                                                                                                   |                                                   |

| Flood/Landslide Response Plan: |                 |           |        |                                                                                                                                                                                                                                                                                                                                                |                                                   |
|--------------------------------|-----------------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Elements at Risk               |                 |           |        | Response Plan                                                                                                                                                                                                                                                                                                                                  |                                                   |
| Area                           | People/Families | Structure | Others | Response and Approach                                                                                                                                                                                                                                                                                                                          | Responders<br>(Contact details of the teams head) |
|                                |                 |           |        | <p>3. (No of inmates)</p> <p>The shelter team will coordinate with the other teams and disaster survivors will be accommodated in the identified shelters.</p> <p>Need and Damage Assessment: Need and damage assessments are undertaken by the department of revenue, which will be assisted by the team and other concerned departments.</p> |                                                   |
| Other Risks:                   |                 |           |        |                                                                                                                                                                                                                                                                                                                                                |                                                   |

**Note:** Under the elements at risk, in the “area” column the village names to be specified along with specific vulnerable location in the village, followed by which the number of vulnerable “population” and “families” to be filled. Under the “structure” vulnerable structures including roads, bridges and houses are to be described and in the “others” column if anything unique to the village are identified to be mentioned. In the response column response and approach would be uniform in all villages. However, if anything specific to the village could be mentioned in the column. Importantly, in the responder’s column the important team members and their contact details to be included.

## CHAPTER V: CONTACT NUMBERS

## Administrative Contacts:

| S.No | Designation                    | Contact Details |           |        |
|------|--------------------------------|-----------------|-----------|--------|
|      |                                | Office          | Residence | Mobile |
| 1    | Deputy Commissioner            |                 |           |        |
| 2    | Chief Executive Officer        |                 |           |        |
| 3    | Superintendent of Police       |                 |           |        |
| 4    | Additional Deputy Commissioner |                 |           |        |
| 5    | Tahashildar                    |                 |           |        |
| 6    | Executive Officer              |                 |           |        |
| 7    | DYSP                           |                 |           |        |
| 8    | DHO                            |                 |           |        |
| 9    | DDPI                           |                 |           |        |
| 10   | PWD                            |                 |           |        |
| 11   | PRED                           |                 |           |        |
| 12   | NHA                            |                 |           |        |
| 13   | DDPU                           |                 |           |        |
| 14   | DD – F&CF                      |                 |           |        |
| 15   | DD – Agriculture               |                 |           |        |
| 16   | DD Horticulture                |                 |           |        |
| 17   | DCF                            |                 |           |        |
| 18   | Social Forestry                |                 |           |        |
| 19   | Territory Forest               |                 |           |        |
| 20   | DD – Mines and Geology         |                 |           |        |
| 21   | DD - WCD                       |                 |           |        |
| 22   | DF & E                         |                 |           |        |
| 23   | BSNL                           |                 |           |        |

| S.No                              | Designation                                    | Contact Details |                |                |
|-----------------------------------|------------------------------------------------|-----------------|----------------|----------------|
|                                   |                                                | Office          | Residence      | Mobile         |
| 24                                | District Information and Broad Casting Officer |                 |                |                |
| 25                                | CHESCOM                                        |                 |                |                |
| 26                                | DD – Animal Husbandry                          |                 |                |                |
| <b>Taluk Level Administrator</b>  |                                                |                 |                |                |
| S.No                              | Designation                                    | Office          | Residence      | Mobile         |
| 1                                 |                                                |                 |                |                |
| 2                                 |                                                |                 |                |                |
| <b>Gram Panchayat Contacts</b>    |                                                |                 |                |                |
| S.No                              | Designation                                    | Office          | Residence      | Mobile         |
| 1                                 |                                                |                 |                |                |
| 2                                 |                                                |                 |                |                |
| <b>NGO's Contact Details</b>      |                                                |                 |                |                |
| S.No                              | Name of the NGO                                | Type of NGO     | Contact Person | Contact Number |
| 1                                 |                                                |                 |                |                |
| 2                                 |                                                |                 |                |                |
| 3                                 |                                                |                 |                |                |
| <b>Emergency Contact Numbers:</b> |                                                |                 |                |                |
| S.No                              | Name of the Department                         | Contact Number  |                |                |
| 1                                 |                                                |                 |                |                |
| 2                                 |                                                |                 |                |                |
| 3                                 |                                                |                 |                |                |
| 4                                 |                                                |                 |                |                |
| 5                                 |                                                |                 |                |                |
| 6                                 |                                                |                 |                |                |

## Chapter VI: Relief Shelter/Camps Guidelines

### 1. Shelter Checklist:

#### Checklist for the shelter management (Relief Homes)

| 1         | Particulars                                                                       | Yes | No | N/A |
|-----------|-----------------------------------------------------------------------------------|-----|----|-----|
| <b>I</b>  | <b>Shelter requirements</b>                                                       |     |    |     |
| 1         | Safety of the building                                                            |     |    |     |
| 2         | Power supply                                                                      |     |    |     |
| 3         | Kitchen facility: stove, cooking oil, vegetables, rice<br>other cooking items etc |     |    |     |
| 4         | Utensils for Kitchen                                                              |     |    |     |
| 5         | Gaslight (alternative lights)                                                     |     |    |     |
| 6         | Candles, matchbox, kerosene, torches etc                                          |     |    |     |
| 7         | Registers, registration and attendance                                            |     |    |     |
| <b>II</b> | <b>Water, Sanitation and Hygiene Promotion<br/>(WASH)</b>                         |     |    |     |
| 1         | Drinking Water                                                                    |     |    |     |
| 2         | Water Safety                                                                      |     |    |     |
| 3         | Water for other purpose                                                           |     |    |     |
| 4         | Hot water for bathing                                                             |     |    |     |
| 5         | Toilet (1: 25)                                                                    |     |    |     |
| 6         | Sanitation near toilet                                                            |     |    |     |
| 7         | Vector control                                                                    |     |    |     |
| 8         | Solid waste management                                                            |     |    |     |
| 9         | MHM – Sanitary Pad                                                                |     |    |     |
| 10        | Oils, comb, mirror etc.                                                           |     |    |     |
| 11        | Hygiene items: Soaps, toothbrush, toothpaste,<br>sanitary pads                    |     |    |     |
| 12        | Laundry (optional)                                                                |     |    |     |
| 13        | Hygiene Promoters                                                                 |     |    |     |
| 14        | IEC Materials on WASH                                                             |     |    |     |

|            |                                                                                                                                                                                                                        |            |           |            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|------------|
| <b>III</b> | <b>Nutrition</b>                                                                                                                                                                                                       |            |           |            |
| 1          | Menu for the food to be followed in accordance with nodal officer's checklist                                                                                                                                          |            |           |            |
| 2          | Special focus on nutrition of <ul style="list-style-type: none"> <li>• Breastfeeding of infants</li> <li>• Under-five children</li> <li>• Children</li> <li>• Pregnant mothers</li> <li>• Postnatal mothers</li> </ul> |            |           |            |
| 3          | Nutritional Supplements (if requires)                                                                                                                                                                                  |            |           |            |
| <b>IV</b>  | <b>Health/Medical Team – PSC</b>                                                                                                                                                                                       |            |           |            |
| 1          | 1 Doctor                                                                                                                                                                                                               |            |           |            |
| 2          | 1 Staff Nurse                                                                                                                                                                                                          |            |           |            |
| 3          | 2 ANMs                                                                                                                                                                                                                 |            |           |            |
| 4          | 1 Counsellor                                                                                                                                                                                                           |            |           |            |
| 5          | Local ASHA's                                                                                                                                                                                                           |            |           |            |
| <b>1</b>   | <b>Particulars</b>                                                                                                                                                                                                     | <b>Yes</b> | <b>No</b> | <b>N/A</b> |
| 6          | Emergency Medicine Basic                                                                                                                                                                                               |            |           |            |
| 7          | Laboratory facility                                                                                                                                                                                                    |            |           |            |
| 8          | Special focus (Children, Women, Pregnant, Specially abled, NCD and Communicable Disease)                                                                                                                               |            |           |            |
| 9          | Psychological First aid                                                                                                                                                                                                |            |           |            |
| <b>III</b> | <b>Non-Food Items (Based on the need)</b>                                                                                                                                                                              |            |           |            |
| 1          | Mattress for the floor                                                                                                                                                                                                 |            |           |            |
| 2          | Blankets, bedsheets, bath towel                                                                                                                                                                                        |            |           |            |
| 3          | Clothes (if requires) including sweater, warm clothes, inner garments, skullcaps, scarfs, lungi, nighty etc                                                                                                            |            |           |            |
| 4          | Plastic buckets                                                                                                                                                                                                        |            |           |            |
| 5          | Mugs                                                                                                                                                                                                                   |            |           |            |
| 6          | Raincoats                                                                                                                                                                                                              |            |           |            |



|            |                                                                      |  |  |  |
|------------|----------------------------------------------------------------------|--|--|--|
| 7          | Umbrella                                                             |  |  |  |
| 8          | Gumboots                                                             |  |  |  |
| 9          | Slippers etc                                                         |  |  |  |
| <b>V</b>   | <b>Self-efficacy</b>                                                 |  |  |  |
| 1          | Scouts and Guides team deployment                                    |  |  |  |
| <b>VI</b>  | <b>Law and Order</b>                                                 |  |  |  |
| 1          | Police and Home guards                                               |  |  |  |
| <b>VII</b> | <b>Livelihood Activities (if stay of inmates exceeds for a week)</b> |  |  |  |

## 2. Nodal Officers Responsibilities:

**The responsibilities of the nodal officer appointed for the shelter management are as follows:**

1. They should issue identity number for the disaster survivors.
2. Food and relief materials to be distributed in accordance with the ID number.
3. It is the responsibility of the Nodal Officer to maintain a sanitation and hygiene at Relief Shelter.
4. Before receiving the materials at the relief shelter, materials need to be checked for the expiry dates. Expired and spoiled materials should not be received and distributed to the disaster survivors.
5. Vulnerable including pregnant mother, children, senior citizens to be provided with nutritious food and beds.
6. Nodal officer should make sure the self-reliance in the shelter.
7. Waste management including the segregation of the waste at the relief shelter are the responsibility of the respective nodal officers.
8. The sufficient toilet facility and water supply to be maintained in the relief shelters.
9. The daily menu to be developed in consultation with the disaster survivors and dietician which provides balanced diet.
10. The medical team to be deployed in the relief shelter and should oversee providing the health and psychosocial care.
11. Daily nodal officer should report to the taluk and district authority

12. Nodal Officer should maintain few registers at the relief shelter including initial registration registry, attendance registry, outgoing registry, stock registry etc.
13. Law and order at the relief shelter to be maintained.

### 8.6.2 TEMPLATE FOR URBAN LOCAL BODY (ULB) LEVEL FLOOD MANAGEMENT PLAN

#### Chapter I: Urban Body Profile

1. Urban Body Name:
2. CMC/TMC/TP:
3. No. of wards:
4. Ward Names:
5. Borders of Urban Body:
6. The nearby river and approximate distance:
7. Approaches (Roads and shadow roads to the ward: Maps prepared by NRDMS, KRSAC)
8. Demographic Details of ULB (Ward wise):

| Sl. No    | Details                   | Ward 1 | Ward 2 | Ward 3 | Ward 4 |
|-----------|---------------------------|--------|--------|--------|--------|
| 1         | No. of households         |        |        |        |        |
| 2         | Males                     |        |        |        |        |
| 3         | Females                   |        |        |        |        |
| 4         | Pregnant Mothers          |        |        |        |        |
| 5         | Infants                   |        |        |        |        |
| 6         | Under five's              |        |        |        |        |
| 7         | Children between 6 – 14   |        |        |        |        |
| 8         | Widow                     |        |        |        |        |
| 9         | Single/Divorced women     |        |        |        |        |
| 10        | Elderly (above 60 years)  |        |        |        |        |
| <b>II</b> | <b>Migrant Population</b> |        |        |        |        |
| <b>I</b>  | <b>Total Population</b>   |        |        |        |        |
| 1         | Males                     |        |        |        |        |
| 2         | Females                   |        |        |        |        |
| 3         | Pregnant Mothers          |        |        |        |        |

| Sl. No     | Details                                           | Ward 1 | Ward 2 | Ward 3 | Ward 4 |
|------------|---------------------------------------------------|--------|--------|--------|--------|
| 4          | Infants                                           |        |        |        |        |
| 5          | Under five's                                      |        |        |        |        |
| 6          | Children between 6 – 14                           |        |        |        |        |
| 7          | Elderly (above 60 years)                          |        |        |        |        |
| <b>III</b> | <b>Physically and Mentally Challenged Persons</b> |        |        |        |        |
| 1          | Locomotor Disability                              |        |        |        |        |
| 2          | Visual Impairment                                 |        |        |        |        |
| 3          | Hearing Impairment                                |        |        |        |        |
| 4          | Intellectual Disability                           |        |        |        |        |
| <b>IV</b>  | <b>Total Number of Families</b>                   |        |        |        |        |
| 1          | Total Antyodaya Cardholders                       |        |        |        |        |
| 2          | Total BPL Cardholders                             |        |        |        |        |
| 3          | Total APL Cardholders                             |        |        |        |        |
| 4          | Total Primitive Tribes Families                   |        |        |        |        |
| 5          | Total Schedule Caste                              |        |        |        |        |
| 6          | Schedule Tribe Families                           |        |        |        |        |
| 7          | Total Other Backward class families               |        |        |        |        |
| <b>VI</b>  | <b>Total Houses</b>                               |        |        |        |        |
| 1          | Total Thatched Houses                             |        |        |        |        |
| 2          | Total Tiled Houses                                |        |        |        |        |
| 3          | Total Asbestos Houses                             |        |        |        |        |
| 4          | Total RCC Houses                                  |        |        |        |        |

**8. Livelihood Activities**

| Sl. No. | Occupation Pattern                                | Ward 1<br>(Number of families) | Ward 2<br>(Number of families) | Total<br>(Number of Families) |
|---------|---------------------------------------------------|--------------------------------|--------------------------------|-------------------------------|
| 1       | Livestock (Animal Husbandry)                      |                                |                                |                               |
| 2       | Fisheries                                         |                                |                                |                               |
| 3       | Mining                                            |                                |                                |                               |
| 4       | Any other/Shops etc                               |                                |                                |                               |
| 5       | Business/Industries etc                           |                                |                                |                               |
| 6       | Labour                                            |                                |                                |                               |
| 7       | Manufacturing Units                               |                                |                                |                               |
| 8       | Handlooms/Power looms                             |                                |                                |                               |
| 9       | Processing Units                                  |                                |                                |                               |
| 10      | Service Repair and Household Industry (Papad etc) |                                |                                |                               |
| 11      | Construction Industry                             |                                |                                |                               |
| 12      | Trade and Commerce                                |                                |                                |                               |
| 13      | Tourism                                           |                                |                                |                               |
| 14      | Transport Storage and Communication               |                                |                                |                               |
| 15      | Service Sector (call centres)                     |                                |                                |                               |
| 16      | Any other                                         |                                |                                |                               |

**9. Livestock Resources (Ward wise):**

| Sl. No. | Live Stocks | Ward 1 | Ward 2 | Ward 3 | Total |
|---------|-------------|--------|--------|--------|-------|
| 1       | Cows        |        |        |        |       |
| 2       | Buffalos    |        |        |        |       |
| 3       | Bullock     |        |        |        |       |

|   |                   |  |  |  |  |
|---|-------------------|--|--|--|--|
| 4 | Sheep's and Goats |  |  |  |  |
| 5 | Poultry           |  |  |  |  |
| 6 | Others            |  |  |  |  |

#### 10. Critical Infrastructure Resources

| Sl. No.    | Particulars                                                                | Ward 1 | Ward 2 | Ward 3 | Total |
|------------|----------------------------------------------------------------------------|--------|--------|--------|-------|
| <b>I</b>   | <b>Education (number of students in brackets)</b>                          |        |        |        |       |
| 1          | Anganwadi / Play homes                                                     |        |        |        |       |
| 2          | Primary School and higher primary school                                   |        |        |        |       |
| 3          | High School                                                                |        |        |        |       |
| 4          | Pre-university College                                                     |        |        |        |       |
| 5          | First Grade College                                                        |        |        |        |       |
| 6          | Professional colleges (Medical / Engineering / Nursing / Hotel Management) |        |        |        |       |
| 7          | ITI/ Vocational Courses                                                    |        |        |        |       |
| <b>II</b>  | <b>Health</b>                                                              |        |        |        |       |
| 1          | Sub Center                                                                 |        |        |        |       |
| 2          | Primary Health Center                                                      |        |        |        |       |
| 3          | Community Health Center                                                    |        |        |        |       |
| 4          | Poly Clinic – Private                                                      |        |        |        |       |
| 5          | Nursing Home – Private                                                     |        |        |        |       |
| 4          | Hospital – Private *Total bed strength                                     |        |        |        |       |
| <b>III</b> | <b>Water Source</b>                                                        |        |        |        |       |
| 1          | Groundwater/Surface Water (surface, specify, river, pond, canals etc)      |        |        |        |       |
| 2          | No. of Borewell (Government/Private)                                       |        |        |        |       |
| 3          | Open Well (Government/Private)                                             |        |        |        |       |
| <b>IV</b>  | <b>Water Supply</b>                                                        |        |        |        |       |
| 1          | Mini Water Supply Scheme                                                   |        |        |        |       |
| 2          | Piped Water Supply Scheme (Spring Water)                                   |        |        |        |       |

| Sl. No.     | Particulars                                | Ward 1         | Ward 2 | Ward 3 | Total |
|-------------|--------------------------------------------|----------------|--------|--------|-------|
| 3           | Multi Ward Water Supply Scheme (Jack well) |                |        |        |       |
| 4           | RO Plant                                   |                |        |        |       |
| <b>V</b>    | <b>Waste Management</b>                    |                |        |        |       |
| 1           | Solid Waste Management Units (Yes/No)      |                |        |        |       |
| 2           | Effluent treatment plant(Yes/No)           |                |        |        |       |
| <b>VI</b>   | <b>Market/Shop (Numbers)</b>               |                |        |        |       |
| 1           | PDS                                        |                |        |        |       |
| 2           | Grocery Shop                               |                |        |        |       |
| 3           | Medicine                                   |                |        |        |       |
| 4           | Kerosene                                   |                |        |        |       |
| 5           | Dry Food                                   |                |        |        |       |
| 6           | Rice/Floor Mill                            |                |        |        |       |
| 7           | Hotels                                     |                |        |        |       |
|             | APMC / weekly market                       |                |        |        |       |
| <b>VII</b>  | <b>Other Infrastructure</b>                | <b>Numbers</b> |        |        |       |
| 1           | Community Hall                             |                |        |        |       |
| 2           | Temples                                    |                |        |        |       |
| 3           | Mosque                                     |                |        |        |       |
| 4           | Church                                     |                |        |        |       |
| 5           | Prayer hall/Bhajana Mandir                 |                |        |        |       |
| 6           | Youth Club Building                        |                |        |        |       |
| 7           | Others (Rangamandira etc)                  |                |        |        |       |
| <b>VIII</b> | <b>Others</b>                              |                |        |        |       |
| 1           | Community Cattle Shed (Goshala)            |                |        |        |       |
| 2           | Burial Ground                              |                |        |        |       |
| 4           | Animal Carcass Disposal Area               |                |        |        |       |

## Chapter II: Hazard, Risk, Vulnerability and Capacity Assessment

### 1. Disaster History:

| Sl. No. | Disaster / Hazard | Month and Year of Occurrence | Details of wards affected |           |                           |                            | People Affected                    |        |         | House Damaged |           |
|---------|-------------------|------------------------------|---------------------------|-----------|---------------------------|----------------------------|------------------------------------|--------|---------|---------------|-----------|
|         |                   |                              | No. of wards affected     | Ward name | Name of the area affected | No. of Households affected | No. of people affected (evacuated) | Deaths | Injured | Completely    | Partially |
| 1       | Flood             |                              |                           |           |                           |                            |                                    |        |         |               |           |
|         |                   |                              |                           |           |                           |                            |                                    |        |         |               |           |
|         |                   |                              |                           |           |                           |                            |                                    |        |         |               |           |
|         |                   |                              |                           |           |                           |                            |                                    |        |         |               |           |

### 2. Vulnerability Analysis:

| Sl. No | Name of the Hazard | Vulnerable Ward | Vulnerable areas in the Wards | Vulnerable Groups               |          |
|--------|--------------------|-----------------|-------------------------------|---------------------------------|----------|
| 1      | Flood              |                 |                               | Total Families:                 |          |
|        |                    |                 |                               | The total number of population: |          |
|        |                    |                 |                               | Males:                          | Females: |
|        |                    |                 |                               | Old age:                        |          |
|        |                    |                 |                               | Infants:                        |          |
|        |                    |                 |                               | Children below 5 years          |          |
|        |                    |                 |                               | Children 6 years to 14 years:   |          |
|        |                    |                 |                               | Pregnant Mothers:               |          |
|        |                    |                 |                               | Disabled:                       |          |
|        |                    |                 |                               | Migrant Population:             |          |
|        |                    |                 |                               | Below Poverty Level:            |          |
|        |                    |                 |                               | Scheduled Caste/tribes:         |          |
|        |                    |                 |                               | Primitive Tribes:               |          |



## 3. Community Resource/ Capacity Assessment:

| Health Facility                  |          |                 |          |                 |          |                 |
|----------------------------------|----------|-----------------|----------|-----------------|----------|-----------------|
| Name/Type of the Institute       | Ward 1   |                 | Distance |                 | Remarks  |                 |
|                                  | Location | Contact Number  | Location | Contact Number  | Location | Contact Number  |
| Sub-Centre                       |          |                 |          |                 |          |                 |
| PHC                              |          |                 |          |                 |          |                 |
| CHC                              |          |                 |          |                 |          |                 |
| General Hospitals                |          |                 |          |                 |          |                 |
| Private Clinic                   |          |                 |          |                 |          |                 |
| Nursing Home                     |          |                 |          |                 |          |                 |
| Ambulatory Care and Medical Shop |          |                 |          |                 |          |                 |
| Details                          | Ward I   |                 | Ward II  |                 | Ward III |                 |
|                                  | Name     | Contact Details | Name     | Contact Details | Name     | Contact Details |
| Ambulance other than 108         |          |                 |          |                 |          |                 |
| Medical Shop                     |          |                 |          |                 |          |                 |
| Human Resource                   |          |                 |          |                 |          |                 |
| Skilled                          | Ward I   |                 | Ward II  |                 | Ward III |                 |
|                                  | Name     | Contact Details | Name     | Contact Details | Name     | Contact Details |
| Doctor                           |          |                 |          |                 |          |                 |
| Specialist Doctor                |          |                 |          |                 |          |                 |
| AYUSH Doctor                     |          |                 |          |                 |          |                 |
| Staff Nurse                      |          |                 |          |                 |          |                 |
| Allied Health Staff              |          |                 |          |                 |          |                 |

| Health Facility                |          |          |                |         |  |  |
|--------------------------------|----------|----------|----------------|---------|--|--|
| Paramedical Staff (Specify)    |          |          |                |         |  |  |
| Junior Health Assistant Male   |          |          |                |         |  |  |
| Junior Health Assistant Female |          |          |                |         |  |  |
| ASHA                           |          |          |                |         |  |  |
| Private Doctor                 |          |          |                |         |  |  |
| Private AYUSH Doctor           |          |          |                |         |  |  |
| Veterinary Health Facility     |          |          |                |         |  |  |
| Name/Type of the Institute     | Location | Distance | Contact Number | Remarks |  |  |
| Government Veterinary Clinic   |          |          |                |         |  |  |
| Private Veterinary Clinic      |          |          |                |         |  |  |
| Human Resource                 |          |          |                |         |  |  |
| Skilled                        | Name     | Contact  | Remarks        |         |  |  |
| Doctor                         |          |          |                |         |  |  |
| Trained Veterinary Assistant   |          |          |                |         |  |  |

| Public Distribution System and Market/Shop |                                   |                                  |                                   |
|--------------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|
| Details                                    | Ward I                            | Ward II                          | Ward III                          |
|                                            | If Yes, Location and Phone Number | If Yes Location and Phone Number | If Yes, Location and Phone Number |
| PDS                                        |                                   |                                  |                                   |
| Petrol Pump                                |                                   |                                  |                                   |

| Public Distribution System and Market/Shop |                  |                   |                     |
|--------------------------------------------|------------------|-------------------|---------------------|
| Kerosene Depot                             |                  |                   |                     |
| Gas Agency                                 |                  |                   |                     |
| Warehouse                                  |                  |                   |                     |
| Bazar day details                          |                  |                   |                     |
| Malls                                      |                  |                   |                     |
| Cold Storage                               |                  |                   |                     |
| Others                                     | Ward I (Numbers) | Ward II (Numbers) | Wards III (Numbers) |
| Vegetable/Fruit Shops                      |                  |                   |                     |
| Hotels                                     |                  |                   |                     |
| Liquor Shops                               |                  |                   |                     |
| Garments                                   |                  |                   |                     |
| General Stores                             |                  |                   |                     |

| Ward wise Education     |             |               |                                           |                              |                 |
|-------------------------|-------------|---------------|-------------------------------------------|------------------------------|-----------------|
| Infrastructures Details | No of Rooms | No of Toilets | Easy Connectivity to the Shelter (Yes/No) | Safety of the Shelter Yes/No | Contact Details |
| <b>Ward I</b>           |             |               |                                           |                              |                 |
| Anganwadi I             |             |               |                                           |                              |                 |
| Anganwadi II            |             |               |                                           |                              |                 |
| Anganwadi III           |             |               |                                           |                              |                 |
| Anganwadi IV            |             |               |                                           |                              |                 |
| Primary School          |             |               |                                           |                              |                 |
| Primary School          |             |               |                                           |                              |                 |
| High School             |             |               |                                           |                              |                 |

|                               |  |  |  |  |  |
|-------------------------------|--|--|--|--|--|
| <b>Pre-University College</b> |  |  |  |  |  |
| <b>Others</b>                 |  |  |  |  |  |

| Ward wise Power and Communication                         |                                         |                                         |                                         |
|-----------------------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Electricity                                               | Yes/No                                  | Contact Number                          | Remarks                                 |
| <b>Ward I</b>                                             |                                         |                                         |                                         |
| Electric Sub-Station                                      |                                         |                                         |                                         |
| Electricity Available in Ward                             |                                         |                                         |                                         |
| Street Light Facility                                     |                                         |                                         |                                         |
| Generator (Public)                                        |                                         |                                         |                                         |
| Generator (Private)                                       |                                         |                                         |                                         |
| Solar Power                                               |                                         |                                         |                                         |
| Others                                                    |                                         |                                         |                                         |
| <b>Electricity Challenges:</b>                            |                                         |                                         |                                         |
| Communication                                             | Yes/No                                  | Contact Number                          | Remarks                                 |
| Telephone Exchange                                        |                                         |                                         |                                         |
| <b>Communication Challenges:</b>                          |                                         |                                         |                                         |
| Public Announcement System                                |                                         |                                         |                                         |
| Loud Speakers                                             | Ward I (Contact Person Name and Number) | Ward I (Contact Person Name and Number) | Ward I (Contact Person Name and Number) |
| Loud Speakers (Temple, Masjid and other religious places) |                                         |                                         |                                         |
| Sound System Private                                      |                                         |                                         |                                         |
| Tent House                                                |                                         |                                         |                                         |
| Others                                                    |                                         |                                         |                                         |

|                                                                    |                                                                  |                                                                   |                                                                    |
|--------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------|
| Urban Body's traditional approach and challenges in narrowcasting: |                                                                  |                                                                   |                                                                    |
| Nationalised Banks and Co-operative Banks                          |                                                                  |                                                                   |                                                                    |
| Name of the Bank                                                   | Ward 1 (Contact Person and Number)                               | Ward 1 (Contact Person and Number)                                | Ward 1 (Contact Person and Number)                                 |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
|                                                                    |                                                                  |                                                                   |                                                                    |
| Waste – Disposal                                                   |                                                                  |                                                                   |                                                                    |
| Details                                                            | Ward I (If yes, Location and Contact Person and Contact Details) | Ward II (If yes, Location and Contact Person and Contact Details) | Ward III (If yes, Location and Contact Person and Contact Details) |
| Solid Waste Disposal Area                                          |                                                                  |                                                                   |                                                                    |
| Dumpsters                                                          |                                                                  |                                                                   |                                                                    |
| Liquid Waste Disposal                                              |                                                                  |                                                                   |                                                                    |
| Burial Ground                                                      |                                                                  |                                                                   |                                                                    |
| Details                                                            | Ward I (If yes, Location and Contact Person and Contact Details) | Ward II (If yes, Location and Contact Person and Contact Details) | Ward III (If yes, Location and Contact Person and Contact Details) |
| Burial Ground                                                      |                                                                  |                                                                   |                                                                    |
| Carcass Disposal Area                                              |                                                                  |                                                                   |                                                                    |

| Public Place for Recreation                                                                        |                                                                  |                                                                   |                                                                    |                          |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------|
| Details                                                                                            | Ward I (If yes, Location and Contact Person and Contact Details) | Ward II (If yes, Location and Contact Person and Contact Details) | Ward III (If yes, Location and Contact Person and Contact Details) |                          |
| Government buildings<br>(Taluk office / Inspection Bungalow / Court complex / Mini Vidhana Soudha) |                                                                  |                                                                   |                                                                    |                          |
| Community Hall                                                                                     |                                                                  |                                                                   |                                                                    |                          |
| Library                                                                                            |                                                                  |                                                                   |                                                                    |                          |
| Ward House                                                                                         |                                                                  |                                                                   |                                                                    |                          |
| Sports Ground                                                                                      |                                                                  |                                                                   |                                                                    |                          |
| Parks                                                                                              |                                                                  |                                                                   |                                                                    |                          |
| Place of ward meeting                                                                              |                                                                  |                                                                   |                                                                    |                          |
| Places of Worship                                                                                  |                                                                  |                                                                   |                                                                    |                          |
| Details                                                                                            | Ward I (If yes, Location and Contact Person and Contact Details) | Ward II (If yes, Location and Contact Person and Contact Details) | Ward III (If yes, Location and Contact Person and Contact Details) |                          |
| Temple                                                                                             |                                                                  |                                                                   |                                                                    |                          |
| Mosque                                                                                             |                                                                  |                                                                   |                                                                    |                          |
| Church                                                                                             |                                                                  |                                                                   |                                                                    |                          |
| Prayer Hall                                                                                        |                                                                  |                                                                   |                                                                    |                          |
| Others                                                                                             |                                                                  |                                                                   |                                                                    |                          |
| Connectivity                                                                                       |                                                                  |                                                                   |                                                                    |                          |
| Type of Road                                                                                       | From                                                             | To                                                                | Condition: Good/Bad                                                | Alternative Road: Yes/No |
| National Highway                                                                                   |                                                                  |                                                                   |                                                                    |                          |
| State Highway                                                                                      |                                                                  |                                                                   |                                                                    |                          |
| Pucca Road                                                                                         |                                                                  |                                                                   |                                                                    |                          |

|                                     |                 |                            |                              |                          |                         |
|-------------------------------------|-----------------|----------------------------|------------------------------|--------------------------|-------------------------|
| Kucchha Road                        |                 |                            |                              |                          |                         |
| Shadow Road                         |                 |                            |                              |                          |                         |
| Any other Specify                   |                 |                            |                              |                          |                         |
| Other Infrastructure                |                 |                            |                              |                          |                         |
| <b>Other Infrastructure</b>         | <b>Yes</b>      | <b>No</b>                  | <b>Condition:<br/>Yes/No</b> | <b>Remarks</b>           |                         |
| Bus Stand                           |                 |                            |                              |                          |                         |
| Railway Station                     |                 |                            |                              |                          |                         |
| Nearest Airport / Helipad           |                 |                            |                              |                          |                         |
| Rickshaw/Van/Car Stand              |                 |                            |                              |                          |                         |
| <b>Transport</b>                    | <b>Yes</b>      | <b>No</b>                  | <b>Numbers if Yes</b>        |                          |                         |
| Bus                                 |                 |                            |                              |                          |                         |
| Mini Bus                            |                 |                            |                              |                          |                         |
| Truck                               |                 |                            |                              |                          |                         |
| Jeep                                |                 |                            |                              |                          |                         |
| Own Car                             |                 |                            |                              |                          |                         |
| Own Jeep                            |                 |                            |                              |                          |                         |
| Own Bike                            |                 |                            |                              |                          |                         |
| Tractors                            |                 |                            |                              |                          |                         |
| <b>Safe Shelters during Hazard:</b> |                 |                            |                              |                          |                         |
| <b>Shelter Identified</b>           | <b>Location</b> | <b>Contact<br/>Details</b> | <b>Capacity</b>              | <b>No of<br/>Toilets</b> | <b>Water<br/>Source</b> |
| <b>Ward I</b>                       |                 |                            |                              |                          |                         |
| <b>Shelter I</b>                    |                 |                            |                              |                          |                         |
| <b>Shelter II</b>                   |                 |                            |                              |                          |                         |
| <b>Shelter III</b>                  |                 |                            |                              |                          |                         |



| Human Resources – Ward Wise           |      |                |           |
|---------------------------------------|------|----------------|-----------|
| Profession                            | Name | Contact Number | Ward Name |
| Doctor – MBBS                         |      |                |           |
| Specialist Doctor                     |      |                |           |
| Doctor AYUSH                          |      |                |           |
| Nurse                                 |      |                |           |
| ANM                                   |      |                |           |
| Pharmacist                            |      |                |           |
| Para Medical Staff                    |      |                |           |
| Allied Health Staff                   |      |                |           |
| Anganwadi Worker                      |      |                |           |
| Veterinary Doctor                     |      |                |           |
| Carpenter                             |      |                |           |
| Mason                                 |      |                |           |
| Motor mechanic                        |      |                |           |
| Electrician                           |      |                |           |
| Electronic Mechanic                   |      |                |           |
| Boat drivers                          |      |                |           |
| Boater                                |      |                |           |
| Heavy Vehicle Diver                   |      |                |           |
| Swimmer                               |      |                |           |
| Retired<br>army/police/fire<br>person |      |                |           |
| Postman                               |      |                |           |
| Home Guard                            |      |                |           |
| First Medical<br>Responder            |      |                |           |

| Equipment's Ward Wise              |                        |                          |          |
|------------------------------------|------------------------|--------------------------|----------|
| Available Resources                | Contact Name of Person | Contact Number of Person | Quantity |
| JCB (Backhoe)                      |                        |                          |          |
| Dumper                             |                        |                          |          |
| Crain                              |                        |                          |          |
| Loader                             |                        |                          |          |
| Tractor and Trolley                |                        |                          |          |
| Woodcutter                         |                        |                          |          |
| Tree Cutter                        |                        |                          |          |
| RCC Cutter                         |                        |                          |          |
| Gas Cutter                         |                        |                          |          |
| Rope                               |                        |                          |          |
| Chain                              |                        |                          |          |
| Heavy Hammer                       |                        |                          |          |
| Crow Bar                           |                        |                          |          |
| Hand Saw                           |                        |                          |          |
| Heavy Axe                          |                        |                          |          |
| Heavy Jack                         |                        |                          |          |
| Shovels                            |                        |                          |          |
| Short Ladder                       |                        |                          |          |
| Generator                          |                        |                          |          |
| Lands and Torches                  |                        |                          |          |
| Tarpaulin                          |                        |                          |          |
| Cooking Vessels for 100 members    |                        |                          |          |
| Gas Geyser                         |                        |                          |          |
| Four-wheeler                       |                        |                          |          |
| Other Fire and Emergency Equipment |                        |                          |          |
| Others                             |                        |                          |          |

### Chapter III: Mitigation and Preparedness Plan

#### Constitution of Urban Local Body Disaster Management Committee (ULBDMC):

The Urban Local Body Disaster Management Committee is to carry out disaster management activities viz preparing Disaster Management Plan, training and awareness activities, identification of resources and search & rescue activity at ward level.

ULBDMC also conducts a community-based risk assessment, analysis and develop risk mitigation plans to enhance communities' preparedness.

#### Key ULBDMC functions in Disaster Risk Reduction:

- Ward level hazard mapping.
- Conduction of ULB disaster risk assessment.
- Analysis of disaster risk based on the assessment and prioritize the key activities to be undertaken in disaster risk mitigation measures.
- Identification and prioritization of critical community infrastructure needed for the disaster risk mitigation measures.
- Formulation of project implementation committees.
- Coordination with ULBDMCs and sharing of information needed to plan Community Based Disaster Management activities

#### Preparedness Function of ULBDMC:

- Share community Disaster Risk Management Plan (DRMPs) with all members of the Community.
- Conduct disaster preparedness training with ULBDMC members.
- Raise community awareness on what to do before, during, and after a disaster.
- Monitor disaster threats, conduct drills and draw lessons to improve the plan.
- Expand membership and involvement in disaster risk management committees and activities.

#### Emergency Functions of ULBDMC:

- Issue of warnings in case of emergencies.
- Manage evacuations at ward level.
- Organize search and rescue with community participation at ward level.
- Conduct Damage Assessment at ward level and report damages and needs to government and disaster management agencies for assistance as per Government designed reporting formats and criteria.
- Coordinate, plan and implement emergency relief delivery operations with DDMA, civil defence and other local agencies.

**Recovery functions of ULBDMC:**

- Ensure that risk reduction measures are integrated during the construction and rehabilitation of critical community infrastructures.
- Evaluate the performance of ULBDMC capacity and effectiveness to promote community safety.
- Coordinate with DDMA's for the implementation of different recovery measures
- The following is the ULBDMC members:

| S.No | Name | Designation                        | Role             | Contact Numbers |
|------|------|------------------------------------|------------------|-----------------|
| 1    |      | President                          | Chairman         |                 |
| 2    |      | CO/AEE                             | Co-Chairman      |                 |
| 3    |      | Revenue Officer                    | Member Secretary |                 |
| 4    |      | Deputy Mayor/Vice President        | Member           |                 |
| 5    |      | ULB Member1                        | Member           |                 |
| 6    |      | ULB Member 2                       | Member           |                 |
| 7    |      | NGO/SHG Member                     | Member           |                 |
| 8    |      | Medical Officer                    | Member           |                 |
| 9    |      | School Head Master/Mistress        | Member           |                 |
| 10   |      | Assistant Superintendent of Police | Member           |                 |
| 11   |      | Engineer                           | Member           |                 |

The teams: The teams are to be formed at ULB level and their SOPs shall be listed down here.

**7. Early Warning Team****Composition of the team:**

| S.No | Name | Designation        | Contact Numbers |
|------|------|--------------------|-----------------|
| 1    |      | ULB Representative |                 |
| 2    |      | ULB Representative |                 |
| 3    |      | Local ULB Member 1 |                 |
| 4    |      | Local ULB Member 2 |                 |
| 5    |      | Local ULB Member 3 |                 |
| 6    |      | Commissioner/CO    |                 |
| 7    |      | Revenue Officer    |                 |
| 8    |      | Engineer           |                 |
| 9    |      | Social Worker/SHG  |                 |

**Roles of the Evacuation, Search and Response Team:**

- Coordination for the alert with District Emergency Operation Centre.
- Dissemination of the alert and warning to the specified location (last-mile connectivity)
- Communication with shelter team
- Communicate the information with other teams.
- Assistance to Police and F&E
- Transportation and emergency medical response for the victims and responders
- Headcount mechanism
- Directing the rescue community to the shelters.
- Deploying rescue boats and rescue kits.
- Evacuating of cattle and livestock.
- Update contact details of local resources/ offices, etc.
- Identifying safe evacuation routes, places, assembly points in and around the ward.
- Search people who trapped in buildings and rescue them.
- Transport victims to a safe location.
- Contact ULB EOC/DEOC / SEOC / KSNDMC (Varuna Mitra - 9243345433) for updated information on Weather Forecast and probable Flood situation.
- On the issue of warning, all ULBDMC members move to the designated shelter & carry out assigned roles & responsibilities, co-ordination of implementing the preparedness measures

**8. Evacuation, Search and Rescue Team**

Fire and Emergency services, SDRF, and NDRF available in the district in case of an emergency. The community will be the first responder: ULB level search and rescue teams to be formed. The member of this should include physically strong men and women in the age group of 18-35 years, the team also shall include Ex-army, Rtd. Paramilitary personnel, Rtd. Police and Rtd. Fire and emergency personnel in the team. Urban Body Member of the ward shall also be part of the team. The Evacuation and Rescue team shall coordinate with the Taluk and District administration for any support government.

**Composition of the Team:**

| S.No | Name | Designation                           | Contact Numbers |
|------|------|---------------------------------------|-----------------|
| 1    |      | ULB Representative                    |                 |
| 2    |      | ULB Representative                    |                 |
| 3    |      | Local ULB Member                      |                 |
| 4    |      | ASI-Police                            |                 |
| 5    |      | Local Home Guards                     |                 |
| 6    |      | Ex-Army, Rtd. Paramilitary, Ex-Police |                 |
| 7    |      | Expert swimmers, Experts drivers      |                 |
| 8    |      | Electrician                           |                 |
| 9    |      | Boatman                               |                 |
| 10   |      | Trained volunteers/ NSS/NCC           |                 |

**Roles of the Evacuation, Search and Rescue Team:**

- Keeping information about the more vulnerable group and the area in which they work and live. Update the information regularly.
- Identify safe routes to reach the vulnerable population and plan their evacuation.
- Keeping transport ready for use to evacuate people
- Informing concerned officials for road repair and get it done in liaison with officials.
- Prepare a rescue kit which contains a rope, iron hooks or tow belongings, rafts/boats, container to bail out the water, torches, transistor, a first aid kit, life jackets, tyres and other floatable objects.
- Identify earthmoving equipment such as JCBs, excavators, etc at the nearest location.
- Keeping some tools handy such as cutting saw and blades, crowbar, hammer, nails etc to cut the fallen trees and to rescue people stuck under falls houses or debris.
- Identify highlands for evacuating cattle and livestock which had enough fodder for about a week.
- Carry out a mock drill for evacuation to get a fair idea of the kind of problems that need to be tackled at such times.
- Help the vulnerable people to get into their respective shelters with minimum important belongings (important documents).
- Arrange to shift of acute cases to the nearest PHC

- 9. Medical and First Aid Team:** The medical and first aid team should comprise of Medical Officer, Elected Representatives, Para-Medical staff and locally trained volunteers. This team is meant to provide the first and other health services in the emergency relief response phase.

**Composition of the Team:**

| S.No | Name | Designation                            | Contact Numbers |
|------|------|----------------------------------------|-----------------|
| 1    |      | ULB Representative                     |                 |
| 2    |      | ULB Representative                     |                 |
| 3    |      | PHC Doctor                             |                 |
| 4    |      | Local Doctors                          |                 |
| 5    |      | Nurses                                 |                 |
| 6    |      | Junior Health Asst. Male and female    |                 |
| 7    |      | ASHA Workers                           |                 |
| 8    |      | NGO/SHG members/NSS/NCC/Rangers/Rovers |                 |
| 9    |      | Trained volunteers                     |                 |

**Roles of the Medical and First Aid Team:**

- Maintain a list of pregnant women, infants, people with special medical needs, etc.
- Keeping First-Aid box with disinfectants, antiseptics, ORS, etc.
- The updated contact number of emergency services i.e. Ambulance, near hospital public & private.
- Moving medicine stocks and first aid kits to the shelters or safe places.
- Looking after the medical needs of the evacuees.
- Attending to injuries of the rescued people.
- Informing the relief group about medical supplies which are running low.
- Helping doctors and paramedics shift the sick & injured to hospitals.
- Isolating cases with infectious diseases and prevent them from spreading after giving due primary care.
- Providing preventive medication if there is a danger of epidemic outbreak like cholera, dysentery, malaria.



- All COVID 19 precautionary measures to have adhered in all phases of disaster.
- Communicable Disease Identification
- Non-Communicable diseases
- Reproductive and Child Health
- Child Production
- Maternal Health
- Psycho-social care
- Psychological first aid

10. **Shelter Management team (Water Sanitation and Hygiene (WASH), Nutrition and Food Security):** This team will play a crucial role in the emergency relief response in terms of providing the Water, Sanitation, Hygiene Services, Food and Nutrition, Non – Food items and Shelter facilities in the disaster-affected areas.

**The Team Composition:**

| S.No | Name | Designation                               | Contact Numbers |
|------|------|-------------------------------------------|-----------------|
| 1    |      | ULB Representative                        |                 |
| 2    |      | ULB Representative                        |                 |
| 3    |      | ULB Member                                |                 |
| 4    |      | PHC Doctor                                |                 |
| 5    |      | COMMISSIONER/CO/Engineer                  |                 |
| 6    |      | Revenue Officer                           |                 |
| 7    |      | School Head Master                        |                 |
| 8    |      | Junior Health Assistant (male and female) |                 |
| 9    |      | Anganwadi teacher                         |                 |
| 10   |      | Water Man                                 |                 |
| 11   |      | ASHA Worker                               |                 |
| 12   |      | Hostel Cooks/Mid meal cook                |                 |
| 13   |      | Swatchagrahis                             |                 |
| 14   |      | Scouts/Guides/NSS/NCC Teachers            |                 |

**Roles of the Shelter Management team (Water Sanitation and Hygiene (WASH), Nutrition and Food Security):**

- Identify safe shelter inward, open spaces for tents installation and nearby areas in case of evacuating the people from the ward.
- Shelter identifications in safe places based on hazard and vulnerability
- Safety:
  - ✓ Road connectivity, communication
  - ✓ Safety of the building
  - ✓ Non-schools as much as possible
  - ✓ Space – 3.5 sqm/person
  - ✓ Power Supply
  - ✓ Water Supply - 15 litres per person
  - ✓ Toilets (1: 25 toilets), frequently cleaning of toilets in light of COVID 19
  - ✓ Bathroom facility with hot water
  - ✓ Kitchen facility – Community Kitchen
- Stocks of food, drinking water, utensil and medicines and stocks made available
- Arrangement of sufficient space to house the evacuee family
- Strict hygiene conditions (WASH)
  - ✓ Water Quality and Quantity
  - ✓ Water supply 15 lts/person
  - ✓ Hot water for drinking and bathing
  - ✓ Drainage
  - ✓ Toilet for 1: 25
  - ✓ Vector control
  - ✓ Solid Waste Management
  - ✓ Hygiene promotion (handwashing, cough hygiene)
  - ✓ Personal protective equipment (face mask for all, hand gloves, head cap and footwear for cooks, volunteers, food servers, sanitation workers)
  - ✓ Disinfectants
  - ✓ MHM – Sanitary pads
  - ✓ Oils, comb, mirrors

## ✓ Laundry

- Special care provisions for the more vulnerable group.
- Every evacuee's name registration and identification slips
- Safety and protection
- Nutrition:
  - ✓ To provide food within nutritional limits for temporary maintenance
  - ✓ Water: plain water, beverage (like tea, coffee) milk
  - ✓ Calories: cereal products, bread, roti, chapatti, ragi, jowar
  - ✓ Protein: egg, sprouted grams, milk and milk products, legumes
  - ✓ Thiamine: Guava, Gooseberry, Orange
  - ✓ Salt: it is needed to conserve water in the body, thus prevent dehydration

**11. Animal Protection and Carcass Disposal Team:** Team shall work in coordination with the wards to safeguard the livestock.

| S.No | Name | Designation                      | Contact Numbers |
|------|------|----------------------------------|-----------------|
| 1    |      | ULB Members                      |                 |
| 2    |      | Veterinary Doctor/Assistant      |                 |
| 3    |      | Milk Cooperative Society Members |                 |
|      |      | Social Workers                   |                 |
| 4    |      | Self Help Groups                 |                 |

**Team Composition: Roles of Animal Protection and Carcass Disposal Team:**

- Identification of space for carcass disposal.
- Stocking kerosene and fuel for disposal of the carcass.
- Maintaining storage of sackcloth to cover dead bodies of animals.
- A proper spray of disinfectants (eg: DDT) to keep the air clean
- Specific cattle evacuation plan and assistance in the same

**12. Damage & Need Assessment Team:** The team will facilitate the wards on damage and need assessment.

**Composition of the Team:**

| S.No | Name | Designation       | Contact Numbers |
|------|------|-------------------|-----------------|
| 1    |      | Revenue Inspector |                 |
| 2    |      | CO                |                 |
| 3    |      | Revenue Officer   |                 |
| 4    |      | Engineer          |                 |
| 5    |      | Engineer          |                 |

**Roles of the Damage and Need Assessment Team:**

- Help in forecasting damages including lives lost and losses to property and assets such as houses, livestock, agriculture, plantation, etc.
- Sensitizing families of the ward to keep their important documents safe, and an emergency kit.

## Chapter IV: Response Plan

| Flood/Landslide Response Plan: |                 |                                                                                              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                         |
|--------------------------------|-----------------|----------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Elements at Risk               |                 |                                                                                              |        | Response Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                         |
| Area                           | People/Families | Structure<br>(Roads,<br>Buildings other<br>infrastructures<br>located in low<br>lying areas) | Others | Response and Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Responders<br>(Contact<br>details of the<br>teams head) |
|                                |                 |                                                                                              |        | <p><b>Early Warning:</b> Early warning will be issued through ULB, which will be based on the alert and warnings issued by the DDMA. A warning will be disseminated to early warning and dissemination team by ULB.</p> <p>Dissemination:<br/>Messages will be disseminated through narrowcasting i.e loudspeakers, mouth to mouth message and also mobile, WhatsApp group or Wireless.</p> <p><b>Early Evacuation:</b> Roads and alternative roads are identified; the evacuation team will</p> |                                                         |

| Flood/Landslide Response Plan: |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|--------------------------------|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Elements at Risk               |  |  |  | Response Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|                                |  |  |  | <p>take a lead to evacuation. Vehicles for transportation and drivers are identified in the plan.</p> <p><b>Search, Rescue and Evacuation:</b> Search, Rescue and Evacuation team will assist the Police, Fire and Emergency and NDRF teams in search, rescue and evacuation. Equipment essential for the search, rescue and evacuations are identified in the ward and will be utilised for the same. First aid and Health team will assist and communicate with the respective centers in the health emergency. Special attention will be paid for the women, children, disabled, senior citizens, pregnant mother, chronically ill in</p> |  |

| Flood/Landslide Response Plan: |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
|--------------------------------|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Elements at Risk               |  |  |  | Response Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|                                |  |  |  | <p>the search, rescue and evacuation.</p> <p>The task force should be formulated to coordinate the uninterrupted essential services.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                                |  |  |  | <p><b>Relief and Temporary Shelter:</b> Relief Camps and Emergency Shelters are identified in the plan are as follows:</p> <ol style="list-style-type: none"> <li>1. (No of inmates)</li> <li>2.(No of inmates)</li> <li>3. (No of inmates)</li> </ol> <p>The shelter team will coordinate with the other teams and disaster survivors will be accommodated in the identified shelters.</p> <p><b>Animal Management:</b> Specific plan for the early evacuation of cattle's etc and also identification of the cattle shed for the cattle management with sufficient fodder and drugs.</p> |  |



| Flood/Landslide Response Plan: |  |  |  |                                                                                                                                                                                                                                                                                             |  |
|--------------------------------|--|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Elements at Risk               |  |  |  | Response Plan                                                                                                                                                                                                                                                                               |  |
|                                |  |  |  | <b>Need and Damage Assessment:</b> Need and damage assessments are undertaken by the department of revenue, which will be assisted by the team and other concerned departments. The need and damage assessment team to be formulated and it is to work closely with the disaster survivors. |  |
| Other Risks:                   |  |  |  |                                                                                                                                                                                                                                                                                             |  |

**Note:** Under the elements at risk, in the “area” column the ward names to be specified along with the specific vulnerable location in the ward, followed by which the number of vulnerable “population” and “families” to be filled. Under the “structure” vulnerable structures including roads, bridges and houses are to be described and in the “others” column if anything unique to the ward is identified including the infrastructure in the low lying areas to be mentioned. In the response column response and approach would be uniform in all wards. However, if anything specific to the ward could be mentioned in the column. Importantly, in the responder’s column the important team members and their contact details to be included.

## Chapter V: Contact Numbers

### Administrative Contacts:

| Sl.No | Designation                                    | Contact Details |           |        |
|-------|------------------------------------------------|-----------------|-----------|--------|
|       |                                                | Office          | Residence | Mobile |
|       | Deputy Commissioner                            |                 |           |        |
|       | Chief Executive Officer                        |                 |           |        |
|       | Superintendent of Police                       |                 |           |        |
|       | Additional Deputy Commissioner                 |                 |           |        |
|       | Project Director - ULB                         |                 |           |        |
|       | AEE - ULB                                      |                 |           |        |
|       | Tahashildar                                    |                 |           |        |
|       | Executive Officer                              |                 |           |        |
|       | DYSP                                           |                 |           |        |
|       | DHO                                            |                 |           |        |
|       | DDPI                                           |                 |           |        |
|       | PWD                                            |                 |           |        |
|       | PRED                                           |                 |           |        |
|       | NHA                                            |                 |           |        |
|       | DDPU                                           |                 |           |        |
|       | DD – F&CF                                      |                 |           |        |
|       | DD – Agriculture                               |                 |           |        |
|       | DD Horticulture                                |                 |           |        |
|       | DCF                                            |                 |           |        |
|       | Social Forestry                                |                 |           |        |
|       | Territory Forest                               |                 |           |        |
|       | DD – Mines and Geology                         |                 |           |        |
|       | DD – WCD                                       |                 |           |        |
|       | DF & E                                         |                 |           |        |
|       | BSNL                                           |                 |           |        |
|       | District Information and Broad Casting Officer |                 |           |        |
|       | ESCOM                                          |                 |           |        |

|                                   |                                                                                 |                                              |                       |                       |
|-----------------------------------|---------------------------------------------------------------------------------|----------------------------------------------|-----------------------|-----------------------|
|                                   | DD – Animal Husbandry                                                           |                                              |                       |                       |
| <b>Taluk Level Administrator</b>  |                                                                                 |                                              |                       |                       |
| <b>S.No</b>                       | <b>Designation</b>                                                              | <b>Office</b>                                | <b>Residence</b>      | <b>Mobile</b>         |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
| <b>Urban Body Contacts</b>        |                                                                                 |                                              |                       |                       |
| <b>S.No</b>                       | <b>Designation</b>                                                              | <b>Office</b>                                | <b>Residence</b>      | <b>Mobile</b>         |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
| <b>NGO's Contact Details</b>      |                                                                                 |                                              |                       |                       |
| <b>S.No</b>                       | <b>Name of the NGO</b>                                                          | <b>Type of NGO</b>                           | <b>Contact Person</b> | <b>Contact Number</b> |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
| <b>S.No</b>                       | <b>Name of the Student Organisations (NCC/NSS/Rangers/Rovers/Scouts/Guides)</b> | <b>Level (College/School/Pre-university)</b> | <b>Contact Person</b> | <b>Contact Number</b> |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
| <b>Emergency Contact Numbers:</b> |                                                                                 |                                              |                       |                       |
| <b>S.No</b>                       | <b>Name of the Department</b>                                                   | <b>Contact Number</b>                        |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |
|                                   |                                                                                 |                                              |                       |                       |

## Chapter VI: Relief Shelter/Camps Guidelines

### 3. Shelter Checklist:

#### Checklist for the shelter management (Relief Homes)

| 1         | Particulars                                                                    | Yes | No | N/A |
|-----------|--------------------------------------------------------------------------------|-----|----|-----|
| <b>I</b>  | <b>Shelter requirements</b>                                                    |     |    |     |
| 1         | Safety of the building                                                         |     |    |     |
| 2         | Power supply                                                                   |     |    |     |
| 3         | Kitchen facility: stove, cooking oil, vegetables, rice other cooking items etc |     |    |     |
| 4         | Utensils for Kitchen                                                           |     |    |     |
| 5         | Gaslight (alternative lights)                                                  |     |    |     |
| 6         | Candles, matchbox, kerosene, torches etc                                       |     |    |     |
| 7         | Registers, registration and attendance                                         |     |    |     |
| <b>II</b> | <b>Water, Sanitation and Hygiene Promotion (WASH)</b>                          |     |    |     |
| 1         | Drinking-Water                                                                 |     |    |     |
| 2         | Water Safety                                                                   |     |    |     |
| 3         | Water for other prposes                                                        |     |    |     |
| 4         | Hot water for bathing                                                          |     |    |     |
| 5         | Toilet (1: 25)                                                                 |     |    |     |
| 6         | Sanitation near toilet                                                         |     |    |     |
| 7         | Vector control                                                                 |     |    |     |
| 8         | Solid waste management                                                         |     |    |     |
| 9         | MHM – Sanitary Pad                                                             |     |    |     |
| 10        | Oils, comb, mirror etc.                                                        |     |    |     |
| 11        | Hygiene items: Soaps, toothbrush, toothpaste, sanitary pads                    |     |    |     |
| 11        | Laundry (optional)                                                             |     |    |     |
| 12        | Hygiene Promoters                                                              |     |    |     |
| 13        | IEC Materials on WASH                                                          |     |    |     |

| 1   | Particulars                                                                                                                                                                                                      | Yes        | No        | N/A        |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|------------|
| III | <b>Nutrition</b>                                                                                                                                                                                                 |            |           |            |
| 1   | Menu for the food to be followed following nodal officer's checklist                                                                                                                                             |            |           |            |
| 2   | Special focus on the nutrition of <ul style="list-style-type: none"> <li>Breastfeeding of infants</li> <li>Under-five children</li> <li>Children</li> <li>Pregnant mothers</li> <li>Postnatal mothers</li> </ul> |            |           |            |
| 3   | Nutritional Supplements (if requires)                                                                                                                                                                            |            |           |            |
| IV  | <b>Health/Medical Team – PSC</b>                                                                                                                                                                                 |            |           |            |
| 1   | 1 Doctor                                                                                                                                                                                                         |            |           |            |
| 2   | 1 Staff Nurse                                                                                                                                                                                                    |            |           |            |
| 3   | 2 ANMs                                                                                                                                                                                                           |            |           |            |
| 4   | 1 Counsellor                                                                                                                                                                                                     |            |           |            |
| 5   | Local ASHA's                                                                                                                                                                                                     |            |           |            |
| 1   | <b>Particulars</b>                                                                                                                                                                                               | <b>Yes</b> | <b>No</b> | <b>N/A</b> |
| 6   | Emergency Medicine Basic                                                                                                                                                                                         |            |           |            |
| 7   | Laboratory facility                                                                                                                                                                                              |            |           |            |
| 8   | Special focus (Children, Women, Pregnant, Specially abled, NCD and Communicable Disease)                                                                                                                         |            |           |            |
| 9   | Psychological First aid                                                                                                                                                                                          |            |           |            |
| III | <b>Non-Food Items (Based on the need)</b>                                                                                                                                                                        |            |           |            |
| 1   | Mattress for the floor                                                                                                                                                                                           |            |           |            |
| 2   | Blankets, bed sheets, bath towel                                                                                                                                                                                 |            |           |            |
| 3   | Clothes (if requires) including sweater, warm clothes, inner garments, skullcaps, scarfs, lungi, nighty etc                                                                                                      |            |           |            |

| 1          | Particulars                                                              | Yes | No | N/A |
|------------|--------------------------------------------------------------------------|-----|----|-----|
| 4          | Plastic buckets                                                          |     |    |     |
| 5          | Mugs                                                                     |     |    |     |
| 6          | Raincoats                                                                |     |    |     |
| 7          | Umbrella                                                                 |     |    |     |
| 8          | Gumboots                                                                 |     |    |     |
| 9          | Slippers etc                                                             |     |    |     |
| <b>V</b>   | <b>Self-efficacy</b>                                                     |     |    |     |
| 1          | Scouts and Guides team deployment                                        |     |    |     |
| <b>VI</b>  | <b>Law and Order</b>                                                     |     |    |     |
| 1          | Police and Home guards                                                   |     |    |     |
| <b>VII</b> | <b>Livelihood Activities (if the stay of inmates exceeds for a week)</b> |     |    |     |

#### Nodal Officers Responsibilities:

**The responsibilities of the nodal officer appointed for the shelter management are as follows:**

1. They should issue the identification number for the disaster survivors.
2. Food and relief materials to be distributed following the ID number.
3. It is the responsibility of the Nodal Officer to maintain sanitation and hygiene at Relief Shelter.
4. Before receiving the materials at the relief shelter, materials need to be checked for the expiry dates. Expired and spoiled materials should not be received and distributed to the disaster survivors.
5. Vulnerable including pregnant mother, children, senior citizens to be provided with nutritious food and beds.
6. The nodal officer should make sure the self-reliance in the shelter.
7. Waste management including the segregation of the waste at the relief shelter is the responsibility of the respective nodal officers.
8. The sufficient toilet facility and water supply to be maintained in the relief shelters.
9. The daily menu to be developed in consultation with the disaster survivors and dietician which provides a balanced diet.

10. The medical team to be deployed in the relief shelter and should oversee providing health and psychosocial care.
11. The daily nodal officer should report to the taluk and district authority
12. Nodal Officer should maintain few registers at the relief shelter including initial registration registry, attendance registry, Outgoing registry, stock registry etc.
13. Law and order at the relief shelter to be maintained.

## 8.7 FLOOD RESPONSE

### Introduction

Management and control of the adverse consequences of floods will require coordinated and effective response systems at all levels-national, state, district, local and community. Many of the components of response initiatives will remain the same for different types of disasters. These systems need to be developed considering the multi-hazard scenario of the region to optimally utilise available resources.

The scale of response for floods and the corresponding role players will be identified and mobilised at the district, state or national levels depending on the magnitude and the severity of the event. Systems will be institutionalised by the DMAs, at various levels, for coordination between the various agencies like central government ministries and departments, state governments, district administration, ULBs, PRIs and other stakeholders for effective post-flood response.

### Response and Rescue Emergency Operations from various stakeholders

#### Neighbourhood Community

The local community in the affected neighbourhood is always the first responder after a disaster. Experience has shown that over 80 per-cent of search and rescue is carried out by the local community before the intervention of the state machinery and specialised search and rescue teams. Thus trained and equipped teams consisting of local people will be set up in flood prone areas to respond effectively in the event of floods.

#### District volunteers DM response teams

Centre for Disaster Management, ATI, Mysuru proposed to organize a skill based training to selected 50 volunteers identified by the district administration, who after undergoing the training would be able to help and extend the voluntary support to the district administration during disaster response activities like search & rescue, evacuation relief including first-aid/medical first-responder etc. As a follow up of the proposal, the Centre for Disaster Management, ATI, Mysuru held discussions with NDRF, SDRF, Red Cross



Society and KSFES to work out appropriate training module to impart this skill based training. The Commandant, National Disaster Response Force, Guntur and other organizations have suggested a training duration of 3 weeks. The objective are:

- Creating a pool of trained dedicated voluntary team in the district to be available on call for search and rescue operations and other emergency works of district administration.
- Develop core skills in Search and Rescue, Relief, Evacuation, Medical first responder /First-Aid, SOPs, responsibilities which will help them to work in coordination with district administration during disasters and other emergencies on call.

### **Search and Rescue Teams**

Community level teams will be developed in each district with basic training in search and rescue. Training modules will be developed for trainers of community level search and rescue teams by the NDRF training institutes. On the ground, besides others, the NDRF battalions will also assist the state government/district authorities in training communities. They will be further assisted by the CDM, ATIs, CD, Home Guards and NGOs.

The state government, through the CDM, ATI, will develop procedures for formally recognising and certifying such trained search and rescue team members; they will also provide suitable indemnity to community level team members for their actions in the course of emergency response following a flood. Youth organisations such as the NCC, NSS and NYKS will provide support services to the response teams at the local level under the overall guidance and supervision of the local administration.

### **Emergency Relief**

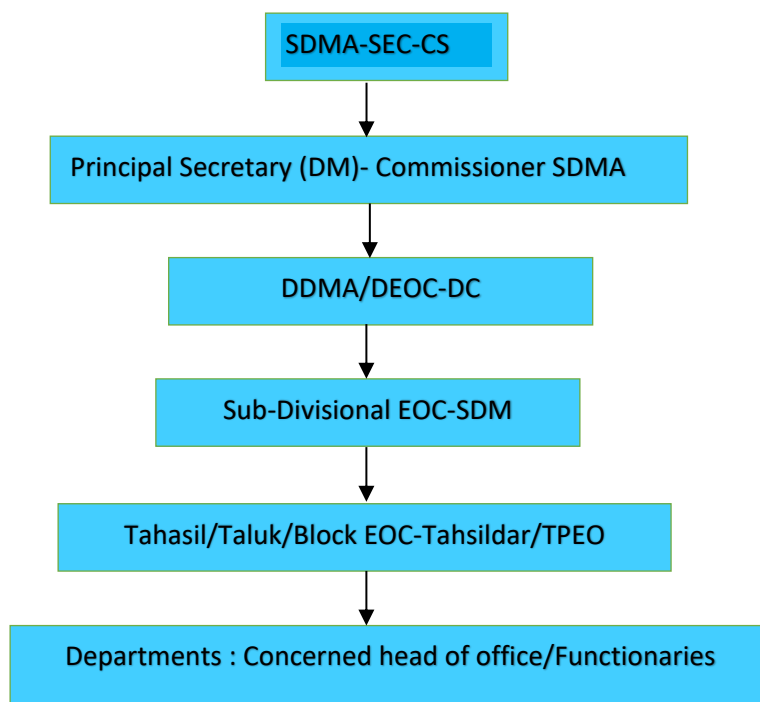
Trained community level teams will assist in planning and setting up emergency shelters, distributing relief among the affected people, identifying missing people, and addressing the needs of education health care, water supply and sanitation, food etc. of the affected community. Members of these teams will be made aware of the specific requirement of the disaster-affected communities. It will be ensured by the concerned authorities that the stockpiling of the essential commodities has been carried out. These teams will also assist the government in identifying the most vulnerable people who may need special assistance following floods.

### **Incident Command System**

All response activities will be undertaken at the local level through a suitably devised Incident Command System (IRS) coordinated by the local administration through the EOCs. State government will commission and maintain EOCs at appropriate levels for the coordination of human resources, relief supplies and equipment.

Standard Operating Procedures (SOPs) for the EOC will be developed by state government and integrated within the framework of the IRS, which will take advantage of modern technologies and tools, such as GIS maps, scenarios and simulation models for effectively responding to disasters. GIS maps available from other sources, such as the city planning departments will be compiled considering their potential application after a disaster. The state government/SDMA will undertake the training of personnel involved in the IRS. Some of the state governments have already adopted this system.

**Chart – 2 State Level Response System**



**The information flow when warning signals available shall be as follows:**

- ↓ Central nodal agency (IMD-CWC)
- ↓ NEOC/NDMA/MHA
- ↓ Chief Secy. /Pr-Secy. Revenue(DM)/ SEOC
- ↓ DEOC/Deputy Commissioner/DDMA
- ↓ AC
- ↓ All nodal Departments-ESF
- ↓ TPEO / Tahasildar
- ↓ GP Adhyaksha / Village Disaster Management Committee
- ↓ All nodal Departments

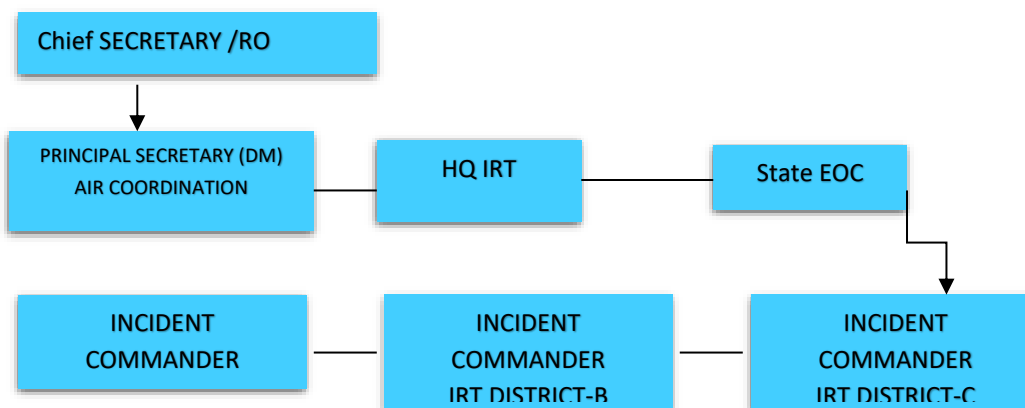
↓ All nodal Functionaries

**When Disaster occurs without early warning:**

- The village response team or any other functionary at the village level shall inform the Tahasildar/AC/TPEO/DEOC about the incidence
- Tahasildar/AC/TPEO/DEOC shall apprise the DDMA and activate the operations of rescue & relief with whatever resources at their command.
- DDMA shall assess the situation and declare the level of disaster i.e. L0, L1, L2, L3.
- DDMA shall identify the support requirement and seek assistance if required.
- SEC and SEOC are activated and NEOC/NDMA/MHA informed.
- SEC shall assess the situation and mobilise external resources if required.
- DDMA shall constantly assess and review the situation and activate coordination, command and control.
- DDMA shall deploy teams for rapid assessment of damage.
- Line department teams shall begin work for restoration of power, water supply telecommunication and road connectivity.

**Trigger Mechanism and Incident Response System (IRS):**

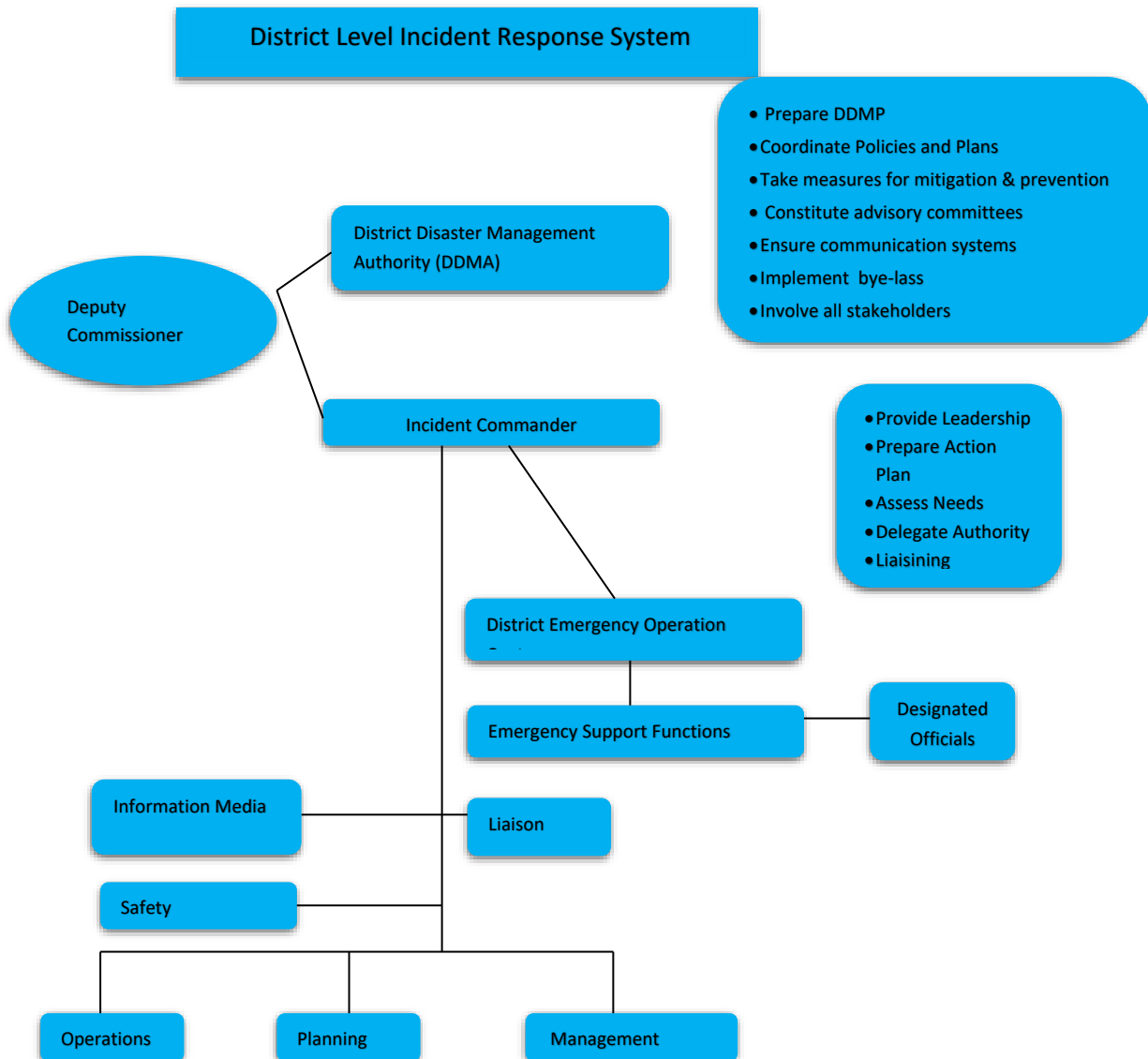
The Trigger Mechanism prescribes the manner in which the disaster response system shall be automatically activated after receiving early warning signals of a disaster happening or likely to happen or on receipt of information of an incident. Activities envisaged in the SOPs under the response phase shall be initiated simultaneously without loss of time to minimize the loss and damage and mitigate the impact of disaster.



**Chart – 3 Trigger Mechanism and Incident Response System (IRS)**

As per the DM Act-2005, CS is the Chief Executive Officer (CEO) of the SDMA as well as Chairperson of the SEC and Deputy Commissioner is the Chairperson of the DDMA and has been assigned all-encompassing role of planning, coordination and execution of DM in his jurisdiction assisted by all line departments and local bodies. As per the Incident Response System (IRS) the chief Secretary shall function as RO at the State level and Deputy Commissioner at district level.

**Chart – 4 District Level Incident Response System**



### **Community-based Disaster Preparedness and Response Coordination among Various Organisations**

Institutionalising the Role of Community Based Organisations, Non-governmental Organisations etc. in Incident Command System. A number of organisations, like NGOs, self help groups, CBOs, youth organisations such as NCC, NYKS, NSS etc., women's groups, volunteer agencies, CD, Home Guards, etc. normally volunteer their services in the aftermath of any disaster. Village level task forces will also be constituted on voluntary basis for better preparedness of the community. The state government/SDMA and DDMA's will coordinate the allocation of these human resources for performing various response activities. State government will work with these agencies to understand and plan their roles in the command chain of the IRS, and incorporate them in the DM plans.

### **Local Authorities (PRIs, ULBs and Development Authorities etc.)**

Local authorities are assigned an important role at every stage of Disaster Management at the local level. For the purpose of DM Act, local authorities would include Panchayat Raj Institutions (PRI), Municipalities, District and Cantonment Boards and Town Planning Authorities which control and manage civic services. These bodies shall ensure capacity building of their officers and employees for managing disasters, carrying out relief, rehabilitation and reconstruction activities in the affected areas and shall prepare DM Plans in consonance with guidelines of the NDMA, SDMA's and DDMA's. Specific institutional framework for dealing with disaster management issues in mega cities will be put in place. These include Municipalities, PRIs and all other local Development authorities and Functions of the local authority.

### **The State Disaster Response Force**

As per the State Disaster Management Act 2005, National Disaster Response Force (NDRF) has been set up. 9 battalions are placed at different states depending on vulnerability. The State of Karnataka is being served by Guntur Company based at Vishakhapatnam and Pune Team based on Pune. These response companies are in touch with the State Government. 2 acres of land has been granted at Yelahanka for positioning one battalion of NDRF at Bangalore. NDRF is in possession of the land, civil work is under progress. In addition, As per Disaster Management Act 2005, the State Disaster Response Force (SDRF) in line with NDRF is being raised in the State. As per the G.O No. OE/183/KA.A.SE/2012 dated: 18-9-2013. 4 companies of SDRF are being raised sharing personnel from KSRP/KSISF and Fire and Emergency Services. The process of raising these companies is under progress and the training to these companies is provided by the NDRF and equipment will be provided under the SDRF funds.

### **Inter-action with the Armed Forces**

The services of Armed Forces is necessary for the purpose of search, rescue, evacuation operations during the major disasters which cannot be handled by the district / state administration.

The Revenue Department(DM) has attended the meeting called by Armed Forces for Civil Administration to ensure co-operation between civil administration and army. Action is being taken on the front.

### **Role of National Cadet Corps, National Service Scheme, and Nehru Yuva, Kendra Sangathan and Nongovernment Organisations (NGOs).**

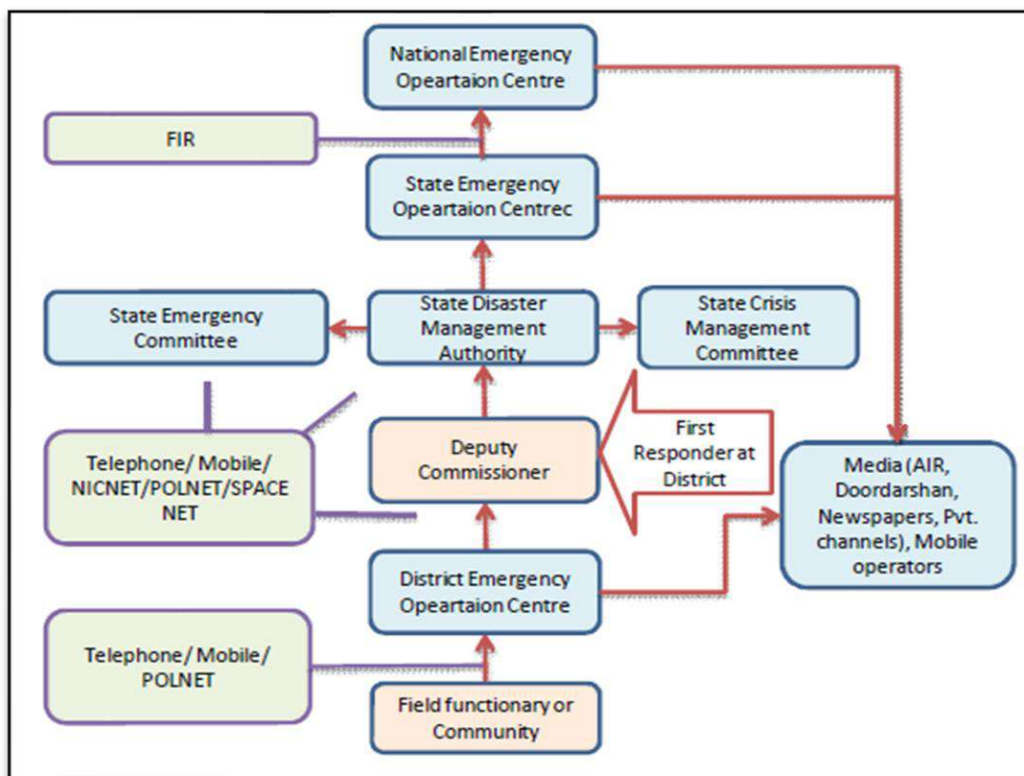
Among the community, the youth are best placed in the community to be involved in disaster management initiatives. Youth based organizations such as Nehru Yuva Kendra Sangathan (NYKS), the National Cadet Corps (NCC), the National Service Scheme (NSS) and other local youth clubs will be involved in community based disaster initiatives. GoK will support initiatives to build capacities of the youth to manage disasters in the communities.

### **Non-Government Organisations (NGOs)**

**NGOs** including HAM Radio Network, Indian Red Cross Society, CARE, Home guards, Scouts and Guides, Sri Swami Vivekananda Youth Movement, Rotary Club, Trusts, Community Based Organisations including Community Structures set up under the Schemes such SJSRY, SGSY, Resident Associations, Lions club, Rotary club, NYKs, International and other NGO's, Self-help Groups etc.

### **Other Research, Technical and Educational Institutions**

Karnataka state is known for housing specialised institutions such as CFTRI, DFRL, NITK, IISc, KSNDMC, IMD, ISRO, KRSAC, GSI, Geographical Survey of India, SJCE, NIE, NIMHANS, VTU, MEG, Coast Guard, Engineering and Technical institutions, including private organisations, MAH units and Government departments. These institutions will be utilised for Research and Development activities in the area of disaster management.



**Chart – 5 Communication Structure for Disaster Management**

#### **Karnataka State Emergency Operation Centre (Free toll No. 1070)**

State Emergency Operation Centre (SEOC)/Control Room shall be the nerve centre for coordination and management of disasters. They shall be the physical location from where coordination of response, relief and restoration will take place. They shall function 24x7 and shall be equipped with contemporary technologies, communication infrastructure facilities and adequate human and material resources. Under the network, the KSEOC is directly connected with the NEOC/Control Room of MHA at the National level. The district EOCs/ Control Rooms are connected with the respective State EOCs/Control Room. Suitable personnel are selected and imparted training in the operation of Control Rooms will be posted to man these EOCs/Control Room and it does the following functions;

- (i) Transmitting information about the development of a crisis as a result of natural disaster on continued basis to the Chief Secretary and Principal Secretary Disaster Management Department, GoK .
- (ii) Receiving instructions and communicating them to appropriate agencies for immediate action.
- (iii) Collection and submission of information relating to implementation of relief measures by the Chief Secretary and Principal Secretary Disaster Management Department, GoK.
- (iv) Keeping the State level authorities apprised of the developments on a continuing basis.

### **Modernization of Emergency Operation Centre (EOC)**

- The EOC will have to monitor continuously the preparedness and the response capacity of each district as per the details given in the DDMP. A constant review of the district situation will imply making provisions of such services and facilities, under the government as well as the private sponsorship, at the district level so that these can be mobilized at a very short notice.
- It will be difficult for the EOC to maintain an inventory of all the resources at the state level. Therefore, identification of agencies and institutions, for locating inventory items for specialized services becomes an important function of the EOC. EOC will also ensure the availability of the inventory items as and when required.
- For instance, speed boats/rescue ships for rescue operations can be located with Irrigation department, Navy, Coast guards at different locations. The EOC/District Control Room can press these boats from the nearest locations into relief operations during emergencies. It will be useful if the state agencies such as Irrigation Department in consultation with other agencies like Coast Guard have a special plan for locating these facilities.
- Similarly, civil hospitals can be equipped for trauma care with mobile trauma vans and CT scan facilities, so that each district will be in a position to handle such emergencies, and the mobile trauma vans can be mobilized from few adjoining districts at a short notice during disaster.

### **Coordination between EOC and District Control Room**

The need for coordination in disaster management between different levels of government, is based on the necessity for having a unified command, and coordinated action by all the agencies. The objective is to ensure that state action is organized in a disaster situation to:

1. Effectively and efficiently meet needs
2. Avoid waste and-duplication of effort
3. Ensure that resources are distributed equitably and to areas of need.

Priorities must be clearly defined and understood by all agencies. This is mainly done at the state level, while preparing the standard operating procedures for each department, during the disaster cycle. Effective coordination is largely dependent upon an effective data collection, processing and reporting machinery.

### **Support of Stakeholders**

Large scale natural disasters draw overwhelming humanitarian support from different stakeholders. The relief and response activities carried out by such stakeholders must comply with the norms prescribed by the appropriate authorities.



### **Dissemination of Information**

Soon after a flood, accurate information will need to be provided on the extent of the damage and other details of the response activities through electronic and print media. The state government/KSDMA will utilise different types of media, especially print, radio, television and internet, to disseminate timely and accurate information.

### **Involvement of the Corporate Sector**

State government/KSDMA will facilitate the involvement of the corporate sector in making available their services and resources to the government during immediate aftermath of flood. The corporate sector, as part of the Corporate Social Responsibility (CSR) effort, can provide, inter alia, the services of hospitals, power and telecommunication, relief supplies, search and rescue equipment, water pumps and transport and logistics for movement of relief supplies to the extent possible. The India Disaster Resource Network (IDRN) is a web based platform for managing inventories of equipment, skilled human resources and critical supplies for emergency response. The primary focus of the IDRN portal is to enable the decision makers to better understand the availability of equipment and human resources required to deal with any emergency situation. State governments and district authorities will develop appropriate mechanisms to receive and optimally utilise all such assistance.

### **Specialised Teams for Response**

#### **National Disaster Response Force**

In terms of the DM Act, 2005, eight battalions of the NDRF are being set up to provide specialised response to any threatening disaster situation or disaster. Out of these seven battalions are already in position. Each of these battalions will have 18 teams with high skill training and latest equipment for water rescue. In order to ensure prompt response to any flood situation, each of these battalions will also have Regional Resource Centres (RRCs) in high vulnerability areas, where boats and other water rescue equipment will be pre-positioned. The NDRF units will maintain close liaison with the state administration and will be available to them proactively, thus avoiding long procedural delays in deployment in the event of any serious threatening disaster situation. The NDRF battalions will also be provided with communication equipment for establishing last mile connectivity.

### **Fire and Emergency Services in the Urban Local Bodies**

The fire and emergency services in the ULBs of various states are being used as an emergency cum- fire services force. The fire and emergency services in the flood prone areas will develop. Adequate capacity to respond to serious flood situations, in addition to managing fires.

### **Police Force**

The police plays an important role in the aftermath of floods in maintaining law and order, assisting in search and rescue, and in the transportation and certification of casualties. It is equally important that the police forces are properly equipped and trained.

### **Home Guards**

The Home Guards serve as an auxiliary arm of the police force and support the district administration in various tasks. They will be trained for carrying out search, rescue and relief operations on occurrence of floods.

### **Civil Defence**

The community has a major role to play both as a victim and necessarily as a first responder. Integration of the CD organisation into disaster management can work as a great catalyst for organising community capacity building. CD has been authorised in 225 designated towns in the country out of which 121 have already been activated where volunteers have been recruited and trained. There is a plan to revamp CD, extending its coverage to all the districts in the country and assigning it an important role in DM framework. According to the proposal for revamping, the primary role of CD will be community capacity building and creating public awareness in pre-disaster phase.

The proposal envisages converting the town specific setup of CD to a district specific set up. It is proposed to have 18 persons employed on full time basis in each district-specific set up, out of which eight will be the trainers and their duty will be to train volunteers. Till the revamping is finalised, states should start using the existing set up for training more and more volunteers and spreading awareness on the different aspects of DM. The state governments will also activate the remaining non-activated towns in a phased manner.

The state governments/SDMAs and DDMA's will coordinate the human resources of the CD set up as well as those of other agencies for performing/ responding to various disaster-related activities.

### **Improving Flood Response**

State Disaster Response Force to augment the capacities of the states, all state governments will constitute, from within their armed police force, adequate strength of personnel for the SDRF with appropriate disaster response capabilities. In addition, the police, fire and emergency services, Home Guards and CD are being strengthened and upgraded to have adequate capacity to respond effectively to disasters. Deployment of the Indian Armed Forces for post-flood response work will be resorted to only as the last option.

## **Emergency Logistic of IRS**

### **Equipment**

Motor launches, country boats, in floatable rubber boats, life jackets, life buoys and other equipments will be required immediately after floods to carry out search and rescue of trapped people. State governments will compile a list of such equipment, identify suppliers thereof and enter into long-term agreement for their quick mobilization and deployment in the event of floods. The IDRN, which is a web-based resource inventory of information on emergency equipment and response personnel available in every district, will also be used for this purpose. The information on IDRN will be revised and updated frequently. The state governments may avail of CRF for this purpose to the extent of 10 per-cent as provided in the existing rules and guidelines for disbursement.

### **Relief Camps**

The setting up of relief camps for the people whose houses have been damaged by floods and the provision of basic amenities in such camps involves complex logist IRS of mobilising relief supplies, tents, water supply and sanitation systems, transport and communication systems, and medical supplies. The panchayat buildings in the villages in flood prone areas will be made flood proof as by raising their plinth level at least 0.6 m above the drainage/flood submergence line and making them at least double storeyed or constructing ring bunds around them. Wherever the panchayat building is single storey, a stairway will invariably be provided to the roof so that people can take shelter there temporarily. The DM plans at the state and district levels will address this issue in detail.

### **Identification of the Deceased**

In the event of mass casualties, states will develop systems for proper identification of the deceased, recording the details of victims, and making use of DNA fingerprinting.

### **Emergency Medical Response**

Emergency Treatment at Site of Floods Prompt and efficient emergency medical response will be provided by Quick Reaction Medical Teams (QRMTs), mobile field hospitals, including floating hospitals for riverine islands and areas inaccessible by roads, Accident Relief Medical Vans (ARMVs) and heli-ambulances.

They will be activated to reach the flood-affected areas immediately, along with dressing material, splints, portable X-ray machines, mobile operation theatres, resuscitation equipment and life-saving drugs, etc. Resuscitation, triage and medical evacuation of victims who require hospitalisation will be done of victims who require hospitalisation will be done.

### **Medical Facilities and Medical Treatment at Hospital**

A well-rehearsed medical preparedness plan is required to provide intensive care to cases rescued from drowning. An emergency medical plan will be triggered immediately on receiving information about imminent threat of flood. The action will be immediately initiated for crisis expansion of required number of beds. The medical superintendent should be able to forecast the requirement of enhanced manpower and medical stores after knowing the number of casualties likely to be received at the hospital. Special efforts will be made for the availability of IV fluid, antibiotics vaccines etc. Children, women, elders and other vulnerable casualties will be attended to on priority basis.

### **Mortuary Facilities and disposal of Dead Bodies**

The state will develop contingency plans to have sufficient mortuaries to preserve the dead bodies. After proper identification, dead bodies will be immediately disposed through district authorities, to prevent outbreak of an epidemic and environmental pollution.

### **Public Health Issues in Aftermath of Floods**

Safe and sufficient drinking water will be ensured. Protecting existing water sources from contamination, adding chlorine tablet in the water for residual disinfection effect and provision of latrine and proper waste disposal to avoid contamination through flies and other insects are important steps required immediately in the aftermath of a flood. Vector control will be done by spraying of shelters with residual insecticides. Provisions of insecticides treated mosquito nets are recommended.

### **Psychosocial Aspects**

A large number of victims will suffer from psychosocial effects in the aftermath of a flood. The psychosocial impact of floods will be manifested as psychosocial reaction in the form of post-traumatic stress disorders (PTSD) and other psychosocial ailments in displaced people due to flood. A team comprising a social worker, a psychologist and a psychiatrist will provide counselling to them.

### **Documentation of Medical Response**

Documentation of the medical response provided after a flood will be done by a medical administrator. This documentation will be used as feedback for future improvement of the response strategies.

**Other Flood Related Guidelines for Reference:****1. URBAN FLOOD MANAGEMENT:**

[https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/management\\_urban\\_flooding.pdf](https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/management_urban_flooding.pdf)

**2. MANAGEMENT OF FLOODS:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/flood.pdf>

**3. BOAT SAFETY:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/boatsafetyguidelines17.pdf>

**4. TEMPORARY SHELTERS FOR DISASTER-AFFECTED FAMILIES:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/Temporary-Shelters-Disaster-Affected-families.pdf>

**5. MANAGEMENT OF DEAD IN THE AFTERMATH OF DISASTER:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/management-of-Dead-in-the-Aftermath-of-Disasters.pdf>

**6. INCIDENT RESPONSE SYSTEM:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/incidentresponsesystemjuly.pdf>

**7. MANAGEMENT OF CYCLONES:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/cyclones.pdf>

**8. MEDICAL PREPAREDNESS AND MASS CASUALTY MANAGEMENT:**

<https://www.ndma.gov.in/sites/default/files/PDF/Guidelines/medical-preparedness.pdf>

**9. KARNATAKA STATE DISASTER MANAGEMENT PLAN (KSDMP):**

[https://ksdma.karnataka.gov.in/storage/pdf-files/Plans/Volume-I\\_30-08-2020\\_compressed.pdf](https://ksdma.karnataka.gov.in/storage/pdf-files/Plans/Volume-I_30-08-2020_compressed.pdf)

# 09

---

## CAPACITY DEVELOPMENT

---

|                                                                                |     |
|--------------------------------------------------------------------------------|-----|
| 9.1 Introduction .....                                                         | 341 |
| 9.2 Opportunity for Capacity Building<br>in Disaster Management .....          | 342 |
| 9.3 Capacity Building for Disaster Management<br>& Training in Karnataka ..... | 342 |
| 9.4 Training Areas & Targets .....                                             | 343 |



## CAPACITY DEVELOPMENT

### 9.1 Introduction

KSDMA has the mandate to develop disaster preparedness plans for the State to meet any eventuality arising out of flood, urban flood and boat safety. The CDM ATI, Mysore has been identified as a nodal training institute for DM training in the State covering the functionaries of 23 departments. KSDMA responsible for;

- (i) Preparation of State disaster management plans & District Plans including automation of all District DM Plans through GIS, RS, GPS technology with the support of CDM, ATI, Mysore and others.
- (ii) Design and development of training programme for the functionaries, decision makers, elected, representatives and the Civil Society groups in collaboration with CDM, ATI Mysore
- (iii) Arranging state and district-wise drilling of the plans to verify the preparedness levels
- (iv) Establish and maintain a failsafe communication network interconnecting the State, district, block and GP Headquarters for dissemination and collection of information relating to disaster management.
- (v) Institutional capacity building in terms of modern equipment, technology, capacity building in all forms required at the state and district levels
- (vi) Capacity building of the communities and community based organisations to handle emergencies in collaboration with CDM, ATI, Mysore
- (vii) Coordination of NGO efforts.

KSDMA will undertake comprehensive restoration and reconstruction of public infrastructure damaged due to flood with the concerned departments and local bodies. KSDMA will be coordinating between the executing agencies i.e. the various line departments and the various funding agencies, such as Govt. of India, World Bank, etc. KSDMA is expected to review and approve the technical proposals received from the executing agencies, process the procurement packages, manage the disbursement of funds and monitor the implementation. The role of KSDMA is critical in capacity building initiatives in the State through designing, developing and implementing effective public policies to reduce risk and vulnerabilities associated with flood. A multidisciplinary group in KSDMA will be set up to strengthen the Disaster Management Unit. The group will include technical experts with experience in managing various disasters,



Engineering/Housing and rehabilitation experts, IT and GIS personnel, social scientist, geologist, medical officer with specialization in Preventive and social medicines and communication specialist.

## 9.2 Opportunity for Capacity Building in Disaster Management

A strong institutional framework supporting overall capacity building for disaster management has been initiated in India by enacting and enforcing a Disaster Management Act in 2005. The Act has clearly assigned the roles and responsibilities to local, district, state and national authorities for enabling disaster resilient and safe community. The Creation of NDMA, NIDM at New Delhi, CDM at every State, Response Forces, Funding mechanism at various levels, Institutional structures etc., have given a greater thrust to capacity building at every level namely local, sub-district, district, state and national levels. In Karnataka, about 23 departments have been identified as responsible for effective disaster management. The Department of Disaster Management (GoK) in Karnataka Government, KSDMA, SEC, DDMA have all been established. The Centre for Disaster Management, ATI Mysore is the nodal institute for disaster management training in Karnataka.

**Capacity Building for Disaster Response:** The fifteenth Finance Commission has recommended capacity building grant every year for building capacity within the administrative machinery for better handling of disaster response and for preparation of District and State level disaster management plans as envisaged under the Disaster Management Act, 2005.

## 9.3 Capacity Building for Disaster Management & Training in Karnataka

### 9.3.1 Centre for Disaster Management (CDM), ATI, Mysuru

Centre for Disaster Management (CDM) was established at ATI Mysore in the year 2000-01. The Advisory Committee of CDM under the chairmanship of Principal Secretary, Department of Disaster Management has approved the training and capacity building plan for the year 2021-22 in the meeting held on 25-02-2021. Further the State Executive Committee of SDMA under the chairmanship of Chief Secretary to Govt. of Karnataka in its meeting held on 26-02-2020 has approved the funds for implementing this training and capacity building plan proposed by CDM ATI Mysuru. Senior and experienced faculty members and professional staff in the disciplines of Civil/Structural Engineering/Housing, Geology/Earth science, Communication, Environmental Science, GIS/RS, Information science and Technology, etc., are working in the centre. The Centre aims at fulfilling training and competency needs of the functionaries working in various government departments, elected representatives of PRIs and ULBs, non-government organizations and the community for effective preparedness, mitigation and management of natural and

manmade disasters in the State.

In addition to in-house faculties, the resource persons and experts comprising senior administrators in the government, professionals from scientific and research agencies, engineering institutions, NDRF, SDRF, NIDM, NDMA, NIMHANS, field level disaster professionals from NGOs, private and CBOs including a host of specialized agencies have been identified and involved in the training, research activities of the centre. The infrastructure facilities and faculties of ATI and other sister institutions namely SIUD, SIRD, PPP Cell, Centre for Social Justice, SDG center and E-governance cell are involved for optimum output and results. The centre has well experienced recognized national level master trainers in the area. The training is conducted at ATI, DTI, sub-district levels and local bodies covering senior level employees to field functionaries and elected representatives.

### **9.3.2 Nodal Training Institute/Networking Role**

Work as a networking organization by organizing seminars, workshops, conferences to share and promote good practices. The CDM has expanded its networking with various organizations such as Karnataka State Natural Disaster Monitoring Centre, Karnataka State Remote Sensing Application Centre, Geological Survey of India, Technical & Educational Institutions, Fire and Emergency service, NIDM, NITK Surathkal, NIMHANS, IISc Bangalore, Factories and Boilers, Red-Cross, Bomb squad, Civil Defense, MEG, CGWB and NGO's etc., to share experience and expertise on Disaster Management. Centre is closely working with Government departments and other private organizations.

### **9.3.3 Training Needs Analysis (TNA) for Disaster Management in Karnataka**

The CDM, ATI, Mysore has carried out a detailed study on TNA for Disaster Management in Karnataka. The CDM, ATI has carried out a comprehensive study to identify and assess the gaps in knowledge, skills, attitude of employees in the departments. Based on the study, the state level training plan for DM involving other training institutes at the district and taluk levels has been prepared and implemented by CDM, ATI, Mysore.

## **9.4 Training Areas& Targets**

The Government Departments at the district level who are involved in the multi-hazard management are grouped as follows based on the similarity in functions;

1. Department of Revenue & Department of Food and Civil Supplies

2. Department of Rural Development and Panchayatraj and Urban Development
3. Department of Education(Primary, Secondary and Technical Education)
4. Department of Health & Family Welfare and Animal Husbandry and Veterinary Services
5. Department of Home (including Fire and Emergency Services), Home Guards & Civil Defence.
6. Department of Industries and Commerce and Factories and Boilers
7. Public Works Department
8. Department of Fisheries and Department of Port and Harbour
9. Department of Social Welfare, Department of Backward Classes & Minorities, Department of Women and Child Development
10. Department of Agriculture and Department of Horticulture
11. Department of Forest, Ecology and Environment
12. Department of Information and Publicity
13. District Disaster Management Authorities
14. Urban local Bodies
15. Panchayath Raj Institutions
16. State Public Sector Undertaking
17. All Educational Institutions
18. Other specific target groups

### Training Strategy

| Levels                       | Place                                | Focus areas                                                                                                                                                                                   |
|------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                        | ATI<br>Group 'A' and 'B'<br>officers | Policy, plans, NDMA guidelines, simulation and mock exercises,<br>knowledge and skill development, best practices, SOPs etc.                                                                  |
| District                     | DTI<br>District level officers       | District specific disasters DM plans, specific case studies, field visits, risk assessment, mock exercises, SOPs etc.                                                                         |
| Taluk and Village            | Taluk and GP                         | Local hazards identification, safe and unsafe zonation, village DM plan, Search and rescue, mock drill, village survey, community awareness, SOPs etc.                                        |
| District Volunteers Training | Specific District                    | Development of core skills : SAR, Relief, evacuation, first-aid, community awareness on safe and unsafe areas, SOPs, IRS, responsibilities with district administration during disaster, etc. |

| Levels                                                                                                                                                                                                                                                                                                                                                                                                 | Place | Focus areas |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|
| <ul style="list-style-type: none"> <li>SATCOM/Video conference based awareness programmes are scheduled to cover large number of elected representatives of PRIs &amp; ULBs, GP, Chairpersons, Municipal Councillors, Chairpersons and officials. SATCOM studio setup at SIRD Mysuru is utilized.</li> <li>Webinars and Online training programmes on specific areas of disaster management</li> </ul> |       |             |

#### Non-Training activities

- Action Research
- Case study
- Handbooks
- State Disaster Management Plan (Kannada)
- State Disaster Management Plan (English)
- Training Modules on DM
- Workbooks
- Re-formulation/ updation of district DM Plans (workshop)
- Training films on DM themes

#### Action Plan for Capacity Building

| Sl.no. | Activity                                  | Lead agency | Support agencies                                        | Commencement        |
|--------|-------------------------------------------|-------------|---------------------------------------------------------|---------------------|
| 1      | Education in schools & colleges           | SDMA        | Dept of Education                                       | Prepare Action Plan |
| 2      | Technical education                       | SDMA        | Dept of Technical Education                             | Prepare Action Plan |
| 3      | Capacity building of professionals        | CDM, ATI    | SDMA, DM dept., all concerned depts. DDMA's, ULBs, PRIs | Already in progress |
| 4      | Flood management research and development | WRD         | KERS, KSNDMC, IMD, CWC, CDM-ATI                         | Prepare Action Plan |
| 5      | Documentation and dissemination           | WRD         | KERS, KSNDMC, IMD, CWC, CDM-ATI                         | Prepare Action Plan |



# 10

---

**FLOODS: DO'S AND DON'TS**

---



**Before**

- Ignore rumours, Stay calm, Don't panic.
- Keep your mobile phones charged for emergency communication; use SMS.
- Listen to radio, watch TV, read newspapers for weather updates.
- Keep cattle/animals untied to ensure their safety.
- Prepare an emergency kit with essential items for safety and survival. • Keep your documents and valuables in water-proof bags.
- Know the safe routes to nearest shelter/ raised pucca house.
- Evacuate immediately to safe places when directed by government officials. • Store enough ready-to-eat food and water for at least a week.
- Be aware of flash flood areas such as canals, streams, drainage channels.

**During**

- Don't enter floodwaters. In case you need to, wear suitable footwear.
- Stay away from sewerage lines, gutters, drains, culverts, etc.
- Stay away from electric poles and fallen power lines to avoid electrocution.
- Mark any open drains or manholes with visible signs (red flags or barricades).
- Do not walk or drive in the flood waters. Remember, two feet of moving flood water can wash away big cars as well.
- Eat freshly cooked or dry food. Keep your food covered.
- Drink boiled/chlorinated water.
- Use disinfectants to keep your surroundings clean.

**After**

- Do not allow children to play in or near flood waters.
- Don't use any damaged electrical goods, get them checked.
- If instructed, turn off utilities at main switches and unplug appliances - do not touch electrical equipment if wet.
- Watch out for broken electric poles and wires, sharp objects and debris.
- Do not eat food that has been in flood waters.
- Use mosquito nets to prevent malaria.
- Be careful of snakes as snake bites are common during floods.



- Don't use the toilet or tap water if the water lines/sewage pipes are damaged.
- Do not drink tap water until advised by the Health Department that the water is safe to drink.

**If you need to evacuate:**

- Raise furniture, appliances on beds and tables.
- Put sandbags in the toilet bowl and cover all drain holes to prevent sewage backflow.
- Turn off power and gas connection.
- Move to a higher ground/ safe shelter.
- Take the emergency kit, first aid box, valuables and important documents with you.
- Do not enter deep, unknown waters; use a stick to check water depth.
- Come back home only when officials ask you to do so.
- Make a family communications plan.
- Clean and disinfect everything that got wet.

## Roles and responsibilities of district authorities, local government and line departments

| Before                                                                                                                                                                                                                                                                                                                                                                                             | During                                                                                                                                                                                                                                                                                                                           | After                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Education</b>                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>Schools as training centers for disaster risk management</li> <li>Teach disaster risk management to students and villagers</li> <li>Take actions to reduce the vulnerability of the built infrastructure of the education sector</li> <li>Conduct orientation programs on flood risk management to raise awareness of the education authorities.</li> </ul> | <ul style="list-style-type: none"> <li>Use of schools as shelters</li> <li>The school building can be used as relief center professors and teachers</li> </ul>                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| <b>Health</b>                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>Keep all hospitals prepared for any kind of disaster</li> <li>Stock pile medicines</li> <li>Keep ambulances in good working conditions</li> <li>Vaccination of the population before flood season Enhance disaster capacities of women</li> </ul>                                                                                                           | <ul style="list-style-type: none"> <li>Emergency treatment to the victims/injured</li> </ul>                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Prevent spread of epidemics</li> </ul>                                                                                                                                                                                     |
| <b>Police</b>                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>Assist local administration in maintaining law and order</li> <li>Provide human and logistic support</li> <li>Keep people peaceful and stop anti-social activities</li> </ul>                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Assist in evacuation and rehabilitation</li> <li>Protect relief items from looting and stealing</li> </ul>                                                                                                                                                                                |                                                                                                                                                                                                                                                                   |
| <b>Local Government and Rural Development</b>                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>Responsible for Disaster Risk Management</li> <li>Arrangement of logistic support</li> <li>Stockpiling of food and other items</li> </ul>                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Collection of data and reporting</li> <li>Evacuation</li> <li>Relief distribution</li> </ul>                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Debris removal in case of landslides and demolition of residential building</li> <li>Rehabilitation of rural access roads (link roads)</li> <li>Rehabilitation of water Supplies</li> <li>Provision of shelters</li> </ul> |
| <b>Civil Defense</b>                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>Training on search and rescue and first aid</li> <li>Mobility and organization of volunteers</li> </ul>                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Relief operation</li> <li>Rescue and evacuation in case of disasters like flood, landslides and</li> <li>Provide first aid to injured persons and</li> <li>Transport them to nearest hospital;</li> <li>Coordinate transport of relief goods to</li> <li>affected communities;</li> </ul> | <ul style="list-style-type: none"> <li>Assist communities in</li> <li>clearing of debris brought about by the</li> <li>Flood</li> </ul>                                                                                                                           |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Supplement flood response equipment of the armed forces</li> </ul>                                                     |                                                                                                                                                                                                                                                                                                                        |
| <b>Public Works Department</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Maintain all telephone, mobile and internet communication in order to Collection and dissemination of information</li> <li>• Supervise the protection of roads and structures in the community</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Provision of communication facilities to the victims and their relatives in other parts of the state/region</li> </ul> | <ul style="list-style-type: none"> <li>• Repairs of damaged telephone lines</li> <li>• Repairs of roads, bridges and other infra-structure</li> <li>• Coordinate assessment of the extent of damage to roads and structures in the community Organize emergency repairs to restore public transport routes.</li> </ul> |
| <b>Forestry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Stop deforestation Plant new saplings</li> <li>• Provision of seeds and pesticides</li> <li>• Advocacy and awareness on environmental</li> <li>• Protection</li> <li>• Undertake vulnerability assessment of natural</li> <li>• resources (forest, lakes, streams, mangroves, coral</li> <li>• reefs, protected areas, coastal areas) to natural</li> <li>• and human induced hazards</li> <li>• Implement programmes for conservation and</li> <li>• rehabilitation of natural resources in order to</li> <li>• reduce risks of natural hazards, e.g., reforestation, mangrove plantation, etc.</li> </ul> |                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Develop mechanisms for assessment of environmental losses and damages in the aftermath of disasters and their rehabilitation</li> </ul>                                                                                                                                       |
| <b>Agriculture and livestock</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Protection of agriculture land from floods Maintaining and repairing water channels</li> <li>• Promote flood and drought resistant crops</li> <li>• Provision of seeds and fertilizers</li> <li>• Training of farmers in cultivation of drought and flood resistant crops</li> <li>• Breeding and vaccination of livestock</li> <li>• Research and education</li> <li>• Advocacy and awareness Ensure sustainable</li> <li>• livelihoods in areas of recurring climate risks</li> <li>• (e.g., arid and semiarid zones, flood and drought</li> </ul>                                                        | <ul style="list-style-type: none"> <li>• Assist in saving crops, agricultural land and livestock in disaster situation</li> </ul>                               | <ul style="list-style-type: none"> <li>• Assess the extent of damage and loss to crops and livestock</li> <li>• Provide inputs like seeds, fertilizers and agriculture equipment to those affected by disasters</li> </ul>                                                                                             |

|                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>prone areas) by promoting supplementary income generation from off-farm and non-farm activities (e.g., animal husbandry)</li> </ul>                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                    |
| <b>Role of Local Media</b>                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                    |
| <ul style="list-style-type: none"> <li>Provide information on the sources and processes of risk generation and patterns of risk</li> <li>Provide information on potential dangers, risks to communities</li> <li>Disseminate warning messages through multiple channels</li> <li>Information provision about precautionary</li> <li>measures to avoid human and material loss</li> </ul> | <ul style="list-style-type: none"> <li>To inform the public with factual information about the extent, losses and current disaster situation Information on safe shelters places, evacuation and routes</li> <li>Efforts of local government to facilitate people</li> <li>Information on rescue and recovery and evacuation</li> <li>Facilitate communication between affected people, their relatives and friends in other parts of the country</li> <li>Highlight needs of the survivors so that all survivors receive appropriate aid, irrespective of their social, economic, ethnic, religious or political status</li> </ul> | <ul style="list-style-type: none"> <li>Appeal for assistance</li> <li>Communicate about rehabilitation and reconstruction plans of district authorities</li> <li>Encourage survivors participation in recovery and rehabilitation</li> <li>Influence for integrating risk reduction and prevention in rehabilitation and reconstruction</li> </ul> |

# The DOS & DON'TS AFTER FLOOD DAMAGE



**DO**

Shut off the water supply as soon as possible to avoid any further flooding

**DO**

Turn the mains electricity supply off as soon as possible



**DO**

Take photographic evidence of the damage caused to your premises



**DO**

Use buckets and towels to remove and mop up any standing water



**DO**

Open windows and doors to let the air circulate the room and dry it out



**DON'T**

Never use a vacuum cleaner to remove standing water

**DON'T**

Do not leave furniture on wet carpet - place small saucers underneath furniture legs to lift it off the wet surface



**DON'T**

Do not attempt any repair work or redecorating until everything has fully dried out

**DON'T**

Never use ordinary cleaning products to clean up flood water



Produced By Flood Cleaning Experts



**CleanSafe**

## **ANNEXURE**

---

### **LIST OF CONTACT ADDRESSES**

---



## ANNEXURE

### List of Important Contact Addresses

Principal Secretary, Revenue Department (DM)  
Room No. 546-547, 5<sup>th</sup> Floor, 2<sup>nd</sup> Stage  
M.S. Building, Dr.B.R. Ambedkar Veedhi,  
Bangalore- 560 001  
Ph No.: 080- 2235 3980, 2232 0582  
Fax: 080- 22354321  
E-mail: secyrelif-rev@karnataka.gov.in

State Emergency Operation  
Centre  
Toll Free No. 1070  
Website: ksdma.co.in

### SEC MEMBERS OF KSDMA

| Designation & Department                                                                                 | Office                           | Internal          |
|----------------------------------------------------------------------------------------------------------|----------------------------------|-------------------|
| Chief Secretary to Government                                                                            | 22252442<br>22253716             | 22033300          |
| Additional Chief Secretary to Government & Developmental Commissioner                                    | 22250715                         | 22033308          |
| Additional Chief Secretary / Principal Secretary to Government, Finance Department                       | 22252078                         | 22033749          |
| Principal Secretary to Govt., Energy Department                                                          | 22252373                         | 22034649/4<br>648 |
| Principal Secretary to Govt., Agriculture Department                                                     | 22250284<br>25727200             | 22032595          |
| Principal Secretary to Govt., Rural Development & Panchayat Raj Department                               | 28460838<br>22353929             | 22032446          |
| Principal Secretary to Govt., / Secretary to Govt (PCAS) Home Department                                 | 22258830                         | 22033710          |
| Secretary to Govt., Revenue Department, Disaster Management                                              | 22353980                         | 22032995          |
| DGP & Commandant General, Home Guards, Director of Civil Defence & Director of Fire & Emergency Services | 25553234<br>25576850<br>25570733 | -                 |
| Director General, Administrative Training Institute, Mysore                                              | 0821-2520906                     | -                 |
| Commissioner, KSDMA & Director, KSNDMC , Revenue Department (DM)                                         | 22340676                         |                   |



|                                                                                      |                                   |
|--------------------------------------------------------------------------------------|-----------------------------------|
| Karnataka State Natural Disaster Monitoring Centre (KSNDMC),<br>Yelahanka, Bengaluru | Director<br>Phone: 080-673 55 000 |
|--------------------------------------------------------------------------------------|-----------------------------------|

**IMPORTANT CONTACT DETAILS FOR DISASTER RESPONSE  
DISASTER MANAGEMENT DIVISION, MINISTRY OF HOME AFFAIRS**

**(for reporting of grave disaster and for requisitioning of Army, Air force and NDRF)**

|                                           |                                                                                                 |
|-------------------------------------------|-------------------------------------------------------------------------------------------------|
| HOME SECRETARY                            | 011-23092989 , 23093031<br>23093003 (Fax)<br>hshso@nic.in                                       |
| Joint Secretary (Disaster Management)     | 011- 24638206      011-                      jsdm@nic.in<br>011-24610906      26874825<br>(Fax) |
| Director (Disaster Management-I)          | 011-24642853    26266708    9871087616                                                          |
| <b>Control Room</b> (Disaster Management) | 011-23093563 ,23093564    23093750<br>23093566                      (Fax)                       |

**NATIONAL DISASTER MANAGEMENT AUTHORITY**

|                     |                                                |
|---------------------|------------------------------------------------|
| Vice Chairman       | 011-26701701<br>011-26701704 011-26701706(Fax) |
| Secretary           | 011-26701710                                   |
| <b>Control Room</b> | 011-26701723 to 728<br>011-26701729 -30        |

**IMPORTANT RESPONSE ORGANIZATIONS**

|                                                                                                                                       |                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Karnataka State Fire and Emergency Service</b>                                                                                     | DGP & DG<br>Karnataka State Fire and Emergency Service, No 1 & 2,<br>Annaswamy Mudilyar Road, Bengaluru 560004<br>Phone no. 080 25570733, 22971501<br>e-mail: <a href="mailto:fireksfes@gmail.com">fireksfes@gmail.com</a> |
| <b>State Disaster Response Force (SDRF)</b>                                                                                           | DIG<br>Phone: 080 22971505, 22942411<br>Deputy Director<br>Phone: 080 22971605                                                                                                                                             |
| <b>NDRF, New Delhi</b><br>Directorate General, NDRF, B-Block, 9th Floor, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi-110003 | 011-24369278 011-24369280<br>011-24363261<br>dg.ndrf@nic.in                                                                                                                                                                |
| <b>NDRF, Guntur</b>                                                                                                                   | Commandant<br>Mobile 07382299621                                                                                                                                                                                           |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NDRF, Bengaluru</b>          | Assistant Commandant<br>Mobile 7995497907                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>IMD, DGM New Delhi</b>       | 011 - 24611842                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>IMD, Bengaluru</b>           | Free toll Number<br>1800 180 1717<br>The Director-in-Charge, Telefax:080-22244419<br>Meteorological Centre,<br>Palace Road, Bengaluru-560 001.<br>Contact Numbers:080-22235725, 22235733, 22235737<br>Telefax: 080-22277059<br>For Weather Enquiry:080-22211118, 22235675,<br>E-mail ID: mc.bng@imd.gov.in<br>For Climate enquiry:cls.bng@imd.gov.in<br>Website: <a href="http://www.imdbangalore.gov.in">www.imdbangalore.gov.in</a> |
| <b>Central Water Commission</b> | Chief Engineer<br>Office of the Chief Engineer (Monitoring South),<br>Central Water Commission, JalaSoudha,<br>Post Jalahalli Bangalore – 560013,<br>Tel. No. 080-29724081<br>e-mail: cemons-twc@nic.in                                                                                                                                                                                                                               |

### CHIEF SECRETARY AND PRINCIPAL SECRETARIES

|                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chief Secretary to Government</b><br>Government of Karnataka<br>Room No.320, 3rd Floor, Vidhana Soudha<br>Dr.B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2225 2442, 2225 3716<br>Fax: 080- 2225 8913                                                                              | <b>Additional Chief Secretary to Government</b><br>Government of Karnataka<br>Room No.324, 3rd Floor, Vidhana Soudha<br>Dr.B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2225 7982 Fax: 080 – 2225 6306                                             |
| <b>Principal Secretary of Government</b><br><b>Infrastructure Development Department</b><br>Government of Karnataka<br>Room No. 28, Ground Floor Vikasa Soudha<br>Dr.B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2225 2366 Fax: 080 – 2228 0605<br>Email: prs-infra@karnataka.gov.in | <b>Principal Secretary to Government</b><br><b>Water Resources Development</b><br>Room No.307, 3rd Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.:080 – 2225 7064 Fax:080- 2235 3983<br>Website: www.waterresources.kar.nic.in |
| <b>Principal Secretary of Government</b><br>Agricultural & Horticulture Department<br>Room No.413, 4TH Floor, Gate No.2<br>MS Building, Dr.B.R. Ambedkar Veedhi<br>Bangalore- 560 001                                                                                                             | <b>ACS &amp; Principal Secretary</b><br>Department of Energy<br>Room No. 236, 2nd Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001                                                                                                         |

|                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ph No.: 080- 2225 0284 Fax: 080- 2225 1420<br>Email: prs-ah@kar.gov.in website:<br>www.raitamitra.kar.nic.in                                                                                                                                                                  | Ph No.: 080- 2225 2373 Fax: 080- 2223 5395<br>Website: www.karnataka.gov.in/energy                                                                                                                                                                                                                                |
| <b>Principal Secretary of Government</b><br>Animal Husbandry & Fisheries Department<br>Room No. 405, 4 <sup>th</sup> Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2235 3977 Fax: 080- 2225 3734<br>website: www.ahvs.kar.nic.in       | <b>Principal Secretary</b><br>Food and Civil Supplies & Consumer Affairs<br>Department<br>Room No. 29, Ground Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2225 9024 Fax: 080- 2235 3959<br>Website: www.ahara.kar.nic.in                                                 |
| <b>Principal Secretary</b><br>Forest, Ecology and Environment Department<br>Room No. 404m 4 <sup>th</sup> Floor, Gate No. 3<br>MS Building, Dr. B.R. Ambedkar Veedhi<br>Bangalore – 560 001<br>Ph No.: 080- 2225 6722 Fax: 080- 2225 8393<br>Website: www.parisara.kar.nic.in | <b>Principal Secretary to Government</b><br>Public Works Department<br>Room No. 335 & 336, 3rd Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore – 560 001<br>Ph No.: 080- 2225 1449 Fax: 080- 2235 3988<br>Email: prs-pwd@karnataka.gov.in<br>Website: www.kar.nic.in/pwd                              |
| <b>Principal Secretary to Government</b><br>Health & Family Welfare Department<br>Room No. 105, 1st Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080- 2225 3924 Fax: 080- 2235 3916<br>Website: www.psecy.hfw.kar.nic.in                   | <b>Principal Secretary to Government</b><br>Housing Department<br>Room No. 213, 2nd Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore – 560 001<br>Ph No.: 080- 2225 6356 Fax: 080- 2225 3718<br>Email: prs-housing@karnataka.net.in<br>psehousing@mail.kar.nic.in<br>Website: www.karnatakahousing.com |
| <b>Principal Secretary to Government</b><br>Department of Industries & Commerce<br>Room No. 106, 1st Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore – 560 001<br>Ph No.: 080- 2225 2443 Fax: 080- 2225 9870<br>Website: www.karnatakaindustry.gov.in             | <b>Principal Secretary to Government</b><br>Department of Urban Development<br>Room No. 436, 4th Floor, Vikasa Soudha<br>Dr. B.R. Ambedkar Veedhi, Bangalore- 560 001<br>Ph No.: 080 – 2225 3958<br>Fax: 080- 2235 3944<br>E-mail: prs_ud@karnataka.gov.in<br>Website:<br>www.karnataka.gov.in/urbandevelopment   |

## Other Important Contacts

| Authority                                                                                                  | STD code | Office                | Res      | Fax               | Mobile      |
|------------------------------------------------------------------------------------------------------------|----------|-----------------------|----------|-------------------|-------------|
| <b>CONTACTS FOR KSNDMC</b>                                                                                 |          |                       |          |                   |             |
| <b>Director</b><br>Karnataka State<br>Natural Disaster<br>Management<br>Centre,<br>Yelahanka,<br>Bengaluru | 080      | 67355000              | 22217038 | 67355198          |             |
| <b>CONTACTS FOR HELICOPTERS</b>                                                                            |          |                       |          |                   |             |
| HQ Training<br>Command                                                                                     |          | 23411061<br>23414111  |          |                   | 9341909452  |
|                                                                                                            |          | 23411061<br>23414111  |          |                   | 9480424008  |
|                                                                                                            | 080      | 23411061<br>23414111  |          | 23419799          |             |
|                                                                                                            | 080      | 23418179              |          | 23418179          |             |
| <b>CONTACTS FOR BOATS, BOATSMEN, SHIPPING, COST GUARD &amp; SEA BIRD</b>                                   |          |                       |          |                   |             |
| Min of shipping,<br>Road Transport &<br>Highways,<br>Transport<br>Bhavan, Sansad<br>Marg. New Delhi        | 011      | 23711873              |          | 23303872          | 09910487464 |
|                                                                                                            | 011      | 23710189              | 24122685 | 23722885          | 09910600334 |
| Coast Guard                                                                                                | 08382    | 263260                |          | 263261            | 9448092360  |
| Sea Bird                                                                                                   | 08382    | 263454                |          | 232004,<br>263618 | 9448144294  |
| Department of<br>Ports, IWT,<br>Karwar                                                                     | 08382    | 221494                |          | 228918            | 9449002350  |
|                                                                                                            | 08382    | 226406                |          |                   | 9448132660  |
| <b>CONTACTS FOR CIVIL AVIATION</b>                                                                         |          |                       |          |                   |             |
| Mini of Civil<br>Aviation, B Block,<br>Rajiv Gandhi<br>Bhavan,<br>Safdarjung<br>Airport, New<br>Delhi      | 011      | 24617692              | 24106344 | 24654614          | 09871329871 |
|                                                                                                            | 011      | 24610386              | 2410044  | 24655839          | 09810866142 |
|                                                                                                            | 011      | 24610386              | 26254963 | 2410386           | 09958877322 |
| Director General<br>of Civil Aviation,<br>Vimanpura Post,                                                  | 080      | 25228475,<br>25223542 |          | 25222933          | 080         |

| Authority                                                                                                               | STD code | Office                | Res      | Fax                   | Mobile                               |
|-------------------------------------------------------------------------------------------------------------------------|----------|-----------------------|----------|-----------------------|--------------------------------------|
| HAL Airport,<br>Bangalore-<br>560017                                                                                    |          |                       |          |                       |                                      |
| <b>CONTACTS FOR RAILWAYS</b>                                                                                            |          |                       |          |                       |                                      |
| Min of Railways                                                                                                         | 011      | 23388146              |          | 23304235              | 09910487464                          |
|                                                                                                                         | 011      | 23384260              | 26884345 |                       | 09910487464                          |
| South West<br>Railway, New<br>General Manager<br>Office, Gadag<br>Road, Hubli- 20                                       | 0836     | 2289813               |          | 2289842               | 9731665730                           |
| <b>CONTACTS FOR ARMY/ DEFENCE</b>                                                                                       |          |                       |          |                       |                                      |
| Min of Defence,<br>Department of<br>Defence, South<br>Block, New Delhi                                                  | 011      | 23011410              | 24103862 | 23013709              | 09717790920                          |
| HQ K & K Sub<br>Area, Cubbon<br>Road, Bangalore-<br>560001                                                              | 080      | 25591722              |          | 25591722              | 909112727                            |
|                                                                                                                         | 080      | 25591686              |          | 25591686              |                                      |
| <b>CONTACTS FOR HOME GUARDS/ CIVIL DEFENCE/ FIRE SERVICE</b>                                                            |          |                       |          |                       |                                      |
| Home Guards,<br>Directorate of<br>Civil Defence and<br>DG Fire Force                                                    | 080      | 22971557              | 22971502 | 22971512              | 9448468558                           |
| <b>CONTACTS FOR NDRF</b>                                                                                                |          |                       |          |                       |                                      |
| NDRF, H. O                                                                                                              | 011      | 26712851,<br>26715303 | 23386566 |                       | 09818916161                          |
|                                                                                                                         | 011      | 26160252              | 26113014 |                       | 0987115726                           |
| Control Room                                                                                                            | 011      | 26107953              |          | 26105912              | 011                                  |
| Commandant 5 <sup>th</sup><br>Bn, NDRF,<br>Talegaon, CRPF<br>Campus, Pune-<br>410507,<br>Maharashtra (For<br>Karnataka) | 02114    | 231245                |          | 231265,<br>231509     | 09423506765                          |
|                                                                                                                         | 02114    | 231509                |          |                       | 09423578446                          |
| Commandant 1 <sup>st</sup><br>Bn, NDRF,<br>(Guwahati,<br>Assam)                                                         | 0361     | 2840284,<br>2843555   |          | 2840284               | 09435545951<br>09435545949<br>(21/c) |
| Commandant 2 <sup>nd</sup><br>Bn, NDRF,<br>(Kolkata, West<br>Bengal)                                                    | 033      | 25264302              |          | 25264394,<br>25263077 | 09434742836<br>09434742866<br>(21c)  |

| Authority                                                               | STD code | Office                | Res | Fax                          | Mobile                               |
|-------------------------------------------------------------------------|----------|-----------------------|-----|------------------------------|--------------------------------------|
| Commandant 3 <sup>rd</sup><br>Bn NDRF,<br>(Mundali, Orissa)             | 0671     | 2879710<br>9937187222 |     | 2879710,<br>09937186222      | 09437964571,<br>09437964574<br>(21c) |
| Commandant 4 <sup>th</sup><br>Bn, NDRF,<br>(Arakkonam,<br>Tamil Nadu)   | 04177    | 246269<br>203050      |     | 246594,<br>246633,<br>246644 | 09442105069<br>09442105169<br>(21c)  |
| Commandant 6 <sup>th</sup><br>Bn, NDRF,<br>(Gandhi Nagar,<br>Gujarat)   | 079      | 23202540,<br>23202539 |     | 23201551,<br>23202540        | 09428826445<br>09427304210<br>(21c)  |
| Commandant 7 <sup>th</sup><br>Bn, NDRF,<br>(Bhatinda,<br>Punjab)        | 0164     | 2246030<br>2246570    |     | 2246570                      | 09417802032<br>09417802031<br>(21c)  |
| Commandant 8 <sup>th</sup><br>Bn, NDRF, (Gr<br>Noida, Uttar<br>Pradesh) | 0120     | 2351101,<br>2351102   |     | 2351087,<br>2351105          | 09968610011,<br>09968610012<br>(21c) |
| <b>CONTACTS FOR MAHARASTRA OFFICERS</b>                                 |          |                       |     |                              |                                      |
| Irrigation Circle,<br>Sangli                                            | 0233     | 2302709               |     |                              | 09420033333                          |
|                                                                         | 0233     | 2332925,<br>2381840   |     |                              | 09921614999                          |
|                                                                         | 0233     | 233295,<br>2381840    |     |                              | 09850827678,<br>09421127678          |
| Revenue                                                                 | 0233     | 2326824               |     |                              | 09764107575                          |
|                                                                         | 0233     | 2326824               |     |                              | 09423859427                          |
|                                                                         | 02162    | 232750                |     |                              | 09422072799                          |
|                                                                         | 02162    | 232349                |     |                              | 09422087088                          |
|                                                                         | 0231     | 2654811               |     |                              | 0932597509                           |
|                                                                         | 0231     | 2654812               |     |                              | 09922298399                          |
| <b>CONTACTS FOR BELGAUM &amp; ALMATTI OFFICERS (DAM RELATED)</b>        |          |                       |     |                              |                                      |
| Krishna Bhagya<br>Jala Nigama Ltd,<br>Belgaum                           | 0831     | 2422339               |     |                              | 9449039786                           |
| Dharwad                                                                 | 0831     | 2422339               |     |                              | 9449039786                           |
| Almatti                                                                 | 08426    | 281038                |     |                              | 9449034113                           |
|                                                                         | 08426    | 281027                |     |                              | 9448132749                           |
|                                                                         | 08426    |                       |     |                              | 9448012946                           |

| DEPUTY COMMISSIONER CONTACT INFORMATION |                  |                           |                     |
|-----------------------------------------|------------------|---------------------------|---------------------|
| SL No.                                  | Districts        | Email ID                  | Land Line No.       |
| 1                                       | Bangalore Urban  | dcurban@kar.nic.in        | 080-22211292        |
| 2                                       | Bangalore Rural  | deo.bangaloreu@gmail.com  | 080-29781022        |
| 3                                       | Ramanagara       | deo.ramanagara@gmail.com  | 080-27273777        |
| 4                                       | Kolar            | deo.kolar@gmail.com       | 08152-243666        |
| 5                                       | Chikkaballapura  | deo.cbpur@gmail.com       | 08156-277001        |
| 6                                       | Tumakuru         | deo.tumkur@gmail.com      | 0816-2272480        |
| 7                                       | Chitradurga      | deo.chitradurga@gmail.com | 08194-222538        |
| 8                                       | Davanagere       | deo.davanagere@gmail.com  | 08192-234640        |
| 9                                       | Chamrajnagara    | deo.cnagar@gmail.com      | 08226-223170        |
| 10                                      | Mysore           | dcmys-ka@nic.in           | 0821-2422302        |
| 11                                      | Mandya           | dcmandya09@gmail.com      | 08232-224600        |
| 12                                      | Shimoga          | deo.shimoga@gmail.com     | 08182-271101        |
| 13                                      | Hassan           | deo.hassan@gmail.com      | 8172267345          |
| 14                                      | Chikkamagaluru   | deo.cmagalur@gmail.com    | 08262-230401        |
| 15                                      | Kodagu           | dckodagu@nic.in           | 08272-225500        |
| 16                                      | Dakshina Kannada | dc.mnglr@gmail.com        | 0824-2220588        |
| 17                                      | Udupi            | dc.udupi@gmail.com        | 0820-2574921        |
| 18                                      | Uttara Kannada   | dckarwar@gmail.com        | 08382-226303        |
| 19                                      | Bellary          | dcbellary@gmail.com       | 08392-277100        |
| 20                                      | Koppala          | deo.koppal@gmail.com      | 08539-220844        |
| 21                                      | Raichur          | dcrevrer@gmail.com        | 08532-229011        |
| 22                                      | Kalaburagi       | dcoglb@gmail.com          | 08472-278601        |
| 23                                      | Bidar            | deo.bidar@gmail.com       | 08482-229668        |
| 24                                      | Belagavi         | dcbgmbelgaum@gmail.com    | 0831-2407200        |
| 25                                      | Bagalkote        | deo.bagalkot@gmail.com    | 08354-235091        |
| 26                                      | Vijapura         | deo.bijapur@gmail.com     | 08352-251289/250479 |
| 27                                      | Gadag            | deo.gadag@gmail.com       | 08372-237300        |
| 28                                      | Haveri           | deo.haveri@gmail.com      | 8375249044          |
| 29                                      | Dharwad          | deo.dharwad@gmail.com     | 0836-2233840        |
| 30                                      | Yadgir           | dcydg123@gmail.com        | 08473-253700        |

| SUPERINTENDENT OF POLICE CONTACT INFORMATION |                  |                                    |      |           |
|----------------------------------------------|------------------|------------------------------------|------|-----------|
| Sl. No                                       | District         | E-Mail Address                     | STD  | Office No |
| 1                                            | Bagalkote        | sp-bagalkote@karnataka.gov.in      | 8354 | 235077    |
| 2                                            | Bangalore Rural  | sp-bangalorerural@karnataka.gov.in | 80   | 22264350  |
| 3                                            | Bangalore Urban  | sp-bangaloreurban@karnataka.gov.in | 80   | 22942215  |
| 4                                            | Belgaum          | sp-belgaum@karnataka.gov.in        | 831  | 2405204   |
| 5                                            | Bellary          | sp-bellary@karnataka.gov.in        | 8392 | 258400    |
| 6                                            | Bidar            | sp-bidar@karnataka.gov.in          | 8482 | 226700    |
| 7                                            | Bijapur          | sp-bijapur@karnataka.gov.in        | 8352 | 250152    |
| 8                                            | Chamrajanagara   | sp-chamrajanagara@karnataka.gov.in | 8226 | 222243    |
| 9                                            | Chikballapur     | sp-chikballapur@karnataka.gov.in   | 8156 | 274000    |
| 10                                           | Chickmagalur     | sp-chickmagalur@karnataka.gov.in   | 8262 | 230403    |
| 11                                           | Chitradurga      | sp-chitradurga@karnataka.gov.in    | 8194 | 222781    |
| 12                                           | Dakshina Kannada | sp-dkannada@karnataka.gov.in       | 824  | 2220503   |
| 13                                           | Davanagere       | sp-davanagere@karnataka.gov.in     | 8192 | 253400    |
| 14                                           | Dharwad          | sp-dharwad@karnataka.gov.in        | 836  | 2233200   |
| 15                                           | Gadag            | sp-gadag@karnataka.gov.in          | 8372 | 236260    |
| 16                                           | Gulbarga         | sp-gulbarga@karnataka.gov.in       | 8472 | 263602    |
| 17                                           | Hassan           | sp-hassan@karnataka.gov.in         | 8172 | 268410    |
| 18                                           | Haveri           | sp-haveri@karnataka.gov.in         | 8375 | 232800    |
| 19                                           | Kodagu           | sp-kodagu@karnataka.gov.in         | 8272 | 229000    |
| 20                                           | Kolar            | sp-kolar@karnataka.gov.in          | 8152 | 222003/   |
| 21                                           | Koppal           | sp-koppal@karnataka.gov.in         | 8539 | 230111    |
| 22                                           | Mandya           | sp-mandya@karnataka.gov.in         | 8232 | 224500    |
| 23                                           | Mysore           | sp-mysore@karnataka.gov.in         | 821  | 2520040   |
| 24                                           | Raichur          | sp-raichur@karnataka.gov.in        | 8532 | 235001    |
| 25                                           | Ramanagara       | sp-ramanagara@karnataka.gov.in     | 80   | 27273700  |
| 26                                           | Shimoga          | sp-shimoga@karnataka.gov.in        | 8182 | 261400    |
| 27                                           | Tumkur           | sp-tumkur@karnataka.gov.in         | 816  | 2272451   |
| 28                                           | Udupi            | sp-udupi@karnataka.gov.in          | 820  | 2534777   |
| 29                                           | Uttara Kannada   | sp-ukannada@karnataka.gov.in       | 8382 | 226233    |
| 30                                           | Yadgir           | sp-yadgir@karnataka.gov.in         | 8473 | 290730/   |



| CHIEF EXECUTIVE OFFICER, ZILLA PANCHAYATH CONTACT INFORMATION |                  |                                        |      |           |
|---------------------------------------------------------------|------------------|----------------------------------------|------|-----------|
| Sl. No                                                        | District         | E-Mail Address                         | STD  | Office No |
| 1                                                             | Bagalkote        | ceo-zp-bagalkote@karnataka.gov.in      | 8354 | 235576    |
| 2                                                             | Bangalore Rural  | ceo-zp-bangalorerural@karnataka.gov.in | 80   | 22260796  |
| 3                                                             | Bangalore Urban  | ceo-zp-bangaloreurban@karnataka.gov.in | 80   | 22211107  |
| 4                                                             | Belgaum          | ceo-zp-belgaum@karnataka.gov.in        | 831  | 2407201   |
| 5                                                             | Bellary          | ceo-zp-bellary@karnataka.gov.in        | 8392 | 267300    |
| 6                                                             | Bidar            | ceo-zp-bidar@karnataka.gov.in          | 8482 | 233133    |
| 7                                                             | Bijapur          | ceo-zp-bijapur@karnataka.gov.in        | 8352 | 276378    |
| 8                                                             | Chamrajanagara   | ceo-zp-chamrajanagara@karnataka.gov.in | 8226 | 224013    |
| 9                                                             | Chikballapur     | ceo-zp-chikballapur@karnataka.gov.in   | 8156 | 262002    |
| 10                                                            | Chickmagalur     | ceo-zp-chickmagalur@karnataka.gov.in   | 8262 | 220140    |
| 11                                                            | Chitradurga      | ceo-zp-chitradurga@karnataka.gov.in    | 8194 | 223061    |
| 12                                                            | Dakshina Kannada | ceo-zp-dkannada@karnataka.gov.in       | 824  | 220578    |
| 13                                                            | Davanagere       | ceo-zp-davanagere@karnataka.gov.in     | 8192 | 261485    |
| 14                                                            | Dharwad          | ceo-zp-dharwad@karnataka.gov.in        | 836  | 2447542   |
| 15                                                            | Gadag            | ceo-zp-gadag@karnataka.gov.in          | 8372 | 234375    |
| 16                                                            | Gulbarga         | ceo-zp-gulbarga@karnataka.gov.in       | 8472 | 278666    |
| 17                                                            | Hassan           | ceo-zp-hassan@karnataka.gov.in         | 8172 | 267534    |
| 18                                                            | Haveri           | ceo-zp-haveri@karnataka.gov.in         | 8375 | 249031    |
| 19                                                            | Kodagu           | ceo-zp-kodagu@karnataka.gov.in         | 8272 | 228905    |
| 20                                                            | Kolar            | ceo-zp-kolar@karnataka.gov.in          | 8152 | 240649    |
| 21                                                            | Koppal           | ceo-zp-koppal@karnataka.gov.in         | 8539 | 220002    |
| 22                                                            | Mandya           | ceo-zp-mandya@karnataka.gov.in         | 8232 | 224004    |
| 23                                                            | Mysore           | ceo-zp-mysore@karnataka.gov.in         | 821  | 2330316   |
| 24                                                            | Raichur          | ceo-zp-raichur@karnataka.gov.in        | 8532 | 228448    |
| 25                                                            | Ramanagara       | ceo-zp-ramanagara@karnataka.gov.in     | 80   | 7276714   |
| 26                                                            | Shimoga          | ceo-zp-shimoga@karnataka.gov.in        | 8182 | 223058    |
| 27                                                            | Tumkur           | ceo-zp-tumkur@karnataka.gov.in         | 816  | 2272898   |
| 28                                                            | Udupi            | ceo-zp-udupi@karnataka.gov.in          | 820  | 2530708   |
| 29                                                            | Uttara Kannada   | ceo-zp-ukannada@karnataka.gov.in       | 8382 | 226560    |
| 30                                                            | Yadgir           | ceo-zp-yadgir@karnataka.gov.in         | 8473 | 253760    |

## REFERENCES

---



## REFERENCES

1. State specific action plan (SSAP) on climate change for water sector, advanced centre for integrated water resources management, Karnataka.
2. Karnataka water resources information system.
3. Karnataka State Disaster Management Plan-2020. (KSDMP Vol 1 & 2)
4. Water resources of Karnataka technical report. January 2017.
5. National disaster management guidelines, management of Flood, NDMA, Govt.of India.
6. Flood mitigation plan by Malcolm and D Parkin, natural hazards programme.
7. Disaster risk reduction –a planning approach, Department of Urban Planning, School of planning and architecture New Delhi, India.
8. Flood early warning system flows-documentation-final, state of climate services, risk information and Early warning systems, WMO -2020
9. State of the global climate 2020 provisional report, WMO
10. Karnataka poverty, Growth & Inequality, report, World Bank Group.
11. Conducting flood loss assessments, a tool for integrated flood management associated programme on flood management, March 2007.
12. Integrated flood management tools series management of flash floods, issue-16, May 2012, WMO.
13. Conducting flood loss assessments associated programme on flood management, March 2007, WMO.
14. Flood management in a changing climate, a tool for integrated flood management, associated programme on flood management, August 2009, WMO.
15. Formulating a basin flood management plan a tool for integrated flood management associated programme on flood management March 2007, WMO.
16. Urban flood risk management, a tool for integrated flood management, associated programme on flood management March 2008, WMO.
17. Integrated state water plan for lower Bhima sub basin (K-6) of Krishna basin Maharashtra Krishna Valley Development Corporation, Pune.
18. Integrated state water plan for Ghataprabha (K-3) sub basin, government of Maharashtra, Water Resources Department.
19. Ghataprabha ((k-3)) sub basin master plan for integrated development and management of water resources of k-2 sub-basin 2005.

20. Upper Bhima Sub basin DRAFT report.
21. Upper Bhima Sub basin (K1) DRAFT report.
22. Urban Flood Management – A Case Study of Bangalore, ATI, Mysore.
23. Disaster Risk Management for District Authorities, Trainer’s manual, NDMA, Govt. of India.
24. Disasters and Ecosystems: Resilience in a Changing Climate, Source book.
25. Flood risk and risk reduction plan prepared for Charlotte-Mecklenburg Storm Water Services by AECOM, January 2012.
26. Flood risk management: A strategic approach Guide for preparation of flood risk management schemes, Selecting Measures and Designing Strategies for Integrated Flood Management, Paul Sayers et.al (2007).
27. Practices and Current Status of Flood Forecasting and Management in India, Indian Institute of Technology, Roorkee, India.
28. National Disaster Management Plan November 2016 & 2019, NDMA, Ministry of Home Affairs, Government of India
29. Flood Smart Action Plan, Town of Greece, Town of Parma, and Village of Hilton, September 2016





**Karnataka State Disaster Management Authority**  
**Revenue Department (Disaster Management)**  
**Government of Karnataka**