District Disaster Management Plan (DDMP)

FOR CHIKKAMAGALURU DISTRICT
2019-20

Approved by:
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Cum. Deputy Commissioner
Chikkamagaluru District, Karnataka

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P R E F A C E

Chikkamagaluru district is a district with varied climatic and geographic conditions. While part of the district falls in the Malnad region, another part falls in the plain lands. Therefore the problems faced by these areas may also be different and diverse. Due to unlimited human intervention with nature and exploitation of nature, the frequency and probability of the disasters and accidents have increased drastically in the recent times. The heavy rains of August 2019 has taught the Administration to be alert and prepared for such type of disasters which are unforeseen. On the one hand heavy rains may cause floods, water logging and intense landslides, there may also be situations of drought and famine. In view of this the district has to be ready and gear itself up to meet any situation of emergency that may occur.

The District Disaster Management Plan is the key for management of any emergency or disaster as the effects of unexpected disasters can be effectively addressed. This plan has been prepared based on the experiences of the past in the management of various disasters that have occurred in the district. This plan contains the blue print of the precautionary measures that need to be taken for the prevention of such disasters as well as the steps that have to be taken for ensuring that the human suffering and misery is reduced by appropriate and timely actions in rescuing the affected persons, shifting them to safer places and providing them with timely medical care and attention.

This plan contains an assessment of the details of the accidents or disasters that are likely to occur based on the topography, climate, industrial and other commercial and agricultural activities of the region. It also contains the standard operating procedures as well as the role of the departments and the officers who have to act in unison and swiftly at the time of such accidents or disasters.

The rigors and suffering of the community can be reduced in times of accidents by an alert administration and vigilant general public. This is a genuine effort of the District Administration to develop a workable plan which can be of handy use in times of accidents and disasters.

This DDMP should enable the Administration to be vigilant and effectively tackle and deal with any type of disaster or accidents that may be caused in future.

Dr.Bagadi Gautham, IAS.,
Deputy Commissioner &
Chairaman,
District Disaster Management Authority,
Chikkamagaluru District,
Chikkamagaluru.

F O R E W O R D

The bounty of nature with land, water, hills and so on are the beautiful creation of God which the so-called modern human beings cannot create or replicate despite advances in science and technology. The whole responsibility lies on us to maintain God's creation in its pristine state without disturbing or intervening in the ecological balance.

It is observed that the more we rise in science and technology, the less we care about protecting and maintaining our environment. Indiscriminate, improper and injudicious use of environment will result in mother nature deviating from its original path and cause hazard to human life and property in the form of disasters.

Chikkamagaluru district is one of the hazard prone district in Karnataka on account of landslides, drought, floods etc. The whole of the district has faced unprecedented rains in August 2019 which has resulted in loss of human lives and destruction of property which has taught a lesson of prudence and sustainable growth to human beings.

This District Disaster Management Plan devises a strategy for reducing the hazards and dangers of all kinds of disasters and accidents. It is a dedicated effort by the DDMA, Chikkamagaluru to prepare a comprehensive District Disaster Management Plan under the leadership of the District Administration. It contains the District Profile, an assessment of vulnerability and a list of possible disasters, risk assessment, the institutional and infrastructural mechanism for facing such disasters, the preparedness of the district to overcome the disasters, an effective communication plan containing the contact numbers of Officers and the standard operating procedures for effectively dealing with the disasters which are likely to occur. I would like to take this opportunity to extend my heartfelt thanks to all the Officers and Officials who devoted themselves in the preparation of this Plan.

I am optimistic that the DDMP of Chikkamagaluru will go a long way in mitigating the hazards and dangers of natural disasters and thereby reduce the loss of human lives and property.

Dr. Kumara, KAS.,
Additional Deputy Commissioner &
Member Secretary,
District Disaster Management Authority,
Chikkamagaluru District,
Chikkamagaluru.

Table of Contents

Abbreviations Used in the Document	
NDMA	National Disaster Management Authority
CEO	Chief Executive Officer
DHO	District Health Officer
DD	Doordarshan
DDMA	District Disaster Management Authority
DDMC	District Disaster Management Committee
DDMP	District Disaster Management Plan
DMT	Disatster Management Team
EOC	Emergency Operation Center
GOI	Government Of India
IAP	Incident Action Plan
ICP	Incident Command Post
ICS	Incident Command System
IRS	Incident Response System
IDRN	India Disaster Response Network
IMD	Indian Meteorological Department
NDRF	National Disaster Response Force
NGO	Non Governmental Organization
NIDM	National Institute of Disaster Management
NSS	National Social Service
PHC	Public Health Centre
PWD	Public Work Department
QRT	Quick Response Team
RCC	Reinforced Cement Concrete
SOP	Standard Operating Procedure
POL	Petroleum Oil and Lubrication
SPM	Single Mooring Point
SCADA	Supervisory Control and Data Acquisition
LPG	Liquid Petroleum Gas
MAH	Major Acciedent Hazard
LEL	Lower Explosive Limit
CMG	Crisis Management Group
MRC	Medical Relief Centre
ATC	Air Traffic Controller
IAAI	International Airport Authority of India
NIC	National Informatics Centre
LECR	Local Emergency Control Room

Chapter 1: Introduction

Preamble: Human beings have been at the receiving end of nature´s fury on a number of occasions. Floods, cyclones, landslides, sea erosion, earthquake and such other natural disasters cause immense loss of human lives, injury to human beings and destruction of property. Accidents can also occur due to industrial and commercial activities of human beings. Though such natural disasters and accidents cannot be completely avoided, the loss, destruction and damage they cause can be mitigated by taking adequate safeguards and proper preventive planning. We have to be prepared to face these natural or manmade disasters or accidents. The District Disaster Management Plan (DDMP) is an attempt to take adequate precautionary measures against the vagaries of nature.

It is a very difficult task to predict the course of nature where unpredictable things happen many a times without even a slightest warning. People tend to think of Disaster Management only in terms of the post Disaster actions which are taken by Officials for relief and reconstruction. Yet, Disaster Management covers a much broader scope, and many modern Disaster Managers may find themselves for more involved in Pre-disaster activities than in the Post-disaster response. In this context, our District Disaster Management Plan has to be active in both pre and post Disaster Management activities. A number of Persons, Departments, Instruments and Stakeholders will be involved with multipronged approach to combat to save the valuable life of human beings, domestic animals and wildlife.

Disaster Management is continuous and integrated process which requires intense planning, coordination, organizing and implementation. Such planning and coordination is necessary for the prevention of the danger or threat of any Disaster, mitigation and reduction of risk, prompt response, quick evacuation, rescue and relief, rehabilitation and reconstruction.

1.1. Legal Mandate of District Disaster Management Plan:

Section 31 of the Disaster Management (DM) Act 2005 mandates that, there shall be a District Disaster Management Plan (DDMP) for the each district. The proposed DDMP complies with the National Policy on Disaster Management (NPDM) of 2009 and conforms to the provisions of the Disaster Management Act making it mandatory for the Government of India and various central ministries to have adequate DM plans. While the District Plan will be pertaining to the disaster management for the whole of the district, the hazard specific nodal Ministries and Departments notified by the Government of India and State Government will prepare detailed DM plans specific to the disaster assigned. As per Section 32 of the Disaster Management Act, every office of the Government of India and of the State Government at the District level and the local authorities shall prepare a comprehensive DM plan detailing how each of them will contribute to the national efforts in the domains of disaster prevention, preparedness, response, and recovery.

1.2. Scope of the Plan:

As per the Disaster Management Act 2005, the District Plan shall include the following ingredients-

a) The areas in the district which are vulnerable to different disasters;

b) Considering the past History and experience the plan has to be prepared envisaging the future occurrences of such disasters.

c) The measures to be taken for prevention and mitigation of such disasters, by the Departments and local authorities in the district;

d) The capacity-building and preparedness measures required to be taken by the Departments.

e) The response plans and procedures, in the event of a disaster, providing for-

   (i) Allocation of responsibilities to the Departments of the Government at the district level and the local authorities in the district;

   (ii) Prompt response to disaster and relief thereof;

   (iii) Procurement of essential resources;

   (iv) Establishment of communication link; and

   (v) The dissemination of information to the public;

f) Such other matters as may be required by the District/State Authority.

The main scope of the DDMP plan is to reduce or avoid the human, physical losses and also to reduce personal suffering from the incident occurred. Providing protections to the victims whose lives are threatened by Disaster. The main intention of DM plan is to make an effort to prepare a plan taking into consideration of past incidents and anticipating future occurrences.

1.3 Aims and Objectives of the DDMP

The aim of Chikkamagaluru District Disaster Management plan is execution of Disaster Management in continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary for prevention, mitigation, capacity-building, preparedness to any threatening Disaster situation.

Accordingly, the major objectives of the DDMP of Chikkamagaluru District are as follows:

1. To promote a culture of prevention and preparedness at all levels.
2. To identify community as the most important stakeholders in the DM process.
3. To identify vulnerable areas based on the past experience.
4. To prevent loss of human life and property damage.
5. To study analyze and evaluate the disasters
6. To improve preparedness, prevention and mitigation at district level.
7. To ascertain the status of existing resources and facilities available
8. To recommend appropriate strategies and responses to deal with future disasters
9. To develop convergence of action in addressing, preventing and mitigating disasters.
10. To assists line Departments in the management of disasters.
11. To impart training to create awareness in the district.
12. To ensure effective Communication Plan and keep ready life saving equipments.
13. To ensure fastest approach for rescue &evacuation, rehabilitation and recovery.
14. To avert further miseries of the calamity-stricken people.
15. To facilitate the mitigation process.
16. To facilitate convergence.
17. Regular updation of resources available in and around the district.

1.4 Authority for the DDMP: Disaster Management Act 2005(DM Act):

Every District must have District Disaster Management Authority.

Deputy Commissioner is the chair person District Disaster Management Authority.

- The elected representatives of local authority who shall be co-chairperson as office. Provided that in tribal areas, as referred to in sixth schedule to the constitution the chief executive member of the district council of autonomous district shall be the co-chairperson ex office.
- The member of DDMA are Superintendent of police, Chief medical officer ,DHO, Commandant of fire services, RTO and elected representatives also
- The district authorities shall act as the district planning; coordinating and implanting body for disaster and take all measures for purpose of disasters management in the district in accordance with the guidelines laid down by the national and the state authority.
- Prepare disaster management plan including district response plan for the district.
- Coordinate and monitor the implementation of the National policy, State policy, National plan, State plan and District plan.
- Ensure that the areas in the district vulnerable to disasters are identified and measures for the prevention of the disasters and the mitigation of its effects are undertaken by the departments of the government at the district level as well as by the local authorities.
- Ensure that the guidelines for the prevention of disaster, mitigation of its effects preparedness and response measures as laid down by the National authority and the state authority are

followed by all departments of the Government at the district level and the local authorities in the district.

The District Disaster Management Plan, Chikkamagaluru, has included-

- The areas in the district vulnerable to different forms of Disasters.
- The measures to be taken, for prevention and mitigation of disaster, by the Departments of the Government at the district level and local authorities in the district;
- The capacity-building and preparedness measures required to be taken by the Departments of the Government at the district level and the local authorities in the district to respond to any threatening disaster situation or disaster;
- The response plans and procedures, in the event of a disaster, providing for-
- Allocation of responsibilities to the Departments of the Government at the district level and the local authorities in the district;
- Prompt response to disaster and relief thereof;
- Procurement of essential resources;
- Establishment of communication links; and
- The dissemination of information to the public;
- Such other matters as may be required by the State Authority.

The District Plan shall be reviewed and updated annually. The copies of the District Plan referred to in sub-sections (2) and shall be made available to the Departments of the Government in the district.

The District Disaster Management Authority, Chikkamagaluru, has sent a copy of the DDMP Plan to the State DDMA-Karnataka State Disaster Management Authority, for final approval.

The DDMA, Chikkamagaluru, is reviewing time to time, the implementation of the Plan and issue such instructions to different departments of the Government in the district as it may deem necessary for the implementation thereof.

1.5 Evolution of the Plan in brief:

Preparation of District disaster Management Plan is responsibility of the District Disaster Management authority of the district.

The main steps involved in the development of this plan are:

- Data collection from all line departments
- Data analysis
- Discussion with experts
- Reference of National and international literature
- Preparation of action plans for all line departments
- Preparation of draft plan document
- Mock drill to check the viability and feasibility of the implementation methodology
- Wide circulation for public and departmental comments
- Preparation of the final plan document

1.6 Stakeholders & their responsibilities:

At the District level, DDMA, with the Deputy Commissioner designated as Response Officer (RO), and other line departments at district HQ are responsible to deal with all phases of disaster management within district.

Other **technical institutions**, community at large, local self-governments, NGOs etc. are also stakeholders of the District Disaster Management Pan.

The role of the stakeholders has been prepared with the sole objective of making the concerned organizations understand their duties and responsibilities regarding disaster management at all levels and accomplishing them. Table briefly mentioned the name of all line departments within the district Chikkamagaluru and their role and responsibilities in context to disaster risk reduction in district Chikkamagaluru.

Table 1.1 Different critical stakeholders in the Chikkamagaluru District and their responsibilities

S. No	Stake Holders	Responsibilities
1.	DDMA	• Overall management of the disastrous situation within the district • Coordination of the district with the various stake holding departments within the district • Coordination of the district with the state and the other neighboring districts • Maintaining a view of the activities of the DDMA and DEOC
2.	DEOC	• Receive and process disaster alerts and warnings from nodal agencies and • Other sources and communicates the same to all designated authorities. • Monitor emergency operations. • Facilitate coordination among primary and secondary ESFs/ Departments/ Agencies • Requisitioning additional resources during the disaster phase. • Issuing disaster/incident specific information and instructions specific to all concerned. • Consolidation, analysis, and dissemination of damage, loss and needs assessment data. • Forwarding of consolidated reports to all designated authorities.
3.	NDMA	• To coordinate and monitor with the State for the implementation of the policies and plans related to DM. • Coordinating DRR activities and implementation thereof. • Facilitating resources on demands raise by administration • Coordinating DRR activities and implementation thereof. • Facilitating resources on demands raised by administration.
4.	SDMA,	• To approve DDMP • Monitor and implementation of the plan. • Provide guidance to DDMP for various facets of this plan. • Providing necessary assistance to the district in an event of disaster. • Recommend provision of funds for mitigation and preparedness measures.
5.	NDRF	• Carrying out search and rescue on requisition by District as well as state administration. • Strengthening the response mechanism through trainings and awareness. • Coordinate with administration in response as well as capacity building. • Facilitate administration with the key resources in disaster.
6.	Army/Air Force	• Coordinating DRR activities and administration in response. • Receive and process disaster alerts and warnings from nodal agencies. • Assess preparedness level
7.	Police	• Establish radio communications and assist in precautionary evacuation activities with DEOC • Provide safety and security to citizens and their property during disaster • Establish command and control in coordination with fire and medical

		teams • Organize training on hazardous chemicals for police officers for facilitating handling of hazardous materials
8.	Fire Department	• To strengthen community response through trainings and awareness camps. • To train first responders at village / Panchayat level in firefighting. • To mitigate the fire risk by auditing and inspection and fighting fire disaster. - • To assist Search and rescue team in fire situations.
9.	Civil Defence, Home Guards	• Establish, maintain and manage search and rescue response system; • Coordinate search and rescue logistics during field operations; • Provide status reports of S&R updates throughout the affected areas.
10.	Health Department	• Coordinate assistance and response related to disaster within the District • Prepare and implement hospital preparedness plan. • Training of health workers on emergency preparedness and response. • Providing efficient and quick treatment of the affected people during the disaster • Prepare, keep and check ready Mobile Hospitals, stocks of equipment and drugs
11.	PWD	• Have a disaster response plan or disaster response procedures clearly defined • Site analysis and risk sensitive land-use planning • Restoration of roads to their normal condition • Repair/reconstruction of public utilities and buildings • Training and capacity building of the department and functionaries. • Preparedness and implementation of preparedness plan of the department
12	Irrigation	• Monitor and protect irrigation infrastructure in pre and post disaster situation • Restoration of water supply to the affected area • Arrange adequate material and manpower to maintain cleanliness and hygiene
13	MESCOM	• Restore the power supply and ensure uninterrupted power to all vital installation, facilities and site. • Identify requirements of external equipment required such as DG sets, generators etc; • Damage Assessment
14	RTO	• Overall coordination of the requirement of transport in implement emergency related response and recovery • Make an inventory of vehicles available for various purposes
15	Food and Civil Supplies	• Identify requirement of food and clothing for affected population; • Control the quality and quantity of food, clothing and basic medicines • Ensure the timely distribution of food and clothing to the people; • Ensure that all food that is distributed is fit for human consumption
16	Information officer	• To provide and collect reliable information on the status of the disaster and disaster victims for effective coordination. • Respect the socio-cultural and emotional state of the disaster victims while collecting information for dissemination. • Coordinate with both print and electronic media to provide news flashes for specific do’s, don’ts & needs. • Establish procedures for coordination among local government agencies,

17	Animal Husbandry	volunteer organizations • Assistance during emergency with regards to medical care, temporary confinement, shelter, food and water • Disposal of dead and unclaimed animals • Imparting special skills required during emergency operations to the officials
18	Forest	• Check available stocks of equipments and materials likely to be most needed after disaster. • Assess the extent of damage to forests, nurseries and storage facilities • A pests and disease monitoring system should be developed • Training of the workers in disaster management
19	Municipal Council	• Land Usage • Solid/ liquid waste treatment and management
20	PRED	• Strengthening the community based response by awareness and implementation of DM policy and guidelines • Preparing the Community as first responder and local authorities as per Village Disaster Management Plan.
21	Education	• Building capacity at school level through various competitions and awareness campaign. • To train the volunteers through NCC/ NSS etc. in Firefighting, First aid, and other disciplinary & volunteering • The fisheries development officer shall check the functioning of life saving appliances and provide and render services of such equipment.
22	Fisheries Dept	• List to be prepared active fishermen, families with Livelihood activities and complete address for identification in case of emergency. • Identification of vulnerable habitations, creek points, likely marooned areas, rate of inundation and receding waters, identify the locations where fishing craft are anchored and prone to damages. • Ensure that boats and other equipments of fishermen are moved to safer places and secured. And ensure positioning the relief boats and expert swimmers, life saving appliances at vulnerable points for preventive and rescue activities. • Mobilize expert swimmers to the cyclone / flood hit areas. And alerting the teams for post disaster activities
23	Sr. Environment Officer	• The representative of the Pollution Control Board would be based in the ECR during any disaster and ensure the environmental damage is kept minimum. • Mobilise all possible resources at his disposal and keep the laboratory functioning for analysis of pollutants and emissions. • Rush the team to the affected area for collection of samples and analyse the same. • Keep the ECR informed about the possible effect on human life as well as environment and corrective actions taken to minimise the same.

1.7 How to use the Plan:

- Plans will work only in the case when present organizational structure is responsible to its non-emergency duties i.e. if a job is done well everyday; it is best done by that organization during emergency.
- Crisis should be met at the lowest and most immediate level of government. Plans call for local response supplemented if necessary, by the next higher jurisdiction.

- Voluntary response and involvement of the private sector should be sought and emphasized. The emergency management partnership is important to all phases of natural and man-made disasters.

1.8 Approval Mechanism of the Plan: Authority for implementation (State Level/ District Level orders):

As per Section 31(2) of the Disaster Management Act 2005, there shall be a plan for disaster management for every district of the State. The DDMP, Chikkamagaluru, has been prepared by the District Disaster Management Authority. Also, as per Section 31(6) of the Disaster Management Act 2005, the District Authority shall send a copy of the District Plan to the State Authority which shall forward it to the State Government. The approved draft plan has been sent to Karnataka State Disaster Management Authority for final approval.

1.9 Plan Review &Updation: Periodicity

As per Section 31(4) The District Plan shall be reviewed and updated annually. Also, As per Section 31(7) The District Authority shall, review from time to time, the implementation of the Plan and issue such instructions to different departments of the Government in the district as it may deem necessary for the implementation thereof.

DDMP, Chikkamagaluru, is a dynamic document and being discussed annually in the meeting of District Disaster Management Authority, Chikkamagaluru. Plan review in charge by Deputy Commissioner.

Chapter 2: DISTRICT PROFILE

2.1 Etymology of the name of Chikkamagaluru

Administrative Head Quarter of Chikkamagaluru district is located at Chikkamagaluru town. It is alternatively spelt as Chickmagalur or Chikmagalur. Chikkamagaluru literally means "The place of the younger daughter" in the native Kannada language. The town is said to have been given as a dowry to the younger daughter of Rukmangada, the legendary chief of Sakrepatna and hence the name. As one can guess, there is indeed a place called Hiremagaluru which means "The place of the elder daughter" which is about 5 km from Chikkamagaluru town.

Chikkamagaluru is situated in south western part of Karnataka and surrounded by the Western ghats dense forests. It is 250 km from Bangaluru. The district is full of scenic surprises hills, valleys, streams and snow-white coffee blossoms. Chikmagaluru is a trekker's delight, with its rugged mountain trails. Mullayanagiri, the highest peak in Karnataka (1930 meters) is 12 Kms away from Chikmagaluru. The rivers Bhadra, Tunga, Hemavathi, Netravathi and Vedavathi flow in all the seasons. Coffee is the major commercial crop and other crops are pepper, etc. Several minerals are found in the district such as iron, magnetite, granite etc., The district is divided into Eight Revenue taluks namely Chikmagaluru, Kadur, Tarikere, Mudigere, Koppa, Narasimharajapura, Sringeri and Ajjampura.

2.2 Geography

Chikkamagaluru, the district head quarters of Chikkamagaluru district is 250 km from the state capital of Bangalore and surrounded by the Chandra Dronha hills and dense forests. The district is situated between 12° 54′ 42′′ and 13° 53′ 53′′ north latitude and between 75° 04′ 46′′ and 76° 21′ 50′′ east longitude. Its greatest length from east to west is about 138.4 kilometers and from north to south 88.5 kilometers. The district receives normal average rainfall of 1904 mm. The highest point in this district is Mullayanagiri, 1926 mts. above sea level which is also the highest point in the state of Karnataka. 30% of the district (2108.62 km²) is covered with forests. The district borders Shimoga district to the north, Davangere district to the north-east, Chitradurga and Tumkur districts to the east, Hassan district to the south, Dakshina Kannada district to the south-west and Udupi district to the west. The rivers Bhadra, Tunga, Hemavathi, Netravati, and Vedavathi flow all year round. The district is rich in iron, magnetite and granite deposits. Black soil is found around inam-Dattatreya peeta.

The districts is having 5 Malnad taluks (Dense Forest and Hilly) and 3 bayaluseeme taluks (tropical climate) whereas Red and Gravel soil are found in the southern parts of the district.

2.3 Rainfall and Climate

Many parts of the district are situated in heavy rainfall zone. However 3 talukas Kadur Tarikere and Ajjampura are located towards the east comprising more or less Tropical climate.

The climate of the district is agreeable and cool throughout the year. Though March, April and May are regarded as summer months, during this period the maximum day temperature stays around 30°c and the night temperature however around 19°c.

The average annual rainfall of the district is 1904mm. The eastern belts receive a rainfall of about 600mm/yr only, while the western belt receiving around 3000mm/yr. The total number of rainy days on a year in the district lies in the range of 42 days at Kadur to 122 days at Balehonnur with an average for the district as a whole as 92 days. However year 2001 and 2002 have been the years of less than the average rainfall with maidan areas suffering from drought conditions.

2.4 Demographics

According to the 2011 census Chikkamagaluru district has a population of 1,137,961 roughly equal to the nation of Cyprus or the US state of Rhode Island. This gives it a ranking of 408th in India (out of a total of 640 districts). The district has a population density of 158 inhabitants per square kilometre (410 /sq mi). Its population growth rate over the decade 2001-2011 was -0.28 %. Chikmagalur has a sex ratio of 1008 females for every 1000 males, and a literacy rate of 79.24%. 81% of the population resides in rural area with the remaining 19% being the urban population. Among Taluks, Sringeri taluk has the least population whereas Chikkamagaluru Taluk has the highest population. Kannada is the Dominant language spoken in this district.

(Demographic Features of Chikkamagaluru district during 2001 to 2011)

Description	2001	2011
Actual Population	1140905	11,37,961
Male	574,911	5,66,622
Female	565994	5,71,339
Population Growth		-0.28%
Density/ Km/sq	158	158
Sex Ratio	984	1008
Child sex ratio (0 to 6 Age)	958	969
Average Literacy	63%	79%
Male Literacy	70.77%	86%
Female Literacy	56.33%	73%

Schedule Caste and Schedule Tribes Population of the district

Sl.No	Description	Total Population	Urban	Rural
1	Schedule Caste	233134	30103	203031
2	Schedule Tribes	41019	3807	37212
	Total	274153	33910	240243

Chikkamagaluru district is under the Mysore Division of Karnataka. It is divided into two Revenue Sub-divisions, Chikkamagaluru Sub-Division and Tarikere Sub-Division. Chikkamagaluru Sub-Division comprises the taluks of Chikkamagaluru, Koppa, Mudigere and Sringeri whereas the Tarikere Sub-Division comprises the taluks of Tarikere, Kadur, Ajjampura and Narasimharajapura. The Deputy Commissioner (also the District Magistrate) is the functional head of the district. Each Sub-Division has Assistant Commissioners and each Taluk has Tahsildars who work under the control and supervision of the Deputy Commissioner. The current administrative setup of the district can be viewed.

Sl.No	Taluk	Hoblis	Revenue villages	Gram panchayth
1	Chikkamagaluru	8	238	47
2	Mudigere	5	140	29
3	Koppa	3	80	22
4	Sringeri	2	49	9
5	Tarikere	6	250	46
6	Kadur	8	315	60
7	Narasimharajapura	2	58	14
8	Ajjampura	34	1130	227

2.5 Socio Economic Profile Of The District

The land of Chikkamagaluru blessed with exceptionally beautiful natural landscapes. Which may be considered as disaster prime factor. The region is well suited for the cultivation of many high valued plantation crops like Arecanut, Coconut, Coffee, black pepper and cardamom. Thus, the district is driven by a thriving rural agriculture based economy, which is supplemented by incomes from tourism. However, the agricultural sector faces critical problems like labour shortage, volatile prices and high transportation costs. Chikkamagaluru is one of the richer districts of Karnataka in terms of gross per-capita (Rs 68,965 in 2008-09). The District Domestic Product (DDP) grew at the cumulative annual compound growth rate (CAGR) of 6.81% (GDDP) with the primary sector registering the highest CAGR (9.63%).

2.6 A-Agriculture/Horticulture/Plantation crops

Agriculture/ Horticulture is the primary economic activity in the district, with most of the district's available non-forest land is used for agriculture. Characteristically and historically, paddy fields are found on the valley floors and ragi fields in maidan area, with Coffee and pepper agro forestry in the surrounding hills. The most common plantation crop is coffee, arecanut and coconut. Especially Coffee robusta variety, although Arabica variety is also grown widely. Further, the district's agro climatic condition is conducive for cultivation of arecanut, coconut, coffee, pepper, and other plantation crops. Thus, together with Coffee, Chikkamagaluru grows a considerable variety of horticulture crops as well. Other horticultural crops are grown on 1,26,347 hectares in the district. The major horticulture crops grown in the district are Arecanut, Coconut, Black Pepper, Banana, Mango, cardamom, ginger, and vegetables. Other minor produces in horticulture include, floriculture, sapota, Orange, Cocoa and jackfruit. Agriculture area is around 155000 Hect. Major cereals crops is Ragi, Paddy, Maize, Jowar, Pulses like green gram, red gram, horse gram and avare, oil seeds like groundnut, sesamum and sun flower. However, agriculture in the district is majorly affected by various issues like the lack of dependable and skilled agricultural labour, market vulnerability due to exposure to the international market.

To promote research and extension activities within Chikkamagaluru, one Zonal Agriculture Horticulture Research Stations(ZAHRS), at Mudigere operating under University of Agricultural Horiticulture Sciences (Shivamogga). A Krishi Vigyan Kendra is located at Mudigere and Coffee research station at Balehonnnur.

The district has one dam, across the Bhadra River at Tarikere taluk. However, a very small portion of command areas of this dam fall in the district boundary of Tarikere taluk. About 5727 hectares of the district have canal based irrigation facilities.

The details of crops grown (area in Hectares)

Sl. No	Taluk	Rice	Coffee	Pulses	Ragi	Oil seeds	Plan tation and Spices	Fruits	Vege tables
1.	Chikkamagaluru	8000	40434	650	3000	3120	7086	4134	5351
2.	Mudigere	9000	33467	0	0	0	6820	1498	40
3.	Koppa	5500	8274	0	0	0	7226	944	84
4.	Sringeri	2500	393	0	0	0	5556	424	107
5.	Tarikere	5000	2689	3500	12500	5200	20730	5810	7013
6.	Kadur	350	25	9750	31500	11650	40331	1556	4731
7.	N.R.Pura	5000	4160	0	0	0	4589	1235	631
	Total	35350	89442	13900	47000	19970	92338	15601	17958

2.6 B. Geo Morphology Of Soil Types

The district has major portion of red sandy loamy soil, small patches of black soil in Maidan taluks of Chikkamagaluru, Kadur and Tarikere and laterite soil in parts of Chikkamagaluru, Sringeri, Mudigere, Koppa Narasimarajapura taluks.

2.6 C. Education

Average literacy rate of Chikkamagaluru in 2011 was 79.25% compared to 64.47% in 2001. The gender wise analysis reveals that male and female literacy was 85.65% and 72.87% respectively. The average literacy level of the district is better than the State-level literacy rate in all the categories like male female, urban-rural, etc. However, literacy rate of the district in 2011, is 3.63% less than the state target of 85%, as specified in the 11th Five Year Plan. The Net Enrolment Rate of the district, in Government Primary schools during the year 2011-12 was about 90% and no noticeable gender difference was found in enrolment rates. There is one technical (private engineering) college in the district with a total enrolment of 2500 students every year. when compared to other surrounding districts number of technical and vocation education institutions in Chikkamagaluru district is less.

The number of Educational Institutions as follows
Higher education institutions in Chikkamagaluru (2011)

Details of Educational institutions	**No .of colleges**
PU colleges	85
Polytechnic Colleges	20
Degree Colleges	20
Technical (Engineering) Colleges	1
Ayurvedic College	1

Some of the notable college institutions of the region are:

Sl.No	Institutions
1	A.I.T Chikkamagaluru
2	A.L.N Rao Aurvedic College, Koppa
3	Ramakrishna Pharmacy College, Koppa
4	Horticulture University, Mudigere

2.6.D. Tourism

Chikkamagaluru is situated in south western part of Karnataka. Chikkamagaluru is famous for its green shola forest and the highest peak of the Karnataka is also situated in Chikkamagaluru dist. And it is home for many holy destinations of Karnataka like Horanadu, Kalasa, Sringeri, Inam-dattatreyapeeta, Balehonnur. The district caters all type of tourist by its many attraction and Chikkamagaluru is also famous for home stays and the Malnad style food which is delicious as well as healthy. District is having lot of scope for River Rafting, Trucking, Nature watching etc.

Scenic attractions	**Cultural Attractions**	
Khandya	Hiremagaluru	Hirekodige
Mutthodi	Marle	Balehonnur
Mullayyanagiri	Belavadi	Simhanagadde
Seethalayyanagiri	Deverammana Betta	Devanur
Honnammanahalla	Baba Buden giri	Yagati
Galikere Ballalarayana Durga	Manikyadhara	Hirenallur
Bettada Byrapura	Horanadu	Asandi
Devaramane	Kalasa	Antharagatte
Meerthi Gudda	Angadi	Sollapura
Kudremukha	Devarunda	Sakryapattna
Sirimane Falls	Ambu Thirtha	Kalthagiri
Ayyanakere	Kuudige	Sompura
Kemmannugundi	Sringeri	Baggavalli
Bhadra Dam	Kigga	Amruthapura
	Hariharapura	Shivani
		Bukkambudhi

2.6.E. Infrastructure Details:

Even with its hilly terrain, Chikkamagaluru is well served by banking facilities, schools, health, road and railway facilities. The proportion of households having electricity connection in the district (68.71%) is significantly less in comparison to the state average (86.71%) mainly because of the lag in electricity connections in rural Chikkamagaluru specifically in Malanad taluks. In urban areas of the district, the progress in household electrification is comparable to that of Karnataka (more than 96% coverage).Partly, owing to its hilly terrain,

The district has a total of 53 regional rural banks, 145 commercial bank branches and co-operative bank branches of 19 apart from 8 PLD banks. The district is served by 8 regulated markets. The district has a police station for every 28449 persons as against the state average of one police station for every 58600 persons.

Sl. No	Infrastructure	Chikka magalur	Mudi gere	Koppa	Sringeri	Kadur	Tari kere	N R Pura	Dist Total
1.	Nationalized Banks	44	19	16	11	25	18	12	145
2.	Private Banks	10	6	7	2	9	2	4	40
3.	Co-op Banks	4	2	3	1	4	3	2	19
4.	Police Station	6	6	3	1	6	4	2	28
5.	Fire stations	1	1	1	-	1	1	-	5
6.	Government General Hospitals	1	1	1	1	1	1	1	7
Sl. No	**Infrastructure**	**Chikka magalur**	**Mudi gere**	**Koppa**	**Sringeri**	**Kadur**	**Tari kere**	**N R Pura**	**Dist Total**
7.	Private Hospitals	13	2	7	1	10	6	1	40
8.	Primary& Hr. Pry School	330	173	113	53	420	220	92	1401
9.	Higher secondary Schools	24	18	12	6	31	17	8	116
10.	PU colleges	25	9	4	5	20	10	8	81
11.	Medical Colleges	-	-	-	-	-	-	-	-
12.	Engineering Colleges	1	-	-	-	-	-	-	1
13.	Nursing colleges	1	-	-	-	-	-	-	1
14.	Ayurvedic college	-	-	1	-	-	-	-	1
15.	Percentage of literacy	81.71	77.34	83.28	86.12	76.02	77.36	83.29	79.25

2.7 Details Of Rivers And Dams

Sl.No	Taluk	Rivers	Dams
1.	Chikkamagalur	-	-
2.	Mudigere	Hemavathi, Bhadra	Lakya dam
3.	Koppa	Tunga	-
4.	Sringeri	Tunga, Bhadra, Netravathi	-
5.	Tarikere	Bhadra	BRP
6.	Kadur	Vedavathi	
7.	N.R.Pura	Bhadra, Tunga	

Danger level of River water in Chikkamagaluru dist.

Sl. No	Name of the River	Flood Gauge Station	Danger	Extra Level
1.	Tunga	Hariharapur Sigdal Bridge	90 Mtr	95 mtr
2.	Bhadra	Balehonnur Bridge	80 Mtr	85 Mtr
3.	Hemavathi	Angadi bridge	40 Mtr	45 Mtr

2.7 a-Details Of Drinking Water (Water Supply)

Sl. No	Taluk	ULB Source	MLDs per Day	Rural Source
1.	Chikkamagalur	Yagachi dam Hirekolale tank	11.97	Open well, bore well, Lake, river, etc.
2.	Mudigere	Hemavathi river and sundekere halla	0.68	Open well, bore well, Lake, river, etc.
3.	Koppa	Hirekere tank, Nagalapura-Tunga river	0.68	Open well, bore well, Lake, river, etc.
4.	Sringeri	Tunga river	0.53	Open well, bore well, Lake, river, etc.
5.	Tarikere	Bhadra channel	4.85	Open well, bore well, Lake, river, etc.
6.	Kadur	Bhadra channel and bore wells	1.37	Open well, bore well, Lake, river, etc.
7.	N.R.Pura	Borewells	1.01	Open well, bore well, Lake, river, etc.

2.7 b- Flora And Fauna

The District Gifted with Rich Flora and Fauna

Chikmagalur district of Karnataka state is situated in the heart of the Western Ghats region. The Malanad region consists of Western Ghats chain from where many rivers originate and the inland plain region of Deccan plateau. The Western Ghats is rich with flora and fauna and is considered as one of the 34 biodiversity hotspots (also one among eight hottest hotspots of biodiversity) of the world (http://www.conservation.org).

The region with a wide range of forest types ranging from tropical wet evergreen forests to grasslands is a repository of rich flora and fauna evident from the occurrence of over 4,000 species of flowering plants (38% endemics), 330 butterflies (11% endemics), 156 reptiles (62% endemics), 508 birds (4% endemics), 120 mammals (12% endemics), 289 fishes (41% endemics) and 135 amphibians (75% endemics). The forests of Western Ghats, in view of their floristic diversity and numerous multipurpose species, are considered a varietal storehouse of economically important plants.

The barrier of the Baba-Budan chain of high elevation is in the centre. There are also more modest ranges which extend throughout the north and the east. The magnificent Merti peak of Kalasa is a land mark.

Chikmagalur district has a rich and varied flora, the major contributing factors to this variety being differences in rainfall and topography within the district. In the region of the Western Ghats, the rainfall is heavy, Sringeri has the distinction of receiving higher annual rainfall of 3773 mms. A rapid transition from evergreen flora to the scrub type, i.e., from mesophytic to xerophytic occurs as one move from the west to the east. The forests of Chikmagalur district consists of Evergreen and Semi-Evergreen climate forests and degradation type and deciduous climax forests and degradation type. Area under forest constitutes 38.60% of the geographical area of the district (7201 sq. km). The district is divided into three Forest divisions, namely Chikmagalur, Koppa, Bhadra Wildlife Sanctuary and Social Forestry for management of forests.

The Bhadra Tiger Reserve (A Project Tiger Reserve Park) is located in Sahyadri hill ranges between 75º 15' to 75º 50' E and 13º 25' to13º 50’ N in the midst of Western Ghats regions of Chikmagalur, N.R.Pura and Tarikere taluks of Chikmagalur District and Bhadravathi taluks of Shimoga District. The forest area mainly consists of moist deciduous, dry deciduous and shola forests. River Bhadra and its tributaries are the chief source of water in the reserve and form a life line to all its flora and fauna. Reserve is home to a diverse range of wildlife such as Tigers, Leopards, Indian Gaurs, Sambars, Spotted Deer, Barking Deer, Malabar Pit Vipers, Racket Tailed Drongos, Otters, Indian Giant Squirrels and Malabar Trogons. Bhadra is also a part of the Mysore Elephant Reserve and has a healthy population of elephants.

The Kudremukh National park is located at the tri-junction of Dakshina Kannada, Udupi and Chikmagalur districts. It lies to the south-west of Karnataka state. It lies between 75˚ 01' to 75˚25' E and 13˚01' to 13˚29' N. It is the part of Sahyadri hill ranges. It has an altitude of 1892 meters from sea level. The park derives its name from highest hill peak which is known as Kudremukh Peak. Kudremukh National Park is houses to about 2500 species of flowering plants. Its wealth includes the most primitive to the advanced of the plant kingdom and few “living fossils”. About 200 hundred species are threatened. There are about 400 species of known medicinal plants, 180 species of edible plants and 70 species of orchids. About 750 species of mushroom flora was estimated within the park. Kudremukh National Park is one largest grassland shola ecosystem in the mid-Western Ghats of Karnataka.

2.8 Road And Railway Network

Chikkamagaluru is well connected by road with Hassan, Mysore, Bangalore Shivamogga, Udupi, Mangaluru There are two Ghat roads for reaching Chikkamagaluru from coastal regions. The nearest airports are at Mysore and Mangalore. The nearest seaport for Chikkamagaluru is New Mangalore Port at Panambur in Mangalore, 145 kilometers (90 mi) from Chikkamagaluru. Chikkamagaluru is partly connected with railway. The district has two railway junctions at Kadur and Birur.

2.9 Details of Grampanchayath

Sl. No	Name of the Taluk	Numbers of GPs
1	Ajjampura	26
2	Chikkamagalur	47
3	Kadur	54
4	Koppa	22
5	Mudigere	29
6	Narasimharajapura	14
7	Sringeri	9
8	Tarikere	26

2.10 Details of Household Details:

S.No.	Name of the Taluk/GPs	No. of APL HH	No. of BPL HH
		Total	Total
1	Chikkamagalur	16391	58498
2	Kadur	2458	59878
3	Koppa	6613	13271
4	Mudigere	8476	19806
5	Narasimharajapura	4342	11805
6	Sringeri	2742	6107
7	Tarikere	9883	40077
	Total	**50905**	**209442**

2.11 Population Details

Sl. No.	Taluk	Male	Female	TOTAL
1	Chikkamagalur	151921	153447	305368
2	Kadur	14683	145185	291668
3	Koppa	41746	43136	84882
4	Mudigere	63102	65032	128134
5	Narasimharajapura	324498	33641	66090
6	Sringeri	18030	18509	36539
7	Tarikere	112891	112389	225280
	Total	**726871**	**571339**	**1137961**

2.12 Literacy Rate in Percentage:

Sl. No.	Name of Taluk/ GP	Male	Female	Total
1	Ajjampura	86.28	71.34	78.88
2	Chikkamagalur	87.16	76.33	81.71
3	Kadur	82.89	68.78	75.84
4	Koppa	88.89	77.86	83.28
5	Mudigere	83.80	71.09	77.34
6	Narasimharajapura	88.02	78.77	83.29
7	Sringeri	90.45	81.91	86.12
8	Tarikere	82.76	70.11	76.41

2.13 Total Map with main features

2.14 Annual Average Rainfall of the Taluks:

Sl No	Taluk Name	Annual Average (in M M)
1	Chikkamagaluru	1342.0
2	Kadur	641.0
3	Koppa	3064.0
4	Mudigere	3077.0
5	N R Pura	1887.0
6	Sringeri	4067.0
7	Tarikere	806.0
	District Average	**1757.0**

2.15 Month wise Average Rainfall of the District:

Sl. No.	Month	Average Rainfall (in mm)
1	January	0.22
2	February	3.65
3	March	35.12
4	April	60.62
5	May	247.98
6	June	492.76
7	July	631.52
8	August	543.0
9	September	111.08
10	October	115.55
11	November	27.31
12	December	9.54

2.16 Rain Recording Stations:

Sl. No	Name of the Taluk	No. of GPs	Rain Recording stations
1	Ajjampura	26	0
2	Chikkamagalur	47	11
3	Kadur	54	3
4	Koppa	22	5
5	Mudigere	29	8
6	Narasimharajapura	14	9
7	Sringeri	9	3
8	Tarikere	26	11

2.17 Month wise Highest and lowest Temperature recorded in the District

Sl .No.	Month	Maximum Temperature (in Centigrade)	Minimum Temperature (in Centigrade)
1	January	35.10	8.0
2	February	37.90	6.6
3	March	39.0	9.4
4	April	40.6	15.6
5	May	39.40	16.70
6	June	34.80	16.0
7	July	33.6	16.8
8	August	30.9	17.0
9	September	36.2	13.2
10	October	35.70	9.10
11	November	35.50	8.30
12	December	37.60	0

2.18 Crop Pattern:

Sl. No.	Name of the Taluk	Type of Crops	Area Cultivated in (Hect.)
1	Chikkamagalur	Paddy coffee	64650
2	Kadur	Ragi,Jowar, Maize	113642
3	Koppa	Paddy , Arecanut	22982
4	Mudigere	Paddy coffee	41977
5	Narasimharajapura	Paddy, Arecanut, coffee	15218
6	Sringeri	Paddy, Arecanut, coffee	6807
7	Tarikere	Jowar, Maize, Paddy, Areacnut, Ragi	72126

2.19 Police Station

Sl.No	Name of the District Hq/Taluk/Municipality	Police Station	Staff Available
1	Chikkamagalur	8	302
2	Kadur	6	221
3	Koppa	3	105
4	Mudigere	6	203
5	Narasimharajapura	2	82
6	Sringeri	1	38
7	Tarikere	4	165

Chapter-3

Assessment of landslide prone areas in Chikkamagaluru District

The term landslide or landslip includes a wide range of ground movements. Such as rock falls, deep-seated slope failures, mudflows, and debris flows. Landslides occur in a variety of environment due to Gravity. This occurs when soil, rock and other earth debris can no longer hold itself together it gives way to gravity and there by slip from its original position. In many cases, landslide is triggered by a specific events such as a heavy rainfall, an earthquake, a slope cut for constructions etc. The topography of Chikkamagaluru District is sensitive and any changes in the land use - land cover pattern causes landslides or slope failures

During heavy rains in monsoon seasons, the slope forming material gets saturated by the water resulting in increase in pore water pressure and decrease in effective cohesion which effectively acts as a triggering factor for slope failures. Since Chikkamagaluru district comprise of hilly regions, the vulnerability to landslides is largely attributed to the deposits of over burden materials on the steep hill slopes. These deposits are primarily loose soil, tumbling stones and debris. The loose overburden deposited on the slopes makes them vulnerable to landslides.

Chikkamagaluru District has received unprecedented heavy rainfall in the month of August. Mudigere Taluk in particular has received bountiful rain on August 9th which caused severe landslide in several parts of Mudigere Taluk such as Malemane, Madhugundi, Durgadahalli, Alekhanhoratti etc. Due to Severe Landslides the people were caught unawares which resulted in loss of 8 Lives. With an intention to assess and determine the reasons and causes for such landslides a preliminary study of the landslides was taken up. It was entrusted to Geological Survey of India. Accordingly the team comprising of *Kapil Singh* and *Kamal Kumar*, Geologists had visited affected sites and evaluated the status. The above said experts team has given the assessment report to District Administration with causes for the incidents and suggestions and recommendation for prevention of such future occurrences. The reports submitted by the team is comprehensive in so far as it contains the Geo Technical appraisal of the area, the Geo Technical evaluation and the measures and recommendation for each of the site where the landslides have occurred in the recent past. This document is a valuable and important document for future reference.

It is felt that the assessment report which is given by the expert committee should reach all the stakeholders as a guiding document in view of taking necessary precautionary measures. Therefore the reports in its entirety has been integrated into the District Disaster Management Plan and preventive and precautionary measures will be taken as per the suggestions and recommendations contained in the report.

Locations of the Landslide Occurrence Area in Mudigere Taluk

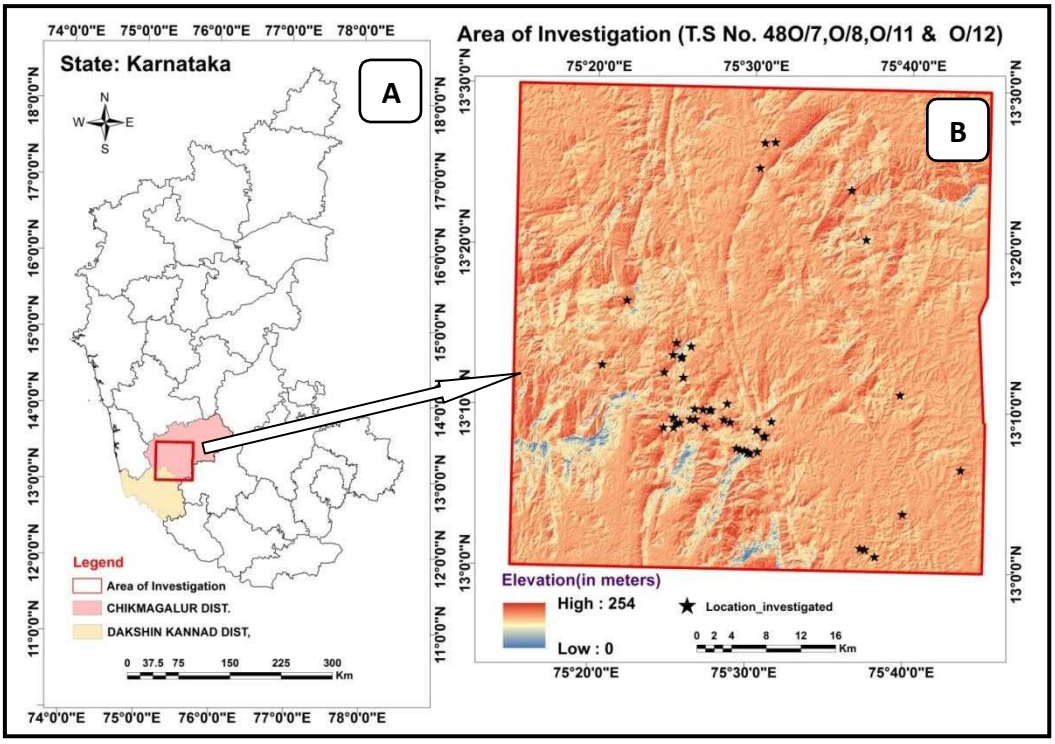


Fig: 1: A) Location of the study area, B) Showing investigated locations in Chikkamagaluru & Mudigere Taluks

Geologically, the area exposes amphibolite and kyanite-muscovite schist of Sargur Group, Gneisses and Granitoids of Peninsular Gneissic Complex, amphibolite, quartzite, meta-basalt, meta-ultramafite and banded magnetite quartzite of Western Ghat schist belt, Shimoga schist belt and Bababudan schist belt.

As per the rainfall records received from Karnataka State Natural Disaster Monitoring Centre (KSNDMC), the Chikkamagaluru district has received actual rainfall of 1296 mm from 1st June to 20th june2019 as against normal rainfall of 1113mm (13%).Further many landslides have been occurred in parts of Chikkamagaluru & Mudigere especially in the road corridors during the current incessant high rainfall.

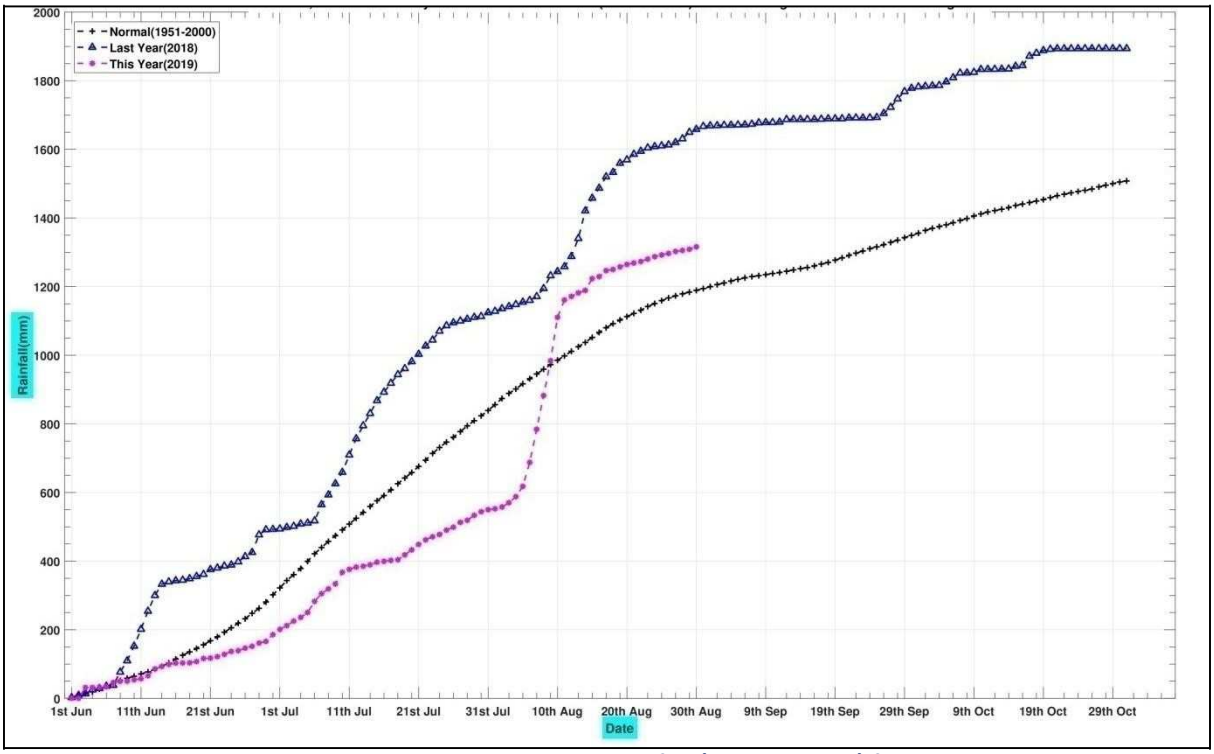


Fig: 2: KSNDMC, Cummulative Daily mean and Normal Rainfall-(June-October) for Chikkamagaluru District as on 30 Aug 2019.

As per the local version heavy rainfall/cloud burst occurred on 9th August, 2019 in which most of these slides occurred in the study area. So an effort was been made to correlate the intensity of rainfall with time of initiation of mobilization. Rainfall data of Chikkamagaluru district reveal that Chikkamagaluru Taluk and Mudigere Taluk are mostly affected by south west monsoon. The data shows percentage deviation of realised rainfall is -29% in Chikkamagaluru Taluk &-43% in Mudigere Taluk in June 2019 month. Similarly, in the July 2019 month -50% in Chikkamagaluru Taluk &-29% in Mudigere Taluk rainfall deficiency from normal values have been noted. While a sharp rise of rainfall between 5th August and 10th August 2019 has been distinct. This percentile rainfall rise for August 2019 month is extremely high as compared to June & july2019 months. The rise of rainfall in the month of August 2019 shows 228% departure from normal rainfall *(Fig.2).*

GEOTECHNICAL APPRAIRSAL, OBSERVATIONS AND RECOMMENDATIONS

A total of 48 locations were studied and have been geo-technically evaluated keeping all geo-factor features like slope morphometry, lithology & structure, water, drainage, slope forming material (overburden) etc. Necessary suitable measures/recommendations have been suggested for each landslide & ground crack affected sites to restore the stability. During the month of August both Chikkamagaluru and Mudigere taluks received excessive rainfall almost 3 times the normal. However, the heaviest rainfall is between 8th August and 10th August 2019.

GEOPARAMETRIC DATA SHEET FOR LANDSLIDES (42 POINTS)

No	Field		Description
1	Location/ Slide No.	:	**01**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotigehera-Charmadi road
7	Latitude	:	N13°7'12.5"
8	Longitude	:	E75°30'7.4”
9	Length *(m)*	:	~33
10	Width *(m)*	:	~30
11	Height *(m)*	:	~24
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~495
15	Run out distance *(m)*	:	~70
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and Widening
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known

24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Foliations trending 240, dipping 70^{o} west
27	Landuse/ Landcover	:	Dense mixed forest. Extensive slope cut along the road.
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Rainfall and Anthropogenic factors like road cutting.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Parapet wall damaged
35	Agriculture/forest/Barren	:	Forest
36	Geo-scientific Causes	:	Removal of toe support due to road widening/construction, high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. The slide has occurred during heavy rainfall that caused infiltration of water resulting in building up of pore water pressure and reducing the cohesive strength
37	Recommendations	:	The toe support should be given at the base contour line of slope (foot of slope) by construction of retaining wall with weep holes and minimize the slope gradient by benching and back filling.
38	Remarks, if any		Date of occurrence: 9th August 2019
39	Photos. Sketch of Plan & section of the slide	:	 **View of Landslide along Kotigehera-Charmadi road**

40	Summary/Abstract	:	The landslide is a debris slide having translational movement along a single rupture plane with approx. 70m run-out distance. The debris material has been moved along with trees and other vegetation. This landslide has occurred on concave slope with 35°-40° gradient. The slope forming material (SFM) laying over the hard rock got saturated by percolation of water during rains which increased its mass. Initially, high angel slope cut for road construction made the slope unstable. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity. The slide has been occurred adjacent to the first order streams running southerly. Almost all loose material has been moved exposing the underlying rocks below the crown. Rocks are highly sheared. Crown of the slide is fractured that may lead to another failure during increased stress.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**02**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotigehera- Charmadi road
7	Latitude	:	N13°7'15.7"
8	Longitude	:	E75°30'0”
9	Length *(m)*	:	~250
10	Width *(m)*	:	~24
11	Height *(m)*	:	~18
12	Area *(m2)*	:	
13	Depth *(m)*	:	~1
14	Volume *(m3)*	:	~6000
15	Run out distance *(m)*	:	~60
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid

19	Activity	:	Active
20	Distribution	:	Confined
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Foliations trending 240, dipping 70^{o} west
27	Landuse/ Landcover	:	Dense mixed forest. Extensive slope cut along the road.
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Removal of toe support due to road cutting, high slope gradient are the primary causes while heavy antecedent rainfall trigger the mass to fail
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Parapet wall damaged
35	Agriculture/forest/Barren	:	Forest
36	Geo-scientific Causes	:	Regolith /Soil thickness varies from 2m to 5m correspond to considerable depth of soil and weathered rock mass. The underlying rock is folded and sheared facilitating water to percolate during heavy rainfall. This resulted in building up of pore water pressure and reducing the cohesive strength.
37	Recommendations	:	The toe support should be given at the base contour line of slope (foot of slope) by construction of retaining wall with weep holes and minimize the slope gradient by benching and back filling. Surface drains to be developed to divert water from entering into the slide area. The obstructions along the natural flow in nalas are to be removed.
38	Remarks, if any		Debris flow has occurred on 9th August, 2019

39	Photos. Sketch of Plan & section of the slide	:	 **View of Debris flow occurred along a stream**  **Debris flow damages the road and parapet along Kotigehera- Charmadi road**
40	Summary/Abstract	:	The debris flow is confined to a long narrow valley. The slide is initiated as a planar failure. The debris is highly saturated with water & the resulted runoff in steep slope damaged the road and parapet wall. The slope forming material (SFM) laying over the hard rock all along the valley path got saturated by percolation of water during rains which increased its mass. Initially, high angel slope has been cut for road construction making the slope unstable. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity. The debris flow has been occurred adjacent to the southerly flowing first order streams. Almost all debris has been removed exposing the underlying rocks below the crown. Rocks are highly sheared & folded.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**03**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotigehera- Charmadi road
7	Latitude	:	N13°7'16.4"
8	Longitude	:	E75°29'56.6”
9	Length *(m)*	:	~22
10	Width *(m)*	:	~30
11	Height *(m)*	:	~18
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.3
14	Volume *(m3)*	:	~198
15	Run out distance *(m)*	:	~20
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive.
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Gneissosity trends NW-SE dipping 70^{o} west.
27	Landuse/ Landcover	:	Dense mixed forest. Extensive slope cut along the road.
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Removal of toe support for road widening/construction, high slope gradient are the primary causes while heavy antecedent rainfall triggered the mass to fail.
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Forest
36	Geo-scientific Causes	:	The contact between the Granite gneiss and amphibolites facilitates penetration of water followed by chemical weathering during rains. The amphibolites show a high degree of alteration and development of reddish-brown, soft and friable materials. The presence of clay formed during weathering promotes instability. The percolating water through soil/clay layer adds to the weight that reduces the shear strength. In addition to this water swells the clay and also decreases friction between grains, contributing to a loss of cohesion, decreasing resistance to landslide.
37	Recommendations	:	The toe support should be given at the base contour line of slope (foot of slope) by construction of retaining wall with weep holes and minimize the slope gradient by benching and back filling. Proper drainage is to be developed to drain the water away from this area.
38	Remarks, if any		Debris slide has occurred on 9th August, 2019
39	Photos. Sketch of Plan & section of the slide	:	 **Multiple Debris slides along Kotigehera-Charmadi road**
40	Summary/Abstract	:	Multiple debris slides are observed downslope of road. The slide is initiated as a planar failure. The debris is highly saturated with water & the resulted runoff in steep slope damaged the road and parapet wall. The slope forming material (SFM) laying over the hard rock got saturated by percolation of water during rains which

			increased its mass. Initially, high angel slope has been cut for road construction making the slope unstable. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity. The slides are occurring near the contact of granite gneiss and amphibolites. Relatively fresh rock was exposed at the top and saprock/saprolite was exposed relatively at the lower sections.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**04**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotigehera- Charmadi road
7	Latitude	:	N13°7'24.4"
8	Longitude	:	E75°29'45.3”
9	Length *(m)*	:	~30
10	Width *(m)*	:	~32
11	Height *(m)*	:	~23
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.3
14	Volume *(m3)*	:	~288
15	Run out distance *(m)*	:	~30
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Widening.
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope

25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Foliations trending NNW-SSE, dipping 70° west
27	Landuse/ Landcover	:	Dense mixed forest. Extensive slope cut along the road.
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Removal of toe support for road widening/construction, high slope gradient are the primary causes while heavy antecedent rainfall triggered the mass to fail.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Parapet wall damage
35	Agriculture/forest/Barren	:	Forest land affected
36	Geo-scientific Causes	:	The percolating water through soil wet the clay layer adding to the weight that reduces the slope strength. In addition to this water swells the clay and also decreases friction between grains, contributing to a loss of cohesion, decreasing resistance to landslide.
37	Recommendations	:	The toe support should be given at the base contour line of slope (foot of slope) by appropriate concrete measures and minimize the slope gradient by benching and back filling process. Later the retaining wall with weep holes should be constructed on upper contour lines of slope for road support.
38	Remarks, if any		Occurred on 09th Aug.2019
39	Photos. Sketch of Plan & section of the slide	:	 **Multiple Debris slides along Kotigehera-Charmadi road**

40	Summary/Abstract	:	Multiple slides initiated as a planar failure. The debris is highly saturated with water & the resulted runoff moved along steep slope damaging the road and parapet wall. The slope forming material (SFM) laying over the hard rock got saturated by percolation of water during rains which increased its mass. Initially, high angel slope has been cut for road construction making the slope unstable. Clay layer (white in color) is well observed on the sliding surface. Top of the hill bushes & sparse vegetation is observed showing presence of rock and thin soil cover. However highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 2m to 3m. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**05**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Alekhan Horatti
7	Latitude	:	N13°7'25.1"
8	Longitude	:	E75°29'29.4”
9	Length *(m)*	:	~800
10	Width *(m)*	:	~20
11	Height *(m)*	:	~60
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~8000
15	Run out distance *(m)*	:	~1000
16	Type of Material	:	Debris-cum-rock
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Widening and Confined to valley
21	Style	:	Single

22	Failure mechanism	:	Deep planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Foliation trending SE, dipping 45°SW
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Rainfall
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Culvert damaged
35	Agriculture/forest/Barren	:	Part of Coffee plantation destroyed
36	Geo-scientific Causes	:	Removal of toe support after road cutting, high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley. Incessant rainfall resulted in built up of cleft water pressure initiating rock slide. It further graded into a debris flow collecting more debris and soil, following a natural stream path.
37	Recommendations	:	Precariously positioned boulders in the flow path should be removed. Natural drainage should be left unaltered. Construction in the valley part should be avoided. Proper dimension of culvert is to be made for free passage of water.
38	Remarks, if any		The debris flow has occurred along the valley on 9th August, 2019, as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Debris flow initiated as translational failure along a valley in Alekhan Horatti area**  **Debris flow with valley widening in Alekhan Horatti area**
40	Summary/Abstract	:	Debris flows caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil or rock on steep slopes. The slide initiated as translational failure & is further graded as debris flow collecting debris from upper catchment area. Debris & rocks are usually confined to the steep gullies that facilitate their downward movement. Rapid debris flow downslope further toe cut the flanks of valley slope resulted in numerous small scale slides within the valley& thus broadening the valley. The big blocks dislodged & carried down with water stream down the channel. Top of the hill bushes & sparse vegetation is observed showing presence of rock and thin soil cover. However, highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 2m to 3m. Consequently the saturated debris material moved down the valley slope along a weak plane under the influence of gravity.

			The debris was highly saturated with water & therefore the runoff in a steep slope damaged the culvert and road.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**06**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Alekhan Horatti
7	Latitude	:	N13°7'31.2"
8	Longitude	:	E75°29'14.8”
9	Length *(m)*	:	~70
10	Width *(m)*	:	~06
11	Height *(m)*	:	~15
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~210
15	Run out distance *(m)*	:	~30
16	Type of Material	:	Soil/Earth
17	Type of movement	:	Flow
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined to valley
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Foliation trending SE, dipping 45°SW
27	Landuse/ Landcover	:	Coffee plantation

28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Rainfall
30	Death of persons	:	Nil
31	People affected	:	As per locales, around 40 families vacated their houses due to road damage and inaccessibility to the villages.
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Culvert damaged
35	Agriculture/forest/Barren	:	Part of Coffee plantation destroyed
36	Geo-scientific Causes	:	Removal of toe support after road cutting, high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley. A first order stream is partly converted into coffee plantation ceases the surface flow. This increases the pore pressure; reducing shear strength of the soil. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. Proper dimension of culvert is to be made for free passage of water. Cracks to be sealed with some impervious material avoiding further infiltration of water.
38	Remarks, if any		The earth flow has occurred along the valley on 9th August, 2019, as per accompanied DMG officials and locals. The failure occurred along the pre-existing stream. The debris is highly saturated with water & therefore the runoff in a steep valley damaged the road& culvert.
39	Photos. Sketch of Plan & section of the slide	:	 **View of Debris flow occurred along a stream**

			 **Ground Crack observed along the road**
40	Summary/Abstract	:	Earth flows caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil on steep slopes. The slide initiated as translational failure & is further graded as earth flow collecting fines from upper catchment area. The flow is usually confined to the steep gully that facilitates their downward movement. Highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 3m to 5m. Consequently the saturated earth material moved down the valley slope along a weak plane under the influence of gravity. Ground cracks observed on the road that can be widen up with more percolation of water. This will result in subsidence of the road.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	II

No	**Field**		**Description**
1	Location/ Slide No.	:	**07**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Hallikere
7	Latitude	:	N13°08'15.3”
8	Longitude	:	E75°30'58.7”
9	Length *(m)*	:	~65
10	Width *(m)*	:	~23

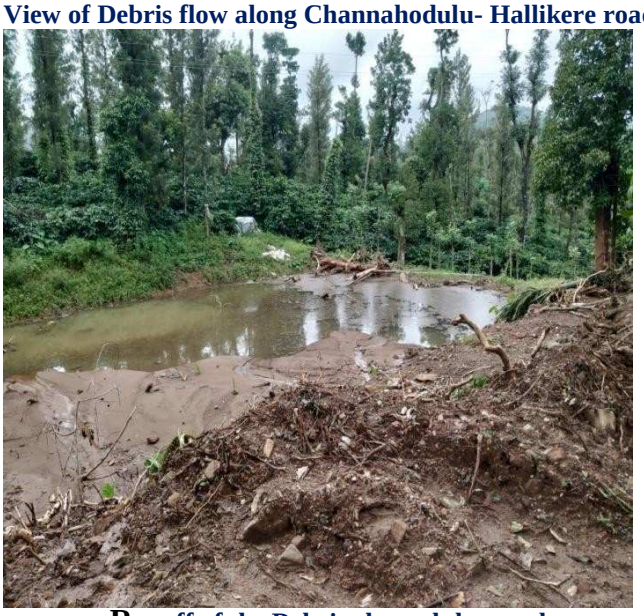
11	Height *(m)*	:	~50
12	Area *(m2)*	:	
13	Depth *(m)*	:	~1
14	Volume *(m3)*	:	~1495
15	Run out distance *(m)*	:	~120
16	Type of Material	:	Debris
17	Type of movement	:	Flow
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	An old slide scar is observed beside the current slide and is occurred at valley part of a palaeo channel, which is now completely converted into coffee plantation. A small running stream (seasonal) is flowing within the old slide scar.
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite Gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Removal of toe support after road cutting , high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley.
30	Death of persons	:	Nil
31	People affected	:	M.L Ravindra and M.L Surendra (owners of the coffee plantation land)
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land of M.L Ravindra and M.L Surendra (owners of the land) consumed under debris flow
36	Geo-scientific Causes	:	Since the area was in the vicinity of an old slide, it further widened and retrograde during incessant rainfall. This resulted in built up of cleft water pressure initiating planar slide at top of the slope. It further graded into a debris flow

			collecting more debris and soil, following a natural weaker path. The area partly comes under valley which is now converted into coffee plantation. This ceases the surface run off causing infiltration of water inside the slope thereby making a potential slide surface.
37	Recommendations	:	The toe support should be given at the base contour line or toe of slide (where slide material stopped) by appropriate concrete measures before going for benching and back filling of slope and leveling of road surface. Surface water is diverted from unstable slopes by ditches and pipes. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The debris flow has occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **View of Debris flow along Channahodulu- Hallikere road**  **View of runoff of the Debris damaging coffee plantation**
40	Summary/Abstract	:	Debris flow caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil or rock on steep slopes. The slide initiated as translational

			failure & is further graded as debris flow collecting debris from upslope having coffee plantation. Top of the hill sparse vegetation is observed reflecting presence of rock and thin soil cover. However, highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 5m to 7m. Consequently the thickly soil saturated with water moved down the slope rapidly under the influence of gravity. An old slide scar is observed beside the current slide.An older slide occurred at valley part of a palaeo channel, which is now completely converted into coffee plantation. A small running stream (seasonal) is flowing within the old slide scar.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**08**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Hallikere
7	Latitude	:	N13°08'19.8"
8	Longitude	:	E75°31'01.3”
9	Length *(m)*	:	~60
10	Width *(m)*	:	~16
11	Height *(m)*	:	~18
12	Area *(m2)*	:	
13	Depth *(m)*	:	~1
14	Volume *(m3)*	:	~960
15	Run out distance *(m)*	:	~6
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure

23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy antecedent rainfall trigger the mass to fail along the valley.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land is consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting , high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley. This resulted in built up of cleft water pressure initiating planar slide at top of the slope. It further graded into a debris flow collecting more debris and soil, following a natural weaker path.
37	Recommendations	:	The toe support should be given at the base contour line or toe of slide (where slide material stopped) by appropriate concrete measures before going for benching and back filling of slope and levelling of road surface. Surface water is diverted from unstable slopes by ditches and pipes. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The debris flow has occurred on 9th August, 2019, as per accompanied DMG officials and locals. The mass failure occurred in the same hill (Loc.7) but in different direction.

39	Photos. Sketch of Plan & section of the slide	:	 **View of Debris flow along Channahodulu- Hallikere road**  **Runoff of the Debris clogged the pond**
40	Summary/Abstract	:	Debris flow caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil or rock on steep slopes. The slide initiated as translational failure & is further graded as debris flow collecting debris from upslope having coffee plantation. Top of the hill sparse vegetation is observed reflecting presence of rock and thin soil cover. However, highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 5m to 7m. Consequently the thickly soil saturated with water moved down the slope rapidly under the influence of gravity. A small running stream has been generated within the slide.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	II

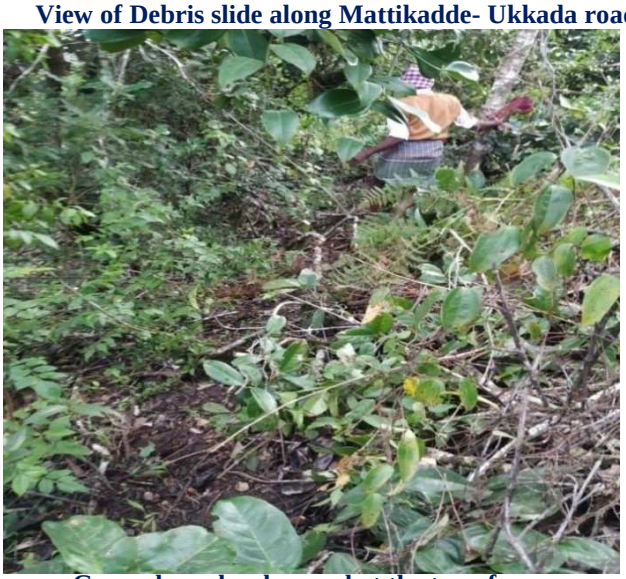
No	Field		Description
1	Location/ Slide No.	:	**09**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Channahodlu
7	Latitude	:	N13°08'40.6"
8	Longitude	:	E75°30'30.8”
9	Length *(m)*	:	Since, the debris has been brought down by a higher order running stream, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected hills
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy antecedent rainfall triggers the mass to fail along the valley.
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Culvert damaged
35	Agriculture/forest/Barren	:	Part of coffee plantation on the upslope has been destroyed
36	Geo-scientific Causes	:	Removal of toe support after road cutting , high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley. This resulted in built up of cleft water pressure initiating planar slide at top of the slope. It further graded into a debris flow collecting more debris and soil, following a natural weaker path.
37	Recommendations	:	Precariously positioned boulders in the flow path should be removed. Natural drainage should be left unaltered. Construction in the valley part should be avoided. Proper dimension of culvert is to be made for free passage of water. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The debris flow has occurred along the valley on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **View of runoff of the Debris flow along Channahodlu-Ukkada road**

			 **Long runoff of the Debris damaging culvert and Road**
40	Summary/Abstract	:	Debris flow caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil or rock on steep valley slopes. The slide initiated as translational failure& is further graded as debris flow collecting debris from upslope. However, highly weathered & fractured rock is observed on the slope corresponding to soil thickness of 5m to 7m. Consequently the thickly soil saturated with water moved down the slope rapidly under the influence of gravity. Debris flows from two different direction merge near the road junction.The rapid flow of the debris breached the road and damage the culvert. Timbers stored in the upper region have been carried downslope under intense debris flow. Huge amount of debris corresponds to the material draw down from two different directions.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	II

No	**Field**		**Description**
1	Location/ Slide No.	:	**10**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Balur Horatti
7	Latitude	:	N13°9'13.8"
8	Longitude	:	E75°31'25.8”
9	Length *(m)*	:	~ 60

10	Width *(m)*	:	~ 25
11	Height *(m)*	:	~ 23
12	Area *(m2)*	:	
13	Depth *(m)*	:	~01
14	Volume *(m3)*	:	~1500
15	Run out distance *(m)*	:	~ 90
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and widening
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Incessant rainfall
30	Death of persons	:	02
31	People affected	:	The house owner's i) ChandrayaSubbama, ii) Manjaiyya, iii) Biliappa, iv) Bommayya, v) Narayana, vi) Motaiaah, vii) Ramesh, viii) Sundresh are advised to leave the place.
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged.
34	Infrastructure	:	Government school building & walls damaged
35	Agriculture/forest/Barren	:	Part of forest land & school land destroyed.
36	Geo-scientific Causes	:	Removal of toe support after road cutting and school building construction; high slope gradient are the primary causes that tend to reduce the lateral support while heavy antecedent rainfall trigger the mass to fail along the weaker plane. High angle slope cut left unsupported for making Settlements at downslope further reduces the slope strength. High water saturation in large soil thickness adding the

			weight on the steep slope thereby reduces slope stability.
37	Recommendations	:	The toe support should be given at the base contour line of slope (foot of slope) by appropriate concrete measures and minimize the slope gradient by benching and back filling process. The house owner's i) ChandrayaSubbama, ii) Manjaiyya, iii) Biliappa, iv) Bommayya, v) Narayana, vi) Motaiaah, vii) Ramesh, viii) Sundresh are advised to leave the place & cracks seen above to be sealed with some impervious material avoiding further infiltration of water. The same has been conveyed to ADC, Chikkamagalur for the safety of persons residing in the area. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The landslide along Mattikadde- Ukkada road occurred on 09th Aug 2019 as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **View of Debris slide along Mattikadde- Ukkada road**  **Ground cracks observed at the top of crown**
40	Summary/Abstract	:	Debris slide caused by intense surface-water flow, due to heavy precipitation that erodes and mobilizes loose soil on

			steep slopes. The slide initiated as translational failure & is further graded as debris flow with heavy saturation. However, highly weathered & fractured rock is observed on the slope corresponding to soil thickness of more than 5m. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity. The debris flown over the road into other side approaching to a nala. The zone is still unstable as the ground crack observed on top (N13°9'17.10"and E75°31'23.6") of the hill (above the crown) which is acquiring arc shape therefore can be an initiation of another slide. With increase rainfall, more percolation will lead to failure of the mass.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**11**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Balur Horatti
7	Latitude	:	N13^{0}08’41.0”
8	Longitude	:	E75^{0}30’29.4”
9	Length *(m)*	:	Road subsidence resulting in debris slide on the downslope side. Dimension was unable to predict visually.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	subsidence
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow Rotational failure
23	History	:	Not known

24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation downslope
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Incessant Rainfall
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road subsidence
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation is consumed under debris flow occurred due to subsidence.
36	Geo-scientific Causes	:	High angle slope cut left unsupported below the road bench, improper and inadequate drainage arrangements, lack of channelized runoff water network on slope, improper toe support measures and incompetent RBM.
37	Recommendations	:	**S**trengthened concrete measures right from firm hard rock surface to provide lateral support to the road. Easing of slope by constructing steps on high gradient slope on either side of the road.The drainage system along the road should be supported by concrete works to restrict infiltration of water.
38	Remarks, if any		
39	Photos. Sketch of Plan & section of the slide	:	 **Subsidence of the road along Channahodlu-Ukkada road**

			 **Coffee plantation damages downslope due to huge debris**
40	Summary/Abstract	:	The collapse of the road due to a huge mass failure beneath the road has occurred at the road junction. The level of the suffered road is down as compare to the main road connecting it. The drainage system along the road is not supported by concrete works. They are made simply as dug out trenches and the bottom is left uncovered. The water coming from the slope is running on the road & following the lower level of road. This increases surface & sub-surface water pressure on downside of the road. There is no lateral support along the road. There is subsurface seepage of water beneath the road that removing the soil from beneath & making other side of the slope unstable.
41	Date of Reporting	:	21/08/2019
42	Landslide Category	:	II

No	**Field**		**Description**
1	Location/ Slide No.	:	**12**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Bhoothanakadu
7	Latitude	:	N13^{0}11’02.4”
8	Longitude	:	E75^{0}39’34.1”
9	Length *(m)*	:	~22
10	Width *(m)*	:	~30
11	Height *(m)*	:	~12

12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~330
15	Run out distance *(m)*	:	~6
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct; highly weathered rock
27	Landuse/ Landcover	:	Settlements on modified slope.
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Incessant Rainfall
30	Death of persons	:	Nil
31	People affected	:	03 families
32	Livestock Loss	:	Nil
33	Communication	:	Electric pole uprooted.
34	Infrastructure	:	Bashir's house damaged
35	Agriculture/forest/Barren	:	Part of agriculture land destroyed.
36	Geo-scientific Causes	:	Removal of toe support due to road cutting, high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Presence of Rock quarry on the upslope disturbing the slope also water storage in it will adding the weight. This as a whole contributing the instability
37	Recommendations	:	Back filling of the slope & retaining wall with weep holes at the toe of slide (where slide material stopped).Deep rooted trees to be planted. Bashir's house to be protected by constructing a supporting wall for providing lateral support.
38	Remarks, if any		The landslide has happened during 9th August, 2019, as per

			accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide along Mudigere-Kadur road**  **Damaged house due to landslide**
40	Summary/Abstract	:	The slide initiated as a planar failure. Debris slide, including big size boulders, was formed at the base of the slide. The debris is highly saturated with water. This occasional type of debris cum earth flow had blocked the road & uprooting the trees & poles. The slide is still active as the crown of the slide is jointed. Bashir's house on the upslope is damage due to another small slide. House of Sundar & Mutti (02houses) near the flanks of slide to be relocated to some safer place during the monsoon.
41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**13**
2	State	:	Karnataka

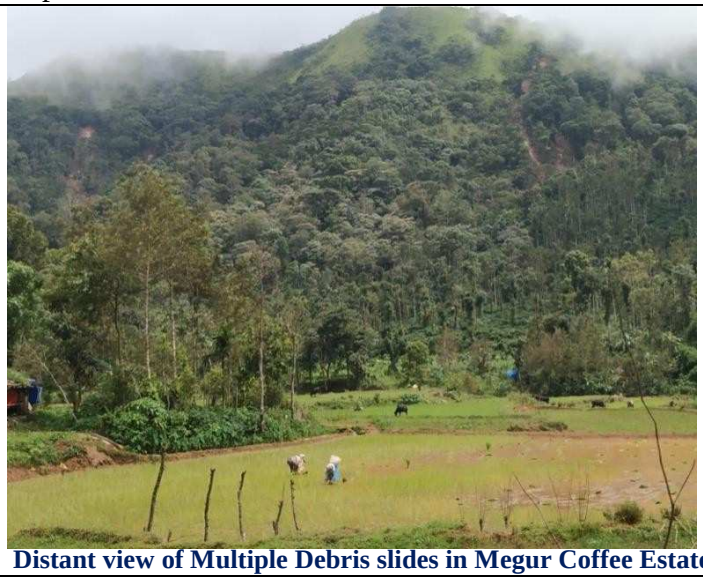
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Malemane
7	Latitude	:	N13^{0}08’52.36”
8	Longitude	:	E75^{0}28’43.52”
9	Length *(m)*	:	Since, the flow is usually confined to the steep gullies & is occurring in inaccessible thick coffee plantation upslope, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and confined to valley part
21	Style	:	Multiple
22	Failure mechanism	:	Deep planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct ,Highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Incessant rainfall
30	Death of persons	:	Nil
31	People affected	:	04 families
32	Livestock Loss	:	Nil
33	Communication	:	Nil

34	Infrastructure	:	04 houses damage, out of which Rajesh's & Ashwat's house (02 houses) are completely washed away in the flow.
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow.
36	Geo-scientific Causes	:	Settlements at the toe part disturb the slope (slope-cut for construction).Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	The slide is still active as more saturated regolith is present in the valley part. Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. The location is not suitable for settlement. Proper dimension of culvert is to be made for free passage of water.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Multiple Debris slides in Malemane Coffee Estate**

			 **Cultivation land converted into stream**
40	Summary/Abstract	:	Multiple debris flows occurred along first order stream sections. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. The flow is usually confined to the steep gullies that facilitate their downward movement. The ridge part of the hill is barren with thin slope wash, whereas in the mid-slope& downslope the thickness of the regolith increases and attains a thickness >5m. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. The coffee plantation covered the valley part that is now consumed under debris flow. A higher order nala running at the foot of hill was converted into cultivation land. After the landslide incident the nala has been rejuvenated into a flowing stream damaging the cultivation.
41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**14**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Megur
7	Latitude	:	N13^{0}09’03.04”
8	Longitude	:	E75^{0}28’22.59”

9	Length *(m)*	:	Since, the flow is usually confined to the steep gullies & is occurring in inaccessible thick coffee plantation upslope, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not Known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Incessant Rainfall
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of cultivation land is consumed under debris flow.
36	Geo-scientific Causes	:	Road at mid-slope and at the base of the hill constitute the highest landslide risk due to subsurface water interception, and overloading and undercutting slopes. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of

			plants or roots on the steep slope is responsible for the formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. The location is not suitable for settlement. Proper dimension of culvert is to be made for free passage of water.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Distant view of Multiple Debris slides in Megur Coffee Estate**
40	Summary/Abstract	:	Debris flows occurred along first order stream sections. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. The flow is usually confined to the steep gullies that facilitate their downward movement. The ridge part of the hill is barren with thin slope wash, whereas in the mid slope & downslope the thickness of the regolith increases and attains a thickness >5m. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. Coffee plantation covering valley part is now consumed under debris flow. A higher order nala running east-west at the foot of hill. As per locales, 03 houses are present in the vicinity of the slide.
41	Date of Reporting	:	22/08/02019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**15**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Javali
7	Latitude	:	N13°10'17.5"
8	Longitude	:	E75°28'36.1”
9	Length *(m)*	:	~40
10	Width *(m)*	:	~25
11	Height *(m)*	:	~15
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~500
15	Run out distance *(m)*	:	~55
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined to valley part
21	Style	:	Single
22	Failure mechanism	:	Shallow Rotational failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss, phyllite and banded magnetite quartzite
26	Structure	:	Highly foliated and sheared. Foliation trending E-W, dipping 60°N. 03 set of joints
27	Landuse/ Landcover	:	Sparse vegetation and scrub
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy antecedent rainfall
30	Death of persons	:	Nil
31	People affected	:	Nil

32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of forest land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting, high slope gradient are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail along the valley. Underlying rocks are prone to weathering and fracturing, which weakens the substrate and creates flow paths for subsurface water. Presence of Phyllitic layer lying in between hard and thick beds provide a congenial set-up for land slide occurrence.
37	Recommendations	:	Easing of the slope with deep rooted plant has to be done. The culverts should be constructed enough wide (preferably in arch type) which can drain the over saturated material without any damage and blockage of road. Retaining wall with weep holes to be constructed at the foot of the slope. Similar retaining wall also constructed on upper contour lines of slope for road support.
38	Remarks, if any		The slide took place on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris flow occurred adjacent to a stream**

			 **Debris flow downhill side of the road**
40	Summary/Abstract	:	Debris flows caused by intense surface & sub-surface water flow, due to heavy precipitation that erodes and mobilizes loose soil or rock on steep slopes. The slide occurred at the bend of the road. The slide initiated as translational failure & is further graded as debris flow. High amount of water discharge into the stream, resulted in broadening its valley. The underlying rocks are exposed after the debris flow. Rocks are highly sheared & jointed. Lithological contact between Granite gneiss and Banded magnetite quartzite is well distinct. It is observed through Google imagery that the landslide area covered with sparse vegetation. Though it is seen in the field that with high saturation the sliding took place at the interface of rock and soil contact. Consequently the saturated debris material immediately slide down to join with the running stream causing long run off of the debris material.
41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**16**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Madhugundi
7	Latitude	:	N13^{o}08’49.0”
8	Longitude	:	E75^{o}27’13.5”

9	Length *(m)*	:	~ 70
10	Width *(m)*	:	~ 160
11	Height *(m)*	:	~ 25
12	Area *(m2)*	:	
13	Depth *(m)*	:	~1
14	Volume *(m3)*	:	~11200
15	Run out distance *(m)*	:	~2000
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive, Widening and Confined to basin area
21	Style	:	Multiple
22	Failure mechanism	:	Deep rotational failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Foliation trending E-W, dipping 45°N
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Incessant rainfall is deduced to be the main triggering factor.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road completely damaged
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of forest land and coffee plantation consumed under debris flows.
36	Geo-scientific Causes	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Road cutting on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the

			formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. The location is not suitable for settlement. Proper dimension of culvert is to be made for free passage of water and debris. Benching on the steep slope is advisable for easing the slope other than the basin area or valley part. The hill (Ramakallu Gudda) is very vulnerable for mass failure. Settlements in the area are not recommended. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		
39	Photos. Sketch of Plan & section of the slide	:	 **Coffee plantation in the valley part (Google imagery of the year 2018)** ***Dash line*** **showing the road section (toe cut) making the slope unstable**  **Slope failure along the valley**

			 **Rapid flow of debris at downhill slide, destroyed the plantation**  **Highly weathered and thickly saturated mass contributing the weight on slope**
40	Summary/Abstract	:	Massive debris flows occurred along a large basin. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. The flow is usually confined to the steep gullies that facilitate their downward movement. The ridge part of the hill is barren with thin slope wash, whereas in the mid slope & downslope the thickness of the regolith increases and attains a thickness >5m.The failure has been occurred at the interface of rock (at the ridge) and soil (at the basin).Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. The coffee plantation covered the valley part that is now consumed under debris flow. Geologically the area comprises well jointed Metabasalt rock with Banded magnetite quartzite form the ridge of the hill. The runoff is km's long as it is flowing in the course of running stream at downslope. The hill (Ramakallu Gudda) is highly dissected with numerous first order streams.

41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	I

Loc.17: This site is located at N13^{0}09'21.8" and E75^{0}25'11.6" in Balige area. Ground cracks of 3-7 cm wide, orienting almost N-S is observed on 9th August, 2019, as per accompanied DMG officials and locals.

Observation: The Slope has been modified for habitation and plantation. The slope is modified by cutting the original trees and making way for cash crops like coffee & pepper. Highly weathered Metabasalt is observed in the area. The cracks are extending down the valley for about 400-500 m. There was no evidence of subsidence at the time of study. Cracks are observed on the walls of two houses which are not constructed on best practiced structural construction methods.

Cause: Heavy rainfall is deduced to be the main triggering factor. Road cutting on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. The slope has been modified for construction of house and plantations. The cracks are caused due to increase in pore water pressure due to heavy infiltration of rainwater. The increase in ground water level has reduced the cohesion and the shear strength of the slope material. The weathered material at places is converted to clay causing lower permeability of slope and increase in pore water pressure.

Recommendation: Cracks are to be sealed with some impervious material to restrict any water infiltration. People living around these slopes should remain vigilant, particularly during the monsoon period and any physical change in the slope or widening of the crack should immediately bring into the notice of authorities.

Ground crack observed near Village Balige

Landslide observed opposite to the investigated location occurred due to road cut

No	Field		Description
1	Location/ Slide No.	:	**18**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Balige
7	Latitude	:	N13^{0}08’19.0”
8	Longitude	:	E75^{0}25’12.7”
9	Length *(m)*	:	Since, the flow is usually confined to the first order nala & is inaccessible to approach to its crown or origin due to heavy rainfall, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	200-300
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined to valley
21	Style	:	Single
22	Failure mechanism	:	Deep rotational failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct, highly weathered
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Incessant Rainfall
30	Death of persons	:	Nil

31	People affected	:	01 family
32	Livestock Loss	:	Nil
33	Communication	:	Road completely damaged
34	Infrastructure	:	D.V Ganesha's house is completely damaged. Culvert damaged at the road.
35	Agriculture/forest/Barren	:	Coffee plantation land occupied in the valley part is consumed during debris flow.
36	Geo-scientific Causes	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Road cutting on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. The location is not suitable for settlement. Proper dimension of culvert is to be made for free passage of water and debris.
38	Remarks, if any		The landslide occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris flow along valley in Balige area**

			 **Highly charged debris flows along downslope damages the house**
40	Summary/Abstract	:	Massive debris flows occurred along a seasonal nala. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. Steep slope accompanied with heavy discharge of water is deduced to have aggravated the pace of erosion along the nala. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The northeast flowing seasonal stream is observed to have overrun the coffee plantation and completely damaged the house of D.V Ganesha in Hebbaragundi stage.01 person injured in this incident. The runoff is 200-300 metres long that damages Road & culvert. Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geologically the area comprises weathered Metabasalt rock.
41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**19**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	

6	NH/SH/Locality	:	Durgadahalli
7	Latitude	:	N13°09'16.13"
8	Longitude	:	E75°26'16.9”
9	Length *(m)*	:	~ 40
10	Width *(m)*	:	~ 32
11	Height *(m)*	:	~ 20
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.3
14	Volume *(m3)*	:	~384
15	Run out distance *(m)*	:	~ 200
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Moving along the steep slope
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Witnessed an old side
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct, Highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Incessant Rainfall
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land is consumed under debris Flow

36	Geo-scientific Causes	:	Removal of toe support after road cutting &high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Since the area already witnessed an old slide earlier, the old cracks so formed may have played a key role for rainfall infiltration. The old slip zone with lower permeability was another important factor to cause the infiltrated water to accumulate and form a high pore water pressure above slip zone. Then the high pore water pressure decreased the shear strength of slip zone and triggered the reactivation of an old landslide deposit again.
37	Recommendations	:	The toe support should be given at the base contour line or toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope and leveling of road surface. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. Cultivation is not permitted in the reactivated failure surface.
38	Remarks, if any		The debris slide has occurred on 9th August, 2019& is a reactivated slide that occurred in the year 2016, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris Slide along Sunkasale- BallalarayanaDurga road**

			 **Run-off along downhill side of the road**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the south-easterly slope. The inclination of failure slope is observed to be around 40°. The width of the failure slope is about 32 meters along the road section. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. The landslide debris is observed to have accumulated at the road. Top of the hill sparse vegetation is observed reflecting presence of rock and thin soil cover. However, oversaturated weathered rock& soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land, down the road.
41	Date of Reporting	:	22/08/2019
42	Landslide Category	:	II

Loc.20: This site is located at N13^{0}20’40.3” and E75^{0}37’13.4” in Avthihosahalli location. Ground cracks of 5-40 cm wide are observed on13th August, 2019, as per accompanied DMG officials and locals.

Observation: The crack is observed on top of the hill at the interface of rock & soil. Below this rocky cliff on top, thick soil cover overlying the weathered Granite gneiss covering the hill (Kallubetta; Survey no.55).Crack is forming an arc shape extending down the valley in length upto 70m. This may be the initiation of a crown of a landslide. Small to large size boulders are placed above the cracks adding the weight on slope. The Slope has been modified for plantation. The slope is modified by cutting the original trees and making way for cash crops like coffee &pepper. The arc shape cracks across the south-easterly slope is active with percolation of water, hence 15 houses at downslope may directly come under

their influence. While coming down through coffee plantation, several plantations pits observed on slope.

Cause: Heavy rainfall is deduced to be the main triggering factor. Removal of toe support after road cutting & Steep slope together with the presence of thick cover of soil dominated with boulders on uphill side are the primary causes that tend to reduce the shearing strength. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope creating tensional cracks on the ground.

Recommendation: The crack should be filled preferably with some impervious material to reduce chances of water infiltration into the overburden material. crack should be monitored regularly and in case of any movement, the concerned authorities may be informed immediately. Any open pits on the slope to be closed during rain. The hill slope around Avati village is deduced to be highly susceptible to failure, particularly in the event of heavy or prolonged rainfall. The People living around these slopes should remain vigilant, particularly during the monsoon period and any physical change in the slope or widening of the crack should immediately bring into the notice of authorities.

Large size arc shape crack observed on top of the hill

Crack is formed at the contact of rock and soil

No	Field		Description
1	Location/ Slide No.	:	**21**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/11
5	Name of the slide	:	
6	NH/SH/Locality	:	Shiravase
7	Latitude	:	N13^{0}23’44.2”
8	Longitude	:	E75^{0}36’12.9”
9	Length *(m)*	:	Since, the flow is usually confined to the first order nala & is inaccessible to approach to its crown or origin due to heavy rainfall and accumulation of huge saturated debris at the mid slope, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	~ 250
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Widening and confined to the valley
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite gneiss, amphibolites and quartz chlorite schist
26	Structure	:	Not distinct due to huge accumulation of sediments/debris
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy antecedent rainfall trigger the mass to fail along the weaker plane
30	Death of persons	:	Nil

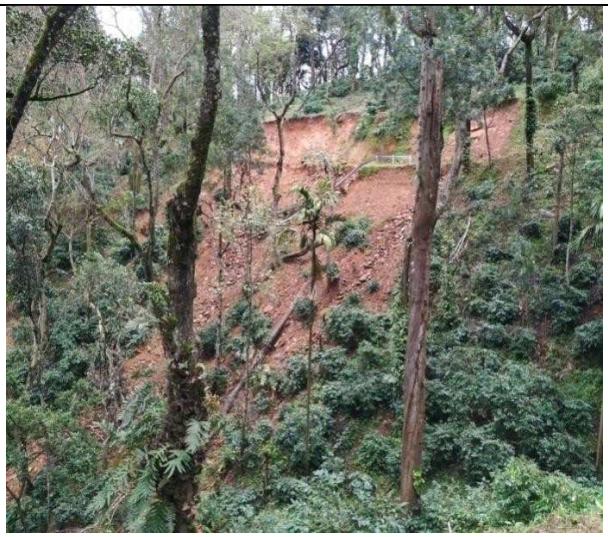
31	People affected	:	03 families
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Completely damaged the house of Suresh while 2 houses are partly damage.
35	Agriculture/forest/Barren	:	Part of forest land and coffee plantation consumed under debris flow
36	Geo-scientific Causes	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Making settlement on the valley and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope. Discontinuity between granite gneiss and amphibolites is contributing to the stability of the slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. As a precautionary step authority should mark some buffer zone around the streams, where no settlements should be allowed. Proper dimension of culvert is to be made for free passage of water and debris. The People living around this location should remain vigilant, particularly during the monsoon period and any physical change in the slope or widening of the crack should immediately bring into the notice of authorities.
38	Remarks, if any		Houses of Nagesh and Sheshaiah are at the flank of the slide that needs to be relocated. Landslide is still active and is getting widened. The landslide occurred on 9th August, 2019, as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Initiation of the slide as translational failure, converted downslope into debris flow along a seasonal stream of first order**  **Debris flow consuming part of coffee plantation at downslope**
40	Summary/Abstract	:	Massive debris flows occurred along a seasonal nala of first order. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. Steep valley slope accompanied with heavy discharge of water is deduced to have aggravated the pace of erosion along the nala. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The northeast flowing seasonal stream is observed to have overrun the coffee plantation and completely damaged the house of Suresh while 2 houses are partly damage. The first order nala discharged its debris to a higher order nala.

			The runoff is 200-250 metres long that damages Road & culvert. Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geologically the area of investigation comprises litho contact between granite gneiss and amphibolites. As informed by the locales, cracks are present on the coffee plantation above the landslide crown that can reactivate & cause mass failure again. Houses of Nagesh and Sheshaiah are at the flank of the slide that needs to be relocated. Landslide is still active and is getting widened.
41	Date of Reporting	:	23/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**22**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Hirebail- Hemmakki road at Chunchadlu Coffee estate (MalleshvaraGudda).
7	Latitude	:	N13°14'00.8"
8	Longitude	:	E75°25'18.0”
9	Length *(m)*	:	~07
10	Width *(m)*	:	~35
11	Height *(m)*	:	~05
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.2
14	Volume *(m3)*	:	~49
15	Run out distance *(m)*	:	~70
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Widening
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure

23	History	:	Not known
24	Geomorphology	:	Moderately dissected
25	Geology/Lithology	:	Amphibolite
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy antecedent rainfall trigger the mass to fail
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Parapet wall damaged
35	Agriculture/forest/Barren	:	Part of cultivation land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support due to road cutting are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. The thick soil cover over the hard rock got saturated by percolation of water during rains which increased its mass. Consequently the saturated debris material moved down the slope along a weak plane under the influence of gravity. The slide has occurred during heavy rainfall that causes infiltration of water resulted in building up of pore water pressure and reducing the cohesive strength.
37	Recommendations	:	The toe support should be given at the foot of slope by appropriate concrete measures (Retaining Wall). Drainage system along the road should be supported by concrete work. Proper dimension of culvert is to be made for free passage of water and debris.
38	Remarks, if any		The incident occurred on 9th August, 2019, as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide occurred along Hirebail-Hemmakki road and damaging Parapet**  **Crown of the slide is highly weathered**
40	Summary/Abstract	:	This landslide is a debris slide having translational movement along a single rupture plane with approx. 70m run-out distance. The debris material has been moved along with trees and other vegetation on other side of the road. This landslide has occurred on concave slope with 35°-40° gradient. The slide has been occurred along the first order streams. Almost all debris has been removed exposing the underlying rocks below the crown. Highly weathered amphibolites rocks are observed. The landslide has damaged the road& parapet.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**23**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Channahadlu; along Mavinkere- Hirebail road
7	Latitude	:	N13^{0}13’15.3”
8	Longitude	:	E75^{0}25’06.0”
9	Length *(m)*	:	~ 60
10	Width *(m)*	:	~ 800
11	Height *(m)*	:	~ 20
12	Area *(m2)*	:	
13	Depth *(m)*	:	1
14	Volume *(m3)*	:	~ 48000
15	Run out distance *(m)*	:	Unable to predict due to adverse ground condition
16	Type of Material	:	Debris
17	Type of movement	:	Slides
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and Widening
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly Dissected slope
25	Geology/Lithology	:	Granite gneiss, amphibolite
26	Structure	:	Foliations trending WSW, dipping 45°NNW
27	Landuse/ Landcover	:	Coffee plantation and Mixed forest
28	Hydrological condition	:	Dripping
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	30 Houses vacated

32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Houses at the up slopes are affected
35	Agriculture/forest/Barren	:	Part of forest land and cultivation land is consumed under debris flow
36	Geo-scientific Causes	:	There are several factors that cumulatively affecting the area prone to landslide. Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Road cutting on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. The presence of mica sheet along the bedding plane becomes a slip surface, facilitating the mass to slide. A sequence of strata having thin, soft and weak beds (quartzofeldspathic) lying in between hard and thick jointed beds (BMQ) provide a congenial set-up for landslide occurrence. Along the amphibolites-gneiss contact, the amphibolites show a high degree of alteration and development of reddish-brown, soft and friable materials (saprolite). The percolating water through soil and sandstone wet the clay layer adding to the weight that reduces the slope strength.
37	Recommendations	:	The location is not suitable for settlement as the hill is highly vulnerable to mass failure during rain. Excavation on steep slope should not be allowed. The excavated slope if left untreated is sure to pose threat during heavy rainfall. Appropriate measures are required for checking infiltration of rainwater. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. It is recommended that appropriately designed retaining structures of suitable height with firm foundation are required to be erected from road level for checking slope failure. The residents are therefore advised to keep safe distance from the vulnerable slope and vacate the area, especially during heavy or prolonged rainfall. It is also strongly recommended that construction of any sort should not be allowed around slide zone. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Bird view of Multiple Debris slides occurred along Hirebail-Hemmakki road at Malleshwaragudda**  **Close view of a Debris slide occurred along Hirebail-Hemmakki road at Malleshwaragudda.**  **Incompetent beds lying in between hard and thick jointed beds (BMQ)**

			 **Presence of mica sheet along the bedding plane**
40	Summary/Abstract	:	Multiple debris slides occurred in Malleshvara Gudda. Massive debris slides occurred in westerly directed steep slope. Huge debris has been accumulated all along the road and is also overrun the road and discharge debris into the westerly and south-westerly running drainages at downslope. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. The ridge part of the hill is barren with thin slope wash, whereas in the mid slope & downslope the thickness of the regolith increases and attains a thickness >5m.The hill is disturbed with road cuts & settlements at the mid slope. The runoff is km's long as it is flowing in the course of running stream at downslope. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. A part of coffee plantation land is now consumed under huge debris flow. Geologically, the area comprises amphibolites rocks forming the ridge part while granite gneiss forms the slope of the area. Relatively fresh rock was exposed at the top and saprolite was exposed relatively at the lower sections. Along the road quartzofeldspathic layers interbedded between well jointed & fractured Banded magnetite quartzite rocks (BMQ).Mica (Muscovite) sheet observed along the bedding plane. The hill (MalleshvaraGudda) is highly dissected with numerous first order streams.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**24**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Budhigundi; along Mavinkere- Hirebail road
7	Latitude	:	N13^{0}13’01.0”
8	Longitude	:	E75^{0}25’16.3”
9	Length *(m)*	:	The flow of debris occurred along the road and downside of the road in basin part. The dimensions were unable to predict as it is inaccessible to approach due to heavy rainfall and accumulation of huge saturated soil.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite gneiss, amphibolite
26	Structure	:	Foliations trending WSW, dipping 45°NNW
27	Landuse/ Landcover	:	Coffee plantation and Mixed forest
28	Hydrological condition	:	Dripping
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	01

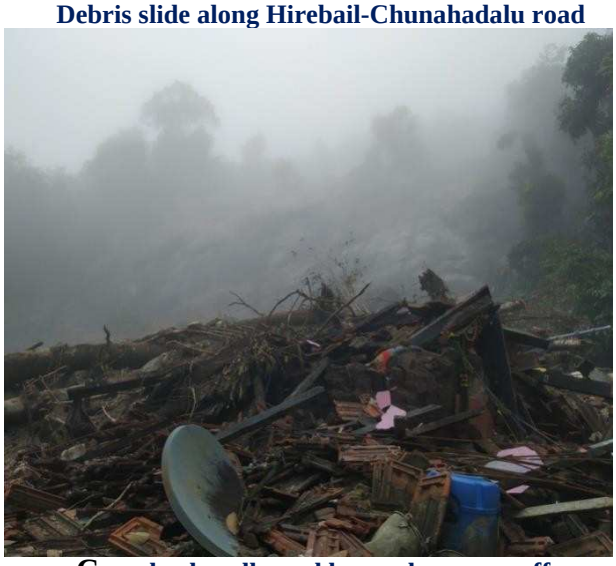
31	People affected	:	Family of 04 houses
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	04 houses damages, Private land consumed under slide
35	Agriculture/forest/Barren	:	Part of forest land and cultivation land is consumed under debris flow
36	Geo-scientific Causes	:	There are several factors that cumulatively affecting the area prone to landslide. Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Steep slope with thick water saturated debris reducing the shear strength. The hill is disturbed with road cuts & settlements at the mid slope. Geologically, it is observed that the road and litho-contact between Granite gneiss and Amphibolite is almost parallel to the road. Road cutting on the steep slopes and the geological discontinuity of different lithology adding an extra weight to the slope. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. The presence of mica sheet along the bedding plane becomes a slip surface, facilitating the mass to slide. Hydrated Clay is adding an extra weight on slope.A sequence of strata having thin, soft and weak beds (quartzofeldspathic) lying in between hard and thick jointed beds (BMQ) provide a congenial set-up for landslide occurrence. Along the amphibolite-gneiss contact, the amphibolite shows a high degree of alteration and development of reddish-brown, soft and friable materials (saprolite). The percolating water through soil and sandstone wet the clay layer adding to the weight that reduces the slope strength.
37	Recommendations	:	The hill (Malleshvara Gudda) is highly dissected with numerous first order streams. The location is not suitable for settlement as the hill is highly vulnerable to mass failure during rain. Excavation on steep slope should not be allowed. The excavated slope if left untreated is sure to pose threat during heavy rainfall. Appropriate measures are required for checking infiltration of rain water. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. It is recommended that appropriately designed retaining structures of suitable height with firm foundation are required to be erected from road level for checking slope failure. The residents are therefore advised to keep safe distance from the vulnerable slope and vacate the area, especially during

			heavy or prolonged rainfall. It is also strongly recommended that construction of any sort should not be allowed around slide zone.Proper attention is needed at the Raju's Houselocation;as slide being a retrogressive in nature can affect the main road with more sub-surface run off; preferably remove the house. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Bird view of Debris slide at downhill side of the house along Hirebail-Hemmakki road at Malleshwara Gudda.**  **Damaged house at the crown of the slide**
40	Summary/Abstract	:	Multiple debris slides occurred in Malleshvara Gudda. Massive debris slides occurred in westerly directed steep slope. Huge debris has been accumulated all along the road and is also overrun the road and discharge debris into the westerly and south-westerly running drainages at downslope. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper area. The ridge part of

			the hill is barren with thin slope wash, whereas in the mid slope & downslope the thickness of the regolith increases and attains a thickness >5m. Sub surface flow is observed soon after an intense rainfall is confined within the pore systems of the soil mass. The runoff is km's long as it is flowing in the course of running stream at downslope. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. A part of coffee plantation land is now consumed under huge debris flow. Geologically, the area comprises amphibolites rocks forming the ridge part while granite gneiss forms the slope of the area. Relatively fresh rock was exposed at the top and saprolite was exposed relatively at the lower sections. Along the road quartzofeldspathic layers interbedded between well jointed & fractured Banded magnetite quartzite rocks (BMQ). Mica (Muscovite) sheet observed along the bedding plane. The slide that occurred at the back side of Raju's house, is retrogressive & widening. DRONE imagery of the area reveals the presence of soil pipes that discharging the sub-surface water along with soil.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**25**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Yedur ; Hirebail- Chunahadalu road
7	Latitude	:	N13°12'09.8"
8	Longitude	:	E75°24'33.9"
9	Length *(m)*	:	The area was inaccessible to approach to its crown or origin due to heavy rainfall and accumulation of huge saturated debris at the mid slope, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	

16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct due to high weathering and thick accumulation of soil.
27	Landuse/ Landcover	:	Thick forest and coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	Families of Muni Krishna S/o Gangappa and Benapaise (House owners)
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	02 Houses completely damaged
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting & high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface.
37	Recommendations	:	The toe support should be given at the toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope and levelling of road surface. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. Cultivation is not permitted in the reactivated failure surface.
38	Remarks, if any		The debris slide occurred at a local road connecting

			Hirebail- Chunahadalu road on 9th August, 2019 as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide along Hirebail-Chunahadalu road**  **Completely collapsed house due to runoff**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the westerly slope. The inclination of failure slope is observed to be around 40°. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. The debris along with rock boulders also observed reflecting the break-up of jointed & fractured rock due to built up of cleft water pressure. Top of the hill sparse vegetation is observed due to the presence of rock and thin soil cover. However, oversaturated weathered rock (Granite gneiss) & soil is observed on the slope corresponding to soil thickness > 5m. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. A part of coffee plantation land is now consumed under huge debris flow. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of

			the slope consuming part of coffee plantation land down the road. The highly saturated soil along the slope moves rapidly. House of Muni Krishna s/o Gangappa & Benapaise (02 houses) are completely collapsed during the incident.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**26**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Yelandur
7	Latitude	:	N13^{0}11’51.7”
8	Longitude	:	E75^{0}25’46.8”
9	Length *(m)*	:	~4
10	Width *(m)*	:	~10
11	Height *(m)*	:	~3
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~20
15	Run out distance *(m)*	:	~2
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss

26	Structure	:	Structure not distinct, highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Backward of the house of Narayan Gowda is partly Damage
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris Slide
36	Geo-scientific Causes	:	Removal of toe support after constructing settlements without giving any lateral support& high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface.
37	Recommendations	:	The slope around the house and the house situated at the top of this hill is deduced to be highly susceptible to failure, particularly in the event of heavy or prolonged rainfall. The residents are therefore advised to keep safe distance from the vulnerable slope and vacate the area, especially during heavy or prolonged rainfall. The toe erosion of slopes by water action should be stopped by appropriate strengthened concrete measures right from firm hard rock surface which may also act as toe support for slope material. Surface water is diverted from unstable slopes by ditches and pipes.
38	Remarks, if any		House of N.C. Narayan Gowda is partly damage on 9th August 2019 due to heavy rainfall.

39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide behind the house**  **Cultivation land converted into stream causing another landslide on other part of the slope due to down cutting**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the north-easterly slope. The inclination of failure slope is observed to be around 30°. There are number of settlements present along the foot of the hill & are constructed without giving any lateral support to the slope. Backward of the house of Narayan Gowda is partly damage due to debris slide. A higher order nala is running around 125m from the house. At top of the hill a large construction observed through Google imagery & is close to the higher order nala. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. However, oversaturated weathered rock (Granite gneiss) & soil is observed on the slope corresponding to soil thickness 2- 5m. Soil pipe is observed at the crown pipe that is responsible for removing soil and water from sub-surface. This will make the slope more vulnerable. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. North of this slide on the other side of cultivation

			land, another debris slide observed. Cultivation land in the valley part is now converted into small stream due to incessant rainfall. The excavated slope if left untreated is sure to pose threat during heavy rainfall.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	II

No	**Field**		**Description**
1	Location/ Slide No.	:	**27**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotemakki ; Hirebail-Hemmakki road
7	Latitude	:	N13^{0}13’04.2”
8	Longitude	:	E75^{0}25’36.8”
9	Length *(m)*	:	Since, the debris has been brought down by a higher order running stream, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined and widening of valley
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite, amphibolite
26	Structure	:	Not distinct

27	Landuse/ Landcover	:	Coffee plantation and forest land
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow
36	Geo-scientific Causes	:	Making settlement on the valley and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. As a precautionary step authority should mark some buffer zone around the streams, where no settlements should be allowed. Proper dimension of culvert is to be made for free passage of water and debris.
38	Remarks, if any		The landslide occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris flow occurred along a seasonal stream**

			 **High sediment laden discharge by the stream**
40	Summary/Abstract	:	Massive debris flows occurred along a seasonal nala of first order. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. Steep valley slope accompanied with heavy discharge of water is deduced to have aggravated the pace of erosion along the nala. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The debris is observed to comprise of river borne material consisting of dark brown to reddish, fine grained silty-sandy matrix with rounded boulders and pebbles. The southeast flowing seasonal stream is observed to have over run the coffee plantation and damaging the road. Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geologically the area of investigation comprises litho contact between granite gneiss and amphibolites. Through Google imageries it is evident that the earlier stream has widened its valley. The Valley widening may be corresponding to the structural discontinuity (litho-contact) or through some weaker planes. The hill (Malleshvara Gudda) is highly dissected with numerous first order streams.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**28**
2	State	:	Karnataka
3	District		Chikkamagaluru

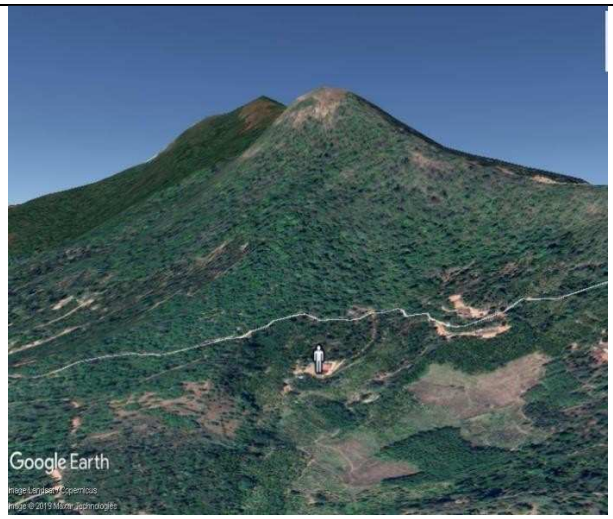
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Kotemakki ; Hirebail-Hemmakki road
7	Latitude	:	N13^{0}13’08.6”
8	Longitude	:	E75^{0}25’41.6”
9	Length *(m)*	:	Since, the debris has been brought down by a higher order running stream, the dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined and widening of valley
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite, amphibolite
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation and forest land
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil

35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow
36	Geo-scientific Causes	:	Making settlement on the valley and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope. Discontinuity between granite gneiss and amphibolites is contributing to the stability of the slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. As a precautionary step authority should mark some buffer zone around the streams, where no settlements should be allowed. Proper dimension of culvert is to be made for free passage of water and debris.
38	Remarks, if any		The landslide occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Massive Debris flow occurred along a seasonal stream**

			 **High sediment laden discharge by the stream transported the log to the downstream**
40	Summary/Abstract	:	Massive debris flows occurred along a seasonal nala of first order. The slide initiated on the upper slope of the ridge as translational failure & is further graded as debris flow collecting fines from upper catchment area. Steep valley slope accompanied with heavy discharge of water is deduced to have aggravated the pace of erosion along the nala. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The debris is observed to comprise of river borne material consisting of dark brown to reddish, fine grained silty-sandy matrix with rounded boulders and pebbles. The southeast flowing seasonal stream is observed to have over run the coffee plantation and completely damaged the house of Chinmay Gowda & the culvert. Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geologically the area of investigation comprises litho contact between granite gneiss and amphibolites. Through Google imageries it is evident that the earlier stream has widened its valley. The Valley widening maybe correspond to the structural discontinuity (litho-contact) or through some weaker planes. The hill (Malleshvara Gudda) is highly dissected with numerous first order streams.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	I

No	Field		Description
1	Location/ Slide No.	:	**29**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Hemmakki ; Malleshvara Gudda hill
7	Latitude (Remotely sensed)	:	~700 m west of N13^{0}08'49.0"
8	Longitude (Remotely sensed)	:	~700 m west of E75^{0}27'13.5"
9	Length *(m)*	:	Unable to predict the dimensions from distance
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined to valley part
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Highly dissected slope
25	Geology/Lithology	:	Granite, amphibolite
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation and forest land
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow
36	Geo-scientific Causes	:	Road cutting (Church road) on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the vicinity of a valley should be avoided. The location is not suitable for settlement. The residents are therefore advised to keep safe distance from the vulnerable slope and vacate the area, especially during heavy or prolonged rainfall. The hill (Malleshvara Gudda) is very vulnerable for mass failure. Settlements in the area are not recommended.
38	Remarks, if any		If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.. The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Remotely sensed Debris slide occurred along a Malleshvara Gudda hill in Hemmakki area**

			 **Google Imagery of the Malleshvara Gudda hill showing barren ridge with forest cover at mid-slope and down slope**
40	Summary/Abstract	:	Massive debris flows occurred along a large basin in the forest region at upslope. The failure is translational & is further graded as debris flow collecting fines from upper catchment area. The flow is usually confined to the steep gullies that facilitate their downward movement. The ridge part of the hill is barren with thin slope wash, whereas in the mid slope & downslope the thickness of the regolith increases and attains a thickness >5m (as observed in tone and texture of vegetation) .The failure has been occurred at the interface of rock (at the ridge) and soil (at the basin).Cultivation in the steep slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geological map of G.S.I shows that the ridge part of the Malleshvara Gudda hill is composed of Amphibolites rock while at mid slope & downslope granite gneiss rocks are dominating. The area of investigation is traversed with east-southeast flowing first order drainages. These dissections in such discontinuities (litho-contact between amphibolites and Granite gneiss) making the easterly facing slope more vulnerable. The runoff is km's long as it is flowing in the course of running stream at downslope. The house situated at downslope at coordinate N13^{0}08'49.0" and E75^{0}27'13.5 are around 700 m away from the landslide & the direction of flow is towards this house. The house can be triggered with debris flow during heavy rainfall.
41	Date of Reporting	:	24/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**30**
2	State	:	Karnataka
3	District		Chikkamagaluru

4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Kaskebylu
7	Latitude	:	N13^{0}06’25.7”
8	Longitude	:	E75^{0}43’30.5”
9	Length *(m)*	:	Since, the flow is usually confined to the higher order nala & is inaccessible to approach to its crown or origin, Dimensions were unable to predict.
10	Width *(m)*	:	
11	Height *(m)*	:	
12	Area *(m2)*	:	
13	Depth *(m)*	:	
14	Volume *(m3)*	:	
15	Run out distance *(m)*	:	
16	Type of Material	:	Debris
17	Type of movement	:	Flows
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Confined
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Outburst of large pond on upslope responsible for heavy discharge.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil

34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow. Paddy field at downslope was worse affected
36	Geo-scientific Causes	:	Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope. Blasting on the slope causes fractures to develop those results in releasing of blocks with water percolation. Also, ponds pounded with water poses additional weight to the slope. During incessant rainfall, ponds breached out & huge volume of water immediately rush to the valley breaking rocks into pebbles and boulders.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. Quarries on the slope that retaining water must be filled with impervious materials. No pond should be constructed on the slope that enhances the load and ultimately lead to failure. Proper dimension of culvert is to be made for free passage of water and debris.
38	Remarks, if any		The landslide occurred on 8th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **High sediment laden discharge by the stream**

			 **Debris flow downside damage the culvert & paddy field**
40	Summary/Abstract	:	During spells of prolonged heavy rainfall slope mass got completely saturated with water and pore water pressure exceeded due to coarse grained soil. This facilitated debris flow along the westerly flowing seasonal stream. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The debris is observed to comprise of river borne material consisting of dark brown to reddish, fine grained silty-sandy matrix with rounded boulders and pebbles. The seasonal stream charged with debris cum rock is observed to have over run the coffee plantation and destroy the culvert. The runoff is km's long as the debris comes from first order streams contributed its load with the higher running stream, destroying paddy field. Cultivation in the slopes; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. The earlier stream has widened its valley with the influx of water. Through Google imageries it is observed that there are several stone quarries on the slope & are filled with water. As per revenue officer a large pond was present at the upslope of the hill at Nandi Coffee Estate, which was using for irrigation.
41	Date of Reporting	:	25/08/2019
42	Landslide Category	:	II

Loc.31: The location is suffered from flooding of Hemavati River. The flash flood damages the property on 09th August. This site is located at N13^{0}03'36.9" and E75^{0}39'51.9" in the village area Uggehalli

Observation: The houses are constructed in valley floor. The meandered stream running westerly rejuvenates during heavy rain. The flood plain area becomes inundated & thus destroying the cultivation land. Houses of Puralamma and Somayya are completly damage due to over flooding. These houses were at the fringe of flood. Other two houses are partly damage. Supporting wall constructed adjacent to the house is observed to have bulged.

Cause: Heavy rainfall is deduced tobe the main triggering factor responsible for flash flooding.

Recommendation: The structural deficiency of the existing houses has been identified; therefore need proper engineering for construction of houses .The basement of the houses should be on a firm rock.

Completely collapsed house due o flash flood

Construction of house at the flood plain area with weak basement

No	Field		Description
1	Location/ Slide No.	:	**32**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Devarunda ; along Sakleshpur link road
7	Latitude	:	N13^{0}00’55.8”
8	Longitude	:	E75^{0}38’09.6”
9	Length *(m)*	:	~ 09
10	Width *(m)*	:	~ 33
11	Height *(m)*	:	~ 06
12	Area *(m2)*	:	
13	Depth *(m)*	:	0.5
14	Volume *(m3)*	:	~149

15	Run out distance *(m)*	:	~120
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Widening
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct, highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation , Extensive cut slope
28	Hydrological condition		Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow. Paddy field at downslope was worse affected.
36	Geo-scientific Causes	:	**S**lope cut left unsupported on upslope& downslope of the road bench, improper and inadequate drainage arrangements, lack of channelized runoff water network on slope, and incompetent Road Bed Material.
37	Recommendations	:	Construction of toe wall with proper lined drainage at both the levels i.e. below the road and above the road. The drainage system along the road should be supported by concrete works to restrict infiltration of water.
38	Remarks, if any		Road has been collapsed due to debris side at downslope of the road bench during the rainfall event of August 2019.

39	Photos. Sketch of Plan & section of the slide	:	 **Slope failure and damaged road due to subsidence along Sakleshpur link road.**  **Crown with thick saturated regolith**
40	Summary/Abstract	:	The collapse of the road due to a huge mass failure beneath the road has occurred at the bend. The drainage system along the road is not supported by concrete works. They are made simply as dug out trenches and the bottom is left uncovered. The water coming from the slope is running on the road & following the lower level. This increases surface &sub-surface water pressure on downside of the road. There is no lateral support along downslope of the road bench. The subsurface seepage of water beneath the road removed the soil from beneath &making the mass vulnerable to fail. Debris slide of 33m width occurred along the road. Westerly directed slope has very thick soil cover & is completely saturated. Coffee plantation is at Upslope. Heavily charged debris with water find its way along the slope & damage the road with surface and sub-surface flows.
41	Date of Reporting	:	25/08/2019
42	Landslide Category	:	II

Loc.33: This site is located at N13^{0}01’22.5” and E75^{0}37’32.4” in Devarunda area, along Sakleshpur link road. Road has been collapsed due to subsidence during the rainfall event of August 2019.

Observation: The collapse of the road due to a huge mass failure beneath the road has occurred .The drainage system along the road is not supported by concrete works. They are made simply as dug out trenches and the bottom is left uncovered. The water coming from the slope is running on the road & following the lower level. The amount of infiltration causing saturation of soil horizon that is leading to soil slip or subsurface erosion. There is no lateral support along downslope of the road bench. The subsurface seepage of water beneath the road removed the soil from beneath & making the mass vulnerable to fail. Ground cracks are still present along the road. Most of them are wide enough, can fail during more rain.

Cause: Slope cut left unsupported on upslope & downslope of the road bench, improper and inadequate drainage arrangements, lack of channelized runoff water network on slope, and incompetent Road Bed Material.

Recommendation: Construction of toe wall with proper lined drainage at both the levels i.e. below the road and above the road. Ground Cracks to be sealed to restrict any percolation of water. The drainage system along the road should be supported by concrete works to restrict infiltration of water.

Road damaged due to subsidence along Sakleshpur link road.

Drainage along the road has been obstructed with soil.

No	Field		Description
1	Location/ Slide No.	:	**34**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12

5	Name of the slide	:	
6	NH/SH/Locality	:	Devarunda
7	Latitude	:	N13^{0}01’26.4”
8	Longitude	:	E75^{0}37’12.8”
9	Length *(m)*	:	~ 18
10	Width *(m)*	:	~ 11
11	Height *(m)*	:	~ 12
12	Area *(m2)*	:	
13	Depth *(m)*	:	~ 0.5
14	Volume *(m3)*	:	~ 99
15	Run out distance *(m)*	:	~ 06
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct, highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation , Extensive cut slope
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow.

36	Geo-scientific Causes	:	Removal of toe support after constructing of road and small canal and thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface.
37	Recommendations	:	The toe erosion of slopes by water action& road cutting should be stopped by appropriate strengthened concrete measures right from firm hard rock surface which may also act as toe support for slope material. The drainage system along the road should be supported by concrete works to restrict infiltration of water.
38	Remarks, if any		Debris slide occurred on 9th August 2019 due to heavy rainfall.
39	Photos. Sketch of Plan & section of the slide	:	 **Slope failure at steep slope near Devarunda village**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the north-westerly slope. The inclination of failure slope is observed to be around 30°. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. However, oversaturated weathered rock (Granite gneiss) & soil is observed on the slope corresponding to soil thickness 2- 5m. Soil pipe is observed at the crown pipe that is responsible for removing soil and water from sub-surface. This will make the slope more vulnerable. Cultivation in the slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. Man-made canal is running at the toe of the slide. The excavated slope if left untreated is sure to pose threat during heavy rainfall.
41	Date of Reporting	:	25/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**35**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/12
5	Name of the slide	:	
6	NH/SH/Locality	:	Attigere
7	Latitude	:	N13°07'21.0"
8	Longitude	:	E75°30'34.8”
9	Length *(m)*	:	~ 30
10	Width *(m)*	:	~ 14
11	Height *(m)*	:	~ 18
12	Area *(m2)*	:	
13	Depth *(m)*	:	~ 0.5
14	Volume *(m3)*	:	~ 210
15	Run out distance *(m)*	:	~ 120
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and Widening
21	Style	:	Single
22	Failure mechanism	:	Shallow Rotational failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Well jointed rocks exposed at the slide surface
27	Landuse/ Landcover	:	Forest at upslope and coffee plantation at midslope and downslope.
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil

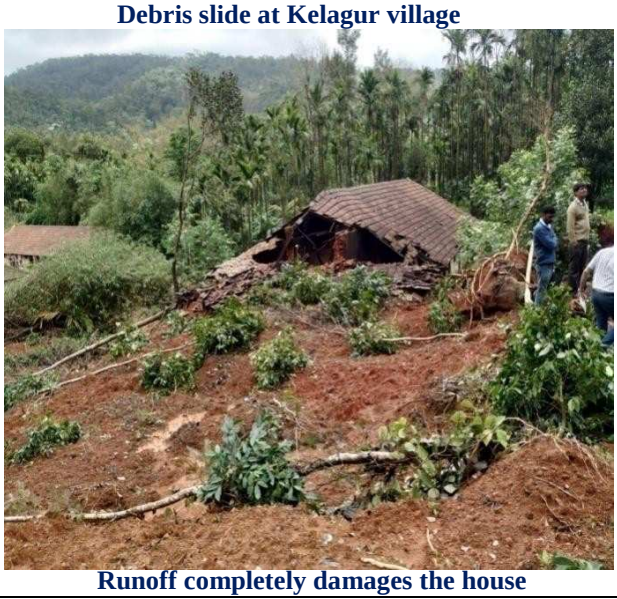
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	House of Ravi S/o Chennapapujari is partly damaged and needs to be shifted immediately.
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow.
36	Geo-scientific Causes	:	Removal of toe support after road cutting & high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Underlying rocks are prone to weathering and fracturing, which weakens the substrate and creates flow paths for subsurface water &increases infiltration of water inside the slope thereby making a potential slide surface.
37	Recommendations	:	The toe support should be given at the toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope. Support should be given at downslope side of the road bench. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. Cultivation is not permitted in the reactivated failure surface. No settlement is allowed near the slide. The house of Ravi s/o Chennapa pujari should be removed.
38	Remarks, if any		The debris slide occurred at the bend of a road on 8th August, 2019 as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slides initiated in forest region**

			 **Debris slides consuming part of coffee plantation at downslope**  **Large crack & subsidence observed near crown**  **Partly damage house near the crown part of slide**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the south easterly slope. The inclination of failure slope is observed to be around 40°. The slide initiated as translational failure & the

			debris are further descending down through the coffee plantation land. The debris along with rock boulders also observed reflecting the break-up of jointed & fractured rock due to built up of cleft water pressure. Top of the hill sparse vegetation is observed due to the presence of rock and thin soil cover. However, oversaturated weathered rock (Granite gneiss) & soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land down the road. The highly saturated soil along the slope moves rapidly. Sub- Surface run off is coming out from the debris accumulated near the toe. The debris slide is found to be close to two streams running south-easterly. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. Well developed cracks and subsidence observed near the crown indicating the widening of landslide. House of Ravi s/o Chennapa pujari is adjacent to the crown of the slide is very high risk of failure.
41	Date of Reporting	:	25/08/2019
42	Landslide Category	:	I

No	**Field**		**Description**
1	Location/ Slide No.	:	**36**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Kelagur
7	Latitude	:	N13°09'52.7"
8	Longitude	:	E75°27'36.0”
9	Length *(m)*	:	~ 25
10	Width *(m)*	:	~ 22
11	Height *(m)*	:	~ 20
12	Area *(m2)*	:	
13	Depth *(m)*	:	~ 0.5
14	Volume *(m3)*	:	~ 220
15	Run out distance *(m)*	:	~ 14
16	Type of Material	:	Debris

17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and Widening
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Moderately dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct, Highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Flowing
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	10 Families residing at the toe side of the slide suffered from the rapid influx of debris into their houses.
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Houses of 7 families has been destroyed , walls are cracked
35	Agriculture/forest/Barren	:	Part of plantation land consumed under debris flow.
36	Geo-scientific Causes	:	Removal of toe support after road cutting, making settlement& high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	The toe support should be given at the toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope. Cultivation is not permitted in the failure surface. No settlement is allowed near the slide. The foundation of the other houses should be strengthened.
38	Remarks, if any		Multiple debris slide occurred in Kelagur coffee estate on 9th August, 2019 as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide at Kelagur village**  **Runoff completely damages the house**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the north easterly slope. Higher order stream is running downslope across the slope. The inclination of failure slope is observed to be around 40°. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. Oversaturated weathered rock (Granite gneiss) & soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. There are number of settlements present along the foot of the hill & are constructed without giving any lateral support to the slope. The runoff was so rapid that it completely destroyed the houses of 7 families out of 10.Cracked walls of the houses in the colony are showing evidence of subsidence. Another slide is also observed, (N13°09'51.6"and E75°27'30.5”) occurred on the

			other side of the same hill.
41	Date of Reporting	:	26/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**37**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Kellagur coffee & tea estate
7	Latitude	:	N13^{0}09’53.2”
8	Longitude	:	E75^{0}27’04.6”
9	Length *(m)*	:	~ 18
10	Width *(m)*	:	~ 08
11	Height *(m)*	:	~ 12
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~ 480
15	Run out distance *(m)*	:	~ 80
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Extremely Rapid
19	Activity	:	Active
20	Distribution	:	Widening.
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct, highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation

28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	**S**everal factors are cumulatively affecting the area prone to landslide. Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the debris. Road cutting on the steep slopes and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. The presence of mica sheet along the bedding plane becomes a slip surface, facilitating the mass to slide. The percolating water through soil and sandstone wet the clay layer adding to the weight that reduces the slope strength.
37	Recommendations	:	The excavated slope if left untreated is sure to pose threat during heavy rainfall. Appropriate measures are required for checking infiltration of rain water. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. It is recommended that appropriately designed retaining structures of suitable height with firm foundation are required to be erected from road level for checking slope failure.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.

39	Photos. Sketch of Plan & section of the slide	:	 **Debris slides at Kelagur coffee estate**  **View from the crown at the downhill side**
40	Summary/Abstract	:	Debris slides occurred in north-westerly directed steep slope. The slide initiated as translational failure & is further graded as debris flow. The mid slope & downslope the thickness of the regolith increases and attains a thickness >5m.The hill is disturbed with road cuts at the mid slope. Cultivation in the steep slopes has been practiced after removing the vegetation cover (Forest) on the middle &upper parts of the slopes. A part of coffee plantation land is now consumed under huge debris flow. Geologically, the area comprises amphibolites rocks and granite gneisses forming the slope of the area. Mica (Muscovite) sheet observed along the bedding plane.
41	Date of Reporting	:	26/08/2019
42	Landslide Category	:	II

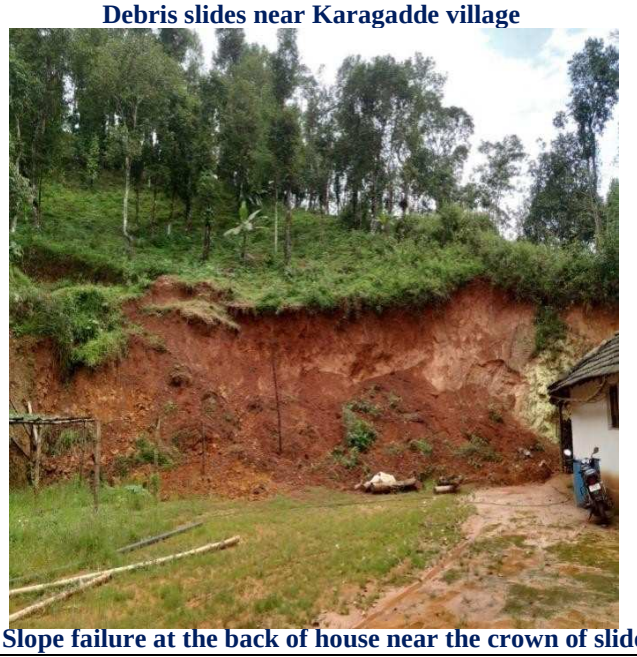
No	Field		Description
1	Location/ Slide No.	:	**38**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Mastikhan coffee estate, Sunkasale
7	Latitude	:	N13^{0}09’55.8”
8	Longitude	:	E75^{0}26’32.8”
9	Length *(m)*	:	~ 07
10	Width *(m)*	:	~ 14
11	Height *(m)*	:	~ 05
12	Area *(m2)*	:	
13	Depth *(m)*	:	~ 0.5
14	Volume *(m3)*	:	~ 49
15	Run out distance *(m)*	:	~ 80
16	Type of Material	:	Soil
17	Type of movement	:	Slide
18	Rate of movement	:	Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under earth flow
36	Geo-scientific Causes	:	Slope cut left unsupported on upslope & downslope of the road bench. Improper and inadequate drainage arrangements and lack of channelized runoff water network on slope. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep valley slope is responsible for the formation of thick soil. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. Proper dimension of culvert is to be made for free passage of water. Drainage system along the road should be supported by concrete work.
38	Remarks, if any		The landslide occurred during 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Earth slide at Sunkasale-Hirebail road section**

			 **Earth material moved down the hill along high angel slope**
40	Summary/Abstract	:	Earth flow occurred along first order stream section. The slide initiated on the upper slope of the ridge as translational failure & is further graded as earth flow collecting fines from upper catchment area. The flow is usually confined to the steep gullies that facilitate their downward movement. The ridge part of the hill covered with sparse vegetation having thin slope wash, whereas in the mid slope & downslope the thickness of the soil increases and attains a thickness >5m.The run-off moves down rapidly along the basin after broadening the valley. Cultivation in the steep slopes has been practiced after removing the vegetation cover on the upper parts of the slopes. The coffee plantation covered the valley part is consumed under earth flow. The loose soil on the foot of the slope has been removed by JCB.
41	Date of Reporting	:	26/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**39**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Karagadde
7	Latitude	:	N13°12'34.7"
8	Longitude	:	E75°20'36.4”
9	Length *(m)*	:	~ 14
10	Width *(m)*	:	~ 22

11	Height *(m)*	:	~ 12
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.7
14	Volume *(m3)*	:	~216
15	Run out distance *(m)*	:	~ 06
16	Type of Material	:	Soil
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive and Widening
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Nil
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under earth flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting and settlements together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Sparse vegetation in the middle & upper part of the slope is unable to hold the thick saturated soil against the gravity.
37	Recommendations	:	Easing of slope to be done and construction of concrete retaining wall with weep holes is suggested. Drainage system along the road should be supported by concrete work. Slope should be

			covered with deep rooted plants. The residents living in the vicinity of the landslide are advised to keep safe distance from the vulnerable slope and vacate the area, especially during heavy or prolonged rainfall.
38	Remarks, if any		The Earth slide occurred at a local road to Karagadde Village connecting Samse-Kalasa road on 9th August, 2019 as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slides near Karagadde village**  **Slope failure at the back of house near the crown of slide.**
40	Summary/Abstract	:	The earth slide is observed to have occurred on the northerly slope. The inclination of failure slope is observed to be around 35°. The slide initiated as translational failure. The width of the failure slope is about 22 meters along the bend of the road and height of the crown from the road is about 12 meters. The thickness of the debris accumulated in the area is observed to be around 5 meters. This overburden material is observed to comprise of dark brown to reddish, fine grained silty-sandy matrix with rounded pebbles. Mid-slope and up-slope of the hill

			is dominated with shrubs, grasses and sparsely placed trees. However, oversaturated weathered rock (Meta basalt) & soil is observed on the slope corresponding to soil thickness >4m. The highly saturated soil along the slope moves rapidly. The slope is dissected with approach road to coffee estates and settlements at mid-slope and up-slope. A higher order nala running WNW at the base of the slope. House of Vamanais situated adjacent to the crown of the slide & is also contributing the disturbance in the slope.
41	Date of Reporting	:	26/08/2019
42	Landslide Category	:	II

Loc.40: This site is located at N13°25'0.80" and E75°30'22.40" in Arishinagiri area. The Bhadra River overflows during the spell of rain in the month of August, 2019 causing loss of assets.

Observation: During incessant rainfall river water gushed into the village on 9th August, 2019. 8 houses are affected while one house is partly damage situated in the flood plain of Bhadra River.

Cause: Heavy rainfall is deduced to be the main triggering factor responsible for flash flooding.

Recommendation: The location is not suitable for settlement. It is adjacent to the main channel of the river. Avoid building in a floodplain, especially the areas prone to flooding. The district authority should vigilant about the weather forecast. The residents living in the vicinity of the river channels are advised to keep safe distance and vacate the area, especially during heavy or prolonged rainfall.

Damaged house due to flooding

Cultivation land affected after flash flood

Loc.41: This site is located at N13°26'35" and E75°30'39.10" in Srigola area. The BhadraRiver overflows during the spell of rain in the month of August, 2019 causing loss of assets.

Observation: During incessant rainfall river water gushed into the village on 9th August, 2019.10 houses are affected while one house is completely washed away. The house was situated 30 m from main stream of Bhadra river.

Cause: Heavy rainfall is deduced to be the main triggering factor responsible for flash flooding.

Recommendation: The location is not suitable for settlement. The area of investigation is adjacent to the main channel of the river. The district authority should vigilant about the weather forecast. The residents living in the vicinity of the river channels are advised to keep safe distance and vacate the area, especially during heavy or prolonged rainfall.

Damaged house due to flooding

Damaged house due to flooding

Loc.42: This site is located at N13°27’41.30” and E75°31’45.30” in Khodi area. The Bhadra River overflows during the spell of rain in the month of August, 2019 causing loss of assets.

Observation: During incessant rainfall river water gushed into the village on 9th August, 2019.Due to heavy discharge of water, flood damages the crops and plantation. Total 27 no. of houses are present and no damages to houses are observed.

Cause: Heavy rainfall is deduced to be the main triggering factor responsible for flash flooding.

Recommendation: The area of investigation is around 1 km to the main channel of the river. The district authority should vigilant about the weather forecast. The residents living in the vicinity of the river channels are advised to keep safe distance and vacate the area, especially during heavy or prolonged rainfall.

No	Field		Description
1	Location/ Slide No.	:	**43**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/07
5	Name of the slide	:	
6	NH/SH/Locality	:	Badnekhan Coffee Estate
7	Latitude	:	N13°16’36.60”
8	Longitude	:	E75°22’5.90”
9	Length *(m)*	:	~15
10	Width *(m)*	:	~30
11	Height *(m)*	:	~12
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.3
14	Volume *(m3)*	:	~130
15	Run out distance *(m)*	:	~04
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive & widening
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Phyllite, Banded magnetite quartzite
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road subsidence
34	Infrastructure	:	Nil
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	Making settlement on the slope and removing soil from hillsides results in a significant reduction in lateral support. Farming of coffee plantation in the estate upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential slide surface. Chemical weathering accelerates after decay of plants or roots on the steep slope is responsible for the formation of thick regolith. During incessant rain the soft soil/regolith soaked with water & slumped down the slope.
37	Recommendations	:	Plantation on the slope should be avoided for the free flow of water. Retaining wall should be constructed along the coffee drying area and both side of drainage should be modified for heavy discharge of rain water during intense rainfall. Proper dimension of culvert is to be made for free passage of water and debris. The workers of coffee estate living around this location should remain vigilant, particularly during the monsoon period and any physical change in the slope or widening of the crack should immediately brought into the notice of authorities.
38	Remarks, if any		The landslide occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide at Badnekhan Coffee Estate**

			 **Part of coffee land consumed due to debris flow**
40	Summary/Abstract	:	The debris slide initiated on the upper slope of the coffee drying area. Steep slope accompanied with heavy discharge of water is deduced to have aggravated the pace of erosion along the nala. A subsurface ground water steam was flowing beneath the coffee drying area. Rapidly running water and gravity driven movement induced by lubricating action of ground water thus derived the debris down slope at fast pace. The northeast flowing seasonal stream is observed to have over run the coffee plantation and partly damage one staff's house. The area of investigation comprises fully weathered rock and converted to a thick pile of overburden soil. In the coffee drying area cracks are present near the landslide crown that can reactivate & cause mass failure again. With more percolation of water &widening of the cracks, landslide can again trigger.
41	Date of Reporting	:	26/08/2019
42	Landslide Category	:	II

Loc.44: The areas Kuniyala and Halagadaka, situated in Ballarayadurgabetta were inaccessible. The road connections to both these villages were disrupted by the numerous landslides. The locations were remotely access from N13°12'34.7"and E75°20'36.4". Recognition and monitoring of the landslides from remote were not possible in such a cloudy weather. The landslide susceptibility and hazard assessment can be done once the communication to the locations gets cleared. If needed, the landslide should be taken for detailed study to assess its stability/instability factor and geometry.

Loc.45: This site is located at N13^{0}08'44.0" and E75^{0}24'35.5" in Ballarayanadurga, where Ground cracks of 7-30 cm wide are observed on 13th August, 2019, as per accompanied DMG officials and locals. The area comes under forest. The location is near to a very large escarpment that also marks the district boundary of Mangalore and Chikkamangaluru.

Observation: This area has a steeply sloping land covered with grasses and shrubs at the top. Slope dips towards southeast at an angle of 40° to 45°. Geologically the area comprises

Metabasalt. Litho-contact between Metabasalt and banded magnetite quartzite observed in the location. The thickness of the regolith accumulated in the area is observed to be around 3-4 meters. This overburden material is observed to comprise of dark brown to reddish, fine grained silty-sandy matrix intermixed with Muscovite mica. The crack is observed on the mid-slope of the hill at the interface of rock & soil. Thick soil covers overlying the weathered meta-basalt covering the hill (Ballarayanadurgabetta). Crack is forming an arc shape extending down the valley in length up to 200m. This may be the initiation of a crown of a landslide. Small to large size boulders are placed above the cracks adding the weight on slope. The Slope has been modified for plantation. The arc shape crack across the south-easterly slope is active with percolation of water& prevention of soil erosion. Along the road forest department has made contour trenches on the slope for water conservation and soil conservation. The hill is highly dissected by first order streams.

Cause: Heavy rainfall is deduced to be the main triggering factor. Removal of toe support after road cutting& Steep slope together with the presence of thick cover of soil dominated with boulders on uphill side are the primary causes that tend to reduce the shearing strength. Discontinuity occurred due to different litho-contact facilitating the water to percolate & thus making the slope vulnerable. Contour trenches made by the Forest department at the mid-slope inducing the instability and reducing lateral support. Trenches are enhancing the weight on the slope and also providing way for the sub-surface seepage of water, thus reducing shear strength. During incessant rain the soft soil/regolith soaked with water & slumped down the valley slope creating tensional cracks on the ground.

Recommendation: The crack should be filled preferably with some impervious material to reduce chances of water infiltration into the overburden material. Crack should be monitored regularly and any physical change in the slope or widening of the crack should immediately bring into the notice of authorities. Any open pits/trenches on the slope should be closed during the monsoon period.

Ground crack observed at mid slope

Contour trench made by forest dept. at mid-slope

No	Field		Description
1	Location/ Slide No.	:	**46**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Durgadahalli; Sunkasale- Ballalarayanadurga road
7	Latitude	:	N13°08'43.9"
8	Longitude	:	E75°25'14.0”
9	Length *(m)*	:	~12
10	Width *(m)*	:	~35
11	Height *(m)*	:	~10
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~210
15	Run out distance *(m)*	:	~70
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Multiple
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Granite gneiss
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil

31	People affected	:	Damaged the house of Anil
32	Livestock Loss	:	Nil
33	Communication	:	Road damaged
34	Infrastructure	:	Electric poles uprooted
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting & high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail.
37	Recommendations	:	The toe support should be given at the base contour line or toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope and levelling of road surface. No settlement is allowed near the slide. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. Cultivation is not permitted in the failure surface.
38	Remarks, if any		Multiple debris slides have occurred on 9th August, 2019. The debris is highly saturated with water & therefore the runoff in a steep slope consumed the coffee plantation.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide along Sunkasale- Ballalarayanadurga road.**

			 **Completely damaged house of Anil**
40	Summary/Abstract	:	Multiple debris slides are observed to have occurred on the east-north easterly slope. The inclination of failure slope is observed to be around 40°. The width of the failure slope is about 35 meters along the road bend. The slide initiated as translational failure. The debris is further descending down through the coffee plantation land, overrun the road and completely damage the house of Anil. The landslide debris is observed to have accumulated at the road. Oversaturated weathered rock & soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land down the road.
41	Date of Reporting	:	27/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**47**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Durgadahalli; Sunkasale- Ballalarayanadurga road
7	Latitude	:	N13°08'59.1"
8	Longitude	:	E75°25'25.9”
9	Length *(m)*	:	~26
10	Width *(m)*	:	~32

11	Height *(m)*	:	~16
12	Area *(m2)*	:	
13	Depth *(m)*	:	~1
14	Volume *(m3)*	:	~468
15	Run out distance *(m)*	:	~50
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil
31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road Damaged
34	Infrastructure	:	Electric poles uprooted
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting & high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail. Farming of coffee plantation in the valley part upslope ceases the surface run off. Infiltration of water made their way inside the slope making a seepage path thereby making a potential

			slide surface.
37	Recommendations	:	Natural drainage should be left unaltered. Plantation on the valley floor should be avoided for the free flow of water. Any construction in the valley part should be avoided. Proper dimension of culvert is to be made for free passage of water and debris. As a precautionary step authority should mark some buffer zone around the streams, where no settlements should be allowed.
38	Remarks, if any		The debris slide has occurred on 9th August, 2019
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide along Sunkasale- Ballalarayana Durga road.**
40	Summary/Abstract	:	Large debris slide occurred on the east-north easterly slope. The inclination of failure slope is observed to be around 40°. The width of the failure slope is about 32 meters along the road section. Cultivation of coffee plantation in the steep valley slope; especially in basin area has been practiced after removing the vegetation cover on the upper parts of the slopes. Geologically the area of investigation comprises Metabasalt. The debris descending down through the coffee plantation land, overrun the road and damages the culvert. The landslide debris is observed to have accumulated at the road. Oversaturated weathered rock & soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land down the road.
41	Date of Reporting	:	27/08/2019
42	Landslide Category	:	II

No	Field		Description
1	Location/ Slide No.	:	**48**
2	State	:	Karnataka
3	District		Chikkamagaluru
4	Toposheet No.	:	48O/08
5	Name of the slide	:	
6	NH/SH/Locality	:	Durgadahalli; Sunkasale- Ballalarayanadurga road
7	Latitude	:	N13°09'02.2"
8	Longitude	:	E75°25'37.2”
9	Length *(m)*	:	~07
10	Width *(m)*	:	~32
11	Height *(m)*	:	~08
12	Area *(m2)*	:	
13	Depth *(m)*	:	~0.5
14	Volume *(m3)*	:	~112
15	Run out distance *(m)*	:	~50
16	Type of Material	:	Debris
17	Type of movement	:	Slide
18	Rate of movement	:	Very Rapid
19	Activity	:	Active
20	Distribution	:	Retrogressive
21	Style	:	Single
22	Failure mechanism	:	Shallow planar failure
23	History	:	Not known
24	Geomorphology	:	Lowly dissected slope
25	Geology/Lithology	:	Metabasalt
26	Structure	:	Not distinct , highly weathered rock
27	Landuse/ Landcover	:	Coffee plantation
28	Hydrological condition	:	Wet
29	Triggering Factor	:	Heavy rainfall is deduced to be the main triggering factor for the downslope movement of the soil.
30	Death of persons	:	Nil

31	People affected	:	Nil
32	Livestock Loss	:	Nil
33	Communication	:	Road Damaged
34	Infrastructure	:	Electric poles uprooted
35	Agriculture/forest/Barren	:	Part of coffee plantation land consumed under debris flow
36	Geo-scientific Causes	:	Removal of toe support after road cutting & high slope gradient together with thick soil cover are the primary causes that tend to reduce the shearing strength while heavy antecedent rainfall trigger the mass to fail.
37	Recommendations	:	The toe support should be given at the toe of slide (where slide material stopped) by appropriate concrete measures (Retaining wall with weep holes) before going for benching and back filling of slope and leveling of road surface. Surface water is diverted from unstable slopes by ditches and pipes. Drainage system along the road should be supported by concrete work. Cultivation is not permitted in the failure surface.
38	Remarks, if any		The debris slide has occurred on 9th August, 2019, as per accompanied DMG officials and locals.
39	Photos. Sketch of Plan & section of the slide	:	 **Debris slide along Sunkasale- BallalarayanaDurga road.**
40	Summary/Abstract	:	The debris slide is observed to have occurred on the southerly slope. The inclination of failure slope is observed to be around 40°. The width of the failure slope is about 30 meters along the road section. The slide initiated as translational failure & the debris are further descending down through the coffee plantation land. The landslide debris is observed to have accumulated at the road. Top of the hill sparse vegetation is observed reflecting presence of

			rock and thin soil cover. However, oversaturated weathered rock & soil is observed on the slope corresponding to soil thickness > 5m. This thickly overburden material is observed to comprise of hill wash and debris consisting of brown to reddish brown, coarse-grained sandy matrix. The debris terminates at the base of the slope consuming part of coffee plantation land down the road.
41	Date of Reporting	:	27/08/2019
42	Landslide Category	:	II

GENERAL RECOMMENDATIONS:

Apart from the site wise recommendations mentioned earlier, some general recommendations have been made to restore the stability of landslide/subsidence affected slopes and to minimize their risk factor at preliminary stage. The general recommendations are,

1. There should be proper and adequate drainage arrangements in the form of well-designed drains and culverts along the road in order to keep the slopes well drained, dry and to avoid the over saturation of the slope forming material (SFM) which adds to the instability of the slope and roads.

2. There should be proper channelization of slope runoff water at unstable zones in order to avoid seepage and development of pore water pressures in the slopes.

3. Proper substrate for the road should be designed and competent road building material (RBM) should be used which can withstand the load due to heavy vehicular movement.

4. The toe erosion of slopes by water action should be avoided by appropriate strengthened concrete measures which may also act as toe support for slope material.

5. The plantation/vegetation along the stream course may be avoided for the free flow of water.

6. The toe of the slopes should not be excavated or disturbed by any means. There should be through analysis of mass capacity of a slope before going for construction of any public or domestic establishment.

7. The areas with cut-slopes and modified road corridors with high slope gradient should be taken for “Slope Stability Assessment Study” keeping in view of the safety of roads and settlements in those areas.

8. Slopes having high gradient/angle are to be monitored regularly, particularly during the monsoon period and any physical change in the slope or widening of any existing crack should immediately brought to the notice of the authorities.

Chapter-4

INSTITUTIONAL ARRANGMENTS FOR DISASTER MANAGEMENT

4.1 Introduction:

Most of the disaster situation is to be managed at State and District levels. The centre plays a supporting role and provides assistance when the consequences of disaster exceed district and State capacities. The centre mobilizes support in terms of providing emergency teams, support personnel, specialized equipments and operating facilities depending on the scale of the disaster and the need of the State and District. Active assistance to an affected State/District would be provided only after the declaration of a national level disaster, the national response mechanism has to be prepared and any impending State or District disaster has to be impending State or District disaster has to be monitored in order to provide immediate assistance whenever required.

The Disaster Management Act, 2005 (DM Act, 2005) lays down institutional and coordination mechanisms for effective disaster management (DM) at the national, state, and district levels. As mandated by this Act, the Government of India (GoI) created a multi-tiered institutional system consisting of the National Disaster Management Authority (NDMA), headed by the Prime Minister, the State Disaster Management Authorities (SDMAs) by the Chief Ministers and the District Disaster Management Authorities (DDMAs) by the District Collectors and co-chaired by elected representatives of the local authorities of the respective districts. These bodies have been set up to facilitate the paradigm shift from the hitherto relief-centric approach to a more proactive, holistic and integrated approach of strengthening disaster preparedness, mitigation and emergency response. (Source NDMA guidelines)

Disaster Management organizational structures at the National level

- The Prime minister of India who shall be the chairperson at the National authority office.
- Other members not exceeding nine members to be nominated by the chairperson of the National authority.
- The chairperson of the National authority may designate one of the members nominate under clause (b) of subsection (2) to be the vice chairperson of the National authority.

National level Nodal Agency

At the national level, the Ministry of home Affairs is the nodal ministry for all matters concerning disaster management. The central relief commissioner (CRC) in the ministry of home affairs is the nodal officer to coordinate relief operation for natural disasters.

The CRC receives information relating to forecasting/warning of a natural calamity for India Meteorological department [IMD] or from central water Commission of Ministry of Water resources on a continuing basis.

The Ministries/Departments/Organizations concerned with the primary and secondary function relating to the management of disasters include: India Meteorological department, Central Water Commission, Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, Ministry of Rural development, Ministry of Urban Development, Department of Communication, Ministry of Health, Ministry of Water Resources, Ministry of Petroleum, and department of Agriculture &cooperation. Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of social Justice, Department of women and child development, Ministry of Environment and Forest, Department of Food. Each Ministry/Department/Organization nominate their model officer to the crisis management Group chaired by Central Relief Commissioner. The nodal officer is responsible for preparing

Emergency Support Function Plan for managing disasters.

- The chief minister of the state who shall be the chairperson
- Other members not exceeding eight to be nominated by the chairperson of the state authority
- The chairperson state executive committee ,Ex office
- The chairperson of the state authority may designate one of the members nominate under clause[b] of subsection [2] to be the vice chairperson of the state authority.
- The chairperson of the state executive committee shall be the chief Executive officer Of state authority office

4.2 Disaster management organization structure in District Level

The following institutional arrangements have been made to enhance the capacity of the district administration in the implementation of disaster preparedness & response to the various type of disaster especially recurring disasters and their vulnerability the hierarchy of various committees set up to activate the implementation mechanism are given here under: District Disaster Management Authority: - The government vide notification *RDG.32/2005128* shall comprise of the following members-:

Sl No	Members	Designation
1	Deputy Commissioner of the District	Chairperson
2	President of the Zilla Panchayath	Co-Chairperson
3	Additional Dy. Commissioner of the District	Member Secretary
4	Chief Executive Officer of Zilla Panchayath	Member
5	Superintendent of Police	Member
6	District Health & Family Welfare Officer	Member
7	Executive Engineer, Panchayatraj Engg Dept	Member
8	Joint Director of Agriculture	Member

4.3 District Crisis Management group - (CMG)

Each Nodal officer will establish a Crisis Manangement Group for dealing with the crises which fall within the ambit of its responsibility. The Crisis Manangment Group will be responsible for dealing with a Crisis situation and for reporting all developments to the District Crisis Manangment committee (DCMC) and Seeking its directions and guidance as and when necessary. DCMC would be apex body of high level officials of the Government of India for dealing with a major crisis which has serious or national ramifications. The composition of the Committee would be as follows:

The Environmental (Protection) act, 1986 was promulgated to provide the protection and improvement of environment and for the matters connected therewith. To achieve the object and goals of the said act, various rules have been framed. The district crisis group formulated under

1.	Deputy Commissioner Chikkamagaluru	:	Chairman	08262-230401	8971860808
2.	Additional Dy. Commissioner Chikkamagaluru	:	Emergency Officer	08262-235336	9480267013
3.	Superintendent of Police, Chikkamagaluru		Member	08262-230403	9480805101
4.	District Commandant Home guards and civil Defence, Chikkamagaluru	:	Member	08262-220379	9902211424
5.	Chief Fire Officer Chikkamagaluru	:	Member	08262-220199	9901120934

6.	District Health & Family Welfare Officer Chikkamagaluru	:	Member	08262-220429	9449843045
7.	Environmental Officer, Chikkamagaluru	:	Member	08262-221694	9448318887
8.	Commissioner, City Muncipal, Chikkamagaluru	:	Member	08262-232272	9972342742
9.	RTO, Chikkamagaluru	:	Member	08262-220366	9449864018
10.	Executive Engineer Panchayatraj Engg Dept. Zilla Panchayath Office, Chikkamagaluru	:	Member	-	9480860103
11.	Senior Asst Director, Information Department Chikkamagaluru	:	Member	08262-231249	9448767033
12.	Joint Director of Agriculture Chikkamagaluru	:	Member	08262-220494	8277930890
13.	Deputy Director, Animal Husbandry And Veterinary Services, Chikkamagaluru	:	Member	08262-232392	9448422004
14.	Executive Engineer PWD Chikkamagaluru	:	Member	08262-234028	9481160113
15.	Asst Commissioner, Chikkamagaluru		Member Secretary	08262-230527	9480783686
16.	Asst Commissioner, Tarikere		Member Secretary	08261-222220	9448263897

4.4 District Disaster Management Committee and Task Forces

District Disaster Advisory Committee:- The district disaster Advisory Committee (DDAC) is hereby constituted vide Notification NO:DPRB/15/2003/162 in order to assist the DDM Committee and to make it more efficacious in its functionality, The DDAC is comprised of the following members and is vested with the functions indicated herein below:-

The functions the Committee shall be

- To advise on all matters relating to the disaster management i.e. pre-disaster, during disaster and post disaster operation
- To seek further advise and interaction at the national and international level in all matters relating to disaster management.
- To advise adoption of safe building codes in the matter of building /house construction in all the villages in the District.

4.5 Incident Response System [IRS]

The guidelines on the Incident Response system [IRS] ARE ISSUED BY THE National disaster Management Authority [NDMA] under section 6 of the DM Act, 2005 for the effective efficient and comprehensive management of disasters in India. The vision to minimize loss of life and property by strengthening and standardizing the disaster response mechanism in the country. Through India has successfully managing the disasters in the past, there are still a number of shortcoming which need to be addressed. The response today has to be far more comprehensive, effective, swift and well planned based on well-conceived response mechanism.

In the view of the provision of the DM act, 2005, NDMA felt that authorities Guidelines on the subject, with necessary modification to suit the Indian administrative setup, were essential. To meet this need, a core group of experts was constituted and four regional consultation workshops were conducted.it was ensured that the representatives of the state government and MHA participate and their views given due consideration. Training institute like that LSBNNA, NIDM and various RTIs /ATIs along with National core trainers also participated. The adaption of the ICS by the other countries was also examined. The draft prepared was again sent to all states .UTs and their final comments were obtained and incorporated .A comprehensive set of guidelines has thus been prepared and is called the Incident **Response system [IRS].**

4.6 Powers and Functions of District Authority:-

[1]The District Authority shall act as the district planning; coordinating and implementing body for disaster management and take all measures for the disaster management in the district in accordance with the guidelines laid down by the National Authority as the State Authority.

[2]Without Prejudice to the generality of the provisions of sub-sections

- The district authority may-prepare a disaster management plan including district response plan for the district.
- Coordinate and monitor the implementation of the National policy, state policy, National plan, State plan and District plan.
- Ensure that the areas in the district vulnerable to disasters are identified and measures for the prevention of disasters and the mitigation of its effects are undertaken by the departments of Government at the District level as well as by local authorities.
- Ensure that the guidelines for prevention of disasters, mitigation of its effects, preparedness and response measures as laid down by the national authority are followed by the all departments of government at the district level and the local authorities in the district;
- Give direction to the different authorities at the district level and to local authorities to take such other measures for the prevention or mitigation of disasters as may be necessary;

- Lay down guidelines for prevention of disaster management plans by the department of the Government at the district level for purpose of integration of measures for prevention of disasters and mitigation in their development plans and project and provide necessary technical assistant thereof;
- Monitor the implementation of measures referred to in clause.
- Review the state of capabilities for responding to any disaster of threatening disaster situation in the district and give direction to the relevant departments or authorities at the district level for their up gradation and may be necessary.
- Review the preparedness measures and give directions to the concerned departments at district level or other concerned authorities where necessary for bringing the preparedness measures to the levels required for responding effectively to any disaster or threatening disaster situation.
- Organize and coordinate specialized training programmers for different levels of officers, employees and voluntary rescue workers in the district.
- Facilitate community training and awareness programmers for prevention of disaster and mitigation with the support of local authorities, governmental and nongovernmental organization.
- Setup, maintain, review and upgrade the mechanism for early warning and dissemination of proper information to public.
- Prepare, review and update district level response plan and guidelines.
- Coordinate response to any threatening disaster situation or disaster.
- Ensure that the departments of the Government at the district level and local authorities and prepare their response plan in accordance with the district response plan.
- Lay down guidelines for, or give direction to, the concerned department of the Government at the district level or any authorities within the local limits of the district to take measures to respond effectively to any threatening disaster situation or disaster.
- Advise, assist and coordinate the activities of the Department of the Government at the district level, statutory bodies and other governmental and non-governmental organizations in the district engaged in the disaster management;
- Coordinate with and give guidelines to local authorities in the district to ensure that measures for the prevention or mitigation of threatening disaster situation or disaster in the district are carried out promptly and effectively.
- Provide necessary technical assistance or give advice to the local authorities in the district for carrying out their functions;
- Review development plans prepared by the departments of the Government at the district level, statutory authorities or local authorities with a view to manage necessary provisions there in for prevention of disaster or mitigation.

- Examine construction in any area in the district and, if it is opinion that the standards for prevention of disaster or mitigation laid down for such construction is not being or has been not followed, may direct the concern authority to take such action as may necessary to secure compliance of such standards;
- Identify building and places which could, in the event of any threatening disaster situation or disaster.be used as relief centers or campus and make arrangements for water supply and sanitation in such building or places.
- Establish stockpiles of relief and rescue materials or ensure preparedness to manage such materials available at the short notice.
- Provide information to the state authority relating to different aspects of disaster management;
- Encourage the involvement of non-governmental organization and voluntary social-welfare institution working at the grassroots level in the district disaster management;
- Ensure communication system are in order, and disaster management drills carried out periodically;
- Perform such other function as the State Government or State authority to assign to it or as it deems necessary for disaster management in the District.

Chapter 5
Communication and Emergency Contact Details

5.1.District Emergency Operation Centre(DEOC)

1	**DC Office**	**08262-238950**	deo.cmagalur@gmail.com
2	**Emergency control room No**	**1077**	dcckmlr@gmail.com

5.2.Control Room Established in the District

Taluk	Control room no
Chikmagalur	08262-231392
Mudigere	08263-220204
Shringeri	08265-250135
Koppa	08265-221047
Narasimharajapura	08266-220128
Kadur	08267-221040
Tarikere	08261-222259

5.3.Fire station Establishment in the District

5.3.1 Fire Station Information

S. No.	Name of the District Hq/Taluk/Municipality	Number of the fire station	Telephone Number	Disposition of Vehicle & Pumps	Disposition of Man Power
1	Chikkamagalur	1	08262-220199	3	23
2	Kadur	1	08267-221800	2	17
3	Koppa	1	08265-222101	2	13
4	Mudigere	1	08263-221101	1	12
5	Narasimharajapura	1	08266-220666	1	14
6	Sringeri	1	08265-251555	1	14
7	Tarikere	1	08261-223700	2	16

5.4 Earth moving and Road cleaning equipments:

Taluk	Type of Equipment	Contact Person and address	Telephone Offices/ Res.
Chikkamagalur	JCB	Krishne Gowda	7760049295
Chikkamagalur	JCB	Charudath UG	9964024739
Chikkamagalur	JCB	Sathish	9276508000
Koppa	JCB	Eshan MR	9448341122
Koppa	JCB	Shivananda US	9449498529
Mudigere	JCB	Kishore Kumar	9448658452
NR Pura	JCB	Krishnamurthy	9986016193
Sringeri	JCB	Nagesh S	9449138327
Sringeri	JCB	Sumathi	9481394420

5.5 Details of Swimmers in Chikkamagaluru district Home Guards

Sl. No.	Name of the Home Guard	Unit	Mobile No.
1	K.C. Mahesh	Sringeri	9481622497
2	H.B. Chandrashekar	Tarikere	9902267387
3	Denendra D	Tarikere	9449413235
4	Nanjundappa P	Tarikere	9900248056
5	C. Umesh	Kadur	8892930930
6	B.R. Raghu	Kadur	8105930317
7	K. Ananda	Lingadahalli	8105444727
8	T. D. Chethan	Chikkamagaluru	9481691907
9	N. Lokesh	Chikkamagaluru	9611533026
10	Thirimakaswamy D.M.	Chikkamagaluru	9739090991
11	C.E. Saganaiah	Chikkamagaluru	8710922571
12	Bhaskar	Balehonnur	9480654757
13	Paramesh G. M.	Kalasapura	9740935111
14	Eshwara G. M.	Kalasapura	9945525670

Sl. No.	Name of the Home Guard	Unit	Mobile No.
15	Ravi K.K.	Kalasapura	8762934496
16	Vinod Kumar K.M.	Kalasapura	8152963513
17	Chandrashekara C. B.	Kalasapura	8497888213
18	Chandrashekar C.N.	Kalasapura	9591029766
19	Rangaswamy S.	Kalasapura	9611695151
20	Lava K.R.	Kalasapura	8970757136
21	A.P. Paramesh	Mudigere	8762434697
22	M. R. Sandeep	Mudigere	9980935972

5.6. Police station Establishment in the District

SL. NO.	NAME OF THE PS	STD	PHONE NO.S	MOBILE NO.S
1	TOWN PS	08262	235333	9480805145
2	BASAVANAHALLI	08262	222102	9480805148
3	RURAL PS	08262	220588	9480805147
4	TRAFFIC	08262	222956	9480805146
5	ALDUR	08262	250041	9480805149
6	MALLANDUR	08262	248222	9480805171
7	MUDIGERE	08263	220333	9480805150
8	BANAKAL	08263	232249	9480805151
9	GONIBEEDU	08263	240117	9480805152
10	BALUR	08263	245111	9480805153
11	KOPPA	08265	221027	9480805154
12	HH PURA	08265	274158	9480805155
13	JAYPURA	08265	245245	9480805172
14	NR PURA	08266	220129	9480805157
15	BALEHONNUR	08266	250666	9480805158
16	KALASA	08263	274877	9480805160
17	KUDREMUKA	08263	234169	9480805159
18	SRINGERI	08265	250150	9480805156
19	TARIKERE	08261	222222	9480805161
20	LINGADAHALLI	08261	254636	9480805163
21	LAKKAVALLI	08261	239446	9480805162
22	AJJAMPURA	08261	245133	9480805164
23	BIRUR	08267	255656	9480805165
24	YAGATI	08267	240033	9480805166
25	KADUR	08267	221333	9480805167
26	SAKARAYAPATNA	08267	244044	9480805168
27	SINGATAGERE	08267	235520	9480805169
28	PANCHANAHALLI	08267	259533	9480805170
29	WOMEN PS	08262	232333	

SDPO OFFICE & OFFICER'S PHONE NO'S	
SDPO CKM	08262 222836 9480805120
SDPO KOPPA	08265 221285 9480805121
SDPO TKE	08261 222266 9480805122
CIRCLE OFFICE & OFFICER'S PHONE NO'S	
CPI TOWN	08262 228120 9480805130
CPI RURAL	08260 220800 9480805131
CPI MDG	08263 220999 9480805132
CPI KOPPA	08265 221127 9480805133
CPI N R PURA	08266 220038 9480805134
CPI KMK	08263 254399 9480805135
CPI TKE	08261 222690 9480805136
CPI BRR	08267 255890 9480805137
CPI KDR	08267 222266 9480805138

5.7 MESCOM Establishment in the District

URBAN SUB DIVISION, CHIKAMAGALUR:				
1	Chikamgalur-1	Assistant Engineer	08262-235566	9448289482
2	Chikamgalur-2	Assistant Engineer	08262-235566	9448289483
3	Chikamgalur-3	Assistant Engineer	08262-229813	9448289484
RURAL SUB DIVISION, CHIKAMAGALUR:				
1	Chikamgalur-4	Junior Engineer	08262-222421	9448289485
2	Chikamgalur-5	Junior Engineer	08262-222421	9448289492
3	Chikamgalur-6	Junior Engineer	08262-222421	9448998789
4	Kalasapura	Assistant Engineer		9480833046
5	Mugthihalli	Junior Engineer		9480880535
Aldur SUB DIVISION:				
1	Aldur	Assistant Engineer	08262-250087	9448289486
2	Saragodu	Junior Engineer		9480880534
3	Haandi	Junior Engineer		9480880543
4	S.M.Pete	Assistant Engineer		9480880542
MUDIGERE SUB DIVISION:				
1	Mudigere Town	Assistant Engineer	08263-222080	9448289478
2	Banakal	Junior Engineer	08263-232207	9448289489
3	Jannapura	Junior Engineer	08263-230207	9448289538
4	Daradahahalli	Junior Engineer		8277882816
Kalasa SUB DIVISION:				
1	Kalasa-1	Assistant Engineer	08263-274425	9448289490
2	Kalasa-2			
3	Baloor	Junior Engineer		8277882815

5.8 SDRF Contact Details

SDRF control room number : 080-22971518

Name of the officer	Designation	Mobile number
Shri.Ramesh Boragi	Deputy Commandant	9448755650
Shri.Arun D.V	Police sub Inspector	9663424324
Shri.Harish B.K	Police sub Inspector	9538360007
Shri.M.N Prakash	Deputy Commandant Driver	7349457790

5.9 Contact Numbers of Important officers

Sl. No.	Designation	Office No.	Mobile No.
1	Deputy Commissioner	230401	8971860808 9449030402
2	ADC	235336(F) 231499	9480267013
3	AC Chikkamagaluru	230527	9480783686
4	AC Tarikere Tah.Gr.II	08261 222220	9448263897
5	Tahsildar Chikkamagaluru Tahsildar-2	08262 231392	8495935494
6	Tahsildar Tarikere Thasildar-2 Shr.	08261 222259	7829893177
7	Tahsildar Ajjampur	08261 245090	9986644445
8	Tahsildar Kadur Tah.Gr.2.	08267 221240	9686464659 9449095583
9	Tahsildar Koppa	08265 221047	9482278910
10	Tahsildar Sringeri	08265 250135	9482278910
11	Tahsildar Mudigere	08263 220204	9449701264
12	Tahsildar, Narasimharajapur	08266 220128	9449494111

FOOD AND CIVIL SUPPLIES DEPARTMENT

Sl.No.	Designation	Office No.	Mobile No.
1	DD Food	295058	7676125932
2	Asst.Dir.Food		
3	Food Inspector		9448346074
4	I/c. DM KSFC	235711	
5	Dist. Food Safety Officer	237225	9741642474

REGISTRATION DEPARTMENT

Sl.No.	Designation	Office No.	Mobile No.
1	Dist.Registrar	232380	9844526862
2	Sub Registrar CKM D.R. Office		9449417562

ZILLA PANCHAYAT

Sl.No.	Designation	Office No.	Mobile No.
1	CEO ZP	220140	9480860000
2	DS-1 ZP	221066	9480860001
3	DS-2 ZP	220280	9480860007
4	CPO ZP	220792	9480860004
5	PD ZP	220288	9480860002
6	CAO ZP	220989	9480860003
7	DIO NIC	220218	8105746468
8	Kundukorathe Nirvahana Pradikari , ZP	220104	9448783400

POLICE DEPARTMENT

Sl. No.	Designation	Office No.	Mobile No.
1	SP CKM	230403	9480805101
2	Addl.SP CKM	234099	9480805102
3	Dist. Home Guard Comdnt.	220379	9902211424
4	DAR- RPI DY.SP (Town) DY.SP(Tarikere) DYSP Koppa Inspector	222150	9480805106 9480805120 9480805122 9480805121 9480805109
5	Basavanahalli Station	222102	
6	Town PC (Strike)	235333	9480258626
7	Asst. Suptd. Sub Jail, CKM Jailer,	222784	8722939130 9980334428
8	Dist. Fire Station Officer	220199(101)	9901120934
9	SB Branch		9611870077
10	Police Control Room-100	230540/234608/ 235608	
11	HC Town (SB Branch)	235400	8105681255
12	Lokayuktha DYSP	230179	
13	I/c.ACB DYSP-Hasssan	222222	9480806223
14	ACB Inspector		8660565005

PWD/PRED/RWS

Sl.No	Designation	Office No.	Mobile No.
1	EE PWD	234028	9481160113
2	T.A. PWD Office. CKM		9448340942
3	AEE PWD-CKM	235416	9886787545
4	AE PWD CKM Office.		9986456832
5	AEE Kadur I/c.EE PRED-9480860108	220936	9480860012
6	AEE PRED CKM		9480860103
7	EE RWS		9480860010
8	I/c.EE PMGSY	9448940130	9449599470[G]
9	TA PMGSY		
10	AEE Rural Water Supply Koppa/Srng.		9480860128
11	AE PMGSY, Kadur/CKM/MDG	228070	
12	AEE PWD Mudigere		9448002144
13	AEE PWD Tarikere		9448554927
14	AEE PWD Kadur		9448812926
15	AEE PWD Koppa (Srng.&NRpura)		9449759199

MAJOR IRRIGATION

Sl. No.	Designation	Mobile No.
1	CE Gorur Maj.Irrign.	9483510818
2	SE KNNL Gorur	9901000989
3	EE Malalur AEE Yagachi Project	9448332309 9448401321

STATE/NATIONAL HIGHWAY

Sl. No.	Designation	Office No.	Mobile No.
1	EE KSHIP Davanagere EE.KSHIP,Shimoga EE NH DN.MNG. EE N.H. MNG	 08182-255042 0824-2450415	9480082696 9880078910 9448403103
2	SLAO NH-206	08182 220020	9449945000
3	AEE NH 206 Kadur		9449809686
4	AEE NH 13 Sringeri		8217347502
5	EE NH Hassan AEE NH 173 Sub.Dn.Sakaleshpur (Mudigere Range		9620149825 9886892736
6	NH Engineer (Mudigere)		9980051122
7	PD NHAI Chitradurga Manager (Tech)NHAI Chit PD NHAI Tumkur-SMG Sec. NH-206)	08194-202235, 223344, 221929(F)	9894597777 9449822783 9482161975

MESCOM/KPTCL

Sl.No.	Designation	Office No.	Mobile No.
1	EE Mescom	222393	9448289455
2	EE Mescom (Koppa Dn.		9480880480
3	Mescom		9448289482
4	AEE Mescom (Rural) AEE Mescom (Town)		9448289509 9448289457
5	EE Mescom Kadur	221600	9448289560
6	SE Mescom Circle Ckm EE Mescom Circle,	233312	9480833031 9480833037
7	SE KPTCL Shimoga EE KPTCL Major works SMG office, & Ckm works		9448365057 9448071515
8	AEE KPTCL CKm		9448365425
9	MD Mescom MNG	0824-2885700	9448289400
10	SE Mescom SMG.	233311	9448289444

HEALTH

Sl.No.	Designation	Office No.	Mobile No.
1	DHO CKM	220429	9449843045[G]
2	DHO Office		9980274374
3	Dist.Surgeon	235213	9448184024
4	Physician		9449620571
5	Physician		9448004817
6	Drug Inspector	236156	9448154368
7	Ayush	220722	9845677789

CO-OPERATION

Sl.No.	Designation	Office No.	Mobile No.
1	DRCS	220732	9448775992
2	I/c.MD DCC Bank	235573	7337774888(G)

CDA/TOWN PLANNING

Sl.No.	Designation	***Office No.***	***Mobile No.***
1	CDA Commr.	220712	9448427411
2	Town Planning Member		9448228974 9008879025
3	AD Town Planning Town Planner Town Planning Member	235937	9019435827 9964483043 9448228974

PROJECT DIRECTOR/ULBS

Sl.No.	Designation	Office No.	Mobile No.
1	PD DUDC	239010	9880531555
2	AEE PD		9448656976
3	CO Tarikere	222233	8904038648
4	CO Kadur	221221	9341468124
5	I CO Birur	255888	9845799783
6	CO Mudigere	220257	9481072682
7	CO Koppa	221021	9964200928
8	CO Sringeri	250121	9482195797
9	CO NR Pura	220121	9481653370
10	CMC Commissioner	232272	9972342742
11	AEE CMC CKM	234032	
12	I/C. AEE +AE CMC CKM		9845301760
13	JE CMC		9448790007

SOCIAL/BCW/BCM/ITDP

Sl.No.	Designation	Office No.	Mobile No.
1	DD SWO	220780	9480843028
2	DO BCW Gazetted Manager,	220922 228382	9448025755 9945861509
3	DO Minority Wel.Devt.	220065 220036	9964493180
4	PCO ITDP –	220779	8310378718
5	Manager ITDP Office		9482973877
6	DM SC/ST (Ambedkar)/Valmiki ST Dev.Corp.	220717	9242112983
7	DM Devrajurs/Vishwakarma Dev.Corp.	221315	9448554702

WOMEN & CHILD

Sl.No.	Designation	Office No.	Mobile No.
1	I/c. DD. W&C	220930	9448555002[G]
2	Dist.Disabled Officer	228171	8860221126
3	CW Disabled Office		8762714730
4	DDRC	238417	9448008417
5	Manager DDW&C Office		9448759249
6	DCPO, jilla Makkala R.G.	232019	9535565761
7	DDW&C stall		9449425275
8	Ashwini Senior citizen cell	1098	9480048741 8495826518

EDUCATION

Sl.No.	Designation	Office No.	Mobile No.
1	DDPI	221400	9448999334
2	EO DDPI Office		9902393253
3	Subject Inspector		9242931391
4	DDPU	232128	9449083291
5	BEO CKM-	235960	9480695129
6	DYPC SSA	220204	9448999391
7	Dy.Co-ordinator RMSA	-‘’-	
8	Principal, ITI		9880539739
9	EO Mid Day Meals	221046	9480835600
10	Principal DIET	222832	9448999364
11	Principal IDSG	220464	9449665569
12	Principal Govt. Jr. College		9448940073
13	Principal, Women Govt.Ist Grade college,ckm	233871	9449207991
14	Principal JNV Balehonnur	250604	09447521433

FOREST

Sl.No.	Designation	Office No.	Mobile No.
1	CCF	229161	9980870771
2	DFO CKM {236888 {R} ACF CKM Sub.Dn. ACF Mudiere Sub.dn. DFO (Working Plan). DFO K.Forest.Deve.Corp. ACF KFD	238800 238086(F)	9449632508 9448026337 8248489989 8608707249 9480579452 9481236649
3	DFO (SF)	238806	9483842581
4	CF & Dir.Bhadra Tiger Reserve ACF Bhadra wild life	234904	9480164367 9448639533
5	DFO Karkala 08258	298183	9480807646
6	ACF Lakkavalli		9901045460
7	ACF Karkala (WL)		9449781555
8	RFO Karkala		9481000555
9	DFO Bhadravathi 08282	266355	9448417027
10	DFO Koppa (08565) Town Forester, Ckm	221266	9535507431 8050505525

TRANSPORT

Sl.No.	Designation	Office No.	Mobile No.
1	RTO CKM 9071361460	220366	9449864018(G)
2	RTO Inspector,CKM		9535264343
3	RTO Inspector,CKM		9845962255
4	RTO Inspector, Tarikere		9480702689
5	RTO PA		9448756174

TOURISM

Sl.No.	Designation	Office No.	Mobile No.
1	AD Tourism	228493	7996668382
2	Tourism Officer		9880028718

INDUSTRIES

Sl.No.	Designation	Office No.	Mobile No.
1	JD DIC - 6362665903(whatasap	220921	9448965403
2	I/c.DD		9900261382
3	DD KV & VI (ZP Unit)		9448657374
4	Spl.DC. KIADB. Bangalore.		9845040168
5	Dev.Offi. KIADB Hassan		9686599666

AGRICULTURE

Sl.No.	Designation	Office No.	Mobile No.
1	JD Agri.	220494	8277930890(G)
2	Agrl.Dept.		8277930894
3	D.D. Agri. Ckm.		8277930891
4	DD Agri. Tarikere		8277930892
5	DD I/C. AD APMC	220526	

EXCISE

Sl.No.	Designation	Office No.	Mobile No.
1	DC. Excise	221269	9449597202
2	Dy.Suptd.of Excise		9449597203
3	AC Legal Metlorgy (W&M)		9448087802

KSRTC

Sl.No.	Designation	Office No.	Mobile No.
1	I/C.DC, KSRTC	229869	7760990400
2	DTO		7760990402
3	Depot Manager KSRTC		7760990413
4	KSRTC Enquiry		7760990419

GEOLOGIST – G.W & MINES

Sl.No.	Designation	Office No.	Mobile No.
1	Geologist,	221456	9611479464
2	(Groundwater)		9844618902
3	Sr.Geologist(Mines)	220039	9972993496
4	Geologist		9901270602

INFORMATION

Sl.No.	Designation	Office No.	Mobile No.
1	Information Officer	231249	9448767033 9480841246
2	AD Information Dept.		9481669285

ANIMAL HUSBANDRY

Sl.No.	Designation	Office No.	Mobile No.
1	DD. AH & VS	232392	9448422004
2	Vet. Dr.		9448668377
3	Manager, Vet. Office		9448244313
4	Vet.Dr.		9448665789
5	TA. Vet. Office,		9448554643
6	I/c.J.D. Amrthmahal Kaval(Birur)	08267-255126	7349255376
7	D.D. Amrthmahal Kaval,Ajjampur	08261-245122	9480066100

HORTICULTURE

Sl.No.	Designation	Office No.	Mobile No.
1	DD. Horticulture	235334	9448999222
2	SADH		9449197743
3	HQA		8277078696
4	A.H.O.		9739496414
5	Deen, Horticulture (RRS)	08263 228152	9480838961

SERICULTURE

Sl.No.	Designation	Office No.	Mobile No.
1	I/c. DD. Sericulture	220007	9141886750

LABOUR

Sl.No.	Designation	Office No.	Mobile No.
1	ALC (Labour Dept)	221586	8147604576
2	ESI Br.Manager.		9391959642
3	PD Child Labour		9482544430
4	Labour Officer-DN-1		9480979421
5	Sr.Labour Inspector ckm		9449204434
6	Labour Inspector		7795281597

FISHRIES

Sl.No.	Designation	Office No.	Mobile No.
1	AD Fishries	220266	9448655014

STATISTICAL

Sl.No.	Designation	Office No.	Mobile No.
1	DSO	221651	9448658179

POLLUTION BOARD

Sl.No.	Designation	Office No.	Mobile No.
1	Dist.Environmental Officer(Polln.Brd.)	221694	9448318887
2	Asst. Env.Officer		9901510123

BSNL

Sl.No.	Designation	Office No.	Mobile No.
1	GM BSNL.	235777	9448010889
2	DGM	233700	9446451099
3	SDE [EB Sec.]BSNL	235500	9449858909
4	BSNL DE Commercial	231888	9449853060
5	BSNL. (Repair)		8277199696
6	BSNL staff		9448493053
7	Complaint Section	230198	
8	Compln. Sec.	230777	

MINOR IRRIGATION

Sl.No.	Designation	Office No.	Mobile No.
1	EE MI Hassan		9448178583
2	EEMI Shimoga (TRK.Kop.Srng.Nrp)		8971732049
3	MI Secy.BNG		7353303328
4	AEE MI CKM AEE MI Tarikere	230202	9448251978 8880753240 9663088013
5	AE MI Tarikere		9591225836
6	AE MI ckm		9481155557
7	CE UTP Shimoga (Sringeri Section (KNNL)	08182 256749	9449088441
9	CE Upper Bhadra Project Chitradurga 08194-	08194-230032 230018(o)	
Sl.No.	Designation	Office No.	Mobile No.
10	EE UB Tarikere pacakage-4 AEE Upper Bhadra Tarikere		9343633605
11	EE Upper Bhadra Dn.Ajjampur		9448013073
12	AEE Lift irrigation BRP		9448836749
13	SE upperbhadra (Lift Irrgn) Tarikere - Shimoga	256338 256331	9480498973

RAILWAYS

Sl.No.	Designation	Office No.	Mobile No.
1	EE CKM-SKLSPR		9731665177
2	DRM Mysore	0821-2514660	9731667000
3	GM Hubli	0836-2360888	

COFFEE BOARD

Sl.No.	Designation	Office No.	Mobile No.
1	DD Coffee Board	221619	9449021620
2	Jr. Liasion Officer Cof.Brd.		9449591754

KEMMANGUNDI

Sl.No.	Designation	Office No.	Mobile No.
1	SPL.Officer K.Gundi	08261 -237126	9448424524
2	SDA K.Gundi		9449138072

Chapter 6

HAZARD VULNERABILITY, CAPACITY AND RISK ASSESSMENT (HVCRA)

6.1 INTRODUCTION

Vulnerability assessment deals with the socio-economic vulnerability, housing vulnerability and environmental vulnerability. Chikkamagaluru is a highly Naturally Diversified and 31% of District flora is endemic to western ghats showing a rich endemically diversified district of Karnataka State and is exposed to multiple hazards, which may result in disaster if they are not controlled properly. In this section, effort has been made to identify all possible hazards in the district. These hazards have been studied further in subsequent chapters to know their possible impact during any disaster. The various hazards that are possible in the Chikkamagaluru have been broadly categorised as follows.

METEOROLOGICAL DISASTERS

- Cyclones / Storm
- Flood
- Drought
- Lightening

GEOLOGICAL DISASTERS

- Earthquake
- Forest Fire
- Land Slide

INDUSTRIAL / CHEMICAL DISASTERS

- Toxic Release
- Fire / Explosion

BIOLOGICAL DISASTERS

- Epidemic
- Food Poisoning

MISCELLANEOUS DISASTERS

- Road Tanker Accident
- Cattle disease
- Bomb Threat
- Rail Accident
- Air craft crash
- Pipeline failure
- Building collapse

Hazard Vulnerability, Capacity and Risk assessment is carried out by using various Participatory Risk Appraisal Tools such as Resource mapping, Seasonality chart, vulnerability mapping etc. Following is the minimum information required.

➢ Flood

There are five major rivers flowing in the district namely Tunga, Bhadra, Hemavathi, Vedavathi and Netravathi Rivers. Hemavathi and Bhadra rivers flows through Mudigere and Sringeri taluk, Tunga, Bhandra and Nethravathi rivers flows through Koppa, Sringeri and N R Pura Taluk. Due to Heavy rainfall in Mudigere, Koppa, Sringeri, N R Pura and some part of Chikkamagaluru taluk creates incidence of flooding.

Historically there have been incidences of floods in the low-lying areas along the major rivers especially Tunga, Bhadra and Hemavathi rivers. A separate flood disaster committee formed in the district under the aegis of the DDMA have identified the areas vulnerable to flood.

6.2 DETAILS OF TALUK WISE NODAL OFFICERS APPOINTED.

Sl. No	Taluk	Name and Designation of the Nodal Officer	Mobile No
1	Chikkamagaluru	Sri Hiremath, Deputy Secretary, Zilla Panchayath, Chikkamagaluru	9480860001
2	Kadur	Project Director, Zilla Panchayath, Chikkamagaluru	9480860002
3	Koppa	District Officer, Backward Classes Minority, Chikkamagaluru	9980014330
4	Mudgiere	District Social Welfare Officer, Chikkamagaluru	94808403028
5	N R Pura	Deputy Director, Horticulture, Chikkamagaluru	9448999222
6	Sringeri	Joint Director, Agriculture, Chikkamagaluru	9448357490
7	Tarikere	Deputy Director, Woman and Child Welfare, Chikkamagaluru	9480860003

6.3 DETAILS OF VULNERABLE AREAS IDENTIFIED IN THE DISTRICT

Taluk	Hobli	Grama Panchayath	Name of Vulnerable area	Approximate Population	Name of Safe Station
Sringeri	Kasaba	Vidyaranyapura	Kurubakeri, Matadagadde, Gandhi Maidana	200	Dr. V R GowriShankar Sabhangana, BCM Hostel Ginigini, Kanchinagara
	Kasaba	Menase	Kikre, Kelakoppa, Halandur, Magalu, Sulugodu, Gubbiga	75	Kikre School, Bennegudde School
	Kasaba	Kuthagodu	Kuthagodu, Vykuntapura, Shuntihaklu, Gundre, Bakurdi, Kochhavalli	30	Tekkur school, Vykuntapura school

	Kasaba	Addagadde	Malavalli, Magalabylu, Sindhuvalli, Golugodu, Thorehadlu, Maduhu, Hebbige, Malavalli Agrahara, Kavadi Agrahara, Ulavebylu	40	Kavadi school, Addagadde school, Ulavebylu school
	Kasaba	Vidyaranyapura	Vidyaranyapura, Harake, Yakkanahalla (Near Hegde residency) Kitlebylu	35	Dr. V R GowriShankar Sabhangana,
	Kasaba	Dharekoppa & Addagadde	Hagadur, Hoskere, Bovigadde, Anegunda, Malugodige, Kesarukodige, Hosur	40	Nallur school, Ulavebylu school, Melukoppa school
	Kigga	Begar	Begar Bridge near, Sasigoli Bridge near	50	Begar School, Hukkali school (Asanabalu)
	Kigga	Kere	Kelasheerlu, Melsheerlu (bridge near), Menasukodige, Horane, Korakanahalla, Taltar	100	Kerekatte School
	Kigga	Markal	Malur, Bennolli bridge near, Manibylu(Nemmar bridge near) Thoranagadde Bridge near	50	Koginabylu school, Sindodi school, Yadadalu school
	Kigga	Nemmar & Kere	Kuradamane, Sunkadamakki (hanging bridge near) Hemmige	25	Nemmarmakki school, Malnad school,

			(near bridge) MelSheerlu (near bridge)		Kerekatte school
Taluk	Hobli	Grama Panchayath	Name of Vulnerable area	Approximate Population	Name of Safe Station
Mudigere	Kalasa	Kalasa	Mummage	250	Ghps, Kalasa
			Abbugudige	250	Ghps, Kalasa
			Bedakki	200	Ghps, Kalasa
		Horanadu	Hebbale	2800	Ghps, Horanadu
		Samse	Balagallu	300	Ghps, Samse
			Karle (Kalakodu)	250	Ghps, Samse
			Biligal	100	Ghps, Samse
		Idakani	Holalu	80	Ghps, Idakani
		Marasanige	-	-	Ghps, Marasanige
		Thotadur	Tanudi (Kagganahalla)	500	Ghps, Balehole

Mudigere	Gonibeedu	Kirugunda	Uggehalli	647	Glps, Uggehalli
	Baluru	Javali	Javali	3129	Ghps, Javali
		Baluru	Baluru	2042	Ghps, Baluru
		Sunkasale	Sunkasale	3230	Glps, Sunkasale
	Banakal	Taruve	Taruve	2353	Ghps, Taruve
	Kasaba	Halemudigere	Halemudigere	25600	Ghps, Halemudigere
		Hesagal	Hesagal	8000	Ghps, Hesagal
Koppa	Kasaba	Narasipura	Narve,	418	G.H.P.S, Narve,
		Narasipura	R.D.Koppa,	180	G.H.P.S, Narve,
		Narasipura	B.G. Katte,	76	G.H.P.S, Narve,
		Narasipura	Belagola ,	121	G.H.P.S, Narve,
		Hirekodige	Bommalapura,	103	GHPS, Bommalapura,
		Bintravalli	Kuduregundi,	97	GHPS, Kuduregundi,
Koppa	Hariharapura	Bhandigadi	Bhandigadi,	300	GHPS Karangi , Hariharapura Hobli
		Hariharapura	Hariharapura,	150	Malleshaiahna Chatra,Hariharapura

Koppa	Hariharapura	Bhandigadi	Halmatturu,	67	GHPS, Halmatturu, Hariharapura Hobli
	Megunda	Guddethota	Kogre,	97	GHPS , Kogre,
		Guddethota	Meguru, Chitnamakki,	26	Ashrama Shale, Meguru,
Tarikere	Lakkavalli	Halasuru	Sompura	195	Chowltry, Rangenahalli
Chikka magaluru	Khandya	Kadavanthi	Bogase	150	Higher Primary School, Kadavanhi
			Kadavanthi	120	Higher Primary School, Kadavanhi
		Bidre	Dandi (byadigere)	120	Higher Primary School, Bidre
		Bidre	Ujjini Hosapete (Kardikhan Estate)	400	Higher Primary School, Bidre
		Huyigere	Kaskemane	80	Higher Primary School, Sangameshwara pete, Devadana
	Jagara	I D Peeta	Mahal	400	Teachers Quarters, I D Peeta
			Attigundi	350	Higher Primary School, Attigundi

Chikkamagaluru	Aldur	Doddamagaravalli	Kanchinkaldurga S T Colont	56	Government Model Higher Primary School, Aldur
			Belgodu S C Colony	124	Government Model Higher Primary School, Aldur
N R Pura	Balehonnuru	B Kanaburu	B Kanaburu	11136	Govt High School Balehonnuru
		Seethuru	Shedigaru	228	Govt Higher Primary School Seethuru
			Mallanduru	573	
		Aduvalli	Bannuru	2240	Govt High School Balehonnuru
			Megaramakki	710	
		Karkeshwara	Karkeshwara	2651	Govt Higher Primary School Karkeshwara
			Melpal		
		Magundi	Magundi	2143	Govt High School Balehonnuru
		Kanuru	Davana	512	Govt Higher Primary School Seethuru
			Sankse	855	
	Kasaba	Muthinakoppa	Byrapura	772	Govt Higher Primary School Muthinakoppa
			Mukthinakoppa	2382	
			Kanive	440	
			Konakere	502	
			K Kanaburu	828	
	Kasaba	Kadahinabylu	Vittala	563	Govt Higher Primary Pete School
			Soosalavani	418	
		Mensuru	Ravooru	605	
			Lingapura	901	
		Honnekudige	Shiragalale	654	
			Saluru	281	
			Sarya	306	

- **Drought**

Drought is a natural hazard that differs from other hazards since it has a slow onset, evolves over months or even years, affects a large spatial extent, and cause little structural damage. Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness. It is important to develop plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve.

In Chikkamagaluru District Kadur, Tarikere and some part of Chikkamagaluru taluk are drought affected areas and in the year 2018-19 Kadur taluk have been declared by state government. Drought conditions are due to deficit rainfall.

6.4 Incidents occurred in the year of 2019

Mudigere Taluk

Type of Hazards	Area affected Village Name	Impact on life	Livelihood	Loss of Human Life
Flood and Landslidings	Channahadlu, Hallikere, Balur	Whole village was affected due to the heavy damage to Kottigehara-Kalasa Main Road and faced severe difficulty for Livelihood and transport communication	150	-
Flood and Landslidings	Durgadahalli, Balige, Sunkasale, Kanivala, Halagadaka	The people of these villages were cut off from the mainstream due to major landslides	125	-
	Idakani, Yalandur	Villagers were faced heavy difficulty for their livelihood.	90	-
	Malleshanagudda, Yedur, Budhigundi		250	-
	Hemmakki	The people were affected because of the overflow of river Bhadra	70	-
	Bidirutala, Alekhan Horatti	These two villages adjoining Alekhan Hill were affected and lost their livelihood because of major landslides	225	-
	Uggehalli	The village was affected due to the rising water of river Hemavathi	40	-
	Attigere	Whole village was affected due to the raising water of river Hemavathi and faced severe difficulty for Livelihood	45	-

Flood and Landslidings	Baluru horatti	Human life loss	135	**2**
	Balur	Human life loss	145	**1**
	Jogannanakere	Human life loss	20	**1**
	Banahalli	Human life loss	25	**1**
	Halagadaka	Human life loss	20	**1**
	Marasanige	Human life loss	140	**1**
	Madhugundi	Human life loss	225	**1**

Chikkamagaluru Taluk

Type of Hazards	**Area affected** **Village Name**	**Impact on life**	**Livelihood (Persons)**	**Loss of Human Life**
Flood and Landslidings	Shiravase, Hadlugadde	The villages were affected because of landslides of Jogigudda	**60**	**-**
	Shiragola (Arishinagiri, Khodi, Karagadde) Shiravase	The villages were affected due to the rising water of river Bhadra	**55**	**-**
	Kuduvalli	Human life loss	**25**	**1**
	Togarihankal (Kambihalli)	Human life loss	**45**	**1**

N R Pura Taluk

Type of Hazards	**Area affected** **Village Name**	**Impact on life**	**Livelihood**	**Loss of Human Life**
Flood and Landslidings	Magundi	The villages were affected due to the rising water of river Bhadra	**110**	**-**
	B.Kanabur, Bannur, Byregudda, Theppadagundi, Madhuguni, Kanur, Balegadde		**350**	**-**
Electric Shock	Malurdinne	Human life loss	**35**	**1**

Kadur Taluk

Type of Hazards	Area affected	Impact on life	Livelihood	Loss of Human Life
Electric Shock	**Nidagatta**	Human life loss	**6**	**1**

6.5 Seasonality Hazards

6.5.1 Water and Climate related Disasters

Sl. No	Type of Hazards	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
1	Cyclone	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
2	Sunstroke	**N**	**N**	**N**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**	**N**
3	Drought	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**Y**
4	Flood	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**
5	Thunder and Lightening	**N**	**N**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**

6.5.2 Geological Related Disasters

Sl. No	Type of Hazards	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
1	Earthquake	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
2	Mining Fire	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
4	Land Slide	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**

6.5.3 Risk Assessment

Sl. No	Type of Hazards	Time of Occurrence	Potential Impact	Vulnerable areas
1	Flood	**August & September months of 2019**	4 villages of Chikkamagaluru taluk, 29 villages of Mudigere taluk and 6 villages of N R Pura taluk totally 1125 families were severely affected by heavy rainfall during August & September months of 2019. More than 75 Villages of Mudigere, Koppa, Sringeri & N R Pura & Chikkamagaluru Taluk were severely faced transportation and communication problems. More than 200 villages of Chikkamagaluru District were disconnected from Electricity and telecommunication.	**Mudigere Taluk** 1. Channahadlu 2. Hallikere 3. Balur 4. Durgadahalli 5. Balige 6. Sunkasale 7. Kanivala 8. Halagadaka 9. Idakani 10. Yalandur 11. Malleshanagudda Yedur 12. Budhigundi 13. Hemmakki 14. Bidirutala 15. Alekhan Horatti 16. Uggehalli **17.** Attigere 18. Baluru horatti 19. Balur 20. Jogannanakere 21. Banahalli 22. Halagadaka 23. Marasanige **24.** Madhugundi **Chikkamagaluru Taluk** 25. Shiravase 26. Hadlugadde 27.Shiragola (Arishinagiri Khodi Karagadde) 28. Shiravase 29. Kuduvalli 30. Togarihankal (Kambihalli) **N R Pura Taluk** 31. Magundi 32. B.Kanabur 33. Bannur 34. Byregudda 35. Theppadagundi 36. Madhuguni 37. Kanur 38. Balegadde

Sl. No	Type of Hazards	Time of Occurrence	Potential Impact	Vulnerable areas
2	Drought	Since, last 3 years Kadur Taluk, part of Tarikere & Chikkamagaluru taluk are facing severe drought due to very less rainfall	Complete Kadur Taluk all the small Marginal farmers and landlords are facing drasting drought. Majority of farmers faced very low crop Production even zero crops production. Villagers also facing heavy shortage of drinking water. Some part of Tarikere and Chikkamagaluru (two Hobli each) taluk are facing big shortage of rain for farming and even nearly 40 villages are facing shortage of drinking water.	**Drought Prone areas** **1.** Kadur Taluk 2. Some part of Kasaba, Amruthapura and Kudlur Hoblies of Tarikere taluk 3. Kasaba and Shivani Hoblies of Ajjampura taluk 4. Lakya Hobli and some part of Sakkarayapatna hobli of Chikkamgaluru taluk.
3	Sunstroke	April to june (Probability)	-	**Kadur, Tarikere and Ajjampura taluk**
4	Lightening	**July to October**		
5	Land Slide	**August 9th to August 30th**		**Mudigere, Koppa, Sringeri Taluk areas**
6	Stampede	**November and December**		**Bindiga, Bababudangiri**

6.5.4 Vulnerability Analysis: Infrastructure Vulnerability against Hazards

Sl.No.	Type of Hazard	Details of Damage	KM	No.	Extent in acres
1	Flood and Landslides	Road	988.86	0	0
2		Bridge	0	188	0
3		Tanks	0	56	0
4(a)		Power Supply -Poles	0	2078	0
4(b)		Power Supply -Transformers	0	41	0
4(c)		Power Supply -Lines	41.56	0	0
5		Telecom	0	34	0
6		Crop	0	0	31816.65
	Total		**1030.42**	**2397**	**31816.65**

Sl. No	Type of Hazard	Taluk	No.of Villages Power Supply Interrupted	No.of Poles Damaged	No of Transformers Damaged
1	Flood and Landslides	Chikkamagaluru	25	339	6
2		Mudigere	74	894	17
3		Sringeri	20	110	2
4		Koppa	45	245	3
5		N.R.Pura	38	171	8
6		Tarikere	29	174	2
7		Kadur	9	86	2
8		Ajjampura	2	62	1
		Total	242	41	2081

6.5.5 Road Accidents

Year	No. of accident	No. of Injured	No. of Deaths
2014	970	1549	206
2015	1036	1527	224
2016	958	1248	206
2017	997	1471	199
2018	902	1290	190
2019 up to October	710	945	207

6.5.6 Epidemic disease

Year	Name of the diseases	No. of people hospitalized
2014	Measles	2
	GE	21
	Enteric Fever	14
	Chickenpox	3
	Dengue Fever	7
	Gastro Enteritis (GE)	20
	Fever	21
	Chikungunya	12
2015	Food Poisoning	20
	Typhoid Fever	17
	Dengue fever	13
	Viral Hepatitis A	48
	Chikungunya fever	48
2016	Chicken Pox	12
	Food Poisoning	15
	Gastro Enteritis (GE)	23
	Chikungunya	8
	Measles	5
2017	Food Poisoning	136
	Chicken Pox	15
	Dengue Fever	18
	GE	7
2018	JE	3
	Mumps	53
	Cholera	31
	GE	72
2019	Food Poisoining	47
	Dengue Fever	45
	Dengue Fever (FIR)	17
	Suspected Diptheria	3

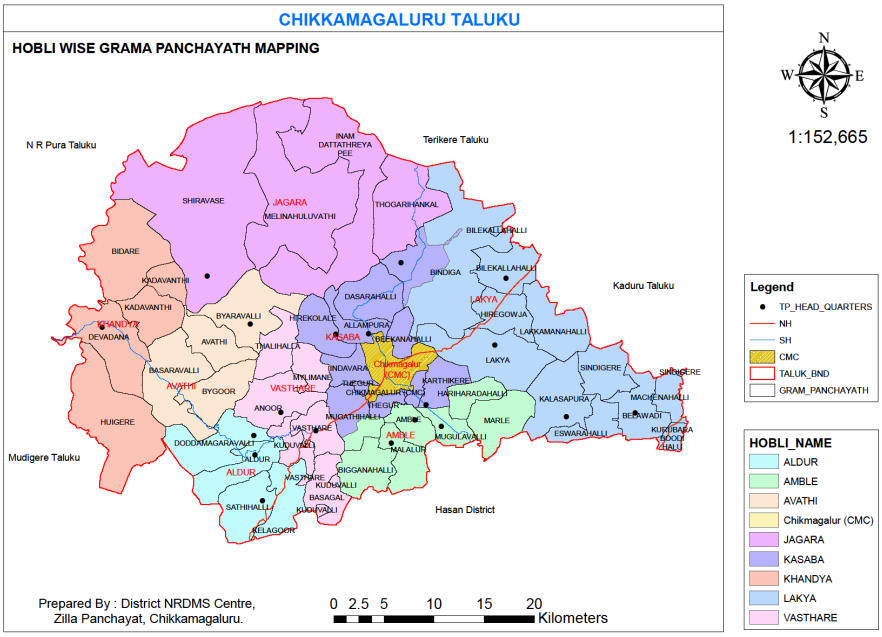
6.5.7 Man- Animal conflicts

Year	**No. of people affected**	**No. of animals dead**	**No. of people dead**	**Crop damaged (Extent in acres)**
2014-15	2	55	0	1276
2015-16	2	28	1	722
2016-17	0	12	1	919
2017-18	8	26	2	1229

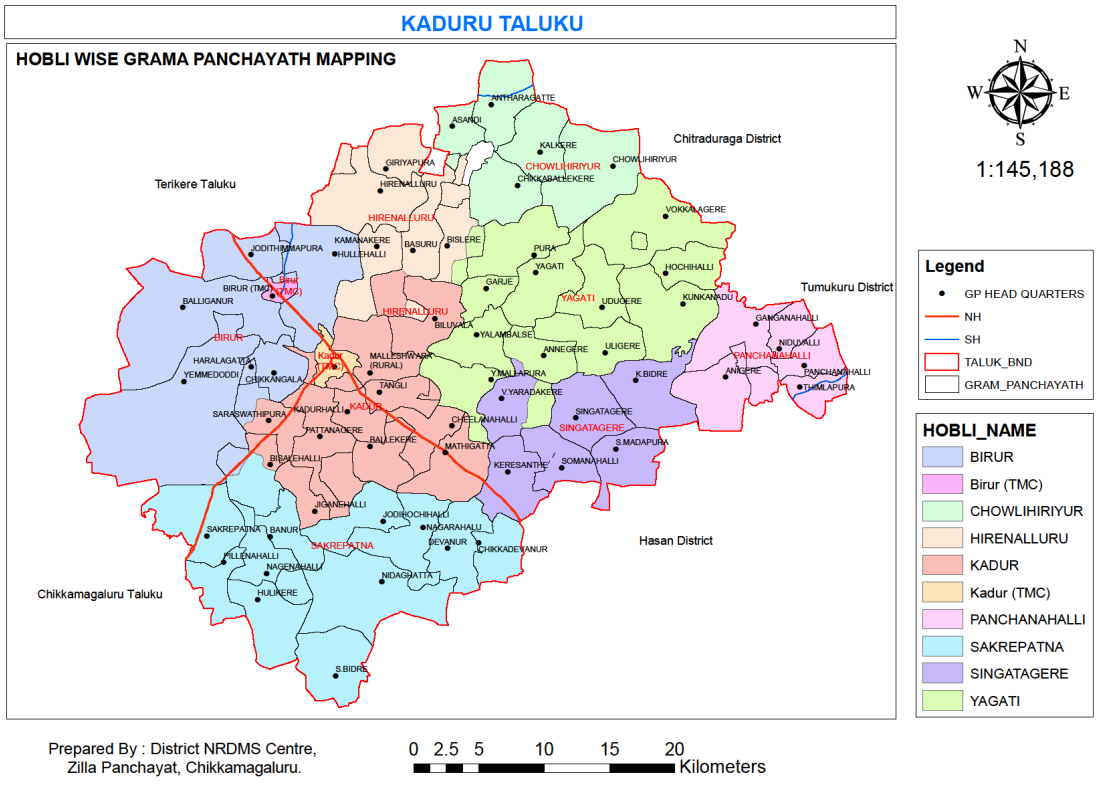
Chapter 7
Important Maps related to Disaster Management

7.1.1 Maps showing boundaries of Taluks, GPs etc

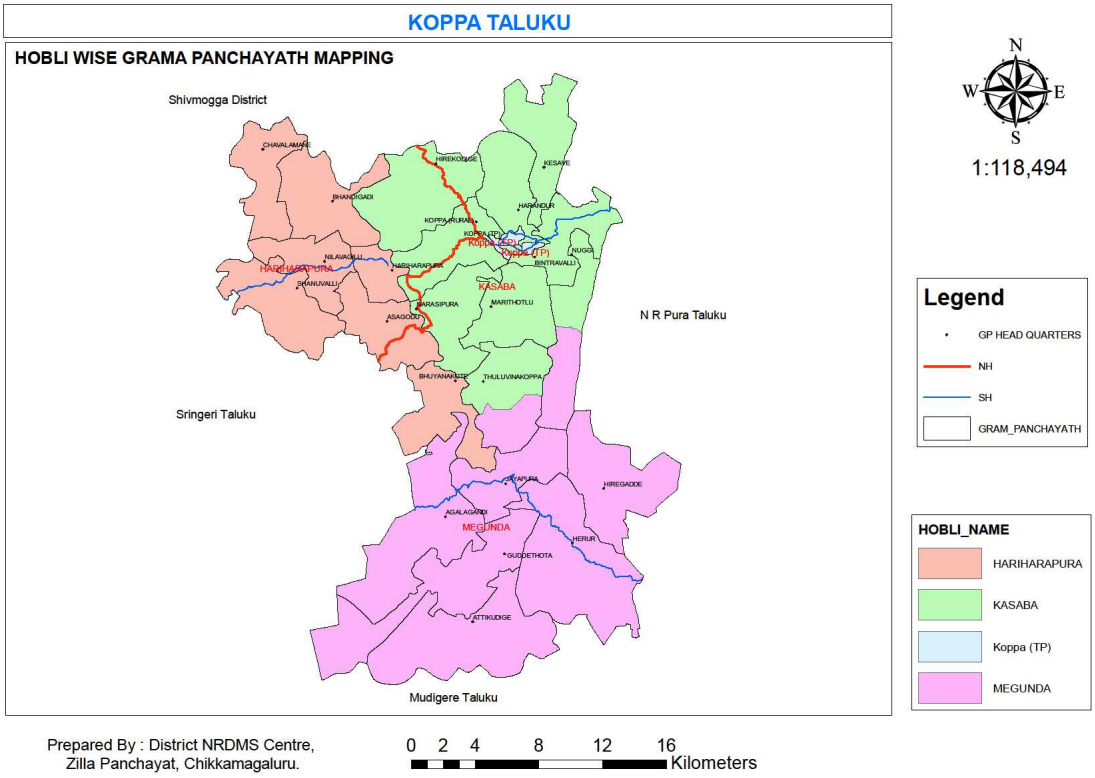
Map showing Hobli Wise Grama Panchayaths of **Chikkamagaluru Taluk**.



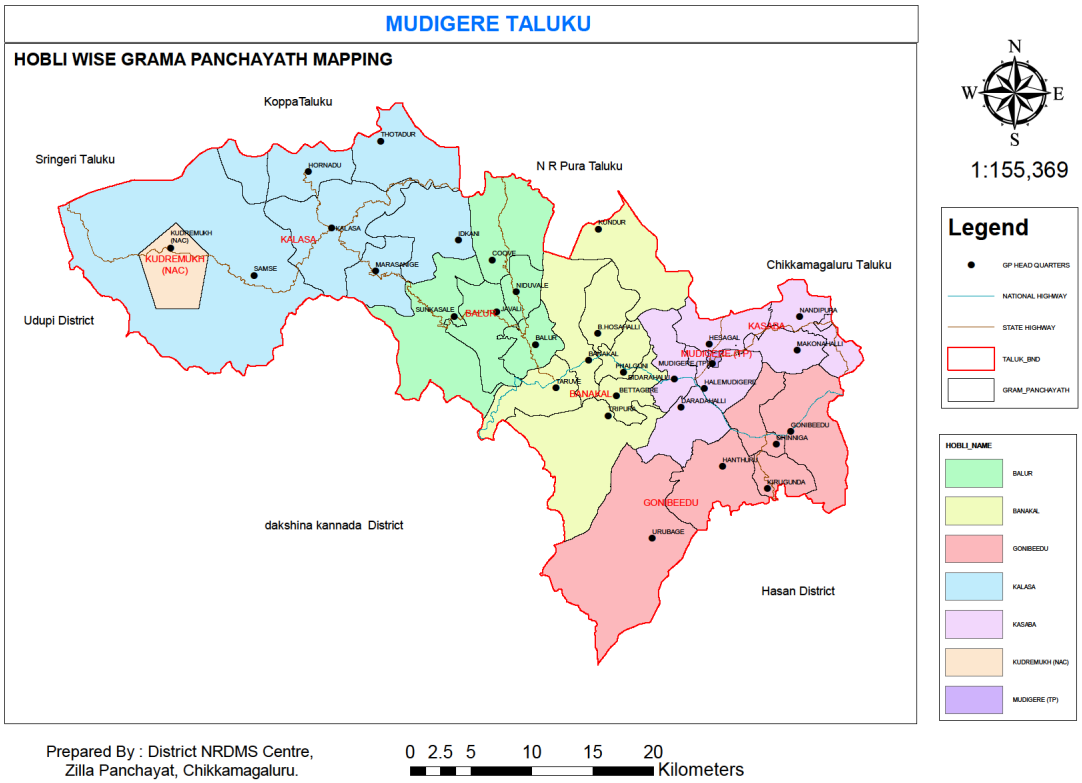
Map showing Hobli Wise Grama Panchayaths of **Kadur Taluk**.



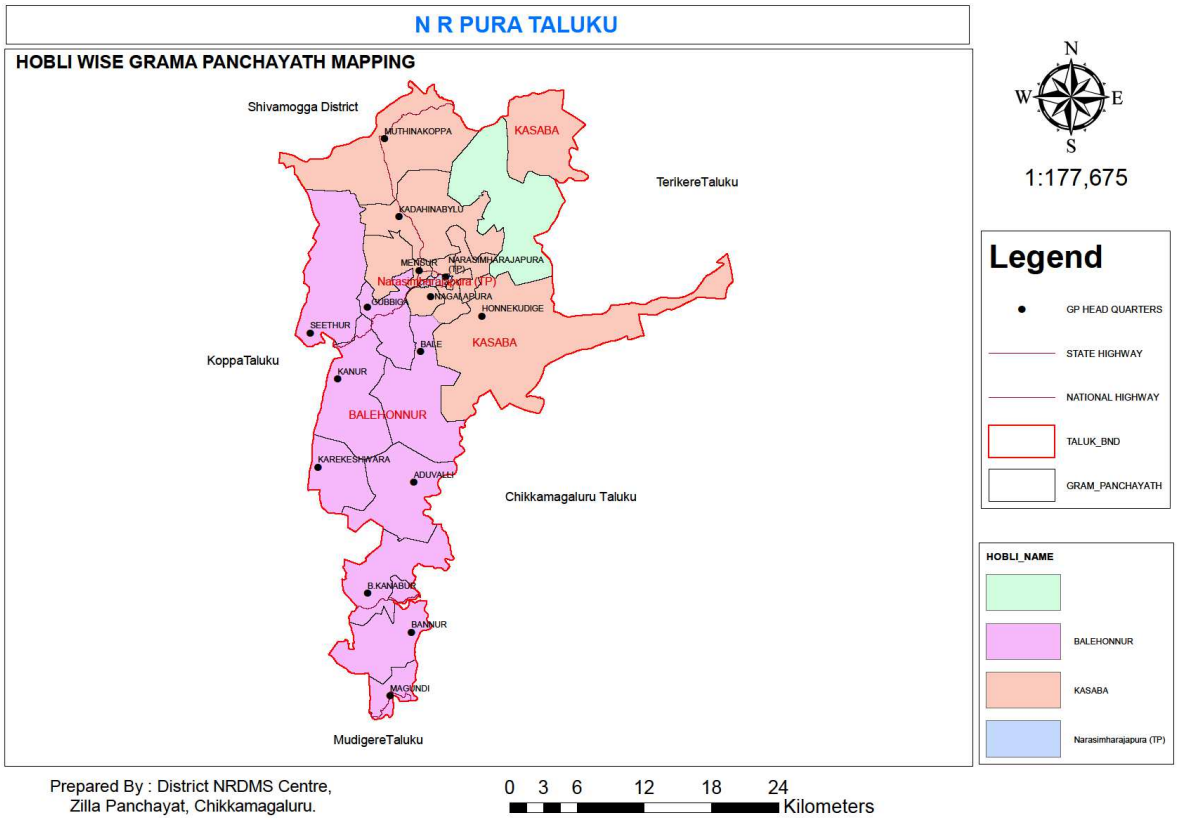
Map showing Hobli Wise Grama Panchayaths of **Koppa Taluk**.



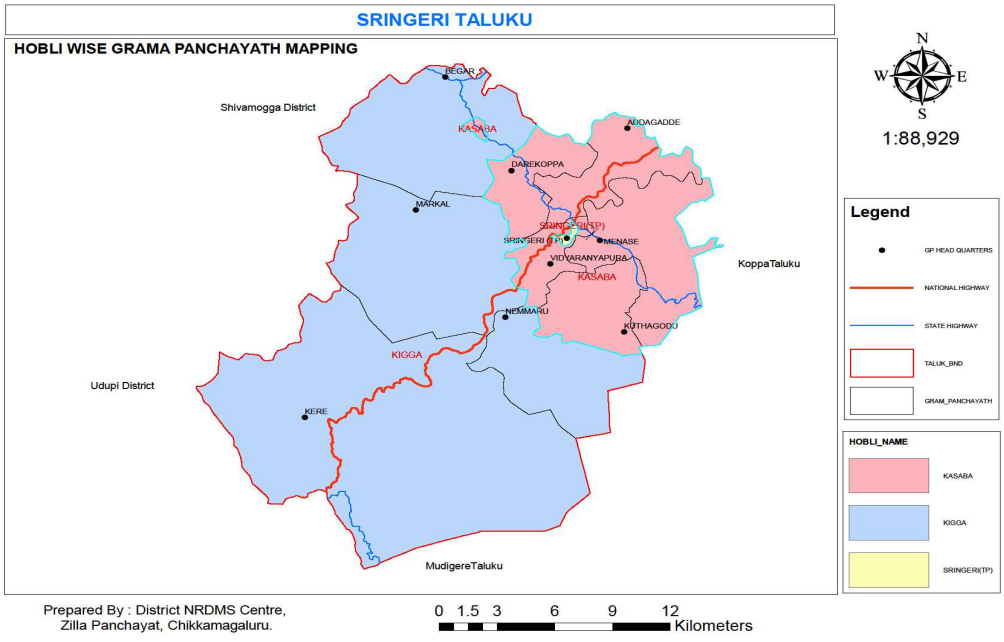
Map showing Hobli Wise Grama Panchayaths of **Mudigere Taluk**.



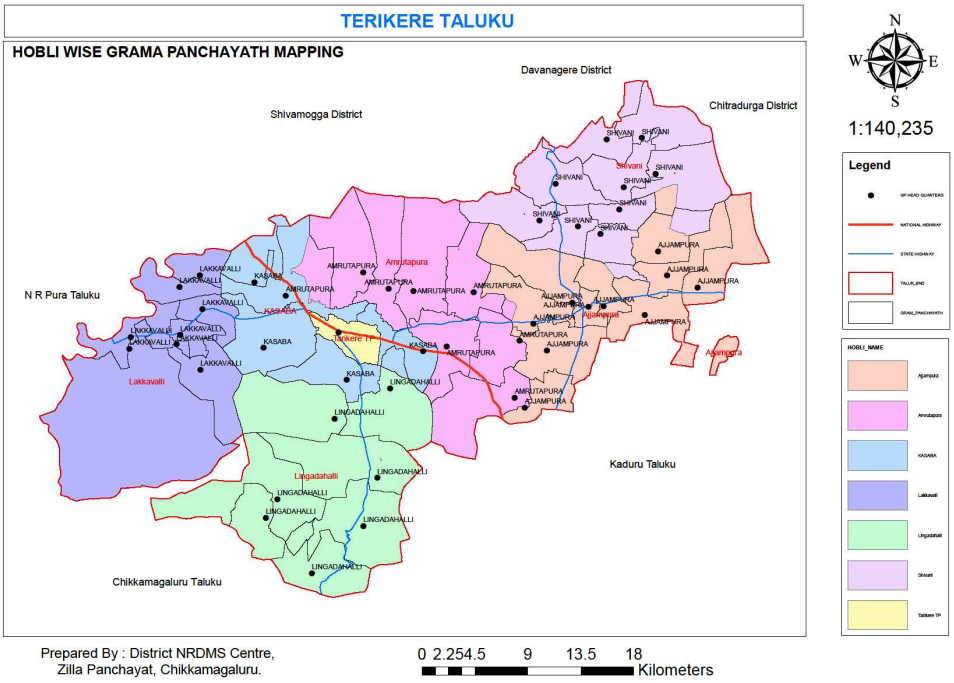
Map showing Hobli Wise Grama Panchayaths of **N R Pura Taluk**.



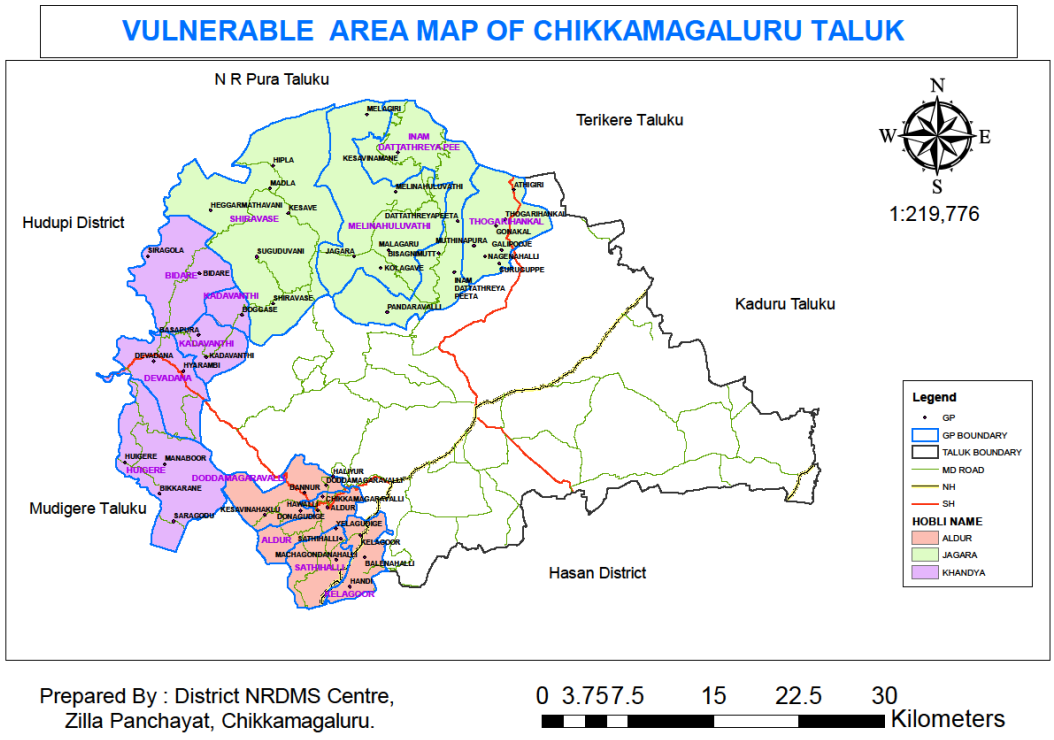
Map showing Hobli Wise Grama Panchayaths of **Sringeri Taluk**.



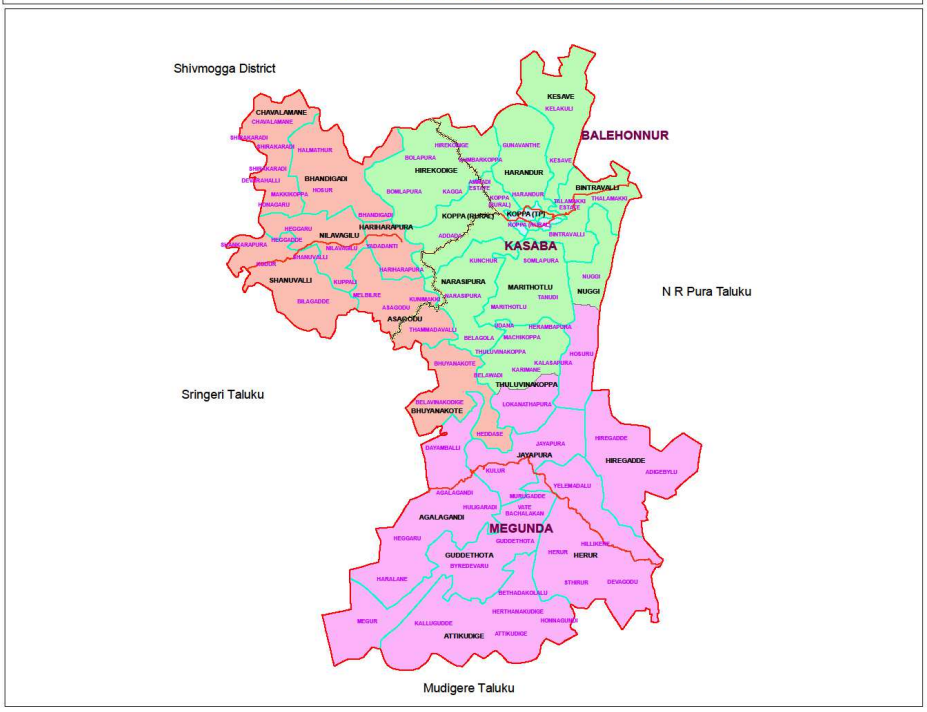
Map showing Hobli Wise Grama Panchayaths of **Tarikere Taluk**.



7.1.2. Map Indicating Vulnerable areas



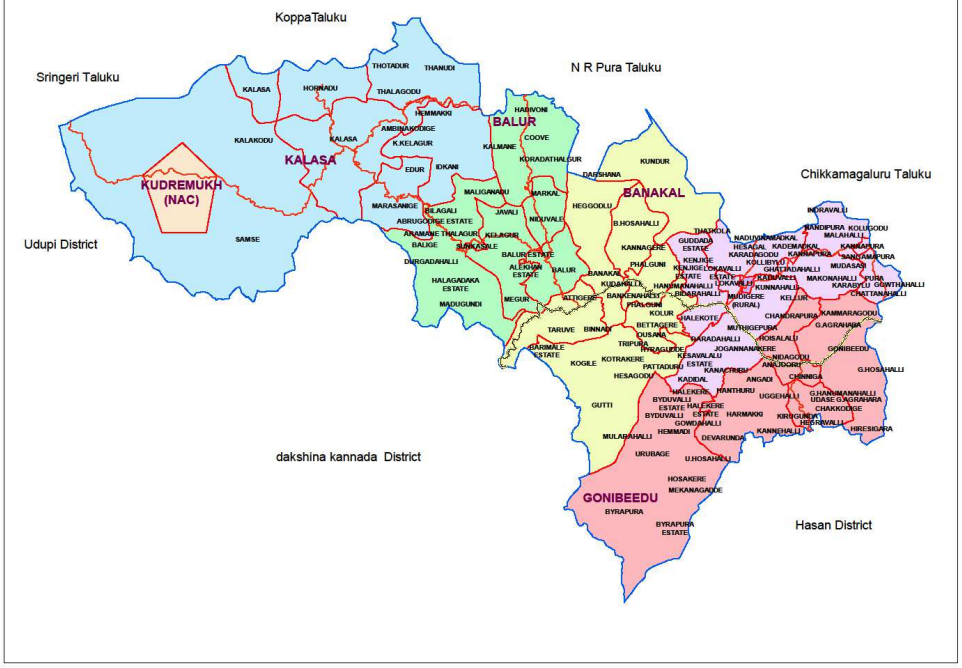
VULNERABLE AREA MAP OF KOPPA TALUK



Prepared By : District NRDMS Centre,
Zilla Panchayat, Chikkamagaluru.

0 2 4 8 12 16 Kilometers

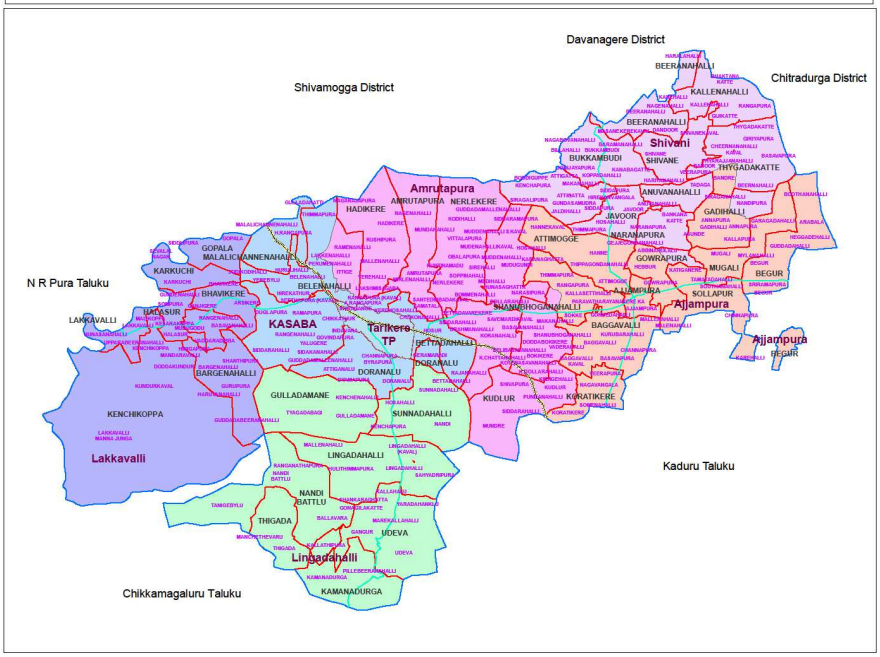
VULNERABLE AREA MAP OF MUDIGERE TALUKU



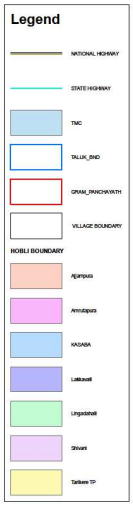
Prepared By : District NRDMS Centre,
Zilla Panchayat, Chikkamagaluru.

0 2.5 5 10 15 20 Kilometers

VULNERABLE AREA MAP OF TARIKERE TALUKU



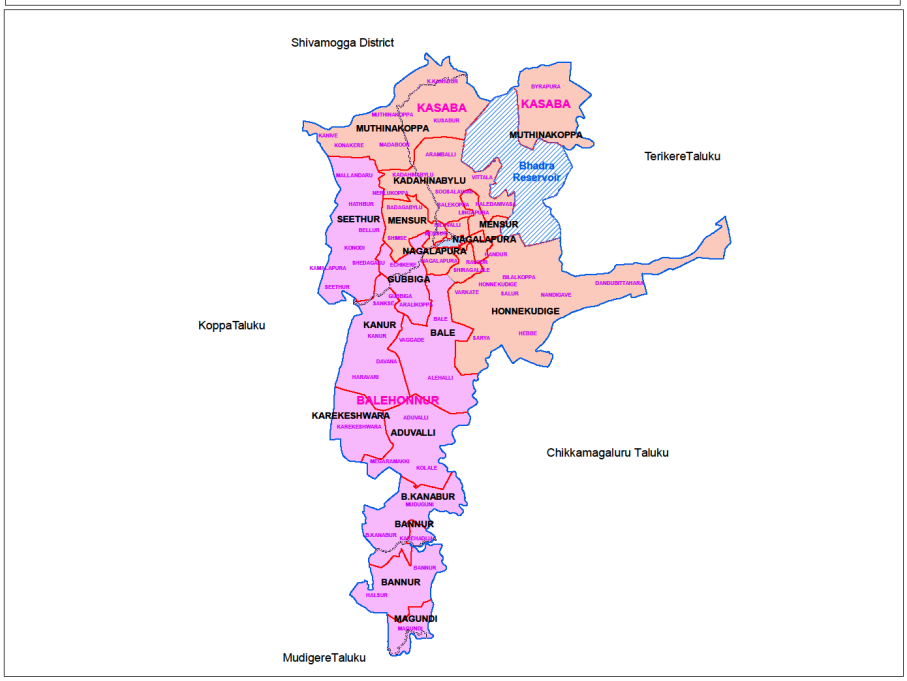
1:140,000



Prepared By : District NRDMS Centre,
Zilla Panchayat, Chikkamagaluru.

0 2.254.5 9 13.5 18 Kilometers

VULNERABLE AREA MAP OF N R PURA TALUK



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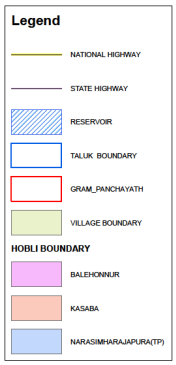
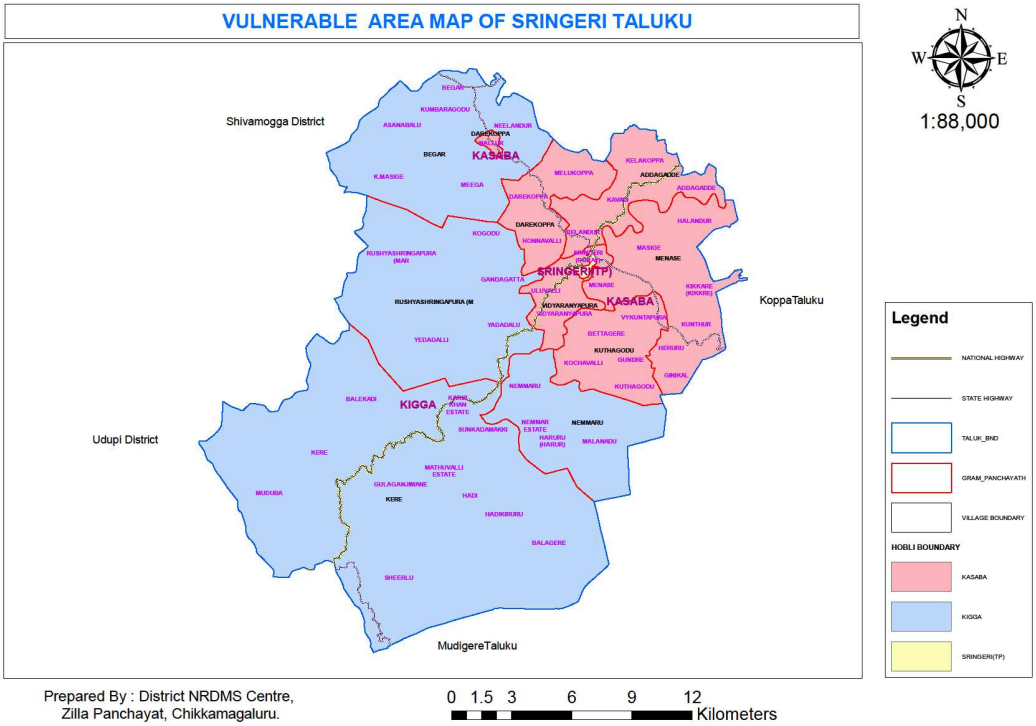
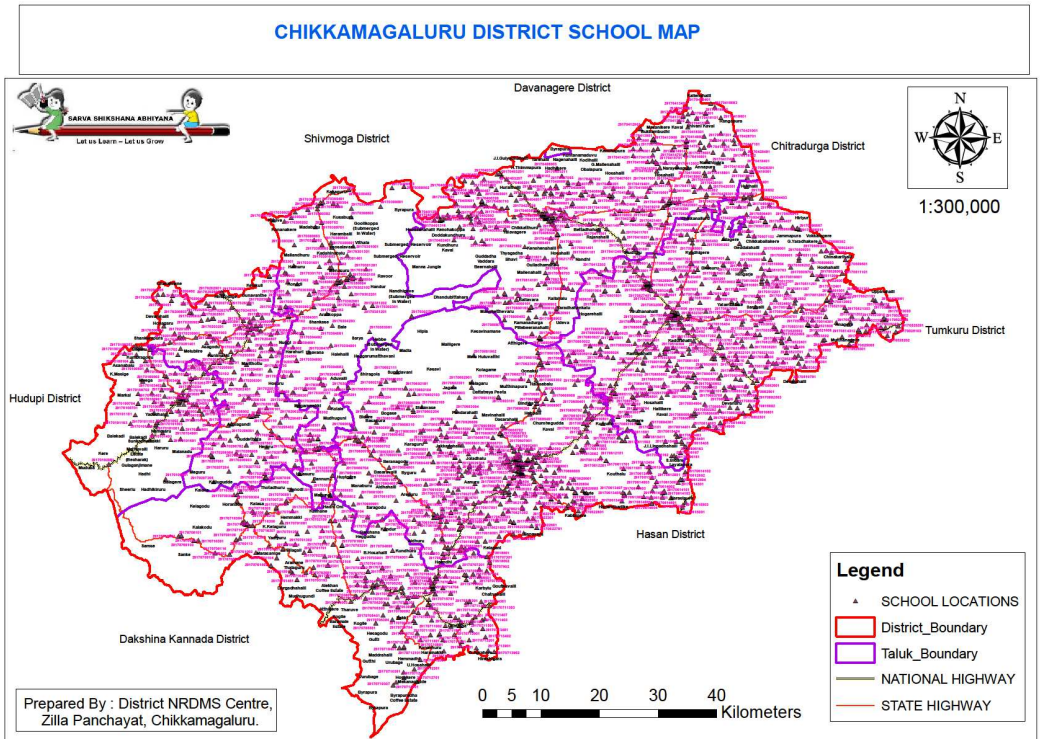


Prepared By : District NRDMS Centre,
Zilla Panchayat, Chikkamagaluru.

0 3 6 12 18 24 Kilometers



7.1.3 Maps showing Educational Institutes, Health Institutes, Public Infrastructure, etc.



Chapter 8
Preparedness & Mitigation Plan

Introduction:

Disaster Mitigation contributes to lasting improvement in safety and is essential to integrate disaster management in mainstream planning. Broadly Mitigation ways can be divided into two parts:- Structural measure and Non-Structural measures.

Structural measures are undertaken to strengthen buildings, lifelines and infrastructure to withstand any hazard.

Non-structural measures emphasise on land-use planning, programmes for sustaining awareness, dissemination of information materials on do's and don'ts at the time of disaster.

Once the area has been identified as hazard prone, it becomes important that the government and the community should adopt the above-said measures. Based on this ideology, mitigation plan may vary according to hazards. The Chikkamagaluru district is being considered prone to Drought, Flood, Landslides, Lightning and fire related hazards are also very frequent in the District.

8.1 Disaster Mitigation Measures:

Disaster mitigation means measures designed to prevent, predict, and prepare, for respond to monitor and / or mitigate the impact of disaster. In chapter-3 all the potential hazards in Chikkamagaluru district has been discussed in details. Chikkamagaluru district lies in Zone II: low damage risk zone and risk gets compounded when hazard meets with Vulnerabilities as high dense population, weak physical structures and conventional construction technologies.

Although, in the district historically there has been no incident of earthquake during last one hundred years. Earthquakes can destroy buildings and infrastructure with secondary effects i.e., fires, embankments failures, release of poisonous gases, chemical explosions etc. Therefore it is important to consider both primary and secondary effects into disaster mitigation planning. So, an effective mitigation planning is necessary to reduce the risk involved in the district. For efficient disaster mitigation, the pre-disaster phase needs to be utilized for planning and implementing preventive measures on the one hand and working on preparedness activities on the other.

Disaster is caused due to failure of manmade structures, lack of preparedness and awareness. So far, disaster mitigation efforts are mostly reactive. Since usually the disaster consider as a development problem, prevention and mitigation needs to be built in this process only. The primary objectives of prevention and mitigation efforts for Chikkamagaluru district are:

- Identifying the vulnerable areas in the district.
- Preventing development/construction along the flood zones/hazard locations
- Avoiding habitation in hazardous areas;
- Developing structures resistant to the onslaughts of hazards

- Constructing flood, earthquake, fire and cyclone resistant housing
- Constructing barriers to prevent coastal erosion
- Developing the ability to rapidly evacuate hazardous areas or to shift residents to hazard-resistant structures.
- Regulating techno-legal regime

Mitigation Measures:

Mitigation embraces all measures taken to reduce both the effect of the hazard itself and the vulnerable conditions to it in order to reduce the scale of a future disaster. Mitigation aims to reducing the physical, economic and to threats and the underlying causes for the vulnerability.

Structural Mitigation Measures:

Building should be strictly confirming to the building bye laws. For an existing building, retrofitting or seismic strengthening is the only solution to make it Disaster resistant.

In the district all life line buildings such as major hospitals, schools, District Administration office, Shopping malls and the other vital installation shall be retrofitted. A panel of expert shall be approached for assessing the structure and to suggest the type of retrofitting required. Illegal construction, encroachments, unapproved additions, alternations etc of residential building and conversion of residential building in to commercial purpose etc shall be checked by the concerned authorities with strict measures.

Theses unauthorized activities may lead to disaster in that particular urban area mitigation measures to be in the district implementation of DM Policy.

- Strengthening of life line buildings.
- Retrofitting of school and life line buildings.
- Preparation of DM Plan at the district, Block and Village level, all schools in the district.
- Prepare a DM plan

8.2 Hazard-Specific Prevention & Mitigation Measures
(Structural & Non-Structural Measures)

The major hazards which are likely to affect district Chikkamagaluru district are discussed in chapter 6 are being discussed below for mitigation purposes. Both Structural and Non-Structural measures shall be taken as part of mitigation plan. Structural mitigation refers to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure. Non-structural mitigation refers to policies, awareness, knowledge development, public commitment, information sharing which can reduce risk.

8.3 Sector wise structural mitigation measures

Sector	Mitigation measures	Responsible Department	Time Frame
Information, education and communication activities	➢ Distribution of leaflets, posters and wall Painting. ➢ Awareness generation programme in schools and colleges, conducting various competitions and rallies. ➢ Organizing Staff development and refresher training to concerned dept, task force team, NGO and CBOs. ➢ Conduct Regular mock drill Plantation Programme	*District Administration*	*Throughout the year (with regular intervals)*
Road	➢ Identification/repair of main and alternative routes. ➢ Repair of vulnerable points. ➢ Conversion of Pucca Roads of Village roads.	*PWD (Roads)*	*During Normal Time*
Embankments	➢ Strengthening and raising the height of weak embankments points. ➢ Storage of flood fighting Materials	*Irrigation Department*	*During Pre Flood Season*
Bridges	➢ Regular Maintenance of Bridges	*Irrigation Department*	*During Normal Time*
Communication	➢ Ensure proper maintenance of telephones, fax, WLL Phones, Wireless & VHA etc.,	*BSNL, AIRTEL, Reliance and Dist. Administration*	*During Normal Time*
Drinking Water Sanitation	➢ Assessment of running /defunct tube wells and makes necessary Arrangements, ➢ Identifications of scarce water pockets installation ➢ Water supply system. ➢ Identifications of submergible TWs and rising of its platform height. ➢ Arrangements of Tankers / Syntex tank	*Karnataka Urban Water Supply*	*Throughout the Year*

Sector	Mitigation measures	Responsible Department	Time Frame
Power	➢ Ensure maintenance of electric stations and power grids. ➢ Complete electrification Throughout the block. ➢ Install solar lamps near flood and cyclone shelters and ensure its Maintenance. ➢ Ensure proper and safe electric connections to the consumer and from electric stand Posts/ transformers	*MESCOM*	*Throughout the year*
Vaccinations	➢ Procurement and stock piling of vaccines. ➢ Regular vaccination of domestic animals. ➢ Regular disinfection of wells and ponds	District Animal Husbandry and veterinary department	Throughout the year
Logistics	➢ Impart trainings on healthcare, sanitations, insurance, first aid to medical staff as fit as volunteers. ➢ Liaison with district administration for allotment of transfer vehicle.	District Animal Husbandry and Veterinary Department	Throughout the year

Non-Structural Measures

Land Use Planning

Damage of buildings depends primarily upon the soil conditions and topology of the area which are moderately favourable in the district. Anyhow, to analyze risk within district microzonation planning should take place. It will help to guide modify land use planning in the district accordingly.

8.4 Capacity Building and awareness generation

Country have a very few experts in mitigation planning. We must focus our attention to the institutionally and manpower development at all levels. There is a need to train architects, engineers, planners and masons in developing safe housing and infrastructure facilities. Manuals have also been developed outlining methodologies for new constructions and retrofitting of old ones. A strong legal and enforcement framework with appropriate incentives and punitive measures is required together with awareness programmes for general public. All these components must be taken up simultaneously; ignoring one aspect for the other could be counterproductive**.**

8.5 Insurance

Insurance brings quality consciousness in the infrastructure and a culture of safety by insisting to follow building codes, norms, guidelines, quality materials in construction. It would enforce safety standards by bringing accountability. Hazardous area should be announced, notified and publicly

displayed so that people would be motivated not to settle in those areas and insurance be mandatory in insurance prone areas

Pre-Disaster Period;

Preparation	***Objectives***	***Action initiated by***
Convening District Level Committee on natural calamity in the month of May	To suggest the least of relief work to be undertaken, advise on the precautionary measures to be taken, directions for stocking of food grains in strategic or key points.	District Emergency Operation Centre (DEOC)
Identification of vulnerable points according to the expected disaster.	Repairing of breaches, stocking of the sand bags, alerting people near highly Vulnerable pockets.	Executive engineers
Identification & Indent of essential commodities for the inaccessible/scarcity pockets	Stocking of food grains and other essential things in Gram Panchayath headquarters	
Selection of Shelters	Arrangements for shelter during Emergency	
Requirement of medicines, formation of mobile teams, identifying epidemic areas	Stocking of medicines and deputation of personals	
Arrangement of food and fodder for the cattle	Stocking of the same	
Organizing Mock drills	Awareness generation and practice	District level officers

8.6 Hazard-Specific Prevention & Mitigation Measures (Structural & Non-Structural Measures)

Hazard	Possible Mitigation Measures	Implementing Departments	Remarks
	Structural Mitigation Measures		
Flood	➢ Desilting /dredging of water bodies and deepening of water channel ➢ Repair/Construction of embankments/ protection wall and maintenance of Flood Channels, Canals, Natural Drainage, Storm waterlines ➢ Drainage improvement and Diversion of flood water in order to lower water levels in the river.	*Primary Agency:* Irrigation *Supporting Agency:* PWD, ULBs	
	➢ Vegetative cover against the land erosion	*Primary Agency:* Forest Department	
	Non- Structural Mitigation Measures		
	➢ Flood Zoning mapping and demarcation using GIS ➢ Capacity building of volunteers and technicians ➢ Awareness generation on health and safety of livestock. ➢ Promote people for the cleanliness of water channels ➢ Tie up with IMD, CWC has been strengthened so that EWS can be effectively communicated to the vulnerable community.	*Primary Agency:* DDMA, Chikkamagaluru District *Supporting Agency:* Irrigatin, District Information Officer, PRED, DUDC, ULBs	
	➢ Safety audit of existing and proposed housing stock in flood prone areas.	*Primary Agency*: Revenue Dept, *Supporting Agency*: PWD, DUDC	
	➢ Promotion of traditional local and innovative practices like bamboo/ plastic rafts etc.,	*Primary Agency:* DRD Dept., Chikkamagaluru district	
	➢ Creation of trained medical first responders for first aid and resuscitation measures. ➢ Developing of patient evacuation plans ➢	*Primary Agency:* Medical and Health Department *Supporting Agency:* DDMA and SDMA	

Fire (Forest and Domestic)	**Structural Mitigation Measures**		
	Establishment of Fire Stations as per Fire Safety Bye-laws All fire tenders should be equipped with wireless sets/ mobile phones	*Primary Agency***:** **Fire Department**	
	Zoning of Forest Areas	*Primary Agency:* Dept. of Forest	
	Non-Structural Mitigation Measures		
	Implementation of Fire Safety measures and enforcement Updating basic infrastructure and adopting modern fire resistant technologies Improving outreach of fire services Making the fire services a multi- hazard response unit Compulsory fire hazard evaluation of life line building eg., Hospital, School, Warehouse, industries and all other public buildings.	*Primary Agency:* Fire Department *Supporting Agency:* Irrigation, PWD, ULBs, DTCP, and DRD Dept	Fire extinguishers will be made available in Panchayat offices far from a water source.
	Training of Community members in fire fighting techniques Planning and calendar of evacuation drills/ mock drills in vital installations /industrial plants/ infrastructure like hospitals etc.,	*Primary Agency:* DDMA *Supporting Agency:* Fire Dept	

Earthquake	**Structural Mitigation Measures**		
	Seismic strengthening of existing structures Prioritization of structures especially critical/lifeline structures Structural safety audit of critical lifeline structures e.g., Hospital, School, warehouse, industries all other Admin Building Retrofitting of lifeline structures, weak or old buildings, rural unsafe house and public building and office. Earthquake resistant construction in urban, rural and semi-urban areas	*Primary Agency:* PWD *Supporting Agency:* DTCP, DRD Dept, MESCOM, ULBs	
	Non-Structural Mitigation Measures		
	Development of Rapid visual screening procedures and Detailed vulnerability Assessment Regular conduction of Fire Safety Audits and Electrical safety Audits. Techno-legal regime for ensuring compliance of earthquake resistant design and construction practices in all new constructions Licensing and certification of professionals Strict enforcement of guideline pertaining to seismic safety for government rural housing, urban development structure.	*Primary Agency:* PWD *Supporting Agency:* DTCP, DRD Dept, MESCOM, ULBs.	*Supporting Agency:* DTCP, DRD Dept, ULBs. Safety in Urban areas of Chikkamagaluru district will be assessed and the same will be disseminated with the help of workshops and trainings.
	Mock drills for Schools, Hospitals and Public buildings and trainings for mason, engineers and architects Registration of trained and certified mason Registration of trained and certified mason	*Primary Agency:* DDMA *Supporting Agency:* District information officer, ULBs, DDPI, PWD	Trainings and awareness campaigns will be aimed at training rural population.

Structural Mitigation Measures

Chemical & Industrial	➢ Creation of appropriate infrastructure as mentioned in Off-site and On-site plans including Public Address system	*Primary Agency:* Dept. of Industries SupportingAgency: PWD and ULBs
	➢ Enforcement of code of practices, procedures and standards ➢ Audits of On-site & Off-site Emergency plans at regular intervals ➢ Statutory inspection, safety audit and testing of emergency plans ➢ Safety Auditing	*Primary Agency*: Dept. of Industries Supporting Agency: Department of labourand Employment,PWD andULBs.
	➢ Hotline telephone connection with nearby emergency services	*Primary Agency*: BSNL Supporting Agency: Dept. of Industries
	➢ Awareness generation among community	*Primary Agency*: DDMA Supporting Agency: Dept. of Industries
	➢ Training of specialized Medical First Aid Responders	*Primary Agency*: Medical and Health Dept. Supporting Agency: Dept. of Industries

Road Accident

Structural Mitigation Measures

➢ Provision of adequate signboards, speed breakers and guard stones near the accident prone spots. ➢ Adequate construction/ resurfacing/widening etc. at risky or prone areas ➢ Construction of pedestrians both side of the road ➢ Install reflectors on roads so that deviations and medians are clearly visible to drivers	*Primary Agency*: PWD *Supporting Agency:* RTO and Revenue Deparment.

Non-Structural Mitigation Measures

➢ Setting up of a Highway Safety Patrol	*Primary Agency:* Police Dept.
➢ Awareness and Installation of warning hoardings	*Primary Agency:* DDMA and Revenue Department
➢ Vehicle registration and proper investigation under road safety acts	*Primary Agency:* RTO

Land Slide

Structural Mitigation Measures

➢ Catchment area treatment/Afforestation, building up of check dams /detention basins in order to reduce the flood peaks and control the suddenness of the runoff ➢ Stabilization of Slopes in landslides prone areas ➢ Construction of retaining walls and other structures to bring greater stability to dangerous slopes. ➢ Construction walls of piles in slope areas to prevent landslides	*Primary Agency:* IPH *Supporting Agency:* Forest Dept. *Primary Agency*: PWD Supporting Agency**:** IPH, DTCP	Distribution of seedlings of plant material useful in land reclamation in sloppy areas will be taken up.

Non-Structural Mitigation Measures

➢ Enforce land-use and building ordinances in areas susceptible to landslides and debris flows. ➢ Discourage construction of buildings on steep slopes or near streams and rivers ➢ Assessment of the availability of equipment's that would be needed at the time of landslides and regular updating of them.	*Primary Agency*: DTCP,/RTO *Supporting Agency:* PWD ➢ Assessment of the availability of equipment's that would be needed at the time of landslides and regular updating of them.	

Structural Mitigation Measures

Water management including water Harvesting and Conservation Promote modern irrigation methods in drought prone areas e.g., micro irrigation including drip and sprinkler irrigation. Rain water Harvesting storage tanks at household level and public buildings Structures for water harvesting and recharging like wells, ponds, check dams, farm ponds etc., Development of fodder plots/banks Afforestation with bio-diesel species through the National afforestation programme. Development of Pasture land in common property, seed farms and trust land	Primary agency: Agency: Forest Department Supporting Agency: Agriculture and **Horticulture Dept.**
Non-Structural Mitigation Measures ➢ Drought-prone area delineation at block level based on rainfall, cropping pattern, available supplement irrigation, satellite derived indicators, soil map, groundwater availability map, cattle population and fodder demand and socio- economic data ➢ Gradation of drought-prone areas based on the frequency of occurrence of droughts, sensitivity to rainfall variation and vulnerability of community. ➢ Monitoring of drought based on rainfall and other parameters, crop health, available ground water and migration and impact on community ➢ Set up control mechanism for regulated water use (ponds, Small dams, Check dams) on the early onset.	*Primary Agency:* Irrigation *Supporting Agency:* PWD,ULBs, DDMA and IMD regional office
➢ Insuring of crops	*Primary Agency:* Banks Supporting Agency: Revenue Dept. & Agriculture and Horticulture Dept.
➢ Farmer education to practice drought resistant crops and efficient water use.	*Primary Agency:* Agriculture and Horticulture Dept. *Supporting Agency:* DDMA

Drought

8.7 Lightning:

Lightening is a natural phenomenon which occurs in the district. Every year people as well as Animals especially cattle's die due to the lighting. Therefore the proper measure needs to be taken to reduce the death toll.

Do's and Don'ts during Lightning

- If you are in a building it is advisable to stay inside. Stay away from windows, doors, fireplaces, stoves, metal pipes, sinks and other electrical charge conductors.
- Unplug TVs, radios and other electrical appliances.
- Don't use the phone or other electrical equipment.
- If you are outside, seek shelter in a building, cave or depressed area. Lightning typically strikes the tallest item in an area.
- If you're caught in the open, bend down with your feet close together and your head down. Don't lie flat - by minimizing your contact with the ground you reduce the risk of being electrocuted by a ground charge.
- Get off bicycles, motorcycles, and tractors.
- If you are in a car, stop the car and stay in it. Don't stop near trees or power lines that could fall.
- If you are swimming, get out of the water immediately, and move away from the body of water. Being near water is extremely dangerous during a lightning storm.
- If you are caught in a lightning storm with a group of people, maintain a distance of at least 50-100 feet between each person.
- While inside, keep windows closed, and try to stay within inner rooms of the structure

Measures to be taken during lightening as follows:

Before Disaster	During Disaster	After Disaster
➢ Installation of an effective lightning rod system ➢ Staying inside for at least 30 minutes after the last strike ➢ Seeking shelter in a low area and staying away from trees while being caught up in an open area ➢ Staying away from metal objects and tall objects, such as telephone poles, light standards, antennas and tall trees. ➢ Staying away from water sources like swimming pool, ponds, lakes or rivers	➢ Mobilization of specialized equipment and machinery to affected areas ➢ Arrangements to be made for quick transportation of injured victims to the hospitals	➢ Arrangements for distribution of gratuitous relief and cash doles

Chapter-9
Standard Operating Procedure (SOPs) for Officers

9.1 Introduction

The DM Act-2005 provided for systematic devolving of roles and responsibilities at every level up to the local authority. At the state level, the SDMA and the Department of Disaster Management are the apex bodies for policy, planning and management of natural and manmade disasters in the state. At the district, DDMA headed by the DC and line departments have been assigned the powers and functions for effective Disaster Management. The local bodies such as PRIs and ULBs are responsible for local level disaster management. However, provision for convergence in the matters of resources, coordination and response among various levels has been laid down. In this chapter the SOPs and Roles and responsibilities of various levels of functionaries are delineated.

Revenue Authorities

1) Activating DCR/EoC and Officers and Heads of Departments in the District
2) Setting up IRS and SoC
3) Activating of various NGOs/Voluntary Organizations for necessary materials.
4) Providing adequate compensation to loss of life and property. To effectively manage the emergency without ambiguity, it is required to entrust individual responsibility and describe them in brief.

9.2 SOP FOR DEPUTY COMMISSIONER

The responsibility include initiating and maintaining co-ordination and co-operation with various agencies involved and provide prompt information, decisions and infrastructure facilities as requested. He/She should also mobilize, direct, and co-ordinate the emergency management staff during emergency.

Following are the main functions during any emergency

- Declaration of emergency after confirming the magnitude of the disaster.
- Activate the Emergency Control Room at Deputy Commissioner's office and make it functional.
- Co-ordinate and establish contact with all agency involved in the emergency actions.
- Ensure setting up of Local Emergency Control Room close to the scene of accident or at Taluk headquarters where the disaster has struck.
- Ensure actions have been initiated to contain the emergency.
- Have overall supervision of all the emergency relief operations.
- Initiate evacuation of people from affected area with the assistance of police, fire and other agencies.
- Depending on type of emergency, mobilize additional resources like heavy lifting gears line cranes, bulldozers for rescue and mitigation operation.
- Set-up safe shelters for evacuated people and ensure they are provided with food and medical attention as the need be.
- Monitor progress or disaster especially in case of natural disasters like cyclone or floods by getting information from various agencies involved and mobilize additional support to mitigate the effects of disaster.
- Keep the State Administration informed regarding the disaster and the steps taken to contain the same.

- Issue statement to the press (both print and electronic media) on the prevailing conditions and the steps being taken by the District Administration to mitigate effects of the disaster.
- Get mutual aid from neighbouring districts, the Major Hazard Industries or seek the assistance of voluntary organization.
- If required, set-up mobile first aid centre or temporary health centres in the affected area or in the safe shelters.
- Visit the scene of the disaster to have first hand information about the rescue or mitigative operations that are being carried out.
- In case of floods, carry out aerial survey of the affected area to have preliminary estimates of the extent of damage caused.
- To co-ordinate with the state government through Principal Secretaries of Depts. mobilize the help of Army/Navy/Air force or other agencies are requires.
- Call off emergency after confirming that all the actions have been taken to normalize the conditions and it is safe for people to re-enter the affected areas

ROLE OF THE DEPUTY COMMISSIONER BEFORE, DURING AND AFTER DISASTER

Phase	**Activities**	**Other Officials to be involved**	**Resources / Equipments to be procured from**
Pre-Disaster	Preparedness before the Disaster	All District Level Officials	The Secretary, Dept. of Disaster Management
During Disaster	Reviewing and analyzing the calamity situation in the district over the next one year through a meeting at the district level involving all the departments of the district as well as sub division and GP levels and the locally active NGOs/CBOs	All ACs; All Tahsildars; All Panchayats	Police/Fire/Fisheries/ RTO/ Civil Defense
	Identifying disaster prone zones and strategies to stay prepared for the worst.	Field functionaries, District Information Officer.	Commandant/ Co-Coordinator of NCC/NSS/NYKS
	Ensure IEC through Emergency section/ Panchayats/NGOs/AW centers/Street plays/ workshops	District Fisheries Officer Leading NGO/CBOs	
	Reviewing the DCR and making it functional as per SOP fixed by him (SOP to be prepared earlier)	NSS/NCC/ NYKS/ Police	VHF from the Police/Mike set/ batteries/generators available in the district office from the private parties on requisition.

	Making the DCR well equipped and depute senior officers from time to time to review the receipt of information and dissemination.	Fire, Civil Defence	
	Calling a meeting of officers/NGOs/CBO co-ordination and discuss issue such as capacity assessment of different NGOs/CBOs and ask them to adopt certain vulnerable areas to avoid overlapping and duplicity	All district level officials. All ACs/Tahsildars	
	Preparing a checklist (containing the dos and don'ts) and pass that on to the NGOs/CBOs.	All Panchayats District Fisheries Officer Leading NGOs Police	Power boats/country boats/ vehicle/rope/rescue kits and trained resource personnel from SRC/SSC/Army/unit/Civil Defense/Hired from the private parties according to the requirement.
	Ensuring/installing communication system to the inaccessible villages	Police Fire Brigade, Leading NGO, Panchayats, Field functionaries programme co-coordinators of NSS/NCC.	
	Checking stock of the public distribution system and arrangement of temporary godown. □ □□Checking the resources with other department such as Police, Fire and of NSS/NCC/NYKS.	ACs/Tahsildars, TPEO, DHO, CDPO, DDs, Panchayath Field functionaries Medical Officers, Police, KUWSDB, Municipality, RTO/ Leading NGO.	
	Preparing a list of vehicles/ ambulance already deployed and/or to be deployed on hire during crisis.		
	Keeping stock of road cleaning equipments and vehicles for relief operation.		

	Assigning specific duties to different officers/ Sr. Officers at headquarters.		
	Staying in constant touch with other line departments.		
	Ensuring proper functioning of warning systems & communication systems.		
	Ensuring mock drill of the rescue and relief teams	Home guards, Police	
	Preparing a map showing the location of temporary shelter camps with accessibility.		

Phase	Activities
	Identifying shelter /temporary shelter in high elevated places and arrangement of tents etc. Identifying and mapping of disaster (of all kinds) prone areas. Ensuring formation of village level Disaster Management. Committee through Block Development Officers.
	Dissemination of warning: - Receiving warning from reliable sources and cross checking them for authenticity. Disseminating warning to District Level Officials/ Revenue/Field Functionaries/ PRIs and Co-ordination with the Revenue control room. Keeping the control room active round the clock. Disturbing duties to the district level officials, ACs Panchayats and Field functionaries.
	Arranging vehicles and public address systems for information dissemination.
	Establishing coordination with the NGOs/CBOs and the village communities and assigning them duties.
	Asking the people in the vulnerable areas to move to the shelters and to move their domesticated animals to safer places and to cooperate with the volunteers and other officials engaged in similar activities.
	Search, Rescue and Evacuation:- To coordinate with NGOs/ CBOs/Police for support. Arrangement & deployment of vehicles etc., for evacuation. Evacuating people from marooned areas and administer emergent relief
	Organizing trained taskforce members and deputing to be marooned and cut-off areas for evacuation. Deployment of police for maintaining discipline and peace keeping during evacuation. Mobilizing people to move to safe shelters. Deployment of police/Fire Brigade for search and rescue. Ensuring proper utilization of the rescue materials. Providing rescue kits at the affected areas.
	Distribution of Relief Materials: - Keeping a record of the affected area and people so as to account for the relief materials needed. Procurement and transportation of relief materials to affected areas.

	Arrangement of free kitchen in the shelter camps & affected areas and assigning the responsibilities to officials for proper distribution.
	Coordinating with the NGOs/ CBOs. Encouraging other voluntary organisations from outside for rescue and relief operation. Distribution of basic medicines and disinfectants to prevent epidemic. Ensuring health care activities by the CDMO in the shelter camps & through mobile units/temporary health in regular intervals. Ensuring cattle health activities by the CDVO through Mobile units/ temporary health camps in the affected areas. Ensuring that there is enough storage of food and pure water in the shelters.
	Monitoring all the activities in the affected areas.

Phase	**Activities**
Post disaster	**Short term measures: -** Formation of special task force with required equipments Assigning responsibilities for specific areas. Emergency cleaning of debris to enable reconnaissance. Cleaning fallen trees and branches from the roads to facilitate local relief work. Forming a work team carrying emergency tool kits. Deployment of towing vehicles, earth moving equipments, cranes. Construction of temporary roads. Keeping national and other highways clear from disaster effects. Assessment of damage. Temporary supply of flood drinking water and medicines to the shelters and affected areas. Arrangement for safe shelter for animals. Providing the lighting facilities for shelter places. Deployment of home guards and constables to maintain law and order. Providing temporary arrangements for income generation for the affected people. Drought resistance short duration paddy seeds to be made available to farmers. Encouraging NGOs/INGOs from outside to carry out restoration and reconstruction works. Ensuring crop insurance. Supervising all the activities. **Long Term Measures: -** Immediate restoration of road communication, irrigation system, educational institutions, Government institutions, electrical installation, drinking water supply, construction of IAY houses for the BPL families and massive area plantation to maintain ecological balance. Meeting with district level officers/Officials at Headquarter and chalk out emergency plan with vulnerable areas and resource list. Co-ordination meeting NGOs/ PRIs and assignment of duties. Pre-positioning of staff in the likely cut off areas. Arrange food and other basic requirement for emergency response. Collect information from different areas and to act accordingly. Co-ordination meeting with officials at Headquarters by 12 hours intervals and 24 hours intervals with the field officials.

Regular collection of situation report of the risk and vulnerable areas from the officers assign for the purpose.

Provision for administering emergent relief and the other basic needs.

Contact with SRC for supply of temporary shelter materials.

Keeping in touch for supply of food articles procuring whole sellers.

Deputation of volunteers to different probable affected areas.

Helping the evacuees for returning to their houses.

Immediate arrangement of free kitchen in the cut off and inaccessible areas.

Relief distribution.

Monitoring of relief distribution.

9.3 SOP FOR SUPERINTENDENT OF POLICE (SP)

After receiving instructions from the Deputy Commissioner, the Superintendent of Police will rush to the ECR and establish contact with the local police station. He would then direct implementation of the action plan through the police station nearest to the scene of the disaster.

ROLES AND RESPONSIBILITIES OF THE SP

Phase	**Activities**	**Other Officials to be involved**
Pre-Disaster	**Preparedness and warning dissemination of Warning:** ➢ Reception of Warning from the DCR ➢ Communication establishment with district and sub-division/GP control rooms and departments offices within the division. ➢ Alerting the team force for deployment at the time of calamity. ➢ To issue directive to police field functionaries to co-operate with revenue personnel in management of relief operation.	Home guard / Police forces, AC / Tahsildars, SIs
During Disaster	Rescue and Evacuation: ➢ Clearance of roads and other means of Transportation ➢ Traffic management and patrolling of all highways and other access roads to disaster sites. ➢ Making sure that discipline is maintained. ➢ Assistance to district authorities for taking necessary action against hoarders, black marketers and those found manipulating relief materials. ➢ Co-ordination with fire personnel ➢ Provision of security in transit camps/feeding centers/relief camps/cattle camps/co-operative food stores and distribution centers. ➢ Safe guarding of belonging of evacuees. Distribution of Relief: ➢ Maintaining Laws and order at the Shelters and the relief camps ➢ Co-ordination with military service personnel in the area. ➢ Deploying officers/police personnel to record death cases. ➢ Assisting the community in organizing emergency transport. ➢ Assisting the District Officials/NGO's in distribution of relief materials.	Home guard/Police foreces, AC/ Tahsildars, SIs NCC, NSS, Trained Volunteers local youth, NGOs /CBOs

	➢ Providing escorts in transit of relief materials to the relief camps/affected areas.	
Post Disaster	**Short Term Measures:** ➢ FIR of the disasters, the damages and the death cases. ➢ Assisting in collection of damage statistics of private properties. ➢ Maintaining law and order. **Long term measures:** ➢ Close co-ordination with district administration and local/external NGOs in reconstruction and rehabilitation process. ➢ Assisting the district authority whenvever the need arises. ➢ Periodical visits to the affected areas to ensure law and order.	Vehicle Communication Systems

9.4SOP FOR DISTRICT HEALTH OFFICER (DHO)

1. District Health Officer (DHO) will be overall in charge of health and medical services to be rendered at the site of emergency or at various rescue shelters, affected places, hospitals, pathology laboratories, etc.
2. On receiving the information from DC, he will contact all Hospital Superintendents, Drug Controller, Blood Banks for mobilization of required ambulances/Doctors/Nurses/Medicines/life saving drugs, blood etc.
3. Rush to the site, assess the extent of severity and establish adequate (Temporary Medical Centre). Ensure hygienic conditions at the rescue shelters cum rallying posts, temporary medical centers. Take appropriate action in shifting affected persons to proper hospitals and provide appropriate treatment.
4. Arrange for removal of dead bodies, if any, after post-mortem and disposal of the same.
5. Render advice on precautionary measures to be taken by public in affected sites/villages, rescue shelter cum rallying posts to prevent the outbreak of epidemic diseases.
6. If necessary, he should undergo training to handle the wireless apparatus for effective communications.

ROLE AND RESPONSIBILITIES OF THE DISTRICT HEALTH OFFICER (DHO)

Phase	Activities	Other Officials to be involved	Resources/ equipments to be procured from
Pre Disaster	➢ **Preparedness and Warning Dissemination:** ➢ Stock piling of life saving drugs/ ORS packets/Halogen tablets on receipt of warning from the Collector/DCR. ➢ Transmission of messages to all PHCs to stock medicines and keep the medical staff ready. ➢ Disease surveillance and transmission of reports to the higher authorities on a daily basis. ➢ Vaccination. ➢ To obtain and transmit information on natural calamities from the DCR. ➢ Ensuring distribution of areas of operation among the mobile team. ➢ Pre distribution of basic medicines to the people who are likely to be affected. ➢ Shifting the patients who are in critical situation to the district hospital. ➢ Awareness messages to stop the outbreak of epidemics. ➢ Conducting mock drills	DHO, Medical Officers of PHCs/ ICDS, CDPOs NGOs, CBOs, private practitioner in the locality/ first aid trainers.	Medicines, required medical equipments, First aid kits, ambulances, public address systems, mobile vans, tents.
During Disaster	**Rescue and Evacuation: -** ➢ Constitute mobile teams and visit the worst affected areas. ➢ Disinfection of drinking water sources. ➢ Opening of site operation camps. ➢ Regular health check-up at shelter camp & affected areas. ➢ Assigning responsibilities to the medical officers for close monitoring of health camps.	DHO, Medical officers of PHCs, ICDS, CDPOs, NGOs, CBOs, private practitioner in the locality, first aid trainers Rescue team, volunteers at the shelters, police, fire officers, trained volunteers.	Medicines, required medical equipments, first aid kits, ambulances, ambulances, public address systems, mobile vans, tents
Post Disaster	**Restoration and rehabilitation: -** ➢ Organization of health camps. ➢ Deploying mobile fully equipped and manned medical vans. ➢ Close monitoring of health camps. ➢ Ensuring adequate quantities of medicine/disinfectants. ➢ Making sure that there is no outbreak of water borne diseases/malnutrition. ➢ Co-ordination with the District Rehabilitation Committees, other line departments, NGOs/ICDS projects, village Committee, PHD, RWSS, etc.	DHO, Medical officers of PHCs, ICDS, CDPOs, NGOs, CBOs, private practitioner in the locality, first aid trainers Rescue team, volunteers at the shelters, police, fire officers, trained Volunteers.	Medicines, required medical equipments, first aid kits, ambulances, ambulances, public address systems, mobile vans, tents

9.4 SOP FOR ASSISTANT COMMISSIONER

He will be the overall in charge of Rescue shelter/Rallying post and parking yards.

1. He will ensure adequate food and clothing in co-ordination with Dy. Director, Food and Civil Supplies, Voluntary Organizations, Individual Persons as deemed necessary in his option.
2. He will also ensure proper medical aid (first aid as well as shifting of affected persons to hospitals, etc) in co-ordination with District Health Officer and District Drug Controller.
3. He will ensure adequate security and safety in co-ordination with SP (Law & Order), and Dy. SP as the case may be.

In addition to these responsibilities, the AC will assist the DC and others in all other matters as the case may be. The concerned Assistant Commissioner is the **Disaster Manager** and he would rush to the Local Emergency Control Room (LECR) which is set up at the taluk headquarter of the affected taluk. He would function as the link between the affected area and the District Disaster Manager based at the main ECR located in the Deputy Commissioner office at Chikkamagaluru.

Following are the main functions during any emergency: -

- Set up the LECR at the concerned Taluk headquarters or at a safe place close to the scene of the disaster.
- Depending on the nature of emergency, co-ordinate with the various agencies at local level.
- Initiate the rescue operation with the help of local police, fire or other voluntary organisations and mutual aid members.
- Have close interaction with the Site Controller to ensure proper actions have been taken.
- Visit the affected area to gain first hand information of various steps being taken to mitigate the effects of the disaster.
- Keep the main Emergency Control Room at district head quarters informed about the developments on a regular basis and request for additional help by way of resources or specialized manpower or equipment.

9.5 SOP FOR TAHSILDAR

He will look after all the facilities required at rescue shelter/rallying post like food, clothing, medical aid, water, electricity, sanitation and other basic necessities in co-ordination with respective Government Agencies as well as voluntary organizations.

1) He will manage and arrange for any other requirements on need basic at that point of time in co-ordination with respective government authorities.
2) He will alert all his sub ordinates and utilize their services to manage the rescue shelter/rallying post.
3) His actions will be in concurrence from AC/DC.

The Site Controller would be at the scene of the disaster or accident and would be reporting to the Disaster Manager located in the Local Emergency Control Room. He is the person who is dealing with the disaster directly in association with the various other emergency services. He would be in direct contact with the Disaster Manager based at the **Local Emergency Control Room (LECR).** His responsibilities vary widely depending on the type of emergency. It could be a natural disaster like flood the effects are wide spread where rescue work would be of main concern. It could be a road accident involving a tanker carrying hazardous chemical where quick action has to be taken to arrest the leakage, if any, followed by evacuation of people if required.

Following are the main functions any emergency

- Take measures to mitigate the emergency in association with various emergency services like fire and police
- Keep in constant touch with the Local Emergency Control Room at taluk headquarters with available means of communication and keep Disaster Manager informed about the developments on regular basis.
- Request for additional help like specialized manpower or equipment to effectively handle the emergency.
- Rescue and evacuate the people from affected area and shift them to safe shelters.
- Ensure setting up of safe shelters with basic amenities for food sanitation.
- Mobilize medical professional with the help of ECR or LECR and ensure the affected persons are given medical attentions.
- Arrange to shift the injured or sick to specialized hospitals if need be.

9.6 SOP FOR DEPUTY SUPERINTENDENT OF POLICE

The DySP of the sub-division where the disaster has struck would get in touch with the nearest police station and ensure the police team is rushed to the scene of the emergency. His main function would be to act as link between scene of the accident and the Emergency Control Room

- On receiving information from the Emergency Control Room, he would rush to the site, assess the situation, obtain first hand information, take control of the overall situation.
- Alert district administration to mobilize Reserve Police personnel for deployment for traffic regulations, supervision of evacuation and security duties.
- Alert area District Commandant of Home guards to mobilize home guards, as necessary (and keep the SP informed).
- Arrange for necessary transportation vehicles for rescue operation in consultation with RTO.
- Arrange for necessary ambulances and other medical facilities for the affected persons in co- ordination with various government and non-governmental agencies.
- Arrange for removal of the dead bodies, identifications and proper preservation.
- Prepare list of missing persons and take immediate steps to trace them.
- Communicate the information to other agencies through police control room.
- Keep in constant touch with ECR to ascertain latest status and intimate police personnel with up to date information regarding response actions and further instructions.
- Arrange for relief to policemen handling the emergency situation.

9.7 SOP FOR CIRCLE INSPECTOR (LAW AND ORDER)

1) The office will be overall in charge of the functions of Police Department in case of offsite emergency. He will receive the communication and instructions from DC/SP from time to time.
2) On receiving the information about the emergency from DC/SP, the officer will rush to the incident spot and oversee law and order, organize for additional requirement of men and Home Guards if required.
3) Receive information from the site in charge and divisional fire officer or his deputy available at site for appropriate and necessary rescue operation.
4) Arrange for necessary transportation of vehicles in co-ordination with RTO and in charge of parking yard for evacuation of people as well as critical cases.

5) Ensure that adequate numbers of vehicle are provided, fitted with public address system and wireless to the convoy team.
6) Arrange for necessary ambulance/medical facilities in co-ordination with District Health Officer/Deputy Director, Animal Husbandry for evacuation of people and livestock respectively.
7) In confirmation with DC/SP, arrange for removal of dead bodies (if any) and will pass on the information to the relatives of the decease and will ensure disposal of dead bodies after conducting post mortem in co-ordination with DHO.
8) Arrange for maintaining law and order at the site of emergency, rescue shelter parking yards, main roads leading to emergency site, etc., pass on the information to the DC/SP about actions on various fields.

The Circle Inspector of the concerned area would also rush to the scene of the accident and direct the various operations like maintaining law and order, barricading and diversion of traffic away from the scene of accident. His main functions would include

- Maintain direct contact with the local police station through the police mobile van.
- Keep monitoring the progress of various rescue measures being undertaken.
- Ensure police personnel are given updated information for announcement during the emergency.
- Mobilize government and private buses through RTO for evacuation.
- Ensure that the bus/vehicle drivers are properly instructed regarding areas to be visited and routes to be taken during evacuation.
- Ensure security duty personnel are at their posts and that only authorised personnel/vehicles are allowed to enter the emergency/affected area with proper identity cards.

Police Inspector will assume the charge of DSP in the absence of the DSP till such time the superior officer arrives at the place of accident and takes control then onwards, he will continue to receive the orders from the superior officers and act accordingly

9.8 SOP FOR INSPECTOR (TRAFFIC)

1) The SP will be the overall in charge of traffic management.
2) Receive the communication of offsite emergency from CEC and disseminate the information to all the functionaries and mobilize required force and put them into action for managing various traffic points, routes, etc.
3) For each industry, separate routes are identified as normal route and emergency route.
4) Mobilize necessary police personnel/vehicles to man and control traffic on various roads identified as safe routes and also take measures to divert normal traffic away from the emergency routes identified.
5) Ensure available of adequate number of vehicles fitted with public address system/wireless etc. and directly supervise manning of routes and parking yards.
6) Initiate action to ensure adequate number of skilled drivers in consultation with RTO, KSRTC, Home guards and Truckers Association etc.
7) The SP will initiate action on his own only under exceptional circumstances; however, his action shall be communicated to his superiors and should be confirmed with CEC.
8) Any other action as deemed necessary base on the circumstances.

Depending on the type of disaster, the traffic police would take control of the traffic movement in the district. During a natural disaster like cyclone or floods the roads may be cut off for a longer period and hence traffic police play a very important role in handling any such emergencies. Their duties would include

- Stop traffic approaching the affected area and advise the crew regarding the impending danger.
- Ensure tankers containing hazardous chemicals are parked in safe places.
- Check for alternate routes and divert the traffic in a controlled manner to prevent congestion in diversions.
- Keep close liaison with other police agencies and assist in crowd control around the affected area.
- Make way for emergency and relief vehicles on priority basis.
- Monitor the condition of the blocked road and resume normal traffic only when the affected area is declared safe.

9.9 SOP FOR THE REGIONAL FIRE OFFICER

He will place himself in the main Emergency Control Centre and maintain continuous contact on VHF with the Station Officer at the site. Depending on the need, the Regional Fire Officer will place himself at the site and maintain contact with the Deputy Commissioner in the Main Emergency Control Centre.

The Station Officer/ Sub-Officer/Asst. Sub-Officer of the fire station closest to the scene of disaster will direct fire-fighting operations at the site and keep the Regional fire officer/station officer informed of the developments at the site.

Main functions: -

- Initiate rescue and fire fighting operation with available means. Ensure that all fire fighters use proper personnel protective equipment while fighting a fire or controlling gas leak.
- Help the District Administration in evacuation of people from affected zones using escape routes decided in advance depending on the wind direction.
- Continuously evaluate the situation and decide the necessity to call in additional Fire Engines from neighbouring taluks/district.
- Mobilize the services of the home guards for fire-fighting through the police.
- He will advice the Deputy Commissioner on the extent of evacuation necessary.
- Preserve valuable evidences, which may be useful for investigation later on.
- Ensure availability of water and make arrangement for private water tanker carriers.
- When the emergency is over, carry out joint inspection of affected areas along with site controller and Technical experts to ensure the emergency is under control.
- Send the message of “SAFE” to DC/SP etc to enable him to officially call off the emergency.

Take any other appropriate actions as deemed necessary in control of emergency

9.10 SOP FOR FIRE STATION OFFICER

The Fire Station can cater to the immediate need of the plant, but certainly not adequate to manage the emergency assumed in this document. Therefore,

1) On receipt of fire call, rush to the site of incident with all crewmembers and equipment and start fighting the fire.
2) Immediately send distress call to all other fire stations for additional reinforcement. Contacts the Divisional Fire Officer and informs him about the severity of the fire, the kind of assistance required, etc.
3) Continue to receive the necessary information from his superior officers and the DSP and adhere to the instructions.
4) Assist the police, Home guards and other Rescue Team the rescue evacuation of persons, salvage, etc.
5) Continue to be inaction till such times the divisional fire officer or his deputy arrives at the place of incident and takes charge. From there onwards, he will continue to assist the officials

9.11 SOP FOR HOME GUARDS COMMANDANT

District Commandant/Dy. Commandant will position themselves in the Emergency Control Room and assist the District Administration in mitigating the emergency. They would be continuous in contact with the field officer/units.

Main functions: -

- Assist the Police or Fire personnel in carrying out their duties.
- Carry out rescue and evacuation operation in close association with other emergency agencies.

Evacuated areas would need to be guarded against theft

9.12 SOP for Superintendent Engineer Public Works/Highway

Depending on type and location of the disaster, the in-charge of the PWD / Highway or Irrigation department representatives would make them available at the ECR and maintain close contact with their engineers who would be at the scene of the disaster.

Main functions: -

- Help the police to divert traffic away from the scene of accident along all the major roads.
- Ensure diversion routes are in good condition and traffic does not get jammed.
- Exhibit proper diversion signs conspicuously at suitable places.
- Provide the mobile crane/heavy earthmoving equipment for the purpose of salvage operation.
- Provide necessary assistance as required and directed by Deputy Commissioner /Superintendent of Police.

9.13 SOP for Deputy Director of Animal Husbandry

1) Deputy Director of Animal Husbandry will be the overall in charge for treatment of affected animals at site/hospital in co-ordination with police / voluntary organizations and revenue authorities.
2) On receiving information from DC, he will rush to the site and activate the Temporary Medical Centre (TMC) at appropriate places in consultation with DC.
3) Dy. Director will also co-ordinate with Assistant Commissioner/RTO/DCP /Inspector of Police (Traffic), for arranging necessary vehicles for shifting of animals, if required.
4) The officer will be provided with one Police Officer with adequate number of Police Personnel and Home guards to ensure the orderly treatment and management of the Temporary MedicalCenter.
5) The officer will identify the drug stores and ensure the supply of adequate and necessary drugs through the Drug Control Authorities.

9.14 SOP for RTO

1) The RTO will be the overall in charge for providing number of rescue vehicles like trucks, buses, cars or any other type of transportation vehicles to emergency site, rescue shelter cum rallying post etc., for transportation of human beings as well as animals.
2) Receive information from DC and act accordingly.
3) Mobilize all possible resources is arranging transportation vehicles in co-ordination with KSRTC, Truckers Association, Travel Agencies, etc, also ensure availability of adequate number of skilled drivers and advise the Inspector (Traffic).
4) Workout the requirement of heavy earth moving equipment like cranes etc., and mobilizes the same in co-ordination with such agencies/parties.
5) Depute adequate numbers of Motor Vehicle Inspectors for assisting Inspector of Police, Traffic (in charge of parking yard), and Rescue Shelter cum rallying post, at the site of emergency.

The transportation department plays an important role during any type of disaster as it would involve large-scale evacuation of people in the affected area. RTO/ARTO would be based at ECR and assist the District Administration in mitigating the emergency.

Main functions

- Deploy required number of buses with drivers to evacuate people to safe shelters.
- Mobilize various earth moving equipment and other heavy machinery from different sources required for rescue operation.
- Provide mobile workshop if required for urgent repairs/breakdown.
- Provide assistance as required and directed by Superintendent of Police/Deputy Commissioner.

9.15 SOP for Environmental Officer, Pollution Control Board

1) On receiving information from DC, the Environmental Officer will mobilize all possible resources at his disposal and keep the laboratory functioning for analysis of pollutants, emissions, etc.
2) Rush to the site, collect the samples, analyze the pollutants and the likely effect on human life/environment and inform the DC about the same and the corrective actions to be taken to prevent further damage.
3) Act as an expert and advice the DC about the kind of message to be disseminated to the public and press, etc, on pollution matters.

The representative of the Pollution Control Board would be based in the Emergency Control Room during any disaster and ensure the environmental damage is kept minimum.

Main functions: -

- Mobilize all possible resources at his disposal and keep the laboratory functioning for analysis of pollutants and emissions.
- Rush the team to the affected area for collection of samples and analyze the same.
- Keep the Emergency Control Room informed about the possible effect on human life as well as environment and corrective actions taken to minimize the same.

9.16 SOP for Executive Engineer of Panchayat Raj Engineering

1) The Executive Engineer will be over all in charge for providing adequate sanitation facilities such as dry latrines, soak-pits, etc. at the temporary rescue shelters.
2) Ensure maintenance of hygienic conditions at all such places including the site of incidence
3) Ensure adequate supply of potable water to all places such as rescue shelters cum rallying post, parking yard, and temporary medical centers.
4) Assist other agencies as advised by DC as and when needed.

9.17 SOP for Dy. Director, Food and Civil Supplies

He would be based in the Emergency Control Room and assist the District Administration in running the safe shelters and relief centres set up during the disaster.

Main functions: -

- Will be overall in-charge or Relief and Rehabilitation activities.
- Identify the rehabilitation centre in advance and establish them in shortest possible time.
- Arrange for orderly transportation of population from the emergency zone and adjacent villages in case evacuation has been ordered by Deputy Commissioner.
- Co-ordinate with the other departments connected with relief measures.
- Provide basic amenities such as food, drinking water and sanitation at the rehabilitation centres.
- Distribute food packets at the affected areas to the people, emergency services agencies such as police, fire fighting personnel and others.
- Exercise any other powers to seek any assistance from the local authorities in achieving this objective.
- Establish contact with the voluntary organisations for assistance.
- To ensure that necessary arrangements are made for the orderly return of all villagers to their respective places once the Deputy Commissioner informs about the termination of the emergency.

9.18 SOP for District Information Officer

The District Information Officer would be based in the Emergency Control Room during any disaster and assist the district authorities in smooth operation.

Main functions: -

- Upon receiving the information from District Administration, the information officer should co- ordinate with media for giving information regarding emergency.
- Co-ordinate with the affected victims families for giving information of their dear ones if

RESPONSIBILITIES OF OTHER LINE DEPARTMENTS:

Designation of the Officer	Duties to be performed in Normal Time	Duties to be performed after receiving 1st Warning	Duties to be performed after the Disaster
Asst Engineer / AEE, Electrical, PWD	He should see that the field staff checks the electrical line and replace old materials used in the power supply. He should see that all had wiring in service connections are rectified. He should enumerate the diesel sale available and his jurisdiction and keep it available. He should see that trees, branches etc., fall on electrical lines are out and removed. The field staff should see that electrical supply in the places where landslides may be serving is cut off. The field staff should be in touch with local panchayats and inform the situation at frequent intervals. To provide diesel generators to hospital water works, control room collector's office in case of failure of powers.	On receipt of the 1st warning it should be communicated to all the sub ordinates staff. He should see that all the vehicles under his control be kept in perfect order. Alert the entire staff to return their headquarters and get in touch with immediate requirement. They should give wide publicity that houses consumers should arrange lanterns and battery light for use in case of power is out off.	Restoration of power lines on priority to: 1) Hospital, water supply 2) Control room 3) Railway station and 4) To other office on priority as per list appended. Live wires on ground should be removed promptly. Damaged or felled electrical poles should be immediately replaced and obstructions on roads should be get removed.
Asst. Engineer/ AEE, Irrigation	The branches to canal drain to be closed. The embankments should be strengthened. It should be checked whether the passage bridge and channels are in good condition. The obstruction in the canals if any should be got removed immediately to be enabling free flow of water. The bocks and shutters of the canals are to be checked and satisfied that they are in good condition. Water supply into canals should be out off by closing the sluices. The canals and drains should be free from constructing and they should be made available for free discharge of drain water.	1st warning should be communicated to all the sub ordinate staff and employees. They should be alerted to check whether the canals and drains are in proper condition to allow free flow of water. The situation tour should take their duty places and be readily available.	Damages due to hazards to government properties, lives of man and cattle etc., should be assessed and reported to Panchayats, Sub-collector concerned immediately.

Fire Officers	The Fire Engineers should alert and other vehicles should be kept in good working condition. Materials required for use in emergency should be indented for and kept in reserve. Message received from public on disaster for help should be immediately attended. Keep in touch with each of the other fire stations in the district.	The 1st warning should be immediately communicated to fire stations. The staff should be called on for duty. Full complement of the staff should be available for the vehicles should be obtained and kept in reserve.	
Executive Engineer, **Roads and Buildings**	Government buildings should be inspected and necessary repairs to be got executed to withstanding hazards affected. Script for slides, pamphlets and cultural programmers should be got prepared immediately. Arrangements should be made to obtain poster and films by addressing the Director through the Collectors. Public addresses equipment should be obtained kept ready. The community radio sets available in the villages should be ascertained. The names of hamlets where they are not available to be reported. The public should be fully educated regarding the precautionary measures and after disaster through available media. Specific duties should be assigned to the field staff. The field staff should proceed to the place of work allotted.	The 1st warning should be communicated immediately to all sub ordinate officers. Wide propaganda should be arranged. The sub divisional public relation officer should be available at their headquarter and got ready for disaster duty with short notice. Ensures that all community radio sets are in working condition.	Photographs of damages should be taken. The field staff should conveying formation regarding the quantum of disaster, loss of property, lives of men and cattle. They should be posted with up-to-date information and the information should be passed to the Collector immediately.
Regional Transport Officer	List of vehicles running condition to be requisitioned kept ready.	Availability of petrol, oils should be ensured. The RTOs and MVIs should be asked to serve requisition orders on owners of vehicles for duty.	Electricity department for restoration. Roads and buildings for clearance. Restoration of Telephone lines to control room to Collector, Hospital, Fire Station, SP and other offices as per the list appended

Motor Vehicle Inspector	The MVI/AMVI will report before ADM (Relief)		
Civil Supplies Officers	The Asst. Engineer and Junior Engineers will remain alert.	Soon after receipt of 1st warning all the public call officers to be informed to instruct the village panchayats, Post Master for dissemination of warning in the villages. All telephone sets to be informed of disaster warning soon after the receiver is lifted from the book as in the case of new year's greetings and to request to telephone users to convey disaster warning to other public. Provision of vehicles	
Divisional Manager, Telephone	Based on the experience on the previous disasters sufficient number of vehicles should be procured and kept in district headquarters To contact all sub division control room and Collector's Office.		
ZP/PWD/ULBs	Identification and supply of availability of potable water sources, water purification tablets, construction of temporary shelters and maintenance		
DD, Veterinary Dept.	Identification of safe shelters for animals		
Police, Dy. Commandant, Home guards	Deployment of Home guards and constables to maintain law and order.		
Revenue	Encouraging NGOs to carry restoration and reconstruction works.		
Secretary Revenue/CS	Supervising all the activities		
Secretary Revenue/CS	Collection of progress reports and furnishing report to the Government.		

Chapter-10
Standard Operating Procedures for Departments

10.1 Introduction

Traditionally, the community provide the first humanitarian response. Responding to a sudden disaster is difficult and may become chaotic and complicated for the authorities and community. Disaster events during night time, rainy season or winter season with collapse of communication & transport network may further complicate the response. The first reaction is to act spontaneously. The district administration headed by Deputy Commissioner provides first organised response to any disaster calamity or crisis. Immediate response to any disaster is to launch rescue operations aimed at saving human lives, animal lives and property in order of priority. The rescue operations are to be carried out over a short period of time ranging from few hours to few days. During this period depending upon intensity, mobilisation of all possible resources is to be done. As the rescue operation is on, the process of providing relief such as food, clothing, shelter, security, first aid, sanitation etc. also starts and this phase may last for few days.

10.2 Response

Immediately on receiving information about the disaster that strikes any area the trigger mechanism is Activated either from 'TOP' or from the 'BOTTOM' depending upon the situations the following actions will be initiated:

- Generation of event scenario report to be sent as per the trigger mechanism.
- Preparation of current status on life line facilities and infrastructure.
- Rapid visual assessment of damage to buildings.
- Assessment of Casualities.
- Assessment of number of displaced persons.
- Assessment of transport requirements
- Assessment of requirement of shelters
- Assessment of basic need requirement of displaced persons.
- Status of search and rescue operations.
- Details and listing of missing persons.
- Assessment of type & extent of medical support for undertaking emergency operation.
- Status of identification of stakeholders and role players for providing supporting
- response and recovery operations.
- Status of activating call centre for providing multiple pieces of information to callers
- and relatives of victims.

Primary tasks during this phase would be

a) Proper need assessment through village response
b) Deployment of resources to all affected sections in an equitable manner
c) Besides food, cloth and shelter facilities such as public health and sanitation is to be provided in shelters or camps.
d) Ensuring total transparency in distribution of relief material
e) Putting in place an objective method of assessing damage

10.3 Role of Specialised agencies

- Civil defence organisations will be involved in organising relief & rescue operations
- Recognising the fact that police are among the first responders in any crisis all police
  stations in the State would be further trained for ensuring effective response rescue in
  the wake of disaster or crisis situation. As first responder police normally communicate information and mount rescue and relief operation with whatever rescue available at their disposal.
- Specific rescue teams will be constituted at State, District and Sub Division level to
  serve as an auxiliary to Police & Fire teams. Home guards will also assist the police in maintaining law and order.

10.4 District Emergency Operation Centre (DEOC):

- District Emergency Operation Centre located in the office of Deputy Commissioner shall discharge the following functions:
- On receipt of information from SEOC/SEC or from any field office or Panchayat or from any other reliable source, DEOC will bring this in the notice of DDMA.
- DEOC shall issue necessary alerts to all authorities in the district or at state level depending on the situation.
- DEOC will send regular status and appraisal reports to SEOC.
- DEOC shall maintain all records.
- DEOC shall collate and synthesise information for consideration of DDMA.

10.5 District Disaster Management Authority:

- DDMA shall assess the situation and give directions to the concerned department heads in the district for better handling of the situation.
- DDMA shall assess the situation by taking into consideration reports from all formal and informal sources and decide upon the level of the disaster.
- Issue necessary direction for handling the response, relief & restoration measures.
- Call for outside support if necessary
- Keep the SDMA /SEC informed about the situation
- Raise demands for support and assistance
- Assess the resource availability and issue necessary direction for pooling resources for speeding an effective response.
- Process requests for NDRF/Army or any other specialised help.
- Coordinate with NGOs and Civil Society for supplementing the efforts of Govt.
- Monitoring and reviewing the situation on a regular basis.

10.6 First Response:

At the local or village level, when disaster is sudden and no early warning signals are available community members and specially the village disaster response team comprising Gram Panchayath Adhyakshya, PDO, Village Accountant, Supervisory level staff of GP & Elected members, Civil Defense, nearest police station, Home-guards, Fire, Health and Family welfare, NCC, NSS, NYKS, Ex-servicemen volunteers shall be the first responder

First information report:

- District Emergency Operation Centre shall prepare and send first information report to SEOC/summarising the following :
- Severity of the disaster • Action being taken
- District resources available and coping capacity.
- Need assessment for relief along with quantities.
- Logistics for delivering relief.
- Assessment on future development including new risks.
- FIR should be sent within 24 hours of occurrence of calamity as per the standard format.

Daily Situation Report:

Daily situation report is to be submitted by DEOC for the consideration of DDMA/SDMA/SEC. The report is to be submitted in a standardized form. SOEC shall submit similar report to NDMA/MHA.

Air Dropping of Food in Inaccessible Areas:

DDMA/SDMA/SEC shall decide about air dropping of essential commodities in cut off and inaccessible pockets. SEC will liaise with AIR Force or Govt. of India for requisition the helicopters. Food and Civil Supplies Department shall arrange preparation food packets for airdropping as per the advice of DDMA/SDMA.

Rapid Damage Assessment:

Teams of officials drawn from various sector and with the support of local Tahasildar shall make first hand ground assessment of the damage & loss for deciding upon the rescue & relief operations. Preliminary report should be available within 24 hours of the calamity. Preforms for FIR, Daily situation report and Damage assessment are placed.

Immediate restoration basic facilities & repair of infrastructure:

MESCOM and KUW&SDB will ensure the restoration and repair for providing electricity and drinking water. IT department through BSNL and other concerned agency shall ensure the communication for smooth operation of rescue and relief works.

Disposal of Dead Bodies:

District hospital, Police and District administration and forest department shall facilitate the disposal of bodies in event of mass casualties. The process of identification and handing over to next of kin shall be followed. Mass burial/disposal of bodies shall be the last resort. The bodies shall be disposed in honourable manner by observing religious and cultural practices in the area. NDMA guidelines in this direction would be followed.

Disposal of Carcasses:

Department of Animal Husbandry in association with the local administration shall be responsible for disposal of carcasses in the event of mass destruction.

Information & Media Management:

Department of Information and Publicity in consultation with SEC/DDMA shall be responsible for dissemination of information to electronic and print media. Press briefing shall only be given by a person authorised by DDMA/SEC

Institutional Mechanism

The State Government has adopted the Disaster Management Act 2005 as enacted by the Govt. of India for providing effective mechanism for Disaster Management in the State

10.7 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.

As per the DM Act, 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 Incidence Response System (IRS) the chief Secretary shall function as RO at the State level and Deputy Commissioner at district level.

10.8 Roles and Responsibilities of Deputy Commissioner as RO:

a) Ensure that IRTs are formed at District, Sub-Division, Tahasil/Taluk levels and IRS is integrated in the District DM Plan as per Section 31 of the DM Act, 2005. This will be achieved by issuing a Standing Order by the RO to all SDMs and Tahasildars/ TPEOs;
b) Ensure web based / on line Decision Support System (DSS) is in place in DEOC and connected with Sub-Division and Tahasil / Taluk level IRTs for support;
c) Ensure that toll free emergency numbers existing for Police, Fire and Medical support etc. are linked to the DEOC for response, command and control;

d) Obtain funds from State Government as recommended by the 13th FC and ensure that a training calendar for IRTs of District is prepared and members of IRTs are trained through ATIs and other training institutions of the District;
e) Delegate authorities to the IC;
f) Activate IRTs at District headquarter, Sub-Division, Tahasil / Taluk levels, as and when required;
g) Appoint / deploy, terminate and demobilize IC and IRTs as and when required;
h) Decide overall incident objectives, priorities and ensure that various objectives do not conflict with each other; i.Ensure that IAP is prepared by the IC and implemented;
i) Remains fully briefed on the IAP and its implementation;

10.9Local Authorities PRIs and ULBs:

The DM Act, 2005 has defined the roles of Municipalities, Municipal Corporations, Municipal Councils and PRIs under section 41 (1) (2). These bodies will ensure that their officials and employees are trained in DM and resources relating to DM are also maintained in order to be readily available for use in any threatening disaster situation. These bodies will carry out relief activities in the affected areas in accordance with State and District DM Plans.

10.10 Community Participation in Disaster Response (CBDM):

A number of community based organizations like NGOs, Self Help Groups (SHGs), Youth Organizations, Volunteers of NYK, Civil Defence (CD) & Home Guard, etc., and workers of different projects funded by Government of India like National Rural Health Mission (NRHM), Integrated Child Development Services (ICDS), etc., would be required to act as volunteer in the aftermath of any disaster.

In the IRS structure, the skills of these organisations shall be utilised as Single Resource. The ROs of the State and District will ensure that such resources at village, ward or Gram Panchayat levels are organized with the help of leadership of PRIs and other community leaders. Their resources would be identified as per hazard and they would be encouraged and trained to be a part of the IRT. As a part of Plan one NGO for each Taluk/block as lead NGO shall be identified and whose capacity will be developed to coordinate response.

10.11 Role of Village Disaster Response Committees (VDRC):

The plan envisages constituting village response committees in each Panchayat comprising Panchayat President, Panchayat Secretary/PDO and village Accountant besides ward members. The village committees will constitute response teams from amongst the villagers by taking in to consideration the local needs vis-a-vis the hazard and vulnerability assessment. These response teams will be trained as first responders to garner disaster response in the absence of outside emergency responders. The plan envisages covering all Panchayats. The capacity building would involve awareness raising (about hazard, risks, disaster response) organising training (medical first aid search & rescue extrication from damaged buildings, road clearance, fire fighting) equipping (first aid kit, radio, extrication equipment) and networking. The plan also envisages establishing and strengthening local warning systems holding community drills through VDRCs.

The committee would be responsible for:

- Developing the village Disaster Mitigating Plan
- Keeping contact with Taluk/sub-district and District level committees and all other agencies related with the issue.
- Constituting response teams for search& rescue, medical aid, extrication of bodies, fire fighting or for any other purpose as per village specific needs.
- Ensuring house hold preparedness to village specific hazards.
- Identification of safe locations for temporary shelters
- Training and capacity building of all teams
- Resource inventory and gap identification with respect to the needs
- Identification of vulnerable groups

10.12 Incident Response Team (IRT):

The ROs of the State and Districts will constitute IRTs from among officers at the State and District level respectively. The members of IRTs will be properly trained and sensitised regarding their roles during the pre-disaster phase itself. The SEOC & DOEC will provide continuous support to the on-scene IRT(s) and if required join them or take over response on the directions of the RO.

10.13 Incident Response System (IRS) Facilities:

For effective response the following facilities will be established depending on the needs of the incidents.

Incident Command Post (ICP):

The ICP is the location at which the primary command functions are performed. The IC will be located at the ICP. There will be only one ICP for each incident. This also applies to situations with multi- agencies or multi jurisdictional incidents operating under a single or Unified command will be located with other incident facilities like Incident Base.

The ICP may be located at Headquarters of various levels of administration and in case of total destruction or non availability of any other space, the ICP will be located in a vehicle, trailer or tent with adequate lighting, effective communication system.

Deployment of IRT:

On receipt of information regarding the impending disaster, the EOC will inform the RO, who in turn will activate the required IRT and mobilize resources. The scale of their deployment will depend on the magnitude of the incident. In the event of occurrence of disaster without warning local IRT (District, Sub-Division, Tahasil /Taluk/ Village) will respond and inform the higher authority and if required seek reinforcement and guidance.

10.14 Roles and Responsibilities of Nodal Departments/ Agencies

State Disaster Management Authority	Lay down policies and plans for disaster management in the State. Declare emergency situation in case of State level disaster and the end of it. Provide policy directions and integration of Disaster Management programmes in the state development framework.
State Executive Committee for Disaster Management (SEC)	Implementation of the State Plan and monitoring body for management of disasters in the State.
ATI Mysuru (Centre for Disaster Management)	Primary agency responsible for conducting and coordinating training to all government officials involved in the planning and implementation of preparedness, mitigation response and relief work.
State Technical Committee(s)	Responsible for ensuring community participation in the disaster management activities. They will also advise the SEC on implementation of activities at State level.
Department of Revenue (Disaster Management)	Member Secretary of SDMA. Member of SEC, Overall coordination, implementation of the EOC activities and documentation and reporting to the SEC
Department of Public Works (PWD)	Primary agency for maintenance of public infrastructure identifies safer places, assess physical damage, identify safer routes, and provide necessary reconstruction and rehabilitation support. Ensure hazard resistant features as per all building by laws and maintain all National & State roads.
Department of Town and country planning	Primary agency responsible for evolving policy and ensuring land use, hazard wise zonation and implementation building by laws.
Department of Urban development	Main agency to ensure repair and maintenance in the urban areas. Implementing disaster resistant Building Codes and Designs
Department of Education	The department will prepare curriculum related to disaster management and conduct training programme for teachers and children. The department will coordinate with the local authority and arrange for mock drills, search and rescue drills. Awareness campaigns, Volunteer Teams. Ensuring maintenance and retrofitting of school buildings/school safety.
Department of Home	Be the primary agency responsible for “Urban Fire”, “Village fire”, Nuclear disasters, Serial Bomb blasts and Festival related disasters. And also for Security, evacuation, emergency assistance, search and rescue, first aid, law and order, communication, shifting of people to relief camps, traffic management. Burial work of dead bodies, Fire management.
Department of Forest	Be the primary agency responsible for “Forest Fire” and Man-Animal conflicts.
Department of Energy	Primary agency responsible for electrical disasters and fires. It will ensure power supply for public facilities such as hospital, police stations, telecommunication building and meteorological stations. Coordination with Hydro Power Projects.
Department of Science & Information Technology , KARSAC	Responsible for the fail proof communication. Maintenance of IT infrastructures, maintain communication and satellite links.
Department of Irrigation	Primary agency responsible for Floods, Water supply and Drought, Issue flood warnings, identification of safer places, construct embankments, arrangement of boats and pump sets, swimmers and divers and communication.

Department of Health	Be the primary agency responsible for "Biological Disasters and Epidemics". First aid, health and medical care, ambulance arrangements, preventive steps for other diseases, establishment of health camps. Providing Trauma Centres and all other health related support.
Department of Information and Public Relations	Communicate warnings to the public, relay announcements issued by SEC, telecast special programmes for information and actions, education and awareness messages for preparedness actions and coordinated response. Promote disaster related polices, provide emergency communication systems, enable critical communication links with disaster sites and coordinate with media.
Department of Rural Development	Primary agency to implement vulnerability reduction projects to alleviate poverty and improve people's livelihoods. Ensure Rural development schemes implemented in the State incorporating disaster reduction measures. Assists in rehabilitation of the victims.
Department of Agriculture	Primary agency for hailstorms, droughts and pest attacks. To provide seeds and necessary planting material and other inputs to assist in early recovery. Information to farmers on rainfall and cropping methods to avoid drought situations
Department of Finance	Arrange necessary funds and ensure equitable distribution, manage accounts.
Department of Planning	Allocation of funds on priority basis for disaster mitigation and rehabilitation projects
Department of Transport	Primary agency for Road accidents. Arrange for sending personnel and relief material to the disaster affected area, relocate the affected people, keep access routes operational and inform about alternate routes. Keep an inventory of resources available with Govt. & private operators
Department of Town and Country Planning	Ensure hazard resistant features are in all building by laws. Zoning for safe construction sites and development of policies.
Department of Technical Education and vocational training	Be the primary agency responsible to conduct certificate training programmes for construction workers. To create a pool of qualified masons to ensure safe construction practices in construction work.
Department of Food, Civil Supplies and Consumers Affairs	Plan for food storage locations keeping in view the necessity. Primary agency responsible for identifying the basic needs of food in the aftermath of a disaster or emergency, to obtain appropriate supplies and transporting such supplies to the disaster area.
Department of Social Welfare	Primary agency for building capacities and increasing awareness of disabled persons and women. Organizing special camps for the disabled, widows, children and other vulnerable groups. It will also provide necessary help and assistance for socio- economic rehabilitation.
Department of Industries	Primary agency for landslides and mudflows and mining collapses.
Department of Horticulture	The primary agency for hailstorm and Pest Attack for horticulture sector. Support in crop damage assessment due to disasters.

Department of Animal Husbandry	Primary agency for Animal epidemics. Responsible for fodder assessments, supply and management during disasters and disposal of dead animals.
Department of Panchayati Raj	Ensure training of Panchayati Raj Institutions on disaster management and also ensure that all the development schemes of the department have the component of disaster mitigation as an integral part.
International Agencies / NGOs	Provide relief, coordinate with Government, and conduct awareness and capacity building programmes, preparedness activities at community level, assist in reconstruction and rehabilitation.
Department of Tourism	Coordinate in providing temporary shelters, food packages for air dropping.