DISTRICT DISASTER MANAGEMENT PLAN

RAIGAD 2024

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Abbreviations

CBRN	Chemical, Biological, Radiological and Nuclear
CMG	Crisis Management Group
CSO	Civil Society Organization
CSR	Corporate Social Responsibility

DC	District Collector
DDMA	District Disaster Management Authority
DDMO	District Disaster Management Officer
DDMP	District Disaster Management Plan
DEOC	District Emergency Operation Centre
DM Act	Disaster Management Act, 2005
DRR	Disaster Risk Reduction
EOC	Emergency Operations Centre
ESF	Emergency Support Function
EWS	Early Warning System
PWD	Persons with Disabilities
GO	Government Offices
GOI	Government of India
GOM	Government of Maharashtra
HOD	Head of Departments
HRVA	Hazard Risk Vulnerability Analysis
ICDS	Integrated Child Development Scheme of the Government of India
IDRN	India Disaster Resource Network
IRS	Incident Response System
IRT	Incident Response Team
MDRR	Mainstreaming Disaster Risk Reduction
MSAAPCC	Maharashtra State Adaptation Action Plan on Climate Change
MIDC	Maharashtra Industrial Development Corporation
NDMA	National Disaster Management Authority
NDMP	National Disaster Management Policy
NDRMF	National Disaster Risk Management Fund
SDRMF	State Disaster Risk Management Fund
NGO	Non-Government Organization
PRI	Panchayati Raj Institutions
PSU	Public Sector Unit
QRT	Quick Response Team
RDC	Residential District Collector Disaster
SDMA	State Disaster Management Authority
SDMP	State Disaster Management Plan
SDRF	State Disaster Response Force
SDRN	State Disaster Resource Network
SEOC	State Emergency Operation Centre
SFDRR	Sendai Framework of Action for Disaster Risk Reduction 2015
SHG	Self Help Group
SOP	Standard Operating Procedure

CHAPTER – 1: INTRODUCTION

1.1. Rational

Section 31 of the Disaster Management Act of 2005 requires districts to have a disaster management plan for every district. Apart from these statutory requirements, the hazard profile and guidelines for mitigation and preparedness of the district demand a comprehensive district disaster management plan to be in place for coordinated and streamlined management of disasters in the districts. The revision of the planning process has been attuned to the paradigm shift from the relief-centric approach of the past to a proactive, holistic, and integrated approach for Disaster Risk Reduction (DRR) by way of strengthening disaster preparedness, mitigation, and emergency response, as embodied in current global goals and frameworks, i.e., the Sendai Framework for Disaster Risk Reduction, Paris Climate Agreement and Sustainable Development Goals (SDGs).

1.2. Vision

"Our vision for the District Disaster Management Authority is to build a resilient and prepared community that prioritizes safety, empowers individuals, and fosters collaboration to mitigate, respond to, and recover from disasters efficiently and compassionately."

1.3. Objectives

A District Disaster Management Plan (DDMP) 's objectives are to ensure comprehensive preparedness, effective response, and sustainable recovery in the face of disasters. Here are the key objectives:

- To conduct hazard risk and vulnerability assessments within the district.
- To define various mitigation, prevention, and preparedness guidelines for all stakeholders.
- To build the capacity of all stakeholders within the district and empower community-based disaster management.
- To mainstream disaster risk reduction in the development planning process.
- To develop an efficient disaster response and recovery force with support from the local community.
- To clarify the roles and responsibilities of concerned stakeholders in various phases of disaster management.
- To promote inter-agency coordination for smooth response during emergencies.
- To promote the ‘Build Back Better’ approach in recovery, rehabilitation, and reconstruction.
- To maintain state-of-the-art early warning systems and communication networks.
- To educate the public and promote volunteerism in responding to a particular disaster or warning.

- To build partnerships with NGOs and CBOs for mutual learning and leveraging resources during emergencies.

1.4. Terminologies in Disaster Management

Hazard: A dangerous phenomenon, substance, human activity, or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Mitigation: The lessening or limiting the adverse impacts of hazards and related disasters. Natural hazard: Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current hazard events or conditions.

Prevention: The outright avoidance of adverse impacts of hazards and related disasters.

Public awareness: The extent of common knowledge about disaster risks, the factors that lead to disasters, and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards.

Recovery: The restoration and improvement, where appropriate, of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Response: The provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected.

Retrofitting: Reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

Risk: The combination of the probability of an event and its negative consequences.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Vulnerability: The characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard.

Coping capacity: The ability of people, organizations, and systems to use available skills and resources to face and manage adverse conditions, emergencies, or disasters.

Critical facilities: The primary physical structures, technical facilities, and systems that are socially, economically, or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.

Disaster risk: The potential disaster losses in lives, health status, livelihoods, assets, and services, which could occur to a particular community or a society over some specified future time.

Disaster risk management: The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster risk reduction: The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare and act appropriately and in sufficient time to reduce the possibility of harm or loss.

Emergency management: The organization and management of resources and responsibilities for addressing all aspects of emergencies, particularly preparedness, response, and initial recovery steps.

Emergency services are specialized agencies with specific responsibilities and objectives in serving and protecting people and property in emergencies.

Environmental degradation: Reducing the environment's capacity to meet social and ecological objectives and needs.

Capacity development: The process by which people, organizations, and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including improving knowledge, skills, systems, and institutions.

Climate Change: The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods.”[1]

1.5. Realigning the Plan as per Maharashtra State DM Plan 2023, Sendai Framework, SDG and COP 21, PM-10 Point Agenda

The State Disaster Management Plan (SDMP) is the basic framework and guides all the state-level government agencies and the district authorities for all phases of disaster management. The SDMP is a dynamic document periodically updated with national guidelines and global best practices. It is also

Ministry of Home Affairs, Govt. of India, Disaster Management in India
http://www.unisdr.org/we/inform/terminology

a knowledge repository related to disaster management. The guiding principles of SDMP are as follows:

1. **Shared Responsibility:** Creating an enabling environment with clearly defined roles and responsibilities, inter and intra-departmental coordination, dialogue, and promoting knowledge transfer.
2. **Disaster Resilience:** Strengthening institutional resilience via the pertinent stakeholders' top-down and bottom-up capacity building, setting up SOPs (Standard Operating Procedures) and mechanisms, and implementing the national and international frameworks (contextualized to local needs and priorities).
3. **Social Inclusion and Civil Society Learning Processes:** To promote an exchange of learning experience between institutional actors, civil society organizations (CSOs), and grassroots groups while ensuring that social inclusion is understood and used in development strategies for all target groups.
4. **Empowering Animation:** The interventions (before, during, or after the crisis) must be planned to strengthen the community over the long term rather than focusing only on the urgent needs of relief and response to a disaster.
5. **Volunteerism:** Promoting universal social behavior and providing opportunities for many people to engage in development.

The main pillars of SDMP are as follows.

1. National Disaster Management Plan, 2019
2. Prime Minister’s 10-point agenda, 2016
    - All development sectors must imbibe the principles of disaster risk management. Maharashtra State Disaster Management Plan, 2023
    - Risk coverage must include all, from poor households to SMEs to multi-national corporations to nation-states.
    - Women’s leadership and greater involvement should be central to disaster risk management.
    - Invest in risk mapping globally to improve global understanding of Nature and disaster risks.
    - Leverage technology to enhance the efficiency of disaster risk management efforts.
    - Develop a network of universities to work on disaster-related issues.
    - Utilize the opportunities provided by social media and mobile technologies for disaster risk reduction.

- Build on local capacity and initiative to enhance disaster risk reduction.
- Make use of every opportunity to learn from disasters; to achieve that, there must be studies on the lessons after every disaster.
- Bring about greater cohesion in the international response to disasters.

3. Sendai Framework and Conference of Parties (COP 21) Paris Agreement

The third UN World Conference on Disaster Reduction in 2015 saw the adoption of the Sendai Framework because of stakeholder discussions and intergovernmental discussions: the Sendai Maharashtra State Disaster Management Plan, 2023. Framework sought to enhance stakeholder responsibility and accountability, disaster risk governance, global collaboration, partnership in managing catastrophes, and understanding of exposure, susceptibility, and hazard in disaster risk (UNISDR, 2015).

The priorities for action for the Sendai Framework are:

- Understanding disaster risk.
- Strengthening disaster risk governance to manage disaster risk.
- Investing in disaster risk reduction for resilience.
- Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction.

4. Maharashtra State Adaptation and Action Plan on Climate Change, 2014
5. National Disaster Management Act, 2005

The most recent National Disaster Management Plan, 2019, explicitly outlines the ten points from the Prime Minister's Agenda for Disaster Risk Reduction, which guides the Maharashtra State Disaster Management Plan (MSDMP) 2023's overall structure and design. The Disaster Management Act of 2005 and the National Policy on Disaster Management are the salient concerns articulated through the three global frameworks of 2015—the SFDRR, SDGs, and COP 21—also included in the Prime Minister's 10-point agenda for DRR.

CHAPTER – 2: DISTRICT PROFILE

2.1 District Background

Raigad is a coastal district situated on the western coast of Maharashtra and renamed after Raigad, the fort and former capital of the Maratha Emperor Shivaji Maharaj. Raigad district spreads between 18.5158° N and 73.1822° E.
Pune bounds the district in its east, Thane in the north, and Ratnagiri in the south, whereas the western

side is covered by the Arabian Sea, with Mumbai harbor in the Northwest. It is divided into 15 Tahsils, namely Uran, Panvel, Karjat, Khalapur, Pen, Alibag, Murud, Roha, Tala, Sudhagad, Mangaon, Shriwardhan, Mhasala, Mahad, andPoladpur. Geographically, Raigad has diverse relief features, climatic conditions, and socio-economic status. The district is a narrow coastal strip of land with hillyand rugged topographic features.

Some of the Tahsil by the coastline are Uran parts of Panvel, Pen, Alibag, Roha, Murud, Tala, Mhasala, and Shriwardhan. The region generally lies below 100 meters, but several spot heights are rising to more than 100 meters, 321 meters in Mhasala Tahsil being the highest. There is limited forest cover on the Raigad coast. Only small patches of reserved forest can be seen in the south, in Murud and Shriwardhan tahsils. There are several creeks all along the coast. Mangroves, marshes, and tidal flats are common, especially in Pen, Uran, and Tala Tahsil, which are more widely spread. All the rivers are tidal to a considerable extent. Coastalalluvium soil is suitable for cultivation where intensive paddy cultivation is carried out. Coconut and Areca nuts are also grown. Sea salt is also produced in this region.

2.2 Administrative Setup

The district has been divided into eight administrative sub-divisions, i.e., Alibag, Panvel, Mangaon, Karjat, Roha, Shrivardhan, Pen, and Mahad. The District Collector, along with the District Judge, Superintendent of Police, and Chief Executive Officers of the State Government, looks after the development and regulatory functions in the district. At the tahsil level, the Tahsildar and Block Development Officer, Judicial Magistrate, Deputy Engineer, and other officers look after their respective departments for development and regulatory functions. According to the 2011 census, the Raigad district has undergone some jurisdictional changes from 2001 to 2011. That led to 16 new census towns and six new villages createdafter the 2001 census. The district covers around 2.32 percent of the total land cover of Maharashtra, with an area of 7152 sq. km. It is an elongated, narrow coastal district with a length of 150 km, a width of 24 to 48 km, anda long-indented coastline of 240 km. Alibag is the headquarters of the district.

Table 1: Taluka Administrative Information

Taluka	Area in Sq. km	Number of Villages	Number of Cities	Gram Panchayat
Alibag	500	229	1	62
Murud	231	75	1	24
Pen	499	184	1	64
Panvel	581	191	1	71
Uran	181	63	1	35
Karjat	652	205	2	55
Khalapur	179	155	1	44

Sudhagad	463	100	1	33
Roha	629	163	1	64
Tala	250	65	1	25
Mangaon	676	163	1	74
Mhasala	230	84	1	39
Mahad	1253	188	1	134
Poladpur	368	87	1	42
Shrivardhan	120	78	-	43

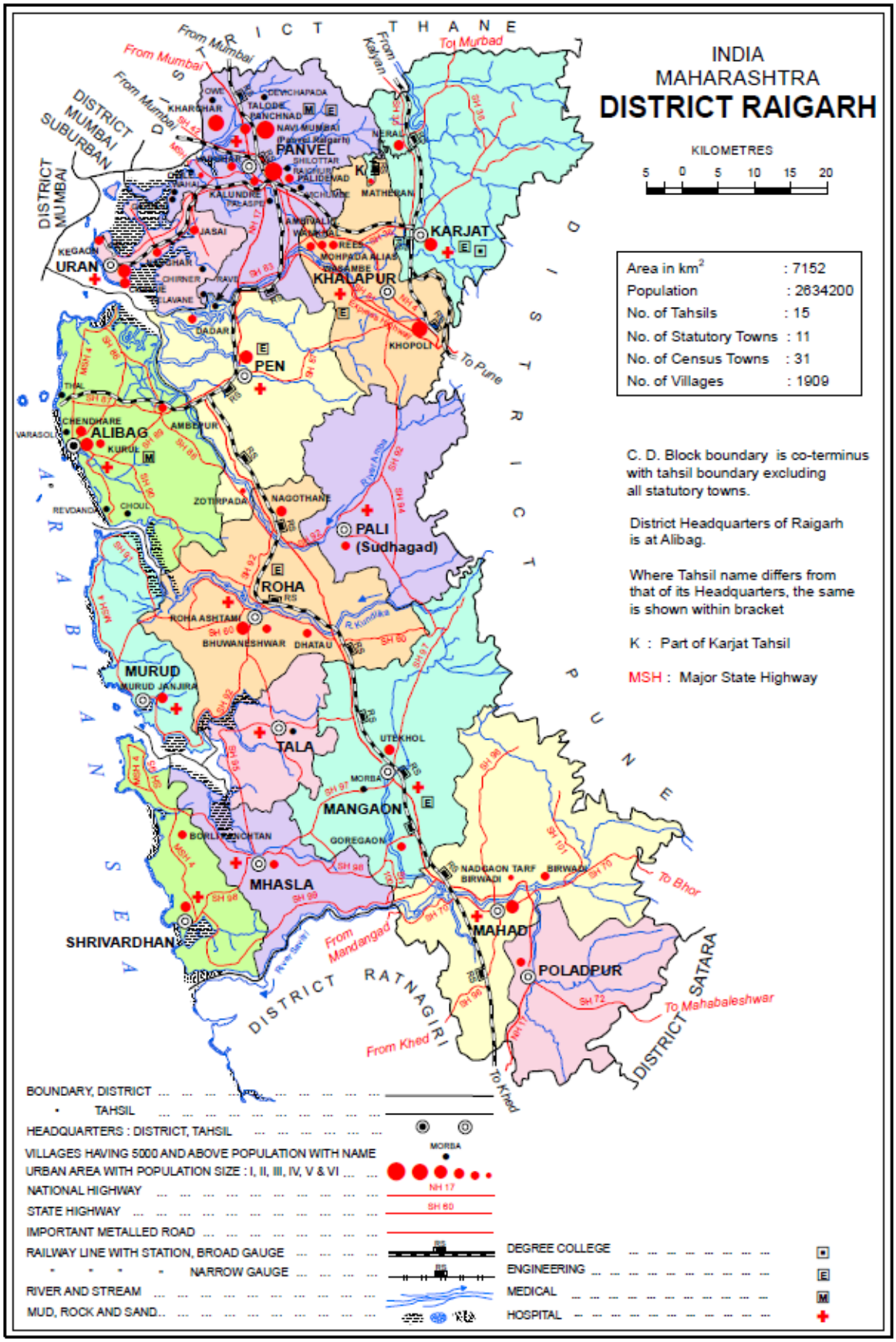


Figure 1: Raigad District Profile Map

2.3 Demographics of District

According to Census 2011, the total population of the district is 26,34,200. Thus, during the 2001-2011 decade, there has been an addition of 426,271 persons. In the rural areas, the district reported a population of 16,64,005 persons; in urban areas, it has 9,70,195 persons. As per the Census 2011, the decadal growth rate of the district is 19.3 percent. Within the District, the growth rate varies from one Tahsil to another. Out of 15 Tahsils in the District, Panvel has the highest growth rate of 77.6 percent, whereas the Poladpur Tahsil has recorded a decline in population by 16.3 percent.

As per the 2011 Census, 85 percent of the district population are Hindus, and Muslims constitute about 8.6 percent. The remaining population consists of Buddhists (4.6 percent), Christians (0.7 percent), Jains (0.5 percent), and Sikhs (0.3 percent). The proportion of others is negligible.

Table 2: Demographic Statistics

Population	Total	Persons	2,634,200
		Males	12,89,855
		Females	13,44,345
	Urban	Persons	970,195
		Males	507,349
		Females	462,846
	Rural	Persons	1,664,005
		Males	836,996
		Females	827,009
	Age group (0 – 6 yrs.)	Persons	300,815
		Males	155,437
		Females	145,378
Schedules Castes Population		Persons	134,952
		Males	67,980
		Females	66,972
Schedules Tribes Population		Persons	305,125
		Males	153,657
		Females	151,468
Population Density		368 per sq. km	
Literacy Rate		Persons	83.14
		Males	89.13
		Females	76.92
Sex Ratio		Total	959
		Urban	912
		Rural	988

Table 3: Tahsil-wise population of Raigad District

Tahsil	Males	Females	Total
Alibag	119254	116913	236167
Murud	36393	37814	74207
Pen	99570	95884	195454
Panvel	397228	353008	750236
Uran	82875	77428	160303
Karjat	107870	104181	212051
Khalapur	109225	98239	207464
Sudhagad	31553	30827	62380
Roha	85638	81472	167110
Tala	19244	21375	40619
Mangaon	78938	80645	159613
Mhasala	27655	32259	59914
Mahad	88734	91457	180191
Poladpur	21621	23843	45464
Srivardhan	38517	44510	83027
Total	**1344315**	**1289855**	**2634200**

Tahsils like Panvel, Alibag, and Mahad have significantly higher populations than others, indicating the presence of urban centers and potentially higher levels of economic activity and infrastructure development in these areas. On the other hand, Tahsils like Murud and Sudhagad have comparatively smaller populations, suggesting a more rural or less densely populated environment. In most Tahsils, the population of males and females is relatively balanced, with only slight variations. This indicates a relatively equitable gender distribution across the district. Tahsils like Panvel, Roha, and Khalapur, which have significant industrial activity or are located near major industrial areas, show relatively high populations. This reflects the influence of industrialization and economic opportunities on population distribution.

2.4 Agriculture and Livestock

Most of the people of this District are engaged in agricultural activities. As per the 2011 Census, 19.29 percent of the total workers are cultivators, and 17.82 percent are agrarian labourers. Together, they constitute 37.11 percent of the total workers of the district.

The livestock sector plays an essential role in an agricultural economy, supplementing the rural population's income and as a source of protein for the masses through milk, eggs, and meat. The livestock sector has immense potential to contribute to the district economy, GDP, and overall development. The quinquennial livestock census, a significant source of Animal Husbandry Statistics, acts as the backbone for policy formulations and implementation of various programs and schemes of the Animal Husbandry sector.

Table 4: Livestock Profile

Sr. No	Livestock	Number
1	Cattle	176906

2	Buffalo	62225
3	Sheep	2203
4	Goat	90188
5	Pig	513

(Source: Livestock Census, 2019)

2.5 Health Profile

The table reveals the distribution of healthcare facilities, including Community Health Centres (CHCs), Primary Health Centres (PHCs), and private hospitals, across various blocks. This distribution is essential for assessing the accessibility of healthcare services to the population residing in different areas of the district.

Disparities in healthcare access may be observed based on the number of healthcare facilities available in each block. Blocks with more CHCs, PHCs, and private hospitals may indicate better access to healthcare services, while those with fewer facilities may need help accessing timely medical care.

Blocks with higher urbanization levels, such as Panvel and Karjat, tend to have more healthcare facilities, including private hospitals. Conversely, blocks with predominantly rural populations, such as Murud and Sudhagad, may need more healthcare facilities. Addressing this urban-rural disparity is crucial for ensuring equitable healthcare access across the district.

The presence of private hospitals in several blocks underscores the role of the private sector in healthcare delivery. Private hospitals often offer specialized services and cater to patients seeking advanced medical treatment. However, reliance on private healthcare may pose affordability challenges for marginalized sections of society.

Table 5: Health profile of Raigad District

Block Name	CHC	PHC	Private Hospital	Total
Alibag	01	14	25	40
Murud	01	5	07	13
Pen	01	10	27	38
Panvel	01	12	-	13
Uran	01	05	21	27
Karjat	02	12	18	32
Khalapur	01	8	29	38
Sudhagad	-	04	02	6
Roha	01	07	06	14
Tala	-	06	1	7
Mangaon	01	11	23	35
Mhasala	01	9	03	13
Mahad	01	12	34	47

Poladpur	01	04	02	07
Shrivardhan	02	08	07	17

2.6 Educational Profile

The literacy rate across the district varies notably between genders, with males boasting a significantly higher rate at 89.13% compared to females at 76.92%. Regarding specific areas, Alibag Tahsil demonstrates the highest percentage of male literacy at 91.84%, while Panvel leads in female literacy at 83.29%. Conversely, Sudhagad Tahsil records the lowest rates for males (76.33%) and females (60.1%). Urban areas exhibit higher literacy rates overall compared to rural regions. There's a 12.21 percentage point disparity between male and female literacy rates. Furthermore, the rural literacy rate shows a wider gap than that of urban areas. The educational profile of the district reveals a gender disparity in literacy rates, with males surpassing females by a notable margin.

Table 6: Educational profile of Raigad District

	Literate			Illiterate			Literacy Rate		
	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females
Total	1939994	1059692	880302	694206	284653	409553	83.14	89.13	76.92
Rural	1162891	639701	523190	501114	197295	303819	78.83	86.43	71.17
Urban	777103	419991	357112	193092	87358	105734	90.55	93.58	87.23

2.7 Industry Profile

The data presents the distribution of factories based on their scale, distinguishing between small-scale and large-scale establishments. Small-scale factories typically employ fewer workers and have lower production capacities than large-scale ones.

The towns of Khopoli, Karjat, Panvel, and Taloje Panchnad are singled out as significant industrial hubs within the Raigad district. These areas host manufacturing units specializing in producing steel pipes and pharmaceuticals. This suggests these towns are focal points for the region's industrial activity and economic development.

The district's industrial sector exhibits a mix of small-scale and large-scale enterprises, each contributing to its economic vitality. While small-scale industries predominate, there are also notable large-scale ventures. These industries span various sectors, including salt production, paper and pulp manufacturing, coated fabric production, chemical manufacturing, and the production of R.C.C. pipes. This diversity indicates a broad industrial base, likely contributing to the district's resilience and adaptability to market changes. Agro-based industries produce Rice, Barli food, and yeast powder. Several Rice mills are found in Alibag, Mahad, Pen, and Panvel Tahsils. In Panvel Tahsil, many mills make ‘Poha’ from paddy. Plastic goods manufacturing industries are in Panvel Tahsil.

Table 7: Industry Profile

Block Name	Small Scale	Large Scale	Total Number of Factories
Alibag	18	11	**29**
Murud	01	01	**02**
Pen	15	13	**28**
Panvel	639	260	**899**
Uran	56	20	**76**
Karjat	11	4	**15**
Khalapur	233	148	**411**
Sudhagad	20	9	**29**
Roha	35	42	**78**
Tala	0	0	**0**
Mangaon	21	14	**35**
Mhasala	0	1	**1**
Mahad	106	58	**164**
Poladpur	0	0	**0**
Shrivardhan	0	4	**4**
Total	**1155**	**585**	**1771**

2.8 Police and Fire Services

Table 8: Division-wise Police Station List

Sr. No	Police Sub-division	Taluka	Police Station
1	Alibag	Alibag	Alibag, Mandwa, Revdanda, Poynad
		Murud	Murud
2	Pen	Pen	Pen, Vadkhad, Dadar Coastal
3	Panvel	Panvel	Rasayani
4	Khalapur	Khalapur	Khalapur, Khopoli
5	Karjat	Karjat	Karjat, Neral, Matheran
6	Roha	Roha	Roha, Nagothane, Kolad
7		Pali	Pali
8	Mangoan	Mangaon	Mangaon, Goregaon
9		Tala	Tala
10	Srivardhan	Mhasala	Mhasala
		Srivardhan	Srivadhan, Dighi
11	Mahad	Mahad	Mahad Taluka, Mahad City, Mahad MIDC

		Poladpur	Poladpur

2.9 NGO Profile

Table 9: NGO of Raigad District

Sr. No	NGO Name	Person	Contact details	Work Profile
1	Social service organization for disaster-affected people	Mr. Gurunath Sathekar	7774812222	Rescue operation of road accident, drowned person, help in industrial accident, etc.
2	2. Yashwanti Hackers, Khalapur	Mr. Machindra Yadav, Khopoli Vice President		Search and rescue of persons trapped in forts, ravines
3	Adventure Water Sports, Kolad, Taluka - Roha	Mr. Mahesh Sanap	9860438144 7083444222 9021483050	Scuba diving team, boat, underwater search and rescue operations
4	Jal Jeevrakshak Sanstha, Pen	Mr. Datta Tare	8983895307	Lifesaving and underwater search and rescue
5	Social and Disaster Management Awareness Association, Uran	Mr. Samadhan Kadu Mr. Aniket Patil	8169688080 7208507030	Organization of Civil Defence Force Disaster Management Training and Rescue Operations
6	Morya Social Services, Uran	Mr. Harshwar Thakur	9664753769	Trained civil defence volunteers and staff
7	Salunkhe Mahad	Mr. Salunkhe	7350646444 8080808305	
8	Indian Medical Association Raigad- Mahad	Dr. Sudhakar Badgire	02141-227101 9422694222	All types of health emergency services
9	Rotary Club, Alibag	Dr. Sunil Bhopale Dr. Kiran Nabar	02141-222295 9422692450	Emergency services
10	Indian Medical Association Raigad- Mahad	Dr. Chandrasekhar Dabhadkar	02145-222728 9422691791	All types of health emergency services
11	Raigadcha Yuvak Foundation, Alibag	Mr. Jaipal Patil	9673727277	Roads, accident prevention work

				and training, emergency search and rescue work
12	Ham Radio Hobby Club, Panvel	Mr. Suresh Risbud	7718838318	Ham Radio
13	Ham Radio Hobby Club, Alibag	Mr. Dilip Bapat	9860946395 8208363116	Ham Radio
14	Lions Club	Mr. Abhijeet Patil	9325520057	Emergency services
15	JanKalyan Sanstha, Mahad	Mr. Paranjpe Dr. Madhav Pawar	02145-222604 9422095108 9422691742	Blood Banks and emergency services
16	Pride India Mahad	Dr. V V Kulkarni	9422371280 02145-222492	Emergency services
17	Nitin & Company, Kolhapur	Mr. Nitin Ainapure	02145-222492 8888105009	Wireless network expert
18	Sahyadri Adventure Trekkers and Sports Association, Mahabaleshwar	Mr. Sanjay Parte	9421208702	Trained volunteers from Red-Cross for search and rescue
19	Mahabaleshwar Trekkers	Mr. Sunil Bhatia	9421430194	Emergency Search and rescue
20	Young Blood Adventure Club	Dr. Rajendra Patil	8007075580	Emergency Search and rescue
21	White Army, Kolhapur	Mr. Ashok Rokde	9850079809	Emergency Search and rescue
22	Darekar Mitramandal, Poladpur	Mr. Darpan Darekar	8087040991	Emergency Search and rescue
23	Seascape Organization, Mahad	Mr. Sagar Mistry	9657864290	Emergency Search and rescue
24	Raksha Samajik Sanstha, Karjat	Mr. Amit Gurav	9421008778	Emergency Search and rescue
25	Sahyadri Rescue Force	Mr. Sachin Deshmukh	9272718008	Emergency Search and rescue
26	Manacha Ganpati Aapatkalin Seva, Dapoli	Mr. Sachin Gaikwad	8888067196	Emergency Search and rescue

27	Shivdurga Sanstha, Lonavala	Mr. Harpal Jadhav	9665900523	Emergency Search and rescue

2.10 Land Use Patterns

Table 10: Land Use of Raigad District

Sr. No.	Standard Land use classification	Subcategory	No. / Ac/Ha
1.	Urban or Built-up Land	Residential Houses	608,026
		Commercial Buildings	1,813
		Schools	Primary: 1,02,054
			Secondary: 23,449
		Hospitals	District Hospital: 01
			Rural Hospital: 16
			PHC: 52
		Government Buildings	1160
		Industries	1547
2.	Rural Land		1860 hectare
3.	Agriculture Land	Cropland	2,48139 sq. km
		Net Area Sawn	2,48,319 sq. km
		Grassland (Grazing / Non grazing)	52 hectares
4.	Forest	Reserved Forest	92834.1385 hectares
		Protected Forest	11208.300 hectares
		Unclassed Forest	2515.4903 hectares
5.	Water	River	06
		Lakes (Artificial/ Natural)	-
		Ponds (Artificial/ Natural)	-
		Dam/ Reservoir	46
		Canals	-
		Well	13,467
		Tanks	402
		Other Water Resources	-
6.	Wetland	-	1,02,107

7.	Barren and Wasteland	Uncultivable wasteland	2,15,497
		Beaches	14

(Source: District Gazetteers, 2015)

2.11 Climate and Rainfall

The climate of Raigad district in Maharashtra resembles that of the west coast of India, characterized by abundant and seasonal rainfall during the monsoon season. Minimal diurnal (daily) and seasonal temperature variations exist in a coastal district. The year is typically divided into four seasons:

- Summer Season (March to May): This period sees increasing temperatures, with May being the hottest month. Afternoons often experience relief from the heat due to sea breezes, particularly along the coast. The onset of the southwest monsoon slightly reduces temperatures.
- Rainy Season (June to September): The southwest monsoon begins around the first week of June and continues until the beginning of October. Nearly 95% of the annual rainfall, which averages 3028.9 mm for the district, occurs during this season. Rainfall is regular, with variations from year to year. The coastal areas receive decreasing rainfall from south to north, while rainfall increases rapidly towards the Sahyadri hills in the east.
- Post-Monsoon Season (October and November): After the withdrawal of the southwest monsoon, temperatures increase slightly. The air remains humid throughout the year. Skies are moderately clouded in October and May, with clearer skies during the rest of the year.
- Winter Season (December to February): Temperatures during this season are relatively mild. Winds are generally moderate and blow from various directions, ranging from northwest to southeast.

Strong winds blow from the west or southwest during the southwest monsoon season. From October to December, winds are moderate and typically blow from northwest to southeast. Between January and March, winds remain moderate but shift between southwest and northwest directions. Cyclonic storms in the Arabian Sea during the post-monsoon months and occasionally in May bring strong winds, sometimes reaching gale force, and heavy widespread rain. Thunderstorms occur in April, May, and late September to mid-November.

Overall, the climate of Raigad district is characterized by its dependency on the southwest monsoon for rainfall, minimal temperature variations, and occasional extreme weather events such as cyclonic storms and thunderstorms.

2.12 Historical and Religious Centres

In the past, the Raigad District, known as Kolaba District, derives its name from the historic Raigarh fort. Its connection to Raja Shivaji dates to 1656, when he marched to Rairi, later known as Raygad, during his campaign against the More of Javli. Shivaji fortified Raygad and established it as his

governmental seat in 1664. After the state reorganization in 1956, Kolaba District became part of Mumbai State, and in 1960, it was integrated into Maharashtra State.

The district's history stretches to ancient times, with Kolaba, Ceul, Mahad Chodegan, and Rajpuri serving as trade hubs as early as 225 B.C. The origin of the term "Konkan" remains unclear, although it is mentioned in Hindu mythology as comprising seven kingdoms along India's west coast. The Pandavas are believed to have traversed this region during their exile, accompanied by the area's ruler, Veerat Ray.

By the 2nd century A.D., the Maurya empire had annexed the Konkan coast. Subsequently, the Silharas governed the area, possibly establishing their capital in Goa before relocating to Ratnagiri and Kharepatan. Chandrapur, founded by Chandraditya, a son of Chalukya King Pulkeshi, emerged as one of the oldest towns in Konkan.

In the 16th century, we witnessed the rise of Portuguese influence on the West Coast, including the Raigad District. However, Portuguese control diminished with Shivaji's rise, leading to Maratha rule until 1817. Following the British defeat of the Peshwas, South Kokan was established as a separate district in 1819, initially headquartered at Bankot and later at Ratnagiri. Three northern sub-divisions were transferred to Thane District in 1830.

Following is the list of some historical places in the district.

2.12.1 Chavdar Tale:

Chavdar Tale, a historic site in Mahad within Maharashtra's Raigad district, gained global recognition due to Dr. Babasaheb Ambedkar's Water Satyagraha on March 20, 1927. The dimensions of this significant pond measure 100 meters in length, 100 meters in width, and 5.5 meters in depth, covering an area of approximately 2.5 acres. Dr. Babasaheb Ambedkar, accompanied by numerous supporters, symbolically drank water from this pond and advocated for its accessibility to all, echoing the principles of social equality.

Mahad, positioned adjacent to the formidable Raigad fort, holds a population of 27,536 residents. At its heart lies Chavdar Thala, a site sanctified by the presence of both Chhatrapati Shivaji Maharaj and Bharat Ratna Dr. Babasaheb Ambedkar.

The legacy of the Chavdar Thala Satyagraha is commemorated annually on March 20th, signifying a historic struggle for equality. Visitors from India gather to pay homage to Dr. Ambedkar and participate in the celebrations, attracting millions of devotees and tourists alike. The Mahad Municipal Council has beautified Chavdar Thala, culminating in an inauguration ceremony on June 2, 1992.

The rejuvenation efforts include decorative walls surrounding the pond, electric lighting fixtures, and the installation of a bronze statue of Dr. Ambedkar atop a platform 100 feet from the western wall of the pond. Additionally, a multipurpose hall adjacent to Chavdar Thala houses an oil painting memorializing Dr. Ambedkar’s life event and serves as a venue for various meetings and programs. The site's significance is further emphasized by a Krantistambh (revolutionary pillar) erected by the

People's Education Society, Mumbai, commemorating Dr. Ambedkar's burning of the Manusmriti on December 25, 1927.

Mahad city, situated along the banks of the Savitri River, boasts a central location and is well-connected to critical towns:

- Mumbai to Mahad: 175 km

- Pune to Mahad: 110 km

- Mahad to Fort Raigad: 24 km

2.12.2 Raigad Fort:

Raigad Fort is in the Sahyadri mountain range, about 25 km from Mahad in the Raigad district. Chhatrapati Shivaji Maharaj repaired this fort and gave it to him. In 1674, it was declared the capital of the Maratha Empire. There is a ropeway facility to reach the fort so that one can get there within a few minutes.

Raigad Fort has an artificial lake named “Ganga Sagar Lake.” The only way to reach the fort is through the “Maha-Darwaja.” The state court inside the fort has a replica throne facing the Nagarkhana gate. The area near the throne is made for sound waves so that words spoken at the court door can easily be heard up to the throne. Raigad Fort has a famous tower built on a high valley called “Hirakni Buruj.”

2.12.3 Murud-Janjira Fort:

Murud-Janjira Fort is a water fort near Murud on the Arabian coast. Boats are available from Rajapuri port to reach the fort. The fort's main gate faces the Rajapuri coast, and the other faces the open Arabian Sea. There is a gate facing the sea in the west, and it is called 'Daria Darwaza.' Many European and indigenous manufactured guns can be seen on the fort's bastion. The fort, which is currently worn, had all the facilities of ancient times, like a palace, rooms for courtiers, a mosque, two small freshwater tanks, etc. The palace for the Nawab of Janjira is still in good condition.

The main attractions of the fort are the three giant guns – 'Kalalbangdi,' 'Chavari,' and 'Landa Kasam,' which are situated on top of the Murud-Janjira fort. It is said that earlier, these guns were known for their long-range shooting.

2.14.4 Colaba Fort:

Colaba Fort was a significant sea fort of the Maratha Empire. This fort is located on the west coast in the sea near the city of Alibag. The fort has two gates, one facing the ocean and one facing Alibag. Although the fort is a water fort, the freshwater wells on the fort are a feature of the fort. In 1713 AD, the Kolaba fort and other forts were handed over to Kanhoji Angre per the treaty with Balaji Vishwanath. Kanhoji Angre used this fort to launch several attacks on British boats.

2.14.5 Sudhagad Fort:

Sudhagad (Bhorpagad) fort is spectacular in the Sahyadri mountain range. The fort is about 50 km west of Pune, about 25 km south of Lonavala, and 10 km east of Pali in Raigad district. Sudhagad fort is also known as Bhorpagad. Shivaji Maharaj changed the name of Bhorap Gad to Sudhagad Fort. Thanale and Khandsable caves exist in Sudhagad area. Sudhagad plateau is divided into three parts. The first section is the western plateau in front of the castle. Many architectural remains can be seen in this area as the land is level, and a lake and a large tank are located here. The second section is the temple of Bhorai Devi and the area up to Takmak Toka. There are remains of four huge barns. The third part is the eastern area. There is a vast tower here, and some ruins can be found in the overgrown forest.

Religious Centres:

2.14.6 Varadvinayak Temple, Mahad:

Varadvinayak Temple is one of the Ashtavinayaka temples of Lord Ganesha. It is said that the Peshwa commander Ramji Mahadev Biwalkar built (restored) this temple in 1725. The temple also houses idols of Navagraha deities, Shivlinga and Mushka. There are four guardian elephant idols on all four sides of the temple. Devotees visit the Varadvinayak temple sanctum throughout the year. During festivals like Magh-Chaturthi, this temple sees vast crowds. The Varadvinayak temple is in Mahad village of Khalapur taluka, near Khopoli village in Raigad district.

2.14.7 Ballaleshwar Temple, Pali:

Ballaleshwar Temple is one of the eight Ashtavinayaka temples of Lord Ganapati. The temple is in Pali village, about 60 km from Karjat in Raigad district. This place is close to Sagargad Fort and Amba River. It is said that Moreshwar Vitthal Sindkar (Dighe) restored this temple in 1640 AD. The temple houses an ancient bell, which Chimaji Appa brought after defeating the Portuguese in the battle between Vasai and Sasti. In 1760, the original wooden temple was reconstructed, and Sri Phadnis made a stone temple.

2.14.8 Harihareshwar Temple, Srivardhan:

Harihareshwar is a village in Raigad district of Maharashtra. It is said that Lord Shiva blesses the temple of Harihareshwar. Harihareshwar is the family deity or clan deity of Peshwa. The Peshwas restored the Harihareshwar temple in 1723 AD. Other temples in the vicinity of Harihareshwar are Kalabhairav temple and Mahalakshmi temple. Harihareshwar, Srivardhan, and Diveagar are three popular seaside tourist attractions.

2.14.9 Kankeshwar Temple, Alibag:

Kankeshwar temple is 10 km from Alibag and has an old Shiva temple. The temple is on a small hill, and Mapgaon village is about 10 km from Alibag. The mountain is almost 370 meters high and has 700+ steps to reach the temple. Near the temple, we can see 'Nagoba's step,' 'God's step,' 'Pushkarni,' 'Gaymukh' and 'Vyaghreshwar.'

2.14.10 Suvarnaganesh Temple, Diveagar

Suvarnaganesh Temple, Diveagar, is about 75 km from Alibag. Suvarnaganesh history is very fascinating. A copper box was found underground in a coconut grove near the temple. A gold Ganesha idol and ornaments of Ganesha were found in that box. Suvarnaganesh is an idol of Ganesha, and the idol's weight is more than 1 kg. According to locals, the Suvarna Ganesha idol is approximately 300 to 400 years old.

2.15 River Systems and Dams

The district of Raigad is primarily characterized by a network of short, westward-flowing streams that originate from the Sahyadri hills in the east and eventually empty into the Arabian Sea. These streams are known for their swiftness, carrying significant amounts of eroded material that they deposit in the lowest zones near the shoreline. While the general pattern of these rivers is parallel, their tributaries often exhibit a rectangular pattern, indicating their adaptation to local rock formations.

The rivers in the district are tidal for a substantial portion of their length, with distinct upper and lower sections divided by the tidal limit. The upper reaches are characterized by steep, rugged terrain with torrential waters, particularly during the monsoon season. Crossing these rivers can be challenging and hazardous due to the strong currents. However, during the dry season, water flow decreases, and the rivers transform into chains of pools separated by gravel banks and rock ridges. Below the tidal limit, the riverbeds become muddy, interspersed with occasional rock formations and dykes. Creeks wind through high and low banks, sometimes requiring reinforcement to prevent overflow during high tides.

Six central drainage systems delineate the Raigad district. The Ulhas drainage, situated in the extreme north, receives the tail waters of the Bhivapuri Hydel System, making it economically significant for agricultural and industrial purposes. The Panvel Creek in the northwest collects water from a radial pattern of short streams, with the prominent Kalundri Stream. The Patalganga, Bhogawati, and Amba rivers drain the Khalapur, Sudhagad, and Pen Tahsils into the Dharmtar Creek. The Kundalika or Roha River drains a narrow central belt into the Chaul Creek. Finally, the southern part of the district is drained by the Savitri River, with its main tributaries being the Ghod, Gandhari, Kal, and Nageshri.

Table 11: Rivers of the Raigad District

Sr. No	Name of the River	Source	Taluka
1	Ulhas	Rajmachi, District Pune	Karjat, Khalapur
2	Patalganga	Lonavla, District Pune	Khalapur
3	Amba	Khandala, Taluka Pune	Sudhagad, Roha
4	Kundalika	Bhira	Roha, Murud
5	Savitri	Mahabaleshwar, District Satara	Mahad, Poladpur
6	Gadhi	Gadheshwar	Panvel

Table 12: Dams of the Raigad District

Sr. No	Name of Dam	Taluka	River Name	Department Name	Capacity	Use
1	Hetavane	Pen	Bhogeshwar	Irrigation Dept., Pen	0.137625km3	Drinking Water
2	Bhira	Roha	Kundalika	Irrigation Dept., Mangaon	10.5 MMC	Hydro Power Plant
3	Morbe	Khalapur	Dhawari	Irrigation Dept., Karjat	3.22 MMC	Drinking Water

2.16 Power Stations and Electricity

There are 1,855 (99.73 percent) villages out of 1,860 inhabited villages, and all 42 towns enjoy the power supply facility.

2.17 Transportation and Communications Networks

Raigad district in Maharashtra is traversed by several major state highways (SH) and national highways (NH), which are crucial to the region's transportation network. Here are some of the significant state highways and national highways passing through Raigad district:

1. National Highways (NH):

- NH 66: Also known as the Mumbai-Goa highway, NH 66 is one of the major national highways passing through Raigad district. It connects Mumbai with Goa and passes through towns like Pen, Mahad, and Mangaon in Raigad.

- NH 166A: This highway connects the town of Mahad in Raigad district with the city of Ratnagiri in Maharashtra.

- NH 753: NH 753 connects the town of Shrivardhan in Raigad district with the city of Mahabaleshwar in Satara district, Maharashtra.

2. State Highways (SH):

- SH 92: This state highway connects Mangaon in Raigad district with Kolad and further to Poladpur in Ratnagiri district.

-SH 97: SH 97 runs through Raigad district, connecting Mahad with Roha.

- SH 104: This state highway links the towns of Alibag and Pen in Raigad district.

- SH 92A: SH 92A connects the towns of Mangaon and Murud in Raigad district.

These highways form the backbone of the transportation network in Raigad district, facilitating the movement of goods and people within the region and beyond. They are crucial in connecting Raigad with other parts of Maharashtra and neighboring states, contributing to the district's economic development and connectivity.

Jetty services are available mainly from September to May. In the rainy season, jetty services do not operate. Various jetty services are available, e.g., Catamaran services offering air-conditioned and non-airconditioned accommodation, regular ferry boat service, etc. Most launch services are available between 6.00 a.m. to 7.00 p.m. They take an average of two hours to travel from Alibag to Gateway of India, Mumbai. There is a bus service from Alibag to Mandawa Jetty, and from Mandawa Jetty to Gateway of India, there is a Launch service. Combined charges for bus service from Alibag to Mandawa Jetty and launch service from Mandawa Jetty to Gateway of India, Mumbai, and vice versa are taken by all launch operators. Buses start right from Alibag for all types of launch services run by all operators.

Alibag needs to be added to the Railway Map. The Nearest Railway station for most purposes is Panvel / Roha, which falls on the Konkan Railway. Railways provide an economical and accessible mode of transportation, linking the Mumbai-Pune line through Karjat with an extension to Khopoli connecting the main line and the harbor line of the Central Railway. Roha and Mangaon talukas are essential nodes for the Konkan Railway, enabling connectivity to various parts of the state. Approximately 125 km of railway tracks are in Karjat, Panvel, Roha, Pen, Mahad, and Mangaon talukas.

CHAPTER – 3: HAZARD ASSESSMENT AND VULNERABILITY ANALYSIS

3.1 Historical Hazards

Table 13: List of historical hazards in the district

Date/year of Occurrence	Category[2] / Intensity	Duration (No. of days)	Area Affected (Location) (Ex. village name, river basin, etc.)
1594, Earthquake	High	1	Matheran
1678, Earthquake	Low	1	Matheran
26th December 1849. Earthquake	Medium	1	Off the coast of Raigad District.
November 1854 Earthquake	Low	1	The northeastern part of Raigad
18th Dec. 1854 Earthquake	Low	1	The northeastern part of Raigad
8th April 1951 Earthquake	Medium	1	Off Coast of Raigad District
1964 Earthquake Tremors	Low	1	Khed, Mahad.
1983 Landslide	(not available)		
24th July 1989 Flood	High	2 days	Sudhagarh, Roha, Pen, Patalganga, Mahad Mangaon, Khalapur.

[2] Category – 1) High; 2) Moderate 3) Low (according to national standards)

2004 Road Accidents	High	12 Months	Mumbai- Goa, Mumbai Pune National Highway.
26th July 2005 Flood	Moderate	4 days (heavy rainfall)	Savatri, Kundlika, (Jui,)
2005 Road Accidents	High	12 Months	Mumbai- Goa, Mumbai Pune National Highway.
26th July 2005 Landslides	High	4 days (heavy rainfall)	Jui, Mahad, Roha, Poladpur,
2006 Road Accidents	Moderate	12 Months	Mumbai- Goa, Mumbai- Pune National Highway
2006 Flood	Moderate	2 days	Amba, Savatri, Kundlika rivers
2007 Road Accidents	Moderate	12 Months	Mumbai- Goa, Mumbai- Pune National Highway
2007 Flood	Low	2 Days	Amba, Kundlika, Savatri
2008 Road Accidents	Moderate	12 Months	Mumbai- Goa, Mumbai- Pune National Highway.
2008 Flood	Moderate	2 days	Amba, Kundlika, Savatri
10th November. 2009 Cyclone Phyan	Moderate	2 days	Alibag, Murud, Shriwardhan, Uran
2009. Flood	Moderate	2 days	Amba, Kundlika, Savatri
2010. Flood	Moderate	2 days	Amba, Kundlika, Savatri
7th August 2010. Oil Spill	High		Coastal Areas of Raigad District (Uran, Kihim Beach, Awas Beach, Revas Beach, Mandwa Beach, Dighodi Beach)
2010 Road Accidents		12 Months	Mumbai-Goa, Mumbai- Pune National Highway

2011 Road Accidents		12 Months	Mumbai-Goa, Mumbai- Pune National Highway
January 2011. Rupture of Crude oil Pipeline (ONGC)	Low	2 days	Uran, Kihim, Alibag, Shriwardhan.
2011. Flood	Low	2days	Amba, Kundlika, Savatri
4th August 2011. Oil Spill (Ship Sink)	High		Coastal Areas of Raigad District (Alibag Beaches)
2012 Road Accidents		12 Months	Mumbai-Goa, Mumbai-Pune National Highway
2013 Road Accidents		12 Months	Mumbai-Goa, Mumbai- Pune National Highway
7th October 2013 ONGC Oil Leakage	Moderate		Coastal Areas of Raigad District(Uran, Kihim Beach, Awas Beach, Revas Beach, Mandwa Beach, Dighodi Beach)
4th May 2014 Rail accident	High	1 day	Nagothane- Roha
2014 Road Accidents		12 Months	Mumbai-Goa, Mumbai- Pune National Highway
2nd August 2016, Bridge Collapse	High	1 days	Mahad- Poladpur Highway.

3.2 Damage and Losses Occurred

Table 14: Damage and loss details of district

Date/year of Occurrence	Human Life Loss	Cattle Loss	Land Affected

	Dead	Injured	Dead	Injured	Land Specification[3]	Area (No./Acers/Hectares)
1964 Earthquake Tremors	190				400 (house) Residential area	-
24th July 1989 Flood	284	-	48,848	-		738 Village
2004 Road Accidents	254	2082	-	-	National Highway (own Vehicle)	NH-4, NH-17
2005 Flood	240		2616	-	Commercial Buildings: 7,975	13 Villages (Majorly affected)
					Residential Buildings: 6,740	
2005 Road Accidents	187	1280	-	-	National Highway	NH-4, NH-17
2006 Road Accidents	337	1738	-	-	National Highway	NH-4, NH-17
2006 Flood	12					Not
2007 Flood	26					
2007 Road Accidents	422	1883	-	-	National Highway	NH-4, NH-17
2008 Road Accidents	383	1843	-	-	National Highway	NH-4, NH-17
2008 Flood	13					
2009 Flood	10		22			

10th November 2009 Cyclone Phyan	00		03		6267 Residential Area	
7th August 2010 Oil Spill	Nil	-	-	-	Arabian Sea	1273.24 hector
2010 Flood	12		09			
2010 Road Accidents	288	1020	-	-	National Highway (own vehicle)	NH-17, NH-4
2011 Road Accidents	338	154	-	-	National Highway	NH-17, NH-4
2011 Flood	17	-	111			
2012 Flood	02		25			
2012 Road Accidents	195	954	-	-	National Highway	NH-17, NH-4
2013 Flood	10		57			
2013 Road Accidents	187	858	-	-	National Highway	NH-17, NH-4
2014 Flood	05		10			
4th May 2014 Rail Accident	22	123			Rail route (trains delayed and cancelled)	
2014 Road Accidents	296	1262	-	-	National Highway	NH-17, NH-4
2015 Road Accident	357	1423	-	-	National Highway	NH-17, NH-4
2015 Flood	16	-	48	-		

2016 Bridge Collapse	41	No	No	No	Mumbai- Goa Highway.	Mahad

3.2 Vulnerability assessment

2.3.1 Probability Table: The table shows the likelihood of the disaster as they are recurring in nature. P1, P2, P3, P4, and P5 depict the certainty of the disaster after a confident period of time.

Probability	Score	Description
Almost Certain	P1	A regular event, on average, at least once in a period of 1 year.
Likely	P2	It will occur in a period of 2 years.
Moderate	P3	It will occur in a period of 5 years.
Unlikely	P4	It will occur in a period of 25 years.
Very Rare	P5	This can be expected to occur in a period of 100 years

3.2.1 Levels

Levels	Description
L	A concept has been developed to define different levels of disasters in order to facilitate the response and assistance to state and district
L0	Denotes normal times, which will be utilized for close monitoring, documentation, and prevention and preparatory activities. Training on search and rescue, rehearsals, evaluation, and inventory updation for response activities will be carried out during the time
L1	Specifies disasters that can be managed at the district level. However, the state and center will remain in readiness to provide assistance if needed.
L2	Disaster situations are those that require assistance and active participation of the state, mobilization of its resources for the management of disaster
L3	A disaster situation is a case of large-scale disaster where the state and district authorities have been overwhelmed and require assistance from the Central Government for reinstating the State and District machinery as well as for rescue, relief, other response,

and recovery measures. In most cases, the scale and intensity of the disasters are determined by technical agencies like IMD for the proper declaration of L3 warnings.

3.2.2 Vulnerability Index

Table 15: Vulnerability Index

Hazard	Intensity of hazard	Possibility of population impact	Possibility of Infrastructure impact	Probability of Hazard
Landslide	L3	5	5	P4
Floods	L2	3	3	P1
Cyclone	L2	2	3	P3
Earthquake	L3	2	4	P4
Tsunami	L3	5	5	P5
Industrial Accidents	L2	3	2	P1
Oil spills	L3	4	1	P3
Heavy Rain	L0	3	2	P1
Road Accidents	L0	1	1	P1
Terror Attacks	L3	3	3	P4
Crowd Disaster	L1	5	2	P4

The Vulnerability Index shows the exposure of the population depending on the hazard type and its probability. The index is taken depending upon the physical features, socio-economic development, cultural practices, and the political scenario of the region.

3.2.3 Social Vulnerability Profile

Many factors, including age or income, the strength of social networks, and neighborhood characteristics, influence vulnerability to hazards. It is the dimensions to see the resilience or the coping capacity of a community to withstand any kind of stress during any kind of hazard. Demographic characteristics are an important indicator in consideration of the vulnerability index for any kind of disaster. Social vulnerability of an area is defined that although different groups of a society may share a similar exposure to a natural hazard, the hazard may have varying consequences for various groups since they have diverging capacities and abilities to handle the impact of a hazard. To determine the social vulnerability various geographic and demographic studies have been considered. That comprises the district's Socioeconomic status, especially of the vulnerable villages. Some of the other considerations are the household composition, minority status, and transportation system in the district.

Most of the poor populations are likely to be impacted in the district. As evaluating the income, employment, and education status of the district, the population residing in the rural part of the district may not be resilient depending on the kind of hazard available in the area. For the population residing in the rural areas, only the houses may be the permanent assets for the older generation, whereas for livelihood or income, they need to depend on their children working in other districts of the state. The household composition and disability rate of the district show that most of the villages in the district

have children below 16 years and older people above 60 years, which makes them socially vulnerable to the kinds of disasters present in the district. Children, especially in the younger age groups, cannot protect themselves during a disaster. Elders living alone and people with physical, sensory, or cognitive challenges are some of the most vulnerable groups who are likely to be left behind during any disaster. Of all the vulnerable groups, marginal ones are most likely to be affected. The social and economic marginalization of certain racial and ethnic groups, especially the scheduled cast and scheduled tribes living in the rural parts of the district, are vulnerable to disaster; they lose their ability to revert back to normal situations after any disaster, may it be of smaller intensity.

9.3 Economic Vulnerability Profile

Economic vulnerability are tends to be classified as tangible and intangible and sub-categorised into direct and indirect loss. In terms of estimating loss for natural hazards, tangible direct loss is defined as loss resulting from the impact of the event such as physical damage to buildings and their contents, vehicles and infrastructure. Tangible indirect loss relates to the disruption to business, transport, utility networks, clean-up costs, emergency response and relief incurred as a consequence of the event. The extent of the indirect cost is dependent on the availability of alternative sources of supply, markets for products and the duration of any disruption to production. Intangible indirect losses from natural disasters include death, injury and loss of memorabilia. Intangible direct losses incorporate health effects and household disruption to activities such as schooling and social life. There are no market values for intangible losses, but nonmarket valuation techniques can be applied to provide proxy values. Ideally, an economic assessment of potential or actual losses from a disaster will incorporate all these loss categories. However, in the first

working population of the district, is some of the measures in considering the economical vulnerabilities of the district. The economic profile of the district is quite stable as people in the region are dependent on various sectors for livelihood. The location or the situational benefit of the region makes the district reliable on the industrialization with the development of the MIDC and various other public and private manufacturing industries in the region. Other than the industrial development most of the population are dependent on agriculture and farming with various kind of crop production throughout the year. People in the western part of the district are also dependent on fishing as an alternative source of livelihood except for monsoon when the fishermen are restricted to go into the sea. The district is also developed in tourism with various historical forts, beaches and spiritual places in the region with trekking facilities in the Sahyadri region of the district, that has developed the lodging and boarding facilities in almost every houses in the tourism areas of the district.

9.3.1 Physical and geographical vulnerability

The physical and the geographical features are some of the vital component in measuring any kind of hazard and vulnerability. To determine any kind of geographical vulnerability, the land use pattern, terrain of the region, rainfall pattern, climate condition, soil contents are considered. Also, the availability of the social and physical infrastructures like schools, colleges, and hospitals of the district are being analysed. However for any kind of vulnerability, turning into hazards geographical feature required instead of physical vulnerability. But physical features are some of the vital component needed in the development of the region. Looking at the geographical features of the

district, it is one of the most vulnerable areas of the region as it is prone to various kinds of hazards throughout district with low or medium provision of physical infrastructures in the region.

9.3.2 Resilience (or Capacity) Assessment

Frequent disasters or hazards worsen the risk and exposure factor of the vulnerable communities, losing their ability to withstand any further situation or disaster of their own or without any external help. Though, the district had some of the disastrous events in the past. There has been a shift in the response factor that is from relief centric approaches to proactive prevention, mitigation and preparedness for any disasters by developing it into disaster resilient district through holistic, proactive, multi-hazard and technology- driven strategies. That is being implemented in the initial phase of any plan. The prevention, preparedness and mitigation strategies are the external facilities provided to the population that may include sensitization of the higher authorities for the further implementation of the strategies. The assessment include direct and indirect mitigation strategies that are through direct provisions like infrastructural development and indirect provisions like policies, plans, yojans that would benefit people. The other kind of capacities includes the awareness programs provided to the population in order to quick response in any kind of emergencies.

9.4 Risk Analysis

Risk=Vulnerability x Hazard

Risk analysis is to determine the nature and extent of disaster risk by analysing potential hazard and evaluating existing conditionof exposureand vulnerability that together can harm people, property, services, livelihood. That may include the identification of hazard, their location, intensity, frequency and probability the analysis of the exposure and vulnerability, includes the physical, social, economical, health and environmental dimension and the evaluation of the effectiveness of prevaling and alternative coping capacities with respect to the likely risk scenerios.

The purpose of preparing Hazard Risk and Vulnerability Assessment is to enable the process of disaster reducing risk in all types of hazards and transform the district into lower risk in terms of disaster. Hazard Risk and Vulnerability Assessment (HRVA) forms a critical part of the disaster risk reduction program. A completed HRVA shows a comparison of any kind of risks that may exist within a community. That is a combination of a hazard or threat impact and the likelihood of its occurrence. It has the potential to instruct the necessary authorities to prepare for emergencies. The primary objective of undertaking a HRVA is to anticipate the potential problems and possible solutions to help save lives, protect property, assets, reduce damage and facilitate a speedy recovery. The use of HRVA helps the policy makers, administrators and the community to make risk based choices to address vulnerabilities, mitigate hazards, and prepare for response to and recovery from hazard events

The district is vulnerable to nine types of hazards that are Landslide, Earthquake, Tsunami, Flood, Cyclone, and Industrial hazards, Road accidents, Oil spills, Terror attack, Crowd disaster/Stamped.In order to get the hazard assessment, the historical data has been analysed

considering the magnitude and frequency of the hazard. In case of vulnerability assessment the factors that has been analysed are demographic status, geographical, industrial, transportation, weather and climatic condition under the social, economic, physical, and environmental status of the district. In order to analyse the risk the varoius sectors functional policies, plans and development strategies has been analysed that has been implented to increses the coping capacities of the population and to mitigate various kinds of hazards and vulnerabilities.

High Risk Zones

Sl. No.	Region	Nature of Vulnerability	Hazard and Risk
1.	Eastern Region	Physical Vulnerability	Landslide
2.	Western Region	Physical Social, and economic Vulnerability	Flood, Cyclone, Oil Spill
3.	Whole District	Physical, Social, and economical Vulnerability	Industrial Accidents, Tsunami
4.	North-Eastern, South Western	Physical Vulnerability	Earthquake
5.	National Highways	Social and Economical Vulnerability	Road Accident
6.	Northern Region	Physical Vulnerability	Terror Accident
7.	Southern Region	Physical and Social Vulnerability	Crowd Disaster

9.4.1 Risk Matrix

Table 16: Risk Matrix

	Very Low	Low	Medium	High	Very High	
5		(Risk Index 10) Road Accident		(Risk Index 20) Flood		Frequent or very likely
4		(Risk Index 8) Industrial Accident				Moderate or likely
3			(Risk Index 9) Cyclone Oil spill	(Risk Index 12) Earthquake	(Risk Index 15) Landslide	Occasional, slight change
2				(Risk Index 8) Crowed Disaster		Highly unlikely (rare event)
1				(Risk Index 4) Terror Attack	(Risk Index 5) Tsunami	Very rare event
	1	2	3	4	5	

Frequency

Severity

9.4.2 Risk Index

(According to the frequency and severity of the disaster)

Table 17: Risk Index

Hazard	Index
Flood	20
Landslide	15
Earthquake	12
Road Accidents	10
Cyclone	09
Industrial Accidents	08
Crowd Disaster	08
Tsunami	05
Terror Attack	04

CHAPTER – 4: INSTITUTIONAL ARRANGEMENT FOR DISASTER MANAGEMENT

At the district level, the District Disaster Management Authority (DDMA) was constituted by notification of the Disaster Management Act 2005. The power of sanction of relief is also vested with the Revenue and Forest Department officials at different levels depending upon the need. The District Magistrate ensures the participation of district and state governments in the response and recovery phase.

4.1 District Disaster Management Authority (DDMA)

As per the Disaster Management Act 2005, each district must establish a District Disaster Management Authority. The DDMA will act as the planning, coordinating, and implementing body for DM at the District level and take all necessary measures for DM according to the guidelines laid down by the NDMA and SDMA. It will, among other things, prepare the DM plan for the district and monitor the implementation of all relevant national, state, and district policies and plans. The DDMA will also ensure that the guidelines for prevention, mitigation, preparedness, and response measures laid down by the NDMA and the SDMA are followed by all the district-level offices of the various departments of the State Government.

Table 18: DDMA Composition

Sr. No	DDMA Members	Position
1	District Collector	Chairman ex-officio
2	Elected representative at the local level	Co-Chairperson, ex-officio
3	Chief Executive Officer	Member, ex-officio
4	Superintendent of Police	Member, ex-officio
5	Chief Medical Officer of District	Member, ex-officio
6	Executive Engineer (PWD)	Member
7	Executive Engineer (Minor Irrigation)	Member
8	Executive Engineer (PWD) Mahad	Member
9	Executive Engineer (Minor Irrigation) Pen	Member
10	District Commandant (Home Guard)	Member
11	Resident Deputy Collector	Member

4.2 Roles and Responsibilities of DDMA:

The roles and responsibilities of the DDMA have been elaborated in Section 30 of the DM Act, 2005. It will, among other things, perform the following roles and duties as per the act:

1. Prepare, Coordinate, and monitor a disaster management plan, including a district response plan for the district.
2. Ensure that the areas in the district vulnerable to disasters are identified and measures for the prevention of disasters and the mitigation of their effects are undertaken by the government departments at the district level and the local authorities.

3. Ensure that the guidelines for the prevention of disasters, mitigation of its effects, preparedness, and response measures as laid down by the National Authority and State Authority are followed by all the departments of Government at the district level and by the local authorities in the district.
4. Review the state of capabilities for responding to any disaster or threatening disastrous situation in the district and give directions to the relevant departments or authorities for their upgrade as necessary.
5. Organize and coordinate specialized training programs for different levels of the district's officers, governmental and non-governmental organizations, and voluntary rescue workers.
6. Set up, maintain, review, and upgrade the mechanism for early warnings and disseminating proper information to the public.
7. Ensure that the Departments of the Government at the district level and the local authorities prepare their response plans according to the district response plan.
8. Lay down guidelines for, or give direction to, the concerned Department of the Government at the district level or any other authorities within the district's local limits to respond effectively to any threatening disaster or disaster.
9. Advise, assist, and coordinate the activities of the Departments of the Government at the district level, statutory bodies, and other governmental and non-governmental organizations in the district engaged in disaster management.
10. Provide technical assistance or advise the district's local authorities on their functions.
11. Review development plans prepared by the Departments of the Government at the district level, statutory authorities, or local authorities.
12. Identify buildings and places that could be used as relief centers or camps in the event of any threatening disaster or disaster and decide on water supply and sanitation in such buildings or places.
13. Establish stockpiles of relief and rescue materials or ensure preparedness to make such materials available at short notice.
14. Ensure communication systems are in order and disaster management drills are carried out periodically.
15. Perform such other functions as the State Government or State Authority may assign to it or as it deems necessary for disaster management in the district.

4.3 Taluka Level Disaster Management Committee

Taluka Level Disaster Management Committee is an essential component of disaster management governance at the block or tehsil level within a district. It is a decentralized body responsible for coordinating and implementing disaster management activities at the grassroots level. The Taluka-level Disaster Management Committee shall be constituted and chaired by the Tahsildar of that Tahsil. Officers from other line departments and representatives from local Panchayat bodies will be the members of this committee.

4.4 Village-Level Disaster Management Committee

The Village Level Disaster Management Committee (VLDMC) is a grassroots-level body responsible for coordinating and implementing disaster management activities within a village or rural community. It aims to create awareness and build community capacity for local hazards with help from the district and the state. The VLDMC typically comprises representatives from the local community, village panchayat, government departments, NGOs, and other relevant stakeholders. Sarpanch is the chairperson of this committee.

4.5 District Disaster Management Committee (DDMC)

The Deputy Commissioner will coordinate all disaster management activities at the district level. A Deputy Commissioner shall head a district disaster management authority. The district authority shall approve the disaster management plans and review all the measures related to pre-and post-phases of the hazards. The district disaster management committee comprises members from Zilla Parishad/panchayat, different line departments, NGOs, and others who are to be notified by the disaster management department occasionally. The chairman of the district authority, such as the DM Relief Committee, DM Rehabilitation Committee, etc, may form specific Committees.

The primary functions of the District Disaster Management Committee include:

1. **Policy Formulation:** The DDMC is responsible for formulating policies, plans, and guidelines for disaster preparedness, response, recovery, and risk reduction at the district level. It develops comprehensive disaster management plans and strategies tailored to the specific risks and vulnerabilities of the district.

2. **Coordination and Collaboration**: The DDMC facilitates coordination and collaboration among various government agencies, departments, NGOs, and other stakeholders involved in disaster management. It ensures effective communication and cooperation to enhance the district's overall disaster resilience.

3. **Resource Mobilization:** The DDMC mobilizes resources, including funds, personnel, equipment, and materials, for disaster preparedness, response, and recovery efforts. It coordinates with relevant authorities to ensure the timely availability and efficient utilization of resources during emergencies.

4. **Capacity Building:** The DDMC conducts training programs, workshops, and awareness campaigns to build the capacity of government officials, first responders, and the public in disaster preparedness, response, and mitigation techniques. It promotes knowledge-sharing and skill development to enhance the district's disaster management capabilities.

5. **Risk Assessment and Planning:** The DDMC conducts risk assessments, hazard mapping, and vulnerability assessments to identify the district's potential hazards, vulnerabilities, and exposure levels. Based on these assessments, it develops risk-informed plans and strategies to mitigate disaster risks and enhance resilience.

6. **Early Warning Systems:** The DDMC establishes and maintains early warning systems for various hazards, such as floods, cyclones, earthquakes, and tsunamis. It ensures the effective dissemination of timely alerts and warnings to at-risk communities, enabling them to take preventive actions and evacuate safely.

7. **Monitoring and Evaluation:** The DDMC monitors and evaluates the implementation of disaster management plans, programs, and initiatives within the district. It assesses the effectiveness of response measures, identifies lessons learned, and recommends improvements for future disaster preparedness and response efforts.

Overall, the District Disaster Management Committee plays a critical role in strengthening the district's resilience to disasters and ensuring the safety and well-being of its residents. By fostering collaboration, coordination, and proactive measures, the DDMC contributes to building safer and more resilient communities capable of withstanding and recovering from adverse events.

4.6 Agencies Competent for Dissemination of Warnings/Alerts

Table 19: List of Competent Dissemination and Generating Alerts

Sr. No	Alert Generating Agencies	Alert Disseminating Agencies
1	Indian Meteorological Department (IMD)	DDMA, SDMA, Television, social media, Indian Railways, Coastal sirens, GAGAN & NavIC, etc.
2	Central Water Commission (CWC)	
3	Forest Survey of India (FSI)	
4	Indian National Centre for Ocean Information Services (INCOIS)	

CHAPTER – 5: PREVENTION AND MITIGATION MEASURES

5.1 Introduction

Prevention consists of actions that reduce risk from natural or human-made disaster incidents. Prevention includes actions or measures to cover or shield assets from exposure, injury, or destruction. Prevention activities are designed to provide permanent protection from disasters. Not all disasters, particularly natural disasters, can be prevented, but the risk of loss of life and injury can be mitigated with good evacuation plans, environmental planning, and design standards. These activities are designed to minimize loss of life and damage.

Mitigation, focusing on the impact of a hazard, encompasses the structural and non-structural approaches taken to eliminate or limit a hazard's exposure and effects on people, property, and the environment. Under the prevention and mitigation phase, structural and non-structural measures are taken to reduce the risk of natural and unnatural disasters. Standard structural measures for disaster risk reduction include the construction of dams, floodwalls, ocean wave barriers, earthquake-resistant structures, and evacuation shelters. In short, engineering measures, construction of hazard-resistant structures, and protective infrastructures are the primary structural measures. Common non-structural measures refer to awareness and education, policy, techno-legal systems, building codes, land use planning and practices, training, capacity building, etc.

5.2 Hazard-Specific Mitigation Measures

5.2.1 Flood

Sr. No	Structural measures	Responsibility
1	Flood control measures such as construction of embankments and levees	SDMA, DDMA, Revenue Dept., Irrigation dept.,
2	Social Housing Schemes	SDMA
3	Multi-purpose Flood Shelters	SDMA, DDMA, PRI and ULBs
4	Waterways and drainage systems for roads, highways, and expressways	SDMA, DDMA, Irrigation and Revenue Dept.
5	Enhancing the safety of dams and reservoirs	Irrigation Dept., Water Resources Dept., DDMA
6	Desilting/ dredging of rivers to improve flow; drainage improvement; flood water diversion through existing or new channels	Irrigation Dept., Water Resources Dept., PRIs, DDMA
7	Hazard-resistant construction, strengthening, and retrofitting of all lifeline structures and critical infrastructure	Revenue Dept., Irrigation Dept., DDMA and PRIs/ULBs

Sr. No	Non-Structural measures	Responsibility
1	Regulation and enforcement of laws, norms, regulations, and guidelines, including Regulation for reservoir management and Integrated Water Resources Management (IWRM)	SDMA, DDMA, Revenue Dept., Irrigation dept.,
2	Regulations to promote flood-resilient buildings and infrastructure	SDMA
3	Implementation of watershed management, including restoration of Catchment Area Treatment/Afforestation Wetland conservation and restoration	SDMA, DDMA, PRI and ULBs
4	Public-Private Partnerships in Disaster Management Facilities	SDMA, DDMA, Irrigation and Revenue Dept.
5	Risk Transfer including multi-hazard insurance for life and property	Irrigation Dept., Water Resources Dept., DDMA
6	Public awareness generation programs	DDMA, SDMA, Police, PRIs and ULBs
7	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs

5.2.2 Earthquake

Sr. No	Structural measures	Responsibility
1	Ensure that earthquake-resistant features are incorporated in the planning and execution of social housing schemes. Ensure compliance with relevant building codes.	SDMA, DDMA, DMU, Revenue Dept., Irrigation dept., PWD
2	Implementation of strengthening and seismic retrofitting as per recommendations of safety audits in all govt. Departments, agencies, public utilities, schools, colleges, community halls, etc.	SDMA, DDMA, Revenue Dept. and
3	Collaboration with technical agencies and implementation	SDMA, DDMA, PRI and ULBs

Sr. No	Non-Structural measures	Responsibility
1	Adoption of suitable byelaws for rural and urban areas puts model codes (e.g., NBC	SDMA, DDMA, Revenue Dept., Irrigation dept.,

	2016) into practice and ensures proper compliance. Micro-zonation for seismic risk reduction	
2	Structural safety audit of lifeline structures and buildings • Prioritization of lifeline structures and buildings for strengthening and seismic retrofitting	SDMA
3	Promote private participation in disaster management facilities	SDMA, DDMA, PRI and ULBs
4	Implementation of Risk Transfer Arrangements, including multi-hazard insurance for life and property.	SDMA, DDMA, Irrigation and Revenue Dept.
5	Public awareness generation programs	DDMA, SDMA, Police, PRIs and ULBs
6	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs

5.2.3 Landslide

Sr. No	Structural measures	Responsibility
1	Improving infrastructure, roads, and land stabilization work	SDMA, DDMA, DMU, Revenue Dept., Irrigation dept., PWD
2	Construction of multi-purpose shelters in high-risk areas at safe sites away from hazard-prone locations Proper maintenance of roads in risk-prone areas	SDMA, DDMA, Revenue Dept. and

Sr. No	Non-Structural measures	Responsibility
1	Adopt suitable bylaws for rural and urban areas. Enforce/ promote model codes (e.g., NBC 2016 and updated standards) into practice. Ensure proper compliance	SDMA, DDMA, Revenue Dept., Irrigation dept.,
2	Implement licensing of engineers through appropriate legal framework and institutional mechanism.	SDMA
3	Public awareness generation programs	DDMA, SDMA, Police, PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs

5.2.4 Drought

Sr. No	Structural measures	Responsibility
1	Drinking water storage and distribution facilities. Fodder storage facilities to maintain fodder banks. Rainwater harvesting systems – individual and community.	SDMA, DDMA, DMU, Revenue Dept., Irrigation dept., PWD
2	Water Conservation Structures.	SDMA, DDMA, Revenue Dept. and

Sr. No	Non-Structural measures	Responsibility
1	Promote water-efficient irrigation systems (sprinklers, drip, etc.). Promote micro-irrigation systems, advise farmers on how to cope with drought, manage crops under drought conditions, and maintain water efficiently. Training in water and soil moisture conservation, Promoting natural resource management like afforestation.	SDMA, DDMA, Revenue Dept., Water Resource Dept., Irrigation dept., Agriculture Dept.,
2	Provide credit and financing products relevant to the drought-prone areas. Promote agricultural insurance programs and ensure that farmers are informed about the availability of insurance products.	SDMA, NABARD, Cooperative Banks and Rural banks
3	Public awareness generation programs	DDMA, SDMA, Agriculture Dept., PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs
5	Risk Transfer, including multi-hazard insurance for life and property	Irrigation Dept., Water Resources Dept., DDMA
6	Ensure the development of state, district, block, taluka, and village drought management plans.	DDMA, SDMA, Water Resource Dept., Irrigation dept., Agriculture Dept., PRIs and ULBs

5.2.5 Thunderstorms and Lightening

Sr. No	Structural measures	Responsibility
1	Promote the installation of lightning conductors/arresters in schools, industries, and Government and private buildings.	SDMA, DDMA, PRI and ULB

2	Inter-agency coordination and review and update preventive measures and procedures.	SDMA, DDMA, PRI and ULB

Sr. No	Non-Structural measures	Responsibility
1	Ensure drives to check the structural strength of trees, old structures.	SDMA, DDMA, Revenue Dept.
2	Setup alternative or emergency communication systems Hospital preparedness, including training in human resources	SDMA, DDMA
3	Public awareness generation programs	DDMA, SDMA, Agriculture Dept., PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs
5	Risk Transfer, including multi-hazard insurance for life and property	Irrigation Dept., Water Resources Dept., DDMA

5.2.6 Cyclone

Sr. No	Structural measures	Responsibility
1	Establishment/ strengthening of Emergency Operation Centres	SDRF, DDMA, PRI and ULB
2	Multi-Purpose Cyclone Shelters	SDRF, DDMA, PRI and ULB
3	Review all housing schemes to ensure that appropriate multi-hazard safety norms, including cyclone-resistant features, are incorporated in all social housing schemes.	SDRF, DDMA, PRI and ULB

Sr. No	Non-Structural measures	Responsibility
1	Ecologically sound land-use zona on Regulating aquaculture and groundwater extraction Strengthen land-use planning.	SDMA, DDMA, Revenue Dept.
2	Promote Public-Private Partnership	SDMA, DDMA, Revenue Dept.
3	Public awareness generation programs	DDMA, SDMA, PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs
5	Risk Transfer, including multi-hazard insurance for life and property	SDMA, DDMA

5.2.7 Fire

Sr. No	Structural measures	Responsibility
1	Procurement of equipment for firefighting, urban search, and rescue as per the requirement	SDRF, DDMA, Fire Dept., PRI and ULB
2	Establish fire stations/ posts up to the sub-divisional level and the block level.	SDRF, DDMA, Fire Dept., PRI and ULB
3	Enhance the multi-hazard response capabilities by considering local hazards and vulnerabilities.	SDRF, DDMA, Fire Dept., PRI and ULB

Sr. No	Non-Structural measures	Responsibility
1	Strict implementation and strengthening of fire safety rules.	SDMA, DDMA, Fire Dept., DISH
2	Ensure frequent inspection of fire safety systems and equipment in public utilities.	SDMA, DDMA, DISH, Fire Dept.
3	Public awareness generation programs	DDMA, SDMA, Agriculture Dept., PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs
5	Risk Transfer, including multi-hazard insurance for life and property	Irrigation Dept., Water Resources Dept., DDMA

5.2.8 Heatwave

Sr. No	Structural measures	Responsibility
1	Promote cool roofs and heat-reducing integrated development	SDMA, DDMA, Forest Dept., PRI and ULB
2	Ensure incorporation of protection from heat waves in multi-hazard resistant features in the planning and execution of social housing schemes in heat wave-prone areas.	SDMA, DDMA, Forest Dept., PRI and ULB
3	Hazard-resistant construction, strengthening, and retrofitting of all lifeline structures and critical infrastructure	SDMA, DDMA, Forest Dept., PRI and ULB

Sr. No	Non-Structural measures	Responsibility
1	Laws and Regulations	SDMA, DDMA, PRI and ULBs

	Institutional arrangements Improving the forest coverage and green areas Promote the use of building materials that protect from heat Promote designs to reduce heat island effects in urban areas. Facilitate integrated development plans that can cope beer with heatwave conditions.	
3	Public awareness generation programs	DDMA, SDMA, PRIs and ULBs
4	Training of community members, including marginalized sections	DDMA, SDMA, PRIs and ULBs
5	Risk Transfer, including multi-hazard insurance for life and property	SDMA, DDMA

5.2.9 Industrial Disasters (Chemical)

When an accident involving chemical substances that could endanger life or the environment occurs in a chemical works or installation, those in charge of it should implement the safety measures to minimize its consequences. Following are some of the mitigation measures for industrial and chemical accident management:

- Information to the relevant local authorities of the accident that will be responsible forinforming the public and deciding upon their instructions.
- The coordinated use of the civil and military means required to deal with the disastershould be ensured.
- All industrial concentrations should be encouraged to establish MARG to manage industrial accidents.
- Industries involved in the production or transportation of flammable, hazardous, and toxic materials should be responsible for preparing an off-site plan and communicating the same to the District Collector. Simulation exercises should be commenced in the adjoining communities.
- Poison checking centers should be established in every civil hospital and the hospitals near the industrial estates with facilities for detoxification.
- All transport of hazardous and toxic materials should be communicated to the RTO.
- All pipelines carrying hazardous and toxic materials should be equipped with devices tocheck any leakage or metal fatigue.
- Small-scale industries releasing toxic wastewater should be encouraged to set up commoneffluent treatment facilities.
- A standard format for chemical data sheets should be devised, which should be used to collect information from all industries in the district, and the same should be available with the fire brigade and police.

Task	**Responsibilities**
Industrial Safety Measures	Public Health Dept. Local Govt. Bodies Municipal Authorities
Techno-Legal Regime	Industrial Dept.MIDC Local Authorities
Strengthening EOC and Warning System	Nodal Authorities MIDC Dist. Collector Municipal Commission
Organize Capacity Building	Nodal Authority MIDC Dist. Collector Municipal Commission
Awareness Activities	Nodal Authorities Dist. Collector MIDC DDMA

CHAPTER – 6: PREPAREDNESS STRATEGIES

Preparedness states the strategy in disaster management that allows the implementation of knowledge and capacities developed by governments in operational response post any disaster. It is based on a sound analysis of disaster risks and good linkages with early warningsystems that include activities like contingency planning, stocking up of equipment and supplies, development and arrangements for coordination, evacuation, public information or awareness, and other associated training and field exercises. These must be supported by formal institutional, legal, and budgetary capacities. Organizational preparedness activities include developing an emergency response plan, training employees and response personnel on what to do in an emergency situation, acquiring needed equipment, supplies, and materials, and conducting drills and exercises. The related term "readiness" describes the ability to quicklyand appropriately respond when required. It is carried out within the context of disaster riskmanagement and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery.

6.1 Identification of stakeholders involved in disaster response.

Communities are the first responders in most of the hazard scenarios. This shows the importance of VDMP, the Village Task Force, and their training. Local people are keptin the loop and provided awareness training on first-aid, search, and rescue operations. Furthermore, people are identified and given training for more specialized actions. However, not every level ofdisaster can be managed by a village task force. Highly trained professionals are needed for larger disaster response. It includes swimmers, divers, etc. Such people are identified and trained at the Taluka and village levels. Local government is another important stakeholder thatincludes various line departments working at the village level. That includes police, firefighters, doctors, and the local stakeholders that can support the response action when the other facilities reach the area. The other stakeholders, including civil defense, the home guard, and the army, assist in the response process depending on the magnitude of the disaster or the event. These are some of the last opted stakeholders if the district is unable to handle the situation. Further, the other stakeholders that involved themselves in the situation include the media and the other private sector stakeholders who provide their assistance according to their will; these generally include NGOs, ex-army personnel, professional or expert teams, etc.

Response and Evacuation (especially person with a disability):

In case of a disaster strike, evacuation and response are the initial stages to minimize the impacts of disasters. Generally, it is the first responders who provide their assistance in evacuating the affected areas and saving lives. But in most cases, the people with disabilities are left behind. The population, particularly people with disabilities, is very important as they are highly vulnerable, as they cannot evacuate on their own evenafter knowing the situation. And thus, in most of the scenarios, they are left behind during the evacuation process, mock drills, or actual disasters. Thus, training can be provided to the rescue workers for rescuing them or evacuating them during an emergency. Firefighters, master trainers, or defense teams are adequately trained in rescuing and evacuating such populations using different equipment or cradle carry methods; firemen carry methods, blanket carry methods, etc. These kinds of training should be provided to the responders to increase their level of

preparedness at Taluka and village levels. That may comprise of various teams with interested and abled people to be trained in the rescue and search missions. Thus further knowledge and awareness training should be provided to the selectedteam members keeping in view, the person with disability

Formation of teams:

Teamwork with proper orientation is generally seen as the way toward success. In the preparedness stage, various teams should be formed that must be responsible for particular activities in the search and rescue process; these teams, as acquired training in a particular field, must carry out their job easily without further guidance during the time of disasters. Generally, the community plays the role of first responder. Thus, at first, the community should be provided with an awareness training program in large numbers; further, teams should be selected for the following tasks to be trained in and people interested in it. Other than the community, the training should include various other professional teams that specifically work on particular areas or category includes search and rescue, first aid, dissemination of information, etc.

6.2 Forecasting and Early Warning

Early warning helps to plan the course of recue and relief operations that help to move the population to safe shelters or safer areas and also help in disseminating the information to the public that may reduce the mass mortality of the population. Early warning systems may not be available for all kinds of hazards. But in most cases, they are being procured from the concerned department working particularly in that field. Some of the

easily available early warnings include heavy rain, flood, landslides, tsunami etc Even though the warning systems are available; their success depends upon rapidness and quick dissemination of information depending upon the magnitude and kind of disaster. Thus, for the better functioning and preparedness of the early warning system, mock drills should be conducted on a regular basis. That may guide the population on the actual disaster. At the district level, DDMA receives the warning information from various nodal agencies or departments that are to be verified, and further information is disseminated on early warning to the public. And thus, further plan on search and rescue and relief operations can be carried out. Some of the nodal departments that provide the warning for disasters are as follows:

Sr.No.	Hazards	Nodal Agencies
	Cyclone Flood Drought Earthquake	India Meteorological Department (IMD)
	Flood	IMD Central Water Commission (Ministry of Water Resources)
	Landside	Geological Survey of India
	Tsunami	INCOIS

Sr. No.	Hazard	Time period
	Cyclone	Days
	Tsunami	Minutes/ Hours
	Drought	Months
	Landslide	Days
	Flood	Hours/ Days

After receiving early warning, the information should be disseminated to various departments for preparedness as well as to the public for safety. It is the responsibility of DDMA and TDMA. The information from nodal agencies or from SDMA should be disseminated to TDMA, VDMA, Panchayat office, line department officials and to public based on the ground situation.

The warning can be disseminated through various means such as

1. Telephone
2. Fax
3. VHF
4. Police Wireless
5. Internet (e-mail)
6. Websites
7. Radio/TV network
8. Mobile Phones (SMS)

CHAPTER – 7: CAPACITY BUILDING AND TRAINING

Capacity building is a sustainable approach that provides external support and skills to strengthen the communities, local government, non-profit organizations, institutions, etc., in order to increase the ability to resist by reducing the disaster risk. It relates to the choice of policies and the mode of implementation among the communities based on understanding the limits, needs, and potential perceived by the communities. It generally encompasses infrastructures, institutions, human and scientific knowledge and technology, and collective attributes such as social relationships, leadership, and management.

7.1 Approach

Capacity building is much more than training that includes various strategic processes of conducting and analyzing the requirements and needs of the ability of people. And further developing plans according to the requirement and implementing it as a result.

Conducting Training Need Assessment: this is the process in which the capacity of a group, organization, or society is reviewed and analyzed against the desired goals, where existing capacities are identified for maintenance or strengthening, and capacity gaps are identified for further action.

Engage stakeholders on capacity development: this is the process by which people, organizations, and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term of capacity-building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training, as well as continuous efforts to develop institutions, political awareness, financial resources, technology systems, and the wider enabling environment.

Assess capacity needs and assets: Assessing pre-existing capacities by engaging with various stakeholders allow capacity builders to analyse the areas with gaps and require additional training, also what areas should be prioritized according to the present need and requirement, in what ways a capacity building can be incorporated into local and institutional development strategies.

7.2 Formulate a Capacity Development Response

Once an assessment has been completed a capacity building response must be created**.**

Institutional Arrangements: Assessments often discover the inefficiencies of the organizations, institutions, communities, etc., because of the gaps in policies, procedures, resource management, organization, leadership, frameworks, and communication. These problems and gaps of the associated institutions should be reconsidered or fixed.

Leadership: It is believed that leadership by either an individual or an organization can catalyze the achievement of development objectives. Strong leadership allows for easier adaptation to changes, and strong leaders can influence people. The master trainers or the one providing the training should use their leadership skills in their awareness training.

Knowledge: It is believed that knowledge is the foundation of capacity. Greater efforts should be made to establish strong education systems and opportunities for knowing the details of disaster management and its institutional development and mechanisms.

Accountability: the implementation of accountability measures facilitates better performance and efficiency. A lack of accountability measures in institutions allows for the proliferation of corruption. That should be strengthened through monitoring and evaluating the accountabilityframeworks of the institutions.

7.3 Capacity Building Plan

Capacity building plans are the approaches or measures required to develop the community or society. These are generally people-centric approaches, made according to the needs of the people and focusing on the developmental features of thecommunity. Capacity building can be of plans are of two types:

- Structural
- Non- Structural

The structural measures generally constrain the strengthening of infrastructural development. That generally includes building codes, temporary shelters, construction of roads, bridges, etc. Whereas the non-structural mainly contains the awareness training programs that generally includes the preparedness and response activities to strengthen the ability to make quick decisions and ability to react in the scenarios.

Institutional Capacity Building

It is the officials and the policymakers that make the plan depending on the needs ofthe people. Thus, officials must be given proper awareness and training through theskill development plans. To develop some of the good and proper plans needed to enhance the needs of the communities at the District, Taluka and village level.

The capacity building training must include the engineers, architects, mason, doctors,nurses, teachers and the other professionals in the awareness programs provided at the villageand the Taluka level. That generally increases the skills ability to respond during particular scenarios or have the skills to design earthquake-resistant buildings. These training programsare conducted annually at the village and the Taluka level before the monsoon.

Community Capacity Building and Community-Based DisasterManagement

The community-based disaster management approach builds the capacity of communities. The increase in disaster occurrence and disaster-related loss is due to an exponential increase in the occurrence of small and medium-scale disasters. This approach encourages the direct involvement of vulnerable communities in the planning and implementation of mitigation measures.

7.4 Training of Trainers

The local government, like the police, PHC, fire services, and various stakeholders, has its own role in the capacity-building process. As these stakeholders too, participate in the capacity building awareness training programs. They are generally given training on search and rescue, response measures, evacuation measures, first-aid, supply, etc. These institutional bodies playa vital role as they are provided training from the disaster institutes, and theyprovide training to others. At the district level, various such units are involved in capacity building. Those are the master trainers, police, home guards, civil defence, etc.

Civil Defence and Volunteers

Civil defense and volunteers are the stakeholders most involved in any disaster, depending on the magnitude of the disaster. Thus, it is of vital importance that these bodies should be trained on a regular basis to enhance their skill periodically. These bodies are also provided training by some of the training institutions, including institutions like YASHADA, State College of Defense, NDMA, etc.

7.5 Disaster Management Education

Implementation of disaster management in schools and colleges should be made available, asin the present scenarios, the rapid development and increased changes in the environment create some of the major hazard scenarios in the world. The district has been implementing the basics of disaster education at the Taluka level by conducting awareness capacity-building training at the schools, colleges, and various other line departments.

7.5.1 Schools

Schools are the most involved institutions where these capacity training are being provided.The students are aware of the Basic details of disaster management. That involved the disasters and risks in their area, and in case of emergency, how they should react and manage the situation until the external support system reaches the area of incident. Various trainings have been conducted in the schools at the village and Taluka level in the district.The students have been involved in various mock drills for their and others safety at their schools or area of living.

7.5.2 Colleges

Engineering and medical colleges have also been involved in capacity-building activities. In which it involves the basic idea of disaster management with mock drills. Other than that, these institutions have been involved in technical and medical studies in disaster situations like the study of trauma care, training on the use of equipment, etc.

Task	Activity	Responsibility
Capacity Building	Training to Nagar Palika, Zilla Parishad, line departments, Panchayat samati, Ngo's, and communities regarding the conceptof disaster management.	Education Dept. DDMA Zilla Parishad Nagar Parishad Panchayat Samati
	Training on the importance of first responders and working in the teams during emergencies to the communities, students, Ngo's SHGs, and CBOs at taluka and village level.	Education Dept. DDMA Ngo's
	Trainings to teachers, students, Nagar Palika, Zilla Parishad regarding the mock drills, fire, safety and emergency services.	DDMA Police Fire Dept. Zilla Parishad
	Training to vulnerable communities, school teachers, police, village rescue team, line departments about the early warning and evacuation process	Education Dept. DDMA Police Defense
	First-aid training in schools, communities, Ngo's.	Panchayat Samati. DDMA Medical Team
	Training on handling oh technical equipment's.	DDMA Civil Defense Technical Team
	Development and strengthening of Early Warning System	Revenue Irrigation Dept. IMD DDMA Technical Dept.

CHAPTER – 8: RESPONSE AND RELIEF

Disaster response predominantly focuses on immediate and short-term needs, sometimes called disaster relief. Effective, efficient, and timely response relies on disaster risk-informed preparedness measures, including developing the response capacities of individuals, communities, organizations, countries, and the international community.

The institutional elements of response often include the provision of emergency services andpublic assistance by public and private sectors and community sectors, as well as communityand volunteer

participation. ‘Emergency services’ are a critical set of specialized agencies orprofessionals with specific responsibilities in serving and protecting people and property in emergencies and disasters. They include civil defense authorities and police and fire services, among many others. The division between the response and subsequent recovery stages is unclear. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.

8.1Response Planning, Preparedness, and Assessment.

Response planning is the initial step during any emergency that provides the rapid and incidentrisk assessment to ensure a quickly scalable, adaptable, and flexible response that can further provide strategies to deal with the emergency. Before the flow of response, the RO IC analyzes the situation by holding a quick meeting for the availability and mobilization of resources, listing the various tasks, and providing a proper briefing to the responders. Based on the situation assessment, the Incident Action Plan will be drawn and put into action.The IC / RO will nominate an Operation Section Commander (OSC) based on ―incident type and the rest will follow as per IRS/IRT and other procedural guidelines issued by the state.

8.1.1 The Quick Assessment of Damages and Needs.

The agriculture and revenue department generally does the quick damage and needs assessment. The assessment is to get the impact of the disaster, with its magnitude, and also the needs of the people in that particular situation. This may be a rapid assessment that may be analyzed with the help of experts who may provide further recovery and relief measures for the affected. The IC is also doing the need assessment, which further disseminates the information to the district EOC. The DM/DC is making further decisions regarding the response and recovery for the recovery measures that are to be provided to the various communities impacted or affected populations in the hazard-struck areas of the district.

8.1.2 Response flow

Response flow clearly led to the involvement of various line departments in disaster situations. The department works in collaboration to handle the disaster. The different departments and agencies need a formalized response management structure that lends consistency, fosters efficiency, and provides appropriate direction during response for proper coordination and effective use of all available resources. Response Management constitutes the functions of planning, execution, and coordination. While planning in the pre-disaster phase isthe responsibility of various authorities created under the DM Act, the execution of the plans must be carried out by the various line departments of the Government and the existing administrative structure in the District and State. For coordination and to ensure smooth execution of the plans, bodies like NDMA, NEOC, and SEOC have been created at the National and State Levels. At the District level, planning, execution, and coordination of all theactivities have been vested.

8.1.3 Warning and alert

On receiving the alert and the warning system the district EOC needs to be activated to its fullcapacity. IRS and various coordinating departments need to be informed. It should be two way communication systems between village and district. The arrangements for dissemination of the information to the last person are to be made with the translation of the alert warning in local languages and disseminate the same through various mediums. After the situation has stabilized, the DDMA needs to withdraw the warning system.

8.1.4 Activation of EOC

EOC is generally an off-site operation center that is activated during a disaster. Generally, the district headquarters functions as an EOC, which is an augmented control room with communication facilities and space to accommodate various ESFs. This combines various line departments and other agencies requiring incident response services. The web-based connectivity EOC helps in accessing awareness, decision support, and multi-agency coordination for the further handling of the situation or event.

8.1.5 First Assessment Report

A rapid assessment is conducted immediately post-disaster by the agricultural and revenue departments in order to assess the disaster-affected areas and the needs of disaster victims locally. The initial step in response is to assess the needs of the affected population and design a prioritized plan of action based on those needs. By doing so, this improves the qualityand speed of response. Without a rapid assessment, significant gaps or overlaps in assistance may occur, which wastes precious resources at a time of great need and can cause further burdens to the affected population. It may not be a detailed survey, but it gives a broad idea of the population's needs.

8.2 Reporting

The reporting system must be followed in two ways, from the incident area to the EOC. The situation report needs to be sent to the district headquarters, which is the functioning EOC duringthe disaster. The situation report must be sent every 30 to 60 minutes of the disaster area. Depending on the situation report, further relief aid must be mobilized. Even thoughit is a two-way communication system, it may not include bilateral informants that may hinderthe information. Whereas on getting the information further, it can be disseminated through the media release.

8.2.1 Demobilization and Winding-up

Demobilization and winding up will be prepared by the PS in consultation with IC and various other Section Chiefs. That is to be approved and widely circulated in advance. But itshould be properly checked before disseminating. It has often been experienced that because of lack of a proper demobilization plan and a lack of its proper dissemination, resources mobilized for disaster response face difficulties in availing transportation while returning. Thus, it may be the duty of the RO to develop an incident DMOB Plan. Review incident resourcerecords to determine the likely size and extent of

DMOB. Personnel, work space, and suppliesneeded. Coordinate the demobilization unit leader with representative agencies. Monitor ongoing operation section resource need. Identify surplus resources and probable release time.Develop incident checkout for all units

8.2.2 Documentation

Documentation is one of the necessary steps for further official and legal purposes. Thus, an appropriate person should be there for the purpose. The proper documentation about theincident situation and the information may be disseminated to the state and various departments, agencies, and line departments who need the information. Some of the steps may include arranging for complete documentation of proceedings at the incident site. Maintaining a record of the incident and taking measures for it. Setting the record straight wherethere are charges of negligence or mismanagement resulting from the incident. The reports should review the response actions taken in the event and analyze them through variousaspects of the situation. The lessons learned or the district's success stories can further refer to that.

CHAPTER – 9: REHABILITATION, RECONSTRUCTION AND RECOVERY

Reconstruction and rehabilitation are the post-phases of recovery that are carried out on a priority basis. The approach has led to the restoration of better reconstruction. While disasters result in considerable disruption of normal life, enormous suffering, and loss of lives and property, the reconstruction phase tries to incorporate a '**Build Back Better**' policy. Being a long-term project, the phase requires immense patience and painstaking effort by all the concerned authorities. All the agencies are required to monitor response activities closely and obtain valuable data regarding the

severity and intensity of the event, the affected geographical area, and the potential unsatisfied critical needs of the affected population to evolve a comprehensive recovery plan. The authorities need to appropriately choose the technology and project impact assessment that needs to be carried out. And look for then contemplationsthat do not create any side effects on the communities' physical, socio-cultural, or economic environment in the affected areas or their neighborhood.

9.1Recovery Process

The recovery process should consider some of the following activities for the further reconstruction and restoration of disaster-affected areas. Both process stakeholders play a significant role in dealing with the phase.

- Damage Assessment
- Clearance and removal of debris.
- Restoration of communication networks
- Disbursement of assistance for houses
- Formulation of assistance package
- Relocation
- Developing DRR in development initiatives
- Awareness and capacity building
- Economic impact analysis.

9.2Recovery Coordination

Recovery efforts require coordination at various levels of government, stakeholders, and institutions with specific roles and responsibilities for central, state, private sector, voluntary organizations, international aid agencies, etc. The role of the district is to coordinate damage assessment, empower of employment, livelihood, water, communication, transport, sanitation, and health facilities. Whereas the other processes include structural constructions like houses, schools, public buildings, and roads. Basic services such as power, water supply, sanitation, wastewater disposal, etc. should be restored quickly.Alternate arrangements of water supply and temporary sanitation facilities can be sought with the helpof special agencies. Special arrangements for the provision of essential services should bemade. It can include creating temporary infrastructure for storing and distributing water supply, running tankers, and power supply and sanitation facilities.

9.2.1 Damage and Loss Assessment

Damage assessment is a necessary procedure that is done by the revenue, and the agricultural departments post-disaster. It is one of the initial processes in the recovery phase of disasters. The assessment is to get a critical analysis of the damage that occurred in any disastrous event.It is only after this report's completion that the disaster's impact and magnitude is known. The damage assessment is also accompanied by the need assessment, in which the need of thepeople or the population affected is known, and further supplies are being made with the help of the concerned line department. The assessment may not be too specific; it is just to get idea and knowledge about the magnitude, loss and needs. It is also helpful in compensating the impacted population that is

distributed accordingly following the rules. The assessment also links with various other departments for restoration and reconstruction purposes; furtherdecisions are made based on this assessment.

9.2.2 Restoration

Restoration is one of the necessary processes in post disasters as it disrupts the normal functioning of people and administration. Restoring lives and properties may start from the rescue and relief measures, in which both the life and properties of people or population are being restored. Thus in case of infrastructural damages like roads, hospital damage, and restoring them may further start the relief and recovery measures.

9.2.3 Infrastructure

Restoration of basic infrastructures is to be done as soon as possible. Public Works is the functioning department that gets involved in restoring the infrastructures but it process may also involve various other departments concerned with the damage. E.g. for the restoration ofthe communication system, even though PWD department will be involved in the restorationof the electric poles, whereas the BSNL or the technical department will be involved in the restoration of the communication line.

9.2.4 Livelihood

Restoration of livelihood is another important measure as the process makes the people independent of their own work, or else they need to depend on the compensation provided bythe government. It may not only be the livelihood but also the other needs of the people like education, housing provision, etc.

9.3 Reconstruction

Reconstruct is the last phase of response that works on the policy of "**build back better**". This phase of a disaster is divided into two phases: long-term and short-term recovery. Short-term recovery lasts for only a few numbers of days, whereas long-term recovery dependson the functioning of the management.

9.3.1 Lifeline Building and Social Infrastructure

Reconstruction of lifeline buildings and social infrastructure generally takes longer number of days, while temporary arrangements are made for the day-to-day function of the affected people. These life line buildings may include houses, hospitals, etc. Whereas for the socialinfrastructures may include the daily social function infrastructures like schools, colleges etc.

9.3.4 Long Term Recovery Program

Long term recovery efforts focus on redeveloping and restoring the socio-economic viabilityof the disaster areas. The reconstruction phase requires a substantial commitment of time andresources by

the Governments and other agencies. It is important to note that much of this commitment would be beyond the scope of traditional emergency management programs. The reconstruction challenge involved would most often be the result of a catastrophic eventthat has caused substantial damage over a very large area and affected a very large population. These reconstruction efforts include: Reconstruction of public infrastructures and social services damaged by the disaster, which can be completed over the long-term. Re- establishment of adequate housing. Disaster recovery have been categorized into levels, withinitial efforts dedicated to helping those affected meet immediate needs for housing, food and water. As homes and businesses are repaired, people return to work and communities continue

with cleanup and rebuilding efforts. Many government agencies, voluntary organizations, and the private sector cooperate to provide assistance and support. The individuals, families, and communities that are hit by the disaster especially need more time and specialized assistance to recover and a more formalized structure to support them to reach a normalized space. This phase of long-term recovery can also be termed reconstruction and rehabilitation, as now the focus of the authorities has shifted from short-term needs to getting the normal lives of affected people on track. During this time, the contribution of both the government and the affected people is significant to dealing with all the issues properly. Proper coordination at each and every stage of implementation is important to make resources and funds useful. For disaster devastated communities the nature of reconstruction and rehabilitation works are different in nature. The overall recovery phase covers a variety of issues like health, education, infrastructure, livelihood, agriculture, business, security, etc. Every project should have a management plan, including designing, planning, implementation, monitoring, and supervision. For technical supervision competent authority is to be involved.

The point that is to be given more importance in project management is to mainstream disaster management in all development projects and make the community disaster resilient. In reconstruction works, it is important to incorporate safe construction practices. In this regard the following construction activities are vital. Retrofitting structures like houses, schoolbuildings, hospitals, theatres, and govt. buildings. Creation of disaster-proof dams, bridges, roads, canals, water towers, etc.

CHAPTER – 10: SOCIAL INCLUSION IN DISASTER RISK REDUCTION

In disaster management, there is often a tendency to view affected individuals as a uniform group, referred to as either 'victims' or 'survivors,' particularly during relief and recovery efforts. However, this approach fails to recognize the existing disparities and inequalities based on gender, caste, or class (Fordham, 1999).

While hazards may not discriminate, societal structures do, resulting in unequal outcomes for different communities, even if they appear demographically similar. Consequently, the most vulnerable groups bear a disproportionate burden during disasters. This chapter underscores the significance of Disaster Risk Reduction (DRR) in addressing unequal disaster coping capacities. It

acknowledges that certain sections of society suffer more than others due to their position within the social hierarchy. While addressing broader challenges of social marginalization and exclusion falls beyond the scope of DRR, DRR initiatives must be socially inclusive, considering the realities of social dynamics to ensure that every effort is made to mitigate disparities and promote equity.

Section 61, DM Act 2005 prohibits discrimination –based on sex, caste, community, descent, or religion – in any activities related to disaster risk reduction, disaster relief, or humanitarian assistance to the affected people. A community's vulnerability to a disaster depends on the social, cultural, economic, and political environment. A cycle of deprivation not only increases their vulnerability but also slowly alienates them from the decision-making process, denying accessibility to basic entitlements.

Socially excluded groups have unique and diverse needs before, during, and after a disaster, which are often neglected in Disaster Management Plans (DMPs). Inclusive Disaster Risk Management aims to ensure equality of rights and opportunities, uphold individual dignity, recognize diversity, and contribute to resilience for all individuals without excluding any community members based on factors such as age, gender, disability, or other characteristics. In the Indian context, the National, State, and District Disaster Management Plan (NDMP) emphasizes social inclusion in Disaster Risk Reduction (DRR) efforts, focusing on the following aspects: Gender, Elderly, Children, and Persons with Disabilities.

10.1 Gender Perspective

The nuances of gender relations can differ based on the socio-cultural norms of a society. However, the underlying divisions of roles, responsibilities, and identities based on gender are prevalent to varying extents worldwide. Within these gender relations, numerous imbalances, often referred to as gender gaps, exist between men and women. Historically, these imbalances have preferred men within predominantly patriarchal societies, hindering women from attaining equal rights and status as partners in Disaster Risk Reduction (DRR) efforts.

Gender inequality significantly affects women during disasters in various ways:

- **Differential Impact:** Natural disasters often disproportionately affect women due to their societal roles and responsibilities. They may face higher risks of injury, displacement, loss of livelihoods, and psychological trauma.

- **Limited Access to Resources:** Gender disparities in access to resources such as education, healthcare, and economic opportunities can exacerbate vulnerabilities during disasters. Women may have less access to essential services and information, hindering their ability to prepare for, respond to, and recover from disasters.

- **Increased Care Burden:** Women often bear the primary responsibility for caregiving within families. During disasters, this caregiving burden can intensify as women may have to care for children, elderly relatives, and other vulnerable members while managing the impacts of the disaster.

- **Higher Risk of Violence:** Disasters can exacerbate existing gender-based violence, including domestic violence, sexual harassment, and exploitation. Women may face increased risks of violence in overcrowded shelters, temporary settlements, and post-disaster recovery settings.

- **Limited Decision-Making Power:** Societal norms and gender roles may restrict women's participation in decision-making processes related to disaster preparedness, response, and recovery. This lack of inclusion can undermine the effectiveness of disaster management efforts and perpetuate gender inequalities.

- **Barriers to Recovery:** Women may encounter barriers to accessing post-disaster recovery and reconstruction resources, including land rights, financial assistance, and employment opportunities. Discriminatory practices and policies may further marginalize women and hinder their ability to rebuild their lives.

To advance gender equity, ensuring that the reconstructed houses are registered jointly in the names of both husband and wife is essential. It is imperative not to exclude widows and single women without land titles from receiving shelters. Providing housing in joint names infuses a sense of security and confidence in women, ensuring they never face homelessness. Adopting Owner Driven Reconstruction (ODR) approaches allows women to take leadership roles in monitoring the implementation of safe housing technologies. Programs should focus on empowering women through access to social security measures and income-generating activities. Additionally, forming Women's Self-Help Groups can create opportunities and skills-based training for livelihood enhancement.

10.1.1 LGBTQ+

Mainstreaming transgender people in disaster management involves integrating their specific needs, vulnerabilities, and capacities into all aspects of disaster risk reduction, preparedness, response, and recovery. Here are vital considerations for mainstreaming transgender individuals in disaster management:

- **Inclusive Policies and Guidelines:** Develop inclusive policies, guidelines, and protocols that recognize and address the unique needs and vulnerabilities of transgender individuals in disaster management planning and implementation.

- **Gender Identity Recognition:** Ensure that disaster management systems recognize and respect the gender identity of transgender individuals, including their preferred names, pronouns, and gender markers, to promote dignity and respect in all interactions.

- **Inclusive Risk Assessments:** Conduct gender-sensitive risk assessments that identify the specific vulnerabilities and capacities of transgender people, including risks related to discrimination, violence, access to healthcare, and safe shelter.

- **Accessible Information and Communication:** Provide accessible and culturally sensitive information and communication materials that address the needs of transgender individuals, including information on disaster preparedness, evacuation procedures, and available support services.

- **Inclusive Shelter and Services:** Ensure that emergency shelters and support services are safe, inclusive, and accessible to transgender individuals, free from discrimination, harassment, and

violence. This includes providing gender-neutral facilities, trained staff, and privacy accommodations.

- **Capacity Building and Sensitization:** Conduct training and capacity-building programs for disaster management stakeholders to raise awareness about the rights, needs, and experiences of transgender individuals and promote inclusive practices.
- **Partnership with Transgender Communities:** Engage and collaborate with transgender communities, organizations, and leaders in disaster management planning, decision-making, and implementation to ensure their meaningful participation and representation.
- **Legal Protections and Advocacy:** Advocate for legal protections and rights-based approaches that promote the inclusion, dignity, and well-being of transgender individuals in disaster management policies, laws, and practices.

By mainstreaming transgender people in disaster management, stakeholders can ensure that their specific needs and vulnerabilities are addressed and that they are empowered to participate fully in disaster preparedness, response, and recovery efforts. This fosters more inclusive and resilient communities for all.

10.2 Elderly

NGO HelpAge India emphasizes that during disasters, the elderly often find themselves at the end of the line, easily overlooked in the chaos, and exceptionally susceptible. Their heightened vulnerability necessitates increased focus across all phases of disaster risk management. It is imperative to prioritize older people within disaster management plans, accounting for their unique needs, such as psychological fragility, limited physical mobility, reduced sensory perception, health challenges, and social and economic constraints. Addressing these factors is crucial as they hinder older people's ability to prepare for, adapt to, and respond effectively to disasters.

In post-disaster situations, the needs of older people must be considered separately, rather than clubbing them with others, keeping in mind the specific concerns applicable to them. It is preferable to have community-based senior-citizen support mechanisms so that the senior citizens are not uprooted from their immediate surroundings. This should include efforts to educate local communities about how they can help senior citizens and raise their awareness about supporting older people. The district DRR plan may prepare a list of senior citizens living without any family support. In a post-disaster situation, looking at the gravity of the situation, the District Collector may take a call to set up temporary arrangements for older people and take care of personal needs such as food, medicine, shelter, and other requirements. Special arrangements could be made to protect the property and assets of senior citizens if required.

10.3 Children

In times of emergency, children are vulnerable to isolation, anxiety, and trauma. Some may become separated from their families or lose their parents, facing the additional threats of gender violence and trafficking. There is also the risk of children being exploited as child labourers. When widespread violence occurs during disasters, children's physical safety is compromised. They often endure neglect, significantly disrupting their education, recreation, and access to food and nutrition.

Following a disaster, it's crucial to swiftly reopen Anganwadi centers and schools. If these structures are damaged, temporary or emergency provisions should be established to ensure children can access essential services. State governments should consider increasing food supplies to double nutrition support in Anganwadi’s and primary schools during such crises, which some have already implemented for a limited duration during past disasters.

10.4 Persons with Disabilities

Disaster risk reduction efforts should prioritize addressing the vulnerabilities of persons with disabilities (PWD) within the affected population rather than treating them as part of a general category. Ensuring that no PWD is left behind or abandoned after a disaster is essential. Community-based initiatives and support systems, including the promotion of a buddy system, are crucial. Under this system, each PWD is paired with one or more individuals in their neighborhood who are tasked with assisting them. Neighbors should be educated on how to support PWD and given appropriate training. PWD should also actively identify trustworthy individuals in their community who can help them during emergencies, ideally having multiple buddies across locations they frequent, such as their workplace, home, or school. Effective communication between PWDs and their helpers is critical, ensuring that helpers are well-informed about the specific needs of the PWD and maintain regular contact with them. Local disaster response planning should include comprehensive lists of PWD requiring special care. In the aftermath of a disaster, agencies responsible for disaster management may establish temporary facilities that are accessible and accommodating for PWD. Additionally, authorities can implement special measures to safeguard the property and assets of PWD, if necessary.

CHAPTER – 11: FINANCIAL RESOURCES

11.1 Recommendation of XV Finance Commission

The XV Finance Commission (FC), in its report for 2020-21, had recommended the creation of a National Disaster Risk Management Fund (NDRMF) and State Disaster Risk Management Funds (SDRMF) at the State level in its first report. The Commission adopted a new methodology for state-wise allocations, which replaced the expenditure-driven methodology. The new methodology is a combination of capacity (as reflected through past expenditure), risk exposure (area and population), and proneness to hazard and vulnerability (disaster risk index). The contribution arrangement

recommended by the FC is a 25 percent contribution by all States, except for the North-Eastern and Himalayan (NEH) States, which shall contribute 10 percent, and we consider it appropriate to maintain the same arrangement.

(I) The ratio of contribution by Union and States to the State-level allocations for disaster management recommended by FC-XIII should be maintained. Thus, States are to contribute 25 per cent of funds of SDRF and SDMF except the Northeastern and Himalayan (NEH) States, including Maharashtra, which shall contribute 10 per cent, and the rest is to be provided by the Union Government.

(II) Mitigation Funds would be set up at both the national and State levels, in line with the provisions of the Disaster Management Act. The Mitigation Fund should be used for those local level and community-based interventions which reduce risks and promote environmentally friendly settlements and livelihood practices.

(III) Allocation of disaster management funds to SDRMFs should be based on factors of past expenditure, area, population, and disaster risk index (which reflect States' institutional capacity, risk exposure, and hazard and vulnerability respectively). Assuming an annual increase of 5 per cent, the Finance Commission has arrived at the total corpus of Rs.1,60,153 crore for States for disaster management for the duration of 2021-26, of which the Union share is Rs. 1,22,601 crore and the States share is Rs. 37,552 crores.

(IV) Total States allocation for SDRMF should be subdivided into funding windows that encompass the full disaster management cycle. Thus, the SDRF would get 80 per cent of the total allocation and the SDMF 20 per cent. The SDRF allocation of 80 per cent may be further distributed as follows: Response and Relief – 40 per cent; Recovery and Reconstruction – 30 per cent; and Preparedness and Capacity-building – 10 per cent. While the funding windows of the SDRF and SDMF are not interchangeable, there could be flexibility for re-allocation within the three sub-windows of SDRF.

(V) The allocation for the NDRMF would be based on expenditure in previous years. Assuming an annual increase of 5 per cent, the total national allocation for disaster management is estimated to be Rs. 68,463 crores for the duration of 2021-26.

(VI) The allocation for the NDRMF should also be subdivided into funding windows like that of States' allocation for disaster management. Hence, the NDRF would get 80 per cent of the total allocation for the NDRMF, with further division into 40 per cent for Response and Relief, 30 per cent for Recovery and Reconstruction and 10 per cent for Preparedness and Capacity-building. The NDMF would be allotted 20 per cent of the total allocation for the NDRMF. While the funding window of NDRF and NDMF shall be maintained, there could be flexibility for re-allocation within these sub-windows.

(VII) To discourage excessive and unsubstantiated demands from States, all Central assistance through the NDRF and NDMF may be provided on a graded costsharing basis. States should contribute 10 per cent for assistance up to Rs. 250 crores, 20 per cent for assistance up to Rs. 500 crore and 25 per cent for all assistance exceeding Rs. 500 crores.

(VIII) A Recovery and Reconstruction Facility may be set up within the NDRF and SDRF. Assistance for recovery and reconstruction is generally a multi-year program, and the assistance, shared between the Union and States, needs to be released annually against expenditures and only as a percentage of total cost.

(IX) State Governments need to have essential disaster preparedness to respond effectively to disasters. Their institutions and facilities must be equipped and well-functioning to meet the exigencies of a situation. The preparedness and capacity-building grants could be used to support the SDMAs, SIDMs, training and capacity-building activities and emergency response facilities. A similar window of preparedness and capacity-building would be made available within the NDRF, which could be used to support national agencies.

(X) Major capital works required for proper upstream river basin management (to mitigate annual flood disasters caused by river erosion) with gestation periods of ten to fifteen years cannot be accommodated through Finance Commission award. Therefore, the Finance Commission has recommended that such projects should be considered as national priority projects. Only such holistic projects can help address flood mitigation properly. A piecemeal approach will simply result in yearly washing away of river embankments.

(XI) There should be six earmarked allocations for a total amount of Rs. 11,950 crores for certain priority areas, namely, two under the NDRF (Expansion and Modernization of Fire Services and Resettlement of Displaced People affected by erosion) and four under the NDMF (Catalytic Assistance to Twelve Most Drought-prone States, Managing Seismic and Landslide Risks in Ten Hill States (this would include Maharashtra), Reducing the Risk of Urban Flooding in Seven Most Populous Cities and Mitigation Measures to Prevent Erosion).

(XII) To strengthen institutional capacities, a dedicated capacity should be set up to supervise the NDRMF and SDRMF and augment disaster funding through other sources. In addition, a disaster database should be developed to help assess the impact of expenditures on different aspects of disaster management.

11.1.1 SDRMF:

The total allocation for disaster management (SDRMF) to the States for the duration of the award period is Rs. 1,60,153 crores. The total State allocation for SDRMF is divided into SDRF and SDMF, which together address the full cycle of disaster management needs – response and relief, recovery and reconstruction, preparedness and capacity-building and mitigation. The SDRF would receive 80 percent of the total SDRMF, while the SDMF would get 20 percent of the allocation. Within the SDRF allocation of 80 percent, there would be three sub-allocations: Response and Relief (40 percent), Recovery and Reconstruction (30 percent), and Preparedness and Capacity-building (10 percent). While the funding windows of SDRF and SDMF are not inter-changeable, there could be flexibility for re-allocation within the three sub-windows of SDRF.

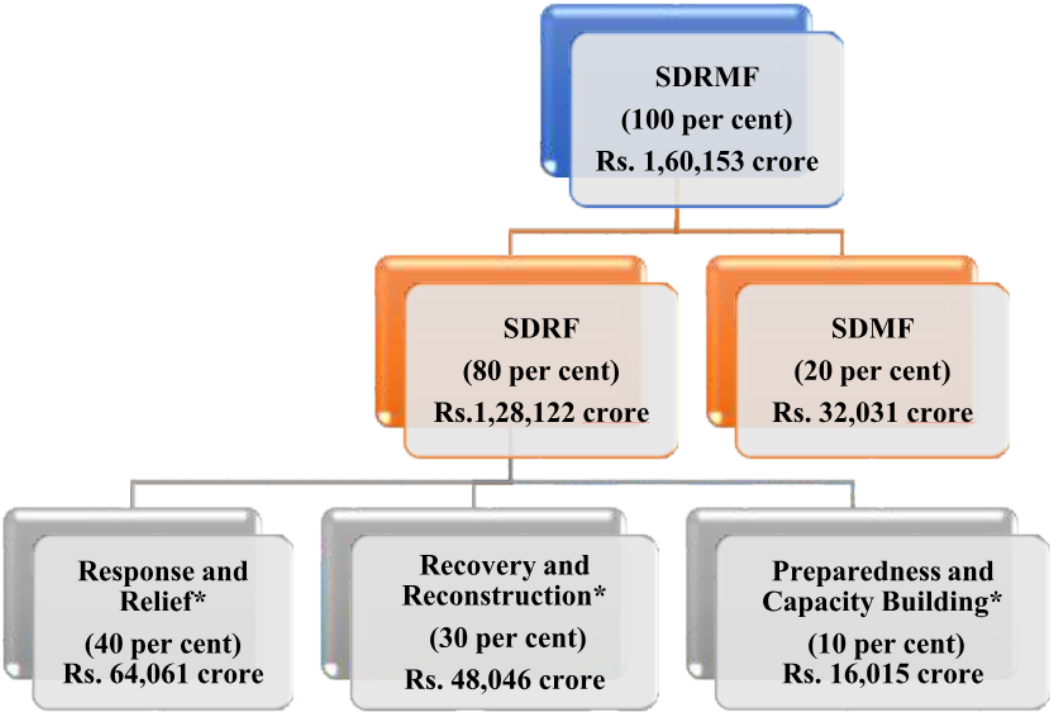
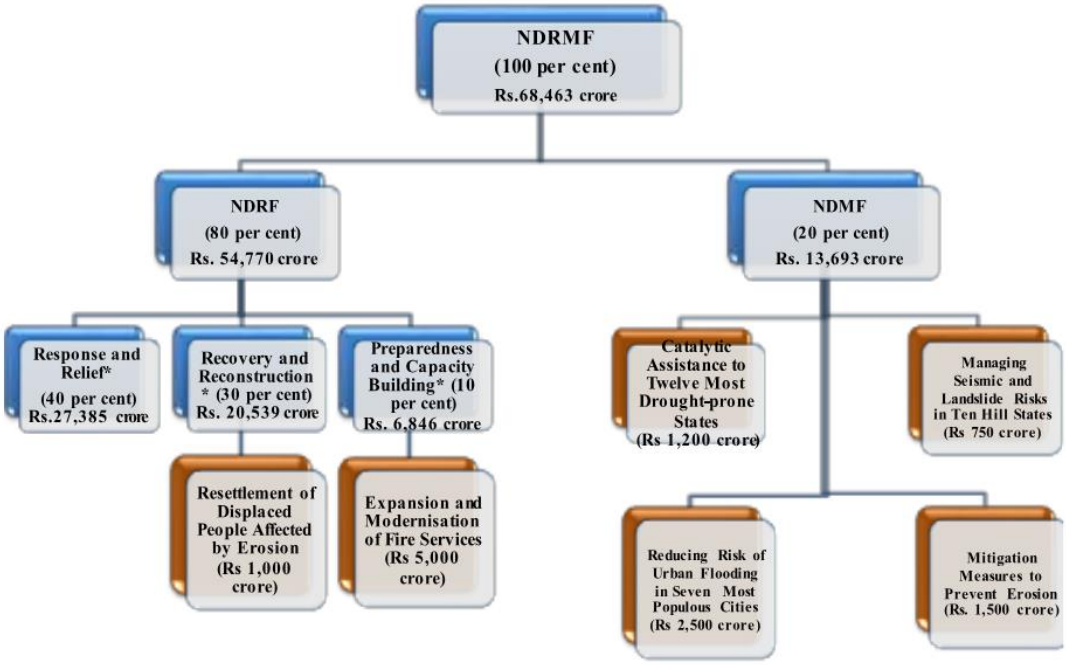


Figure 2: Funds earmarked for SDRMF.

11.1.2 NDRMF:

The NDRF represents the national disaster reserve, which supplements the SDRF. The NDRF needs to be budgeted and aligned with the SDRF in such a way that it assists States and supplements their SDRF allocations, rather than becoming the main source of disaster assistance. A total national allocation of Rs. 68,463 crores for NDRMF for the period from 2021-22 to 2025-26. The Disaster Management Act stipulates two windows of funding at the national level, namely NDRF and NDMF. We have now proposed that these two will fall under the overall amount fixed at the national level called NDRMF. The total allocation for NDRMF should thus be divided among NDRF and NDMF in an 80:20 ratio.

The preparedness and capacity-building grants could be used to support the SDMAs, SIDMs, training and capacity-building activities, and emergency response facilities. A similar window of preparedness and capacity-building should be made available within the NDRF, which could be used to support national agencies.



** Reallocation within the three sub-windows is recommended, subject to the condition that earmarked allocations under the respective sub-window is duly fulfilled.*

Figure 3: Funds earmarked for NDRMF.

11.2 SDMF Guidelines

The State Disaster Mitigation Fund (SDMF) is constituted under section 48 (1) (c) of the DM Act, 2005. This fund is exclusively for the purpose of mitigation projects in respect of disasters covered under the State Disaster Response Fund (SDRF)/ National Disaster Response Fund (NDRF) Guidelines and the State specific local disasters notified by the State Governments. The Mitigation Fund shall be used for local-level and community-based interventions that reduce the risks and promote environment-friendly settlements and livelihood practices. Largescale mitigation interventions such as the construction of coastal walls, flood embankments, support for drought resilience, etc., shall be pursued through the regular development schemes and not from the mitigation fund. Mitigation measures can be structural and non-structural as explained below table:

Structural measures	Non-Structural measures
Structural mitigation measures include any physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques or technology to achieve hazard resistance and resilience in structures or systems. These measures attempt to strengthen buildings to better endure future disasters like cyclones and earthquakes.	It does not involve physical construction but uses knowledge, practices, policies, laws/Regulations, public awareness-raising, training, and education, etc. For example, Building codes and Laws, location-specific planning/strategies, forest management/restoration of mangroves, awareness campaigns, etc.

11.2.1 Scope of SDMF Guidelines

SDMF will fund mitigation projects at the State level. It will support and fund the following types of projects:

i) All projects relating to mitigation measures: (a) for the notified disasters by the Government of India namely cyclones, drought, earthquake, fire, flood, tsunami, hailstorms, landslide, avalanche, cloud bursts, pest attacks and frost & cold wave; and (b) for the 'disasters' notified by the State Government within the local context in the State, which are to be completed within the geographical jurisdiction of the State, will be funded from the SDMF.

ii) The State Government may use up to 10% fund of the annual allocation of the SDMF for the purpose of mitigation projects in respect of disasters that they consider to be 'disasters' within the local context in the State as notified under SDRF guidelines.

iii) Projects that are of State-level significance, protecting assets, ecosystems, and settlements within the State.

iv) Projects that promote practices to reduce disaster risks and their impacts.

v) Projects that build community resilience through information and knowledge.

vi) Projects that focus on creating safe conditions of living for people from weaker socio-economic categories, people with disabilities, and women.

vii) The Regional projects, which are initiated by the National Disaster Mitigation Fund (NDMF).

viii)Research and studies related to disaster mitigation through the small grants window.

ix) In the case of flood mitigation projects, States should undertake the following non-structural measures:

- Adopting an Integrated Flood Management approach by considering the river basin as a hydrological unit.
- Real-time hydro-meteorological Data Acquisition Network coupled with a Decision Support System for integrated or standalone operation of the reservoir(s), as the case may be.
- Delineation and demarcation of flood plain zones on certain notified stretch (es) of river(s) within the State and regulation of various activities permissible therein.

11.2.2 Limitation for Utilization of SDMF

i) At least 10% of the SDMF each year should be earmarked for non-structural measures. (Components of non-structural measures in projects consisting of both kinds of measures may be counted towards this limit).

ii) In a year, not more than 50% of SDMF may be utilized for measures/projects to mitigate risks from a single hazard. However, this stipulation may be relaxed by the Ministry of Home Affairs on the recommendations of the Sub Committee of the National Executive Committee (SC-NEC), based on the written request of the State with proper justification.

iii) In a year, up to 5% of the SDMF funds may be earmarked for small grants window to support small proposals related to innovation, technology, community leadership, research, studies, and learning. The NDMA and the SDMA will devise a mechanism to fund projects from this window.

iv) Funds available under SDMF shall not be used for general environmental improvement or landscape beautification and for funding the existing Government programmes/ongoing schemes etc.

v) Mitigation Fund should generally not be used for maintenance and upkeep of any structure or engineering measure aimed at mitigation. This fund should be used for developing and implementing new projects. The mitigation measures that have been implemented, should be maintained through other sources of funding.

vi) Resources under the Mitigation Fund cannot be used towards the establishment expenditures such as salaries, office expenditure, etc., to be incurred by the Disaster Management Authorities or other entities, except for payment of remuneration to technical staff included in the project costs. Such payments will be as per the GFR-2017 and extant Government of India guidelines.

11.3 Alternative Sources of Funding

The resources provided by the SDRF and NDRF would be insufficient in many situations, and both the Union and State Governments would be constrained to mobilize disaster funding through other sources like reconstruction bonds, contingent credit/standby facilities with international financial institutions, crowdfunding platforms, and corporate social responsibility. Developing these financial mechanisms and instruments ahead of a contingent situation would help governments identify and select more cost-effective options.

1. **Reconstruction Bonds:** In a post-disaster situation, State Governments can issue reconstruction bonds, with a maturity of three to five years, with the approval of the Union Government. People would like to contribute to recovery and reconstruction efforts, and they would prefer to invest in bonds, for reasons other than just financial returns. So, the State Governments could issue these bonds with a lower yield. However, the resources raised by these bonds should largely be spent on the construction of productive and social assets.

2. **Contingent Credit/Stand-by Facility with International Financial Institutions:** International financial institutions, the World Bank, and the Asian Development Bank (ADB) have been among the most important sources of financial assistance for post-disaster recovery and reconstruction in India. If the World Bank and ADB have provided loans for recovery and reconstruction on a regular basis, there could be a long-term arrangement through which the lending operation could be made shorter and easier. Such an arrangement would ensure that if the cost of a disaster exceeds a certain threshold, States could request loans from these institutions with necessary approvals. Such proposals may be considered considering the cost of borrowing, knowledge transfer, and organizational help.

3. **Crowdfunding Platforms:** It is playing an increasingly larger role in mobilizing resources for disaster relief and recovery. Campaigns are launched on the Internet to raise funds from the public. Communities and organizations with volunteers on the ground ascertain critical needs and create targeted donation pages. Within a matter of hours, a fundraising campaign is launched, and a community of fundraisers takes shape. While several crowdfunding platforms come up following a disaster event, a platform set up by the government with specified objectives and assurance of transparency can attract public contributions on a more significant scale. Setting up a crowdfunding platform would require skills and expertise,

which the governments could consider outsourcing. Identifying the right time for crowdfunding, setting up secure payment gateways, and ensuring accountability and transparency are the most important considerations for the success of such an initiative.

4. **Corporate Social Responsibility:** The private sector has been supporting disaster relief and recovery for a long time. However, it can expand its contribution to disaster management by diversifying its engagement. In addition to relief and recovery assistance, it can support an event or campaign to raise awareness, mobilize donations from private sector employees, and support crowdfunding. It can provide technological and innovation support for disaster management.

CHAPTER – 12: MONITORING AND EVALUATION OF DDMP

The DDMP is updated regularly and on an annual basis. Evaluating the effectiveness of plans involves a combination of training events, exercises etc. It is being determined taking into consideration the

risk reduction achievements, capacities enactments attained, resources requirements, and updates on the availability of human resources and involvement of response organizations, technologies, enhancement, and coordination. It outlines the action and timing of an effective response.

The following guidelines are followed for monitoring and evaluation of the plan is as given below:

1. As per Sub Section (4) of Section 31 of the Disaster Management Act, 2005, the plan is being reviewed and updated annually, and the year in which the plan has been reviewed is clearly mentioned in the header on each page of the plan.
2. The inventory resources are being updated at the National Information Council and in the Indian Disaster Resource Network.
3. Update coordinates of responsible personnel and their roles/responsibilities every six months or whenever a change happens. Names and contact details of the officers/officials who are the nodal officers or those in charge of resources are to be updated on a regular basis.
4. The plan should be circulated to all stakeholder departments, agencies, and organizations so that they know their roles and responsibilities and prepare their own plans.
5. The DEOC should be responsible for keeping the plan updated and collecting, collating, and processing the information.

CHAPTER – 13: DISASTER RISK GOVERNANCE

Disaster risk governance refers to the system of policies, institutions, mechanisms, and processes put in place to manage and reduce disaster risks within a society. It encompasses the coordination,

planning, decision-making, implementation, and monitoring of disaster risk reduction and management activities. Effective disaster risk governance strengthens resilience, reduces vulnerabilities, and minimizes the impacts of disasters.

Strengthening disaster risk governance is considered a cornerstone of the efforts to understand, reduce, and manage risks in global practices in DM (UNDP 2015). Good governance also entails improving accountability, transparency, and meaningful participation throughout all disaster management procedures, protocols, and practices. Negotiating, building consensus, and reaching agreements comprise both formal and explicit mechanisms (legislation, policies, standards, and administrative procedures) and informal and implicit agreements that mediate social, economic, and political relations. In places where there is a proactive, responsive, and accountable local government that works with local actors, the possibilities of resilience are much higher.

Local Government Leading the Process:

Ownership of the DRR and resilience strategy by the local government is essential for its effective implementation on the ground. Hence, special efforts will be made to build the capacities of the local governments (PRIs & ULBs) to help them lead the process from the local level.

Community Engagement:

This plan is based on this implicit recognition that communities, being the first responders, their active engagement is critical to having robust DRR strategies and their effective implementation on the ground. It is well established that governments alone cannot address DRR effectively. Larger ownership of the agenda, with vulnerable communities being the primary stakeholders in the process of DRR planning and implementation, is the key to the effectiveness of DRR efforts. Several DRR success stories involve planning and implementation that give central importance to community or civil society involvement. With the support of local PRIs/ULBs, NGOs, academia, and/or the private sector, engaged communities would enable priorities to be better defined and actions planned, responding to real (mostly local) needs and concerns, and bringing about long-term change.

The NDMP 2019 emphasizes the importance of governance at different levels for an effective and efficient management of disaster risk. Effective risk governance requires clear vision, plans, competence, guidance, and coordination within and across sectors, as well as participation of relevant stakeholders. Strengthening disaster risk governance is necessary to foster collaboration and partnerships for the implementation of disaster risk reduction and sustainable development at the state and local levels.

Accordingly, the MSDMP 2023 will strengthen disaster risk governance in the state of Maharashtra through the following measures:

- Mainstream and integrate DRR within and across all sectors and promote the coherence and development of relevant laws, regulations, and public policies.
- It will guide the public and private sectors through the legal framework that clearly spells out the roles and responsibilities to address disaster risk in publicly owned, managed, or regulated services and infrastructures.
- It must encourage actions by persons, households, communities, and businesses.

- It must enhance relevant mechanisms and initiatives for disaster risk transparency.
- It must put in place coordination and organizational structures.
- Adopt and implement DRR strategies and plans across different levels (state, district, and community) and time scales aimed at preventing the creation of risk, reducing existing risk, and strengthening resilience – economic, social, health, and environmental.
- Decentralize and ensure devolution of functions horizontally (line departments) and vertically (Districts/Talukas/PRIs/ULBs).
- Promote engagement and participation of a community in planning, implementation, and monitoring of DRR initiatives to foster community ownership.
- Carry out an assessment of the technical, financial, and administrative disaster risk management capacity to deal with the identified risks at different levels.
- Promote necessary mechanisms and incentives to ensure high levels of compliance with the safety-enhancing provisions of laws and regulations, including those addressing land use, urban planning, building codes, environment, resource management, health, and safety standards, and update them, where needed, for better disaster risk management. • Develop and strengthen mechanisms to periodically review and assess the progress on various DM plans as well as encourage institutional debates, including by policymakers and relevant officials, on DRR plans. Assign clear roles and tasks to community representatives within disaster risk.

CHAPTER – 14: STANDARD OPERATING PROCEDURES (SOP) FOR DEPARTMENTS

14.1 SOP for Revenue Department

Pre-Disaster Preparedness

1. Establishing Disaster Management Committees at the district, taluka, and village levels to promptly initiate various actions during disasters and provide them with training.
2. Prepare a comprehensive disaster management plan and sensitize all departments, accordingly, preparing a list of phone numbers and relevant contacts.
3. Activate control rooms at the district and taluka levels for 24 hours during monsoon emergencies, ensuring safe shelters are identified in advance.
4. Engage with voluntary organizations and other agencies for their participation in emergency management.
5. Coordinate the distribution and management of essential items and conduct thorough inspections of all arrangements.
6. Disseminate urgent messages through village committees upon receiving prior information, planning for safe evacuation of people. Also, finalize alternative arrangements promptly.
7. Formulate response teams and coordinate alternate communication arrangements.
8. Coordinate with the administration and machinery of adjoining districts for waterlogging and rainfall-related issues.
9. Maintain updated records of standing orders.
10. Plan for alternative arrangements based on the severity of contact breakdown in villages.

During an emergency

1. Prepare immediate damage assessment reports and plan for prompt action. Formulate response teams and appoint coordination and control officers.
2. Tackle natural disasters through various committees at the village and taluka levels.
3. Provide assistance as per government decisions, maintaining a record on the GR table.
4. Provide food grains, clothing, and shelter assistance to the affected population. Prepare shelters and provide immediate relief and support, including food and water, as necessary.
5. Collect information on incidents and report to senior offices promptly.
6. Provide essential items for first aid to voluntary organizations for distribution and assistance.
7. Arrange vehicles for transporting patients to hospitals.
8. Coordinate with various government offices.
9. Ensure the availability of diesel and petrol for all vehicles and machinery.
10. Seek assistance from neighbouring districts in the event of a major disaster.
11. Keep control rooms operational during disasters and maintain coordination.
12. Ensure proficiency in handling relief work without any lapses.
13. Arrange for meetings with key individuals as needed.
14. Maintain smooth operation of the emergency response committee through regular meetings.

Post-emergency/disaster

1. Provide orders/guidance from the government regarding the government's stance and disaster relief work to all departments.
2. Initiate disaster relief work by coordinating with the relevant departments.
3. Implement government aid funds and material distribution in the affected district.
4. Engage experts to assess the extent of damage caused by the disaster and formulate a comprehensive plan for addressing the situation.
5. Maintain a 24-hour information centre to disseminate information through media and communicate with the public.
6. Arrange for the safety of key individuals.
7. Collect information and report to the government.
8. Implement special programs to mitigate post-disaster stress and tension in the affected areas.

14.2 SOP for Police Department

Pre-Disaster Preparedness

1. Plan to swiftly evacuate people stranded due to heavy rainfall.
2. Activate control rooms to operate 24/7.
3. Pre-plan alternate routes for traffic in case of road closures due to flooding.
4. Arrange for relief funds and other necessities for those affected by the disaster. Deploy message transmission devices to areas prone to being cut off.

During an emergency

1. Ensure smooth traffic management systems.
2. Enforce laws and maintain order during the relief efforts.
3. Utilize various media channels to dispel rumours.
4. Clear roads and pathways in disaster-affected areas.
5. Provide immediate assistance and shelter to affected individuals.
6. Conduct medical assessments and provide first aid to injured individuals.
7. Maintain communication via wireless devices when landlines are down.
8. Engage in relief operations alongside NCC/NSS/Home Guard units.
9. Implement emergency communication setups in areas with broken communication links.
10. Ensure law and order are maintained.

Post-emergency/disaster

1. Enforce laws and maintain order to prevent looting and theft in affected areas.
2. Conduct search and rescue operations and control the crowd.
3. Organize safe shelter and relief distribution centres.
4. Ensure legal procedures and arrangements are made promptly for deceased individuals.

Home Guard

1. Control crowds and traffic in disaster-affected areas.
2. Assist in search and rescue operations.

3. Aid in the normalization of civilian life.

14.3 SOP for Irrigation & Water Resource Department

Pre-Disaster Preparedness

1. Implementation of Control Rooms operational 24 hours.
2. Appointment of Nodal Officers at each taluka and establishment of control rooms at the headquarters.
3. Deployment of communication devices capable of transmitting messages on all possible platforms.
4. Vigilance and coordination with relevant departments by ensuring proper management and coordination before and during the release and closure of water from dams. Stay in touch with Rainfall Measurement Centres and Survey Stations.
5. Arrangements for informing the people in the affected areas about the threat of floods and the release of water from dams, using vehicles such as sirens, cables, and radios. Provision of pumps, generators, boats, excavators, etc., where necessary for water evacuation.

During an emergency

1. Monitor all dams by establishing communication networks and keeping a close watch on the water level rise due to heavy rainfall.
2. Alert the people in the areas of the dams before the release of water.
3. Search and rescue operations for those stranded in flooded areas and provision of pumps, generators, boats, excavators, etc., for water evacuation where necessary.
4. Provide necessary information to the Revenue Department in case public panic leads to property damage.

Post-emergency/disaster

1. Surveying the condition of water resources and promptly rectifying any damages.
2. Providing the administration with all possible assistance in relief work.
3. Providing immediate water supply to relief camps and affected areas.
4. Ensuring that water resources are not contaminated.

14.4 SOP for Nagarpalika

Pre-Disaster Preparedness

1. Establishing 24-hour control rooms and appointing control officers.
2. Keeping firefighting equipment such as hoses, fire extinguishers, fire buckets, sandbags, and other supplies ready.
3. Planning for the immediate cleaning of all drains/sewers to ensure swift water drainage. Implementing preventive measures such as spraying of disinfectants to control diseases.

4. Inspecting buildings susceptible to collapse during disasters and arranging for immediate relocation if necessary.
5. Establishing emergency committees for disaster management and ensuring individual awareness. Prepare safe evacuation routes during emergencies.
6. Implementing an effective waste management system, raising public awareness.

During an emergency

1. Issuing alerts to the public using sirens during emergencies.
2. Mobilizing firefighting teams, equipment, and other resources.
3. Taking immediate action to ensure quick drainage of excess water. Conducting cleanliness drives, administering medication.
4. Organizing relocation efforts if necessary.

Post-emergency/disaster

1. Maintaining 24-hour operation of control rooms for information dissemination and communication with the public.
2. Conducting awareness campaigns for public health and ensuring the provision of clean water.
3. Implementing sanitation campaigns to prevent the outbreak of diseases among the population.

14.5 SOP for Health Department

Pre-Disaster Preparedness

1. Establishing 24-hour control rooms.
2. Keeping all officers stationed at headquarters and ensuring availability of essential medicines and medical kits. Planning to ensure continuous availability of gloves, masks, first aid supplies, anti-snake venom, and chlorine tablets even in emergencies.
3. Establishing health camps and organizing department-wise planning. Providing education to the public on cleanliness and health.

During an emergency

1. Ensuring all hospitals, primary health centres, and dispensaries have stocked medicines and updated medical records. Making available medical officers and updated medical kits at disaster sites.
2. Distributing preventive medicines and anti-allergic doses to prevent the spread of contagious diseases. Providing necessary information to municipalities and village panchayats to prevent the spread of infectious diseases.
3. Providing immediate medical treatment to the injured and conducting post-mortems for deceased individuals.

Post-emergency/disaster

1. Communicating with municipalities and relevant village panchayats to provide necessary information to prevent the spread of diseases. Ensuring the availability of preventive medicines and medical supplies.
2. Providing immediate preventive medicines and anti-allergic doses to people engaged in relief work to prevent the spread of diseases.
3. Deploying health workers to provide health services to affected areas and controlling the situation.

14.6 SOP for Zila Parishad Health Department

During an emergency

1. Providing information to the public to prevent the spread of communicable diseases by controlling food and water, as well as emphasizing hygiene and cleanliness. Assistance should be sought from voluntary organizations and concerned individuals.
2. Contacting the Tehsildars for additional assistance such as staff and medicines.
3. Providing medical treatment to the injured and those in distress.
4. Provision of first aid and medicines in affected areas.
5. Establishing information centres in hospitals.
6. Maintaining communication with the District Magistrate's control room.

14.7 SOP for Public Works Department

Pre-Disaster Preparedness

1. Conduct regular risk assessments to identify vulnerable infrastructure.
2. Develop and maintain an updated disaster management plan for the PWD that includes protocols for assessing damage, prioritizing response actions, and coordinating with other relevant agencies.
3. Implement routine maintenance schedules for critical infrastructure assets to ensure structural integrity and resilience against disasters.
4. Identify high-risk structures and prioritize retrofitting or reinforcement measures to enhance their ability to withstand seismic activity, flooding, and other hazards.
5. Conduct community outreach programs and awareness campaigns to educate the public about disaster risks, evacuation routes, and emergency protocols related to public infrastructure.

During Emergencies

1. Deploy rapid assessment teams to conduct on-site inspections of damaged infrastructure, assess the extent of structural damage, and identify immediate safety hazards.
2. Collect and compile data on infrastructure damage, road blockages, and other critical issues to inform decision-making and resource allocation for emergency repairs and recovery operations.
3. Prioritize the clearance of debris, fallen trees, and other obstructions to restore access to roads, highways, and public facilities for emergency responders and the public.
4. Undertake temporary repair works, such as patching potholes, repairing damaged culverts, and stabilizing slopes, to ensure the safety and usability of key transportation routes and public assets.

Post-Emergency/Disaster Recovery

1. Conduct detailed structural assessments and engineering surveys to evaluate the long-term impacts of disasters on public infrastructure and determine the scope of rehabilitation and reconstruction efforts.
2. Document and analyse lessons learned from the disaster response and recovery process to identify areas for improvement in infrastructure design, construction standards, and emergency management practices.
3. Develop detailed reconstruction plans and specifications for repairing or replacing damaged infrastructure in accordance with engineering standards and safety regulations.
4. Coordinate with contractors, suppliers, and other stakeholders to expedite the procurement of materials and equipment needed for infrastructure restoration projects and ensure compliance with quality control measures.
5. Integrate disaster risk reduction principles and climate resilience considerations into the design and construction of new infrastructure projects to minimize vulnerability to future disasters.
6. Enhance the capacity of PWD staff through training programs, workshops, and knowledge sharing initiatives on disaster risk management, emergency response procedures, and resilient infrastructure development strategies.

14.8 SOP for Telecommunication Department

During Emergencies

1. Restoration of telecommunication services.
2. Preparation of various teams for the restoration of telecommunication services.
3. Contact the District Control Room through the Tehsildars for additional assistance.
4. Providing updated information every two hours to the District Control Room during emergencies.

14.9 SOP for Railway Department

During Emergencies

1. Control of crowds at railway stations through railway police.
2. Providing updated information on railway schedules and accidents to the public.
3. Sending injured individuals to hospitals.
4. Providing updated information every two hours to the District Control Room during emergencies.

14.10 SOP for Agriculture Department

Pre-Disaster Preparedness

1. Conduct regular risk assessments to identify potential hazards.
2. Provide training to agricultural extension officers, farmers, and other stakeholders on disaster-resistant farming practices, early warning systems, and emergency response procedures.

3. ps and awareness programs to educate farmers on crop diversification, soil conservation techniques, and water management strategies to enhance resilience against disasters.
4. Maintain an inventory of agricultural inputs, including seeds, fertilizers, pesticides, and farming equipment, to ensure adequate supplies are available for emergency response.
5. Establish strategic stockpiles of essential agricultural commodities in accessible locations to support immediate post-disaster recovery efforts.
6. Coordinate with relevant government agencies, NGOs, and private sector partners to procure and distribute relief supplies to affected farmers in a timely manner.

During Emergencies

1. Monitor weather forecasts, crop conditions, and pest infestation patterns to provide early warnings to farmers about potential risks and advisories for preventive actions.
2. Activate communication channels, such as mobile alerts, radio broadcasts, and community meetings, to disseminate timely information and guidance to farmers during emergencies.
3. Deploy rapid assessment teams to survey agricultural areas affected by disasters and assess the extent of crop damage, livestock losses, and infrastructure destruction.
4. Compile and analyse data collected from field assessments to prioritize response efforts, allocate resources, and develop recovery plans tailored to the needs of affected farmers.
5. Establish emergency assistance centres or mobile outreach teams to provide immediate support and relief services to affected farmers, such as emergency shelter, food, water, and veterinary care for livestock.

Post-Emergency/Disaster Recovery

1. Implement rehabilitation and recovery programs to restore agricultural infrastructure, rehabilitate degraded lands, and promote sustainable farming practices in disaster-affected areas.
2. Provide technical assistance and training to farmers on soil conservation, water management, organic farming, and climate-resilient agriculture techniques to build long-term resilience against future disasters.
3. Support farmers in marketing their produce, accessing markets, and diversifying income sources to mitigate the economic impacts of disasters and improve livelihood resilience.
4. Facilitate the revival of local agricultural value chains, agribusinesses, and rural enterprises through targeted interventions, market linkages, and capacity-building initiatives.

14.11 SOP for District Information Office

1. Dissemination of information about various accounts in the district through media.
2. Coordination with various media for dissemination.

14.12 SOP for State Transport Department

Pre-Disaster Preparedness

1. Conduct regular risk assessments to identify potential hazards and vulnerabilities in the transport infrastructure, including roads, bridges, and public transport systems.
2. Develop and maintain an up-to-date emergency response plan that outlines roles, responsibilities, and procedures for different scenarios, such as natural disasters, accidents, and security threats.
3. Provide regular training to transport department personnel on emergency response procedures, including evacuation protocols, first aid, and communication protocols. Conduct drills and simulations to ensure readiness.
4. Implement a robust maintenance program to ensure the structural integrity of roads, bridges, and other transport infrastructure. Regular inspections should be carried out to identify and address potential hazards.
5. Establish partnerships and communication channels with other emergency response agencies, such as police, fire departments, and disaster management authorities, to facilitate coordinated responses during emergencies.
6. Educate the public about emergency preparedness measures, such as safe driving practices, evacuation routes, and emergency contact information. Utilize various communication channels, including social media, to disseminate information.
7. Maintain stockpiles of essential emergency supplies, such as road flares, first aid kits, emergency lights, and communication equipment, at strategic locations for rapid deployment during emergencies.

During Emergencies

1. Immediately activate emergency response teams to assess the situation and coordinate response efforts. Designate specific personnel to manage communication with other agencies and stakeholders.
2. Implement traffic control measures to manage congestion and facilitate the movement of emergency vehicles. Deploy traffic marshals at key intersections and diversion points to ensure smooth traffic flow.
3. Aid evacuees, including providing transportation services for vulnerable populations such as the elderly, disabled, and those without access to private vehicles. Coordinate with other agencies to establish evacuation shelters and distribution centres.
4. Mobilize teams to clear debris, repair damaged roads, and restore transport infrastructure as quickly as possible. Prioritize routes leading to critical facilities such as hospitals, emergency shelters, and relief distribution centres.
5. Maintain regular communication with other emergency response agencies and stakeholders to share information, coordinate response efforts, and address emerging challenges. Utilize designated communication channels for efficient coordination.

Post-Emergency/Disaster

1. Conduct rapid assessments to evaluate the extent of damage to transport infrastructure and facilities. Compile detailed reports on damage and submit them to relevant authorities for further action.
2. Initiate recovery and restoration efforts to repair damaged infrastructure, including roads, bridges, and public transport systems. Mobilize resources and personnel to expedite the restoration process.
3. Aid and support to affected communities, including facilitating transportation for relief workers, distributing emergency supplies, and offering counselling services to those in need.
4. Conduct a comprehensive review of the emergency response to identify strengths, weaknesses, and areas for improvement. Use the findings to update emergency response plans, procedures, and training programs.
5. Invest in measures to enhance the resilience of transport infrastructure against future emergencies and disasters. This may include infrastructure upgrades, adoption of new technologies, and implementation of risk reduction measures.

14.13 SOP for Maharashtra State Electricity Board

Pre-Disaster Preparedness

1. Establishment of control rooms.
2. Identification of vulnerable power supply infrastructure for ensuring electrical safety.
3. Ensuring availability of maintenance equipment such as transformers, poles, and wires at appropriate locations.
4. Elevating transformers in flood-prone areas if feasible.

During Emergencies

1. Prompt restoration of damaged power supply lines.
2. Continuous operation of control rooms.
3. Swift replacement of submerged transformers.
4. Providing information about restoration work and estimated time of completion.
5. Establishment of information desks to address citizens' complaints.
6. Implementing measures to prevent accidents due to electrical hazards, ensuring proper flow of electricity on power lines, and promptly removing fallen trees and poles.

Post-emergency/disaster

1. Immediately conduct assessments of the electricity distribution infrastructure to identify damage to substations, transformers, poles, and power lines. Report findings promptly to the relevant authorities.
2. Develop a restoration plan that prioritizes critical infrastructure such as hospitals, emergency services, and communication facilities. Ensure that restoration efforts are coordinated and efficient.
3. Efficiently allocate resources, including personnel, equipment, and materials, to expedite the restoration process. Coordinate with other agencies and stakeholders to maximize resource utilization.
4. Implement stringent safety protocols to prevent accidents during the restoration process. Provide training and guidance to field personnel on safe working practices.
5. Keep the public informed about the progress of restoration efforts, estimated timelines for power restoration, and safety instructions. Use multiple communication channels to reach a wide audience.
6. Engage with affected communities to address their concerns, provide assistance where needed, and facilitate community resilience efforts. Establish communication channels to receive feedback and address grievances.
7. Monitor the restoration process closely and adapt plans as necessary based on evolving conditions and challenges. Maintain open communication channels with field teams to address any issues promptly.
8. Conduct a thorough review of the response to identify strengths, weaknesses, and areas for improvement. Use the findings to enhance future disaster preparedness and response efforts.