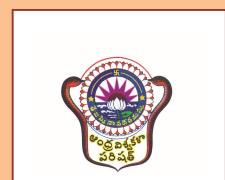




City Disaster Management Plan (Draft Final Report)



Greater Visakhapatnam Municipal Corporation



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ABBREVIATIONS

AP	Andhra Pradesh
APSDMP	Andhra Pradesh State Disaster Management Plan
APSRAC	Andhra Pradesh State Remote sensing Applications Centre
CBDM	Community Based Disaster Management
CD	Civil Defence
CDP	Centre for Disaster Preparedness
CRF	Calamity Relief Fund
CSCs	Community Service Centers
DDMPs	District Disaster Management Plans
DDMA	District Disaster Management Authority
DM	Disaster Management
DM ACT, 2005	Disaster Management Act, 2005
DRR	Disaster Risk Reduction
DSF	Disaster Support Function
EOC	Emergency Operations Centre
I&CAD	Irrigation and Catchment Area Development
IDRN	India Disaster Resource Network
IMD	India Meteorological Department
GIS	Geographic Information System
GoAP	Government of Andhra Pradesh
Gol	Government of India
SDMA	State Disaster Management Authority
SDRF	State Disaster Relief Fund
SDRP	State Disaster Response Plan
SEC	State Executive Committee
SHGs	Self-Help Groups
SOPs	Standard Operating Procedures
ULBs	Urban Local Bodies
UNDP	Urban Risk Reduction Project

1. INTRODUCTION

1.1. PREFACE

The City of Visakhapatnam, also known as Vizag, is one of the important cities on the east coast of India. It is the industrial capital of the state of Andhra Pradesh. Its health infrastructural facilities and educational opportunities made it as the destiny for the people of the bordering state like Orissa, and Chhattisgarh. It is abode of rich heritage, culture and natural beauty with lush green forest cover and sunshine golden beaches. In view of its exclusivity, the city scholars and the administration set the vision of the city as: "to become and economically vibrant, SAFE and inclusive city providing the best of social and physical infrastructure facilities for its residents, businesses and visitors". The preparation of Basic City Disaster Management Plan (CDMP) project is supported by the Government of India (GOI) and United Nations Development Programme (UNDP) with financial support from USAID. The basic objective of the preparation of the basic CDMP is to help in building a safer and disaster resilient Vizag.

Disaster is the most difficult concepts in literature to arrive at a definition. Most often the definition itself runs into the problem of either to broad or too narrow. The definition of Disaster as per the DM act 2005 is "a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area. Disaster Management (DM) means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for (i) prevention of danger or threat of any disaster; (ii) mitigation or reduction of risk of any disaster or its severity or consequences; (iii) capacity building; (iv) preparedness to deal with any disaster; (v) prompt response to any threatening disaster situation or disaster; (vi) assessing the severity or magnitude of effects of any disaster; (vii) evacuation, rescue and relief and (viii) rehabilitation and reconstruction. It implies the interaction of an external stress or with a human community and it carries the implicit concept of non-manageability. The term is used in the entire range of risk-reduction activities, but it is possibly the least appropriate for response.

Disaster Management-Need of the Hour

Visakhapatnam experiences a variety of natural disasters throughout the year. The core city region which constitutes about 73.7% of the total area and 62.8% of the population are vulnerable to natural calamities.

Disaster and Hazards

Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area; Natural Disaster means a serious disruption of the functioning of a society, causing widespread human, material or environmental losses caused due to earthquake, cyclone, flood, Tsunami or landslide which exceeds the ability of the affected society to cope using only its own resources. Hazards are defined as "Phenomena that pose a threat to people, structures or economic assets and which may cause a disaster. They could be either manmade or naturally occurring in our environment."

Disasters whether natural or man-made can strike at any time. The general response to a disaster is in terms of relief and rescue operations - after the event. However, if we are adequately prepared, it's possible to reduce the impact of a disaster. The impact can be reduced through Knowledge of certain life-saving tools and techniques, which when used at the time of the event of disaster can control the total damage to life and belongings. The disaster and hazards classification is presented in Table 1.1.

Rationale

Rapid urbanization in Visakhapatnam has led to the increase in demand for land within the city area and expansion of the city along the peril-urban areas. Since there is a lack of efficient and effective public transportation in many habitations, people especially from the low socio-economic class started to gradually move towards the prime (in terms of accessibility) but highly hazard risk prone locations within the city. With inadequate public infrastructure, higher population growth rate, inadequate contingency planning, and deficient urban governance the problem of settlements within unsafe locations are steadily increasing.

Table 1-1 Classification of disasters and hazards

1. Water and Climate Related	1.Floods and Drainage Management 2.Cyclones 3.Tornadoes & Hurricanes 4.Hailstorm 5.Cloud burst 6.Snow Avalanches 7.Heat & Cold Waves 8.Thunder & Lightning 9.Sea Erosion
2. Geologically Related	10.Earthquakes 11.Landslides & Mudflows 12.Dam Bursts & Dam Failures 13.Mine Fires
3. Chemical, Industrial, Electrical and Nuclear Related	14.Chemical and Industrial Disasters 15.Nuclear Disasters 16.Fire
4. Accidents related	17.Road /Rail Accidents
5. Biologically Related	18.Biological Disasters & 19.Epidemics 20.Food Poisoning 21.Cattle Epidemics 22.Pest Attacks

Source: High Powered Committee Report, Indian Institute of Public Administration, Delhi.

1.2. CLASSIFICATION OF DISASTERS

There is no country that is immune from disaster, though vulnerability to disaster varies. There are four main types of disaster.

Natural Disasters: including Floods, Hurricanes, Earthquakes, Tsunamis and Volcano eruptions that have immediate impacts on human health and secondary impacts causing further death and suffering from (for example) floods, landslides, fires, Tsunamis.

Environmental Emergencies: including technological or industrial accidents, usually involving the production, use or transportation of hazardous material, and occur where these materials are produced, used or transported, and forest fires caused by humans.

Complex Emergencies: involving a break-down of authority, looting and attacks on strategic installations, including conflict situations and war.

Pandemic Emergencies: involving a sudden onset of contagious disease that affects health, disrupts services and businesses, brings economic and social costs.

Any disaster can interrupt essential services, such as health care, electricity, water, sewage/garbage removal, transportation and communications. The interruption can seriously affect the health, social and economic networks of local communities and countries. Disasters have a major and long-lasting impact on people long after the immediate effect has been mitigated. Poorly planned relief activities can have a significant negative impact not only on the disaster victims but also on donors and relief agencies. So it is important that physical therapists join established programs rather than attempting individual efforts.

Local, Regional, National and International organizations are all involved in mounting a humanitarian response to disasters. Each will have a prepared disaster management plan. These plans cover Prevention, Preparedness, Relief, Capacity building and Recovery.

Disasters whether natural or man-made can strike at any time. The general response to a disaster is in terms of relief and rescue operations - after the event. However, if we are adequately prepared, it's possible to reduce the impact of a disaster. The impact can be reduced through a Knowledge of certain life-saving tools and techniques, which when used at the time of the event of disaster can control the total damage to life and belongings.

In order to deal with such disaster, this plan was commissioned by UNDP to provide support to the establishment of a multi-hazard disaster management in Visakhapatnam City under the pilot initiative of GoI-UNDP Urban Risk Reduction Project.

Need of Plan

With passing of Disaster Management Act., 2005 due importance has been given to Disaster Management apart from many state interventions, local preparedness and mitigation of Disasters is also required to have a strategy by integrate all existing resources and opportunities under unified plan for stipulate effective mitigation mechanism. Therefore each City is commissioned to make an integrated City Disaster Management Plan.

1.3. OBJECTIVES

The objectives of the project are to prepare the basic CDMP encompassing the elements of the pre and post disaster management activities including capacity building. Further it describes how life, assets, infrastructure losses and adverse impacts can be mitigated and minimized with advance and proactive measures. The study envisages the roles and responsibilities of various Departments of GVMC and required coordination with various other organizations of the city to carry out action plans of preparedness and response strategies. Line of authority and organizational structure of various agencies is enshrined in providing personnel, equipment and other supplies during response and recovery actions. Capacity building plan of various stakeholders and community in specific with participatory approach is described to bring awareness in the city. The main objectives of the study are to:

- achieve a comprehensive and updated picture of the possible urban disaster scenario of the city
- prepare the plans for disaster preparedness, response, recovery, and mitigation; and ultimately
- prepare the Basic City Disaster Management Plan (CDMP) for the GVMC

1.4. SCOPE OF THE WORK

The study helps in identification of the key areas for action plans on pre-disaster, during and post-disaster of each of the disasters sub systems. It involve the preparation of basic mapping of risks and vulnerabilities areas of Vizag due to various natural or manmade disasters like cyclones, floods, fire, industrial hazards, landslides, forest fires, earthquake, tsunami etc. of the city. The evacuation routes should be documented suitably. Proper institutional mechanism mainly coordination of various agencies in the city is suggested for appropriate utilization of personnel and equipment during emergency operations including transportation plan, evacuation, rescue and rehabilitation plans. Basic life line commodities like food, water, medicine etc. and critical sectors like sanitation, electricity, communication etc. shall be tied up with rescue and rehabilitation plans. Short, medium and long term mitigation measures will be identified for structural and non-structural risks. Strategic training needs across various stakeholders will be formulated and methods to reach the beneficiaries are planned in capacity building

Present study includes the preparation of the basic profile of the city and the organizational structure during normal state of affairs in the activities. Apart from this it is envisaged to prepare the plans of important components of the basic CDMP of the city. The existing data base available with GVMC and several other organizations involved in the administration of city during normal days and during emergency operations will be used for the preparation of the basic CDMP.

1.5. GVMC PLANS AND PROGRAMMES FOR CDMP

Greater Visakhapatnam Municipal Corporation has an unwritten plan for the disaster management particularly with reference to GVMC jurisdiction. The engineering, public health and the UCD departments of GVMC used to participate actively in the evacuation, restoration and reconstruction activities of any event of disasters due to flooding or cyclones. There used to be some sort of coordination with the district administration, Power Distribution Corporation and the NGOs in the city. In order to make a well prepared CDMP under USAID–GOI-UNDP project the GVMC has initiated the process on 30th April 2013 through the organization of a workshop. The purpose of this workshop is to agree on the (1) Implementation strategy, (2) relevant stakeholders, (3) roles and responsibilities of various line departments and other partners in project implementation, (4) focal point for the project from the state government and (5) project monitoring mechanism. The initial deliberations were held on CDMP, Hazard Risk and Vulnerability Analysis (HRVA), Capacity Building, Early Warning System (EWS), sectoral plans to mainstream Disaster Risk Reduction (DRR) and knowledge management. Since then modest progress was made in the direction of the preparation of CDMP.

Later in the year 2014, GVMC engaged consultants for the preparation of the HRVA and Climate Change and Early Warning Systems (EWS). Both HRVA and EWS need to be synchronized with the proposed CDMP as they are important inputs for the CDMP. GVMC envisages designating a nodal officer for the City's DM activities with a team drawn from different domains. It proposes to include Hospital Emergency Management Plan including mass casualty management plan. Police and Fire Services role is sought in DM and include simulation and mock drills for testing the plan. GVMC is does not have plans for organizing programs in schools, colleges, and at ward level to create awareness on disaster preparedness, response and mitigation. It may be achieved through representatives, website and social networking for public access. All the above need a CDMP beforehand to help the civic body authorities to make the city a safe and disaster resilient city.

Recognizing the importance of the disaster management plan, GVMC authorities entrusted the Basic CDMP preparation work to the Andhra University, Visakhapatnam.

2. PROFILE OF GREATER VISAKHAPATNAM MUNICIPAL CORPORATION

2.1. PROFILE OF THE CITY

Visakhapatnam, also popularly known as Vizag, is a fast developing cosmopolitan shore city fondly called as, The City of Destiny. The city is naturally gifted with unique picturesque Eastern Ghats along the coast. Studded with archaeological sites of Buddhist, Hindu and historical remains of Dutch, French, British and Indian royal families of pre-Independence India, Visakhapatnam is unique centre for the heritage and cultural value. Apart from its natural beauty, hill stations like Araku, Ananathagiri, Lambasingi, Paderu, Sileru etc., in the vicinity of Visakhapatnam has attracted tourists, domestic and foreign as well. The natural port, major, medium and small scale industries and ancillary commercial activity, availability of natural resources of petroleum, iron ore, lime etc. has attracted people and economy from all over India making it truly a cosmopolitan City of Destiny. The city is well connected by all modes of transport viz., Air, Rail, Road and Water ways for goods and passengers. There are numerous R & D organizations and academic Institutes par excellence. Eastern Naval Command, Indian Coast Guard are located here due to its strategic location and the Dolphin's Nose that protects from most of the harshest cyclones.

Greater Visakhapatnam Municipal Corporation (GVMC) includes the erstwhile suburban municipalities of Gajuwaka, Bheemunipatnam and Anakapalle. The city is growing steadily, with a current population of 17.30lakhs in 2011 to rise towards a projected population of 20.99lakhs by 2021. The population growth rate in the city is inflated due to the high in-migration, owing to the multitude of economic opportunities that it offers. The city spreads over more than 600 km². It is the second largest city of Andhra Pradesh. It has a strong industrial base on the south of the city, with further projected growth around Gajuwaka and the planning of the new industrial region along the southern coastal belt. The flourishing ports both Visakhapatnam Port Trust (VPT) and Gangavaram Port together with extensive rail connections support this industrial growth. In contrast to the industrial south, the northern coastal corridor to Bheemunipatnam offers long beaches, Buddhist cultural heritage and a coastal landscape that has begun to attract new IT and knowledge industry and residential development. The service sector such as IT and tourism is by comparison small, but is showing slow and sure signs of growth.

This multifaceted growth has presented the city with new challenges and problems. Traffic congestion has increased significantly, and travelling in the core city is becoming tricky. Environmental pollution and management, particularly from the industrial belt needs significant improvement, especially if the city is to promote itself as a place to live, work and visit. The quality of water: viz. ground, surface and sea, reflects the success in controlling and treating emissions, wastewater and sewage. The city will need to

show significant improvements in managing solid waste hygienically and reducing the risk of flooding through adequate and well-maintained storm water systems. Visakhapatnam's growth story needs to be equitable. With more than a third of its citizens in slums and high in migration adds to the challenges. Visakhapatnam is administered by the Greater Visakhapatnam Municipal Corporation. Significant increase in GVMC jurisdiction from 111 sq.km to more than 600 sq.km, activity in the city and the population, it is dire necessity for the city to have CDMP.

Regional setup of the City

This beautiful city is said to have derived its name from the deity 'Visakha' - the God of Valour. The history of the town can be traced back to Ashoka the Great (273-232 B.C.) when this was a small fishing village of the Kalinga empire. Later on this port town successively passed from the Andhra Kings of Vengi to the Pallavas, Cholas and the Gangas. In the 15th century Visakhapatnam became a part of Vijayanagar Empire. The British took charge of this beautiful land and transformed this into a busy and flourishing port town. Today it has emerged as an important port on the east coast of India. The Vizag port handles the maximum cargo in the country and promises to become one of Asia's major ports.

The city was ruled by Andhra Kings of Vengi, Kalinga and after that to the Pallavas. The city is named after Sri Vishaka Varma. It is believed that an Andhra king, built a temple to pay homage to his family deity Visakha. This is now inundated under sea water near R K Beach. Another theory is that it is named after a women disciple of Buddha named Visakha. Later it was ruled by Qutb Shahis, Mughal Empire (between 1689–1724), Nizam (1724–1757) and France (1757–1765) before being captured by the British in 1765. Visakhapatnam is surrounded by ancient Buddhist sites, most of which have been excavated recently and illustrate the legacy of Buddhism in the region. British and French squadrons fought the naval Battle of Vizagapatam near the harbour. After India's independence it was the largest district in the country, and was subsequently divided into the districts of Srikakulam, Vizianagaram and Visakhapatnam. Part of the city is known by its colonial British name, Waltair; during the colonial era, the city's hub was the Waltair railway station and the surrounding part of the city is still called Waltair.

Location & Topography

Vizag is located on the east coast of India, in 17o42' North latitude and 82o02' East range of hills. Based on topographical conditions, the city and its environs can be divided into four categories viz., Hilly region, Upland tracks, Rolling plains and Plains. The Kailasa and Yarada are the major hill ranges in the city. The Kailasa hill range stretches from Simhachalam to MVP Colony on the north flank of the city. The city, which appears like a small basin, is surrounded by the Yarada hill popularly known as Dolphin's nose (358m) on

the side of the Kailasgiri hills on the north, with the Bay of Bengal forming the eastern wall. The coastal line runs from north- east to south west over a distance of six kilometres. On the west there is an extensive tidal basin called Upputeru now under reclamation. Beyond Yarada there is a valley followed by another range of hills.

Location & Administrative Features

Name of City : Visakhapatnam
 Name of District: Visakhapatnam
 Name of the Taluka: Visakhapatnam
 Longitude & Latitude: 83013` 08" E and 17014` 18" N

Table 2-1 Locational Details of City

City	Surrounded by	North	South	East	West
		Vizianagaram	East Godavari	Bay of Bengal	Malkangiri (Odhis)

2.2. DEMOGRAPHIC PROFILE

Population particulars:

Greater Visakhapatnam Municipal Corporation constitutes about 3.91 % of the total urban population of the state. After the state government approved the formation of Greater Visakhapatnam with the merger of Gajuwaka municipality and 32 villages in the vicinity in the Visakhapatnam Municipal Corporation, the population of the city and the metro area swelled present population may be between 1.6 to 1.8 million. Males constitute 50% of the population and females 50%. The city has an average literacy rate of 82.6%, higher than the national average of 59.5%. Male literacy is 88% and female literacy is 77.1 %. Visakhapatnam is listed as one of the 100 Fastest Growing Cities of the World. The population of Visakhapatnam city is 17, 30,320 as per census 2011. The population of Vizag urban agglomeration increased from 1.05 million in 1991 to 1.32 million in 2001. The growth of population was more than 80% during 1971-81 and 37.11% during 1991-2001. Due to formation of GVMC and merger of surrounding villages, several well established urban components of the city are located within the GVMC. The details of population of the Municipal Corporation Visakhapatnam and now functioning as the Greater Visakhapatnam Municipal Corporation are given in Table 2.2 and Figure 2.1 – 2.3.

Table 2-2 The details of population of the Greater Municipal Corporation Visakhapatnam

72 WARDS POPULATION									
Sl.No	Ward No	Total Population	Male	Female	S.C	S.T	%of Women	%of S.c	%of S.T
1	1	18598	9445	9153	2284	286	49.21	12.28	1.54
2	2	17966	9217	6749	1733	62	48.7	9.65	0.35
3	3	21002	10774	10228	1743	105	48.7	8.3	0.5
4	4	18267	9387	8880	1555	203	48.61	8.51	1.11
5	5	18390	9454	8936	1639	334	48.59	8.91	1.82
6	6	21861	11139	10722	1556	464	49.05	7.12	2.12
7	7	21800	11014	10786	875	168	49.48	4.01	0.77
8	8	21916	11418	10498	1208	88	47.9	5.51	0.4
9	9	21575	10880	10695	1912	185	49.57	8.86	0.86
10	10	21920	11175	10745	933	45	49.02	4.26	0.21
11	11	21006	10590	10416	1332	90	49.59	6.34	0.43
12	12	21282	10719	10563	2953	157	49.63	13.88	0.74
13	13	21473	11027	10446	1377	182	48.65	6.41	0.85
14	14	19728	9895	9833	635	72	49.84	3.22	0.36
15	15	21868	11017	10851	2300	82	49.62	10.52	0.37
16	16	21667	10860	10807	1567	86	49.88	7.23	0.4
17	17	21418	10925	10493	926	39	48.99	4.32	0.18
18	18	19988	10068	9920	1961	122	49.63	9.81	0.61
19	19	21915	11173	10742	2484	35	49.02	11.33	0.16
20	20	20880	10483	10397	1464	27	49.79	7.01	0.13
21	21	19022	9408	9614	3799	31	50.54	19.97	0.16
22	22	19076	9717	9359	2518	12	49.06	13.2	0.06
23	23	18136	9195	8941	3197	28	49.3	17.63	0.15
24	24	17969	9143	8826	117	2	49.12	0.65	0.01
25	25	18357	9280	9077	458	13	49.45	2.49	0.07
26	26	20663	10505	10158	797	113	49.16	3.86	0.55
27	27	19424	10028	9396	1333	144	48.37	6.86	0.74
28	28	18708	9422	9286	972	114	49.64	5.2	0.61
29	29	19020	9422	9598	2220	43	50.46	11.67	0.23
30	30	18437	9316	9121	1326	85	49.47	7.19	0.46
31	31	18582	9470	9112	1194	122	49.04	6.43	0.66
32	32	18480	9371	9109	332	15	49.29	1.8	0.08
33	33	19770	9869	9901	1388	115	50.08	7.02	0.58
34	34	18353	9514	8839	1811	370	48.16	9.87	2.02
35	35	19607	9897	9710	3595	137	49.52	18.34	0.7
36	36	20633	10520	10113	2254	144	49.01	10.92	0.7
37	37	18643	9493	9150	4971	94	49.08	26.66	0.5
38	38	20776	10668	10108	2312	195	48.65	11.13	0.94
39	39	20270	10532	9738	2456	244	48.04	12.12	1.2
40	40	21372	10305	11067	2371	258	51.76	11.09	1.21
41	41	21910	10968	10942	1231	149	49.94	5.62	0.68
42	42	18439	9604	8835	2714	129	47.91	14.72	0.7
43	43	18322	9703	8619	1726	680	47.04	9.42	3.71
44	44	18295	9145	9150	1076	49	50.01	5.88	0.27
45	45	21323	10840	10483	1769	271	49.16	8.3	1.27
46	46	21544	10821	10723	1201	95	49.77	5.57	0.44
47	47	21537	10830	10707	1214	164	49.71	5.64	0.76
48	48	20394	10370	10024	2565	98	49.15	12.58	0.48
49	49	21239	10823	10416	2487	43	49.04	11.71	0.2
50	50	20873	10757	10116	426	332	48.46	2.04	1.59
51	51	18211	9366	8845	1799	64	48.57	9.88	0.35
52	52	18498	9671	8827	812	158	47.72	4.39	0.85
53	53	18847	9674	9173	873	649	48.67	4.63	3.44

54	54	19949	10129	9820	3088	731	49.23	15.48	3.66
55	55	19106	9823	9283	660	48	48.59	3.45	0.25
56	56	20881	10519	10362	924	111	49.62	4.43	0.53
57	57	19781	10168	9613	904	156	48.6	4.57	0.79
58	58	18082	9280	8802	1790	367	48.68	9.9	2.03
59	59	18460	9466	8994	1969	368	48.72	10.67	1.99
60	60	18987	9837	9150	675	54	48.19	3.56	0.28
61	61	21066	10846	10220	583	135	48.51	2.77	0.64
62	62	20560	10632	9928	1104	56	48.29	5.37	0.27
63	63	18144	9411	8733	552	45	48.13	3.04	0.25
64	64	20775	10589	10186	949	56	49.03	4.57	0.27
65	65	18217	9569	8648	1506	83	47.47	8.27	0.46
66	66	19987	10161	9826	905	47	49.16	4.53	0.24
67	67	20940	10560	10380	3383	108	49.57	16.16	0.52
68	68	20534	10469	10065	2392	104	49.02	11.65	0.51
69	69	19283	9666	9617	856	166	49.87	4.44	0.86
70	70	21936	10906	11030	2390	200	50.28	10.9	0.91
71	71	18699	9663	9036	1255	131	48.32	6.71	0.7
72	72	20462	10370	10092	791	398	49.32	3.87	1.95
	TOTAL	1435099	730371	702728	118427	11356	49.11	8.25	0.79

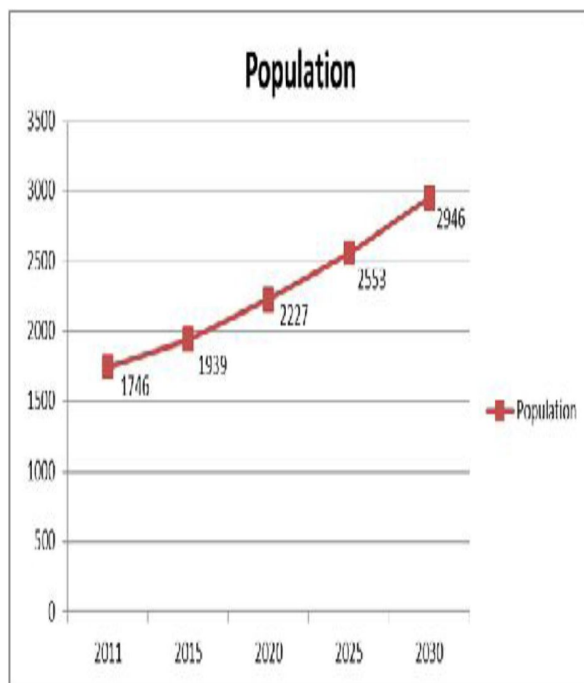


Figure 2-1 Population Growth Rate

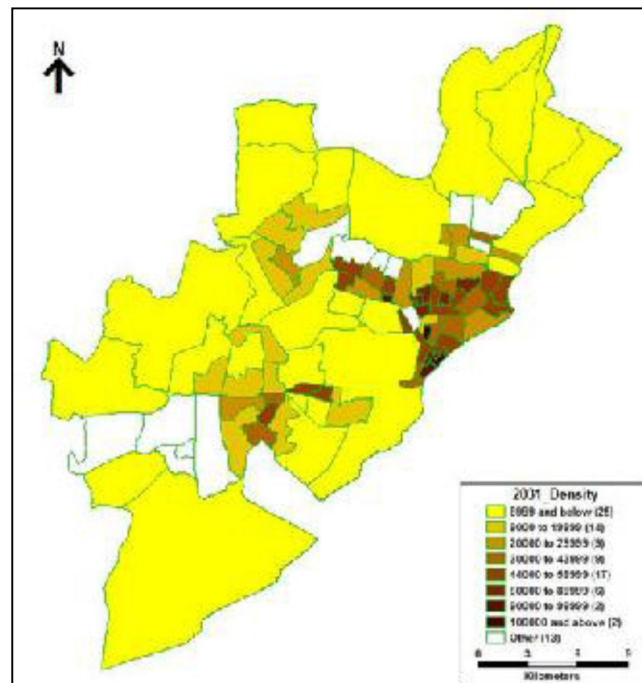


Figure 2-2 Population Distribution

Visakhapatnam Population has grown rapidly and is amongst the most densely populated cities

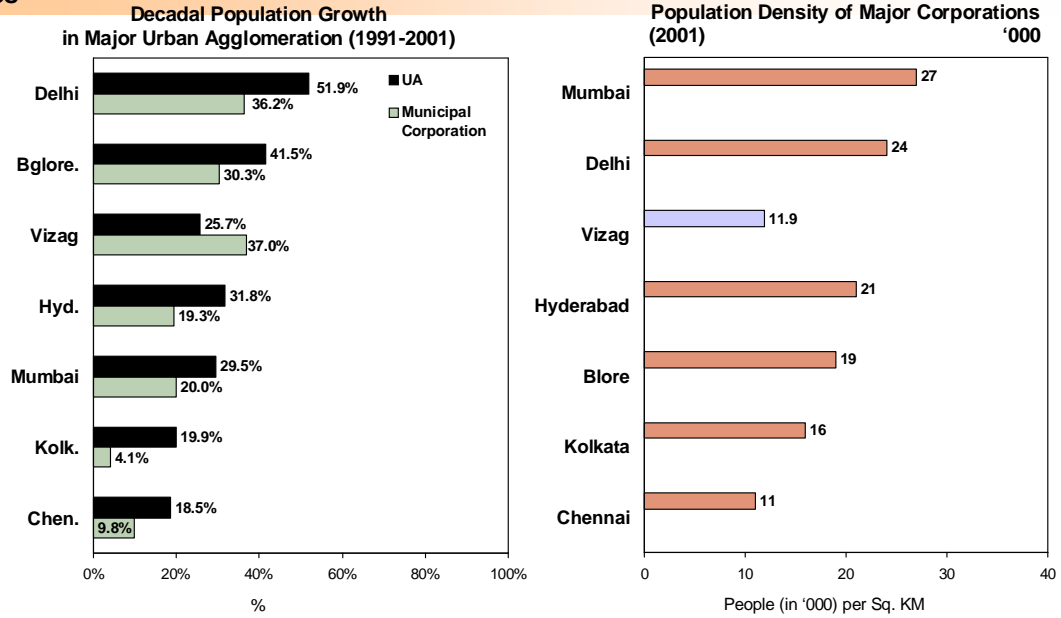
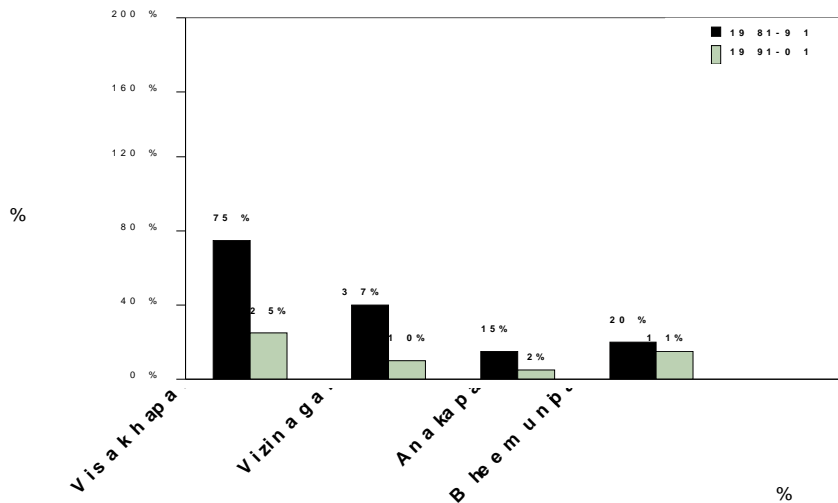


Figure 23: Population Growth in VMC and Surrounding Municipalities

Most of the growth is concentrated in Vizag city area and there is no substantial growth in other municipalities compared to Vizag

Decadal Population Growth Rates in Municipal areas under VUDA (1981-2001)



Note: City refers to Census Town, Metros & Municipalities
 Source: Census of India (1991 and 2001)

Figure 2-3 Comparative decadal growth rate of Vizag with other surrounding Municipalities

A key feature of population growth in Greater Visakhapatnam Municipal Corporation is that the people living in surrounding areas, especially from the nearby districts are migrating in search of livelihoods owing to rapid fast growth of industrialisation to the city of Visakhapatnam. Comparative to other surrounding Municipalities of Vijayanagaram, Anakapalli and Bimunipatnam the decadal population growth in Vizag City is phenomenal during the year 1991-01 at 75% compared to Vijayanagaram at 37.2%, Anakapalli at 15% and Bhimunipatnam 20%..

The Municipal Corporation of Visakhapatnam, prior to its constitution as Greater Visakhapatnam Municipal Corporation in 2005 has a jurisdiction of 111 square kilometers with a population of 9.69 lakhs as per the 2001 census while the Visakhapatnam Urban Agglomeration covered approximately 5.3 square kilometers with a population of 13.62 lakhs. The government of Andhra Pradesh has reconstituted the Municipal Corporation of Visakhapatnam in the year 2005 by extending the jurisdiction and by merging the adjoining municipality and panchayats. The reconstituted Greater Visakhapatnam Municipal Corporation has an area of 515 square kilometers with a population of 14.5 million. Thus the GVMC is representative of the urban agglomeration in terms of area as well as population. The Visakhapatnam Urban Development Authority has a jurisdiction of 1701 square kilometers and covers a population of 22.02 lakhs. Table 2.3 gives the details.

Table 2-3 Population by Major Geographical Units

Sl no.	Geographical unit	Area (Sq.kms)	Population (in Lakhs)	components
1	Municipal Corporation Vizag (MCV) – Prior to 2005	111	9.69	M.corp
2	Visakhapatnam Urban Agglomeration (VUA)	503 (approx)	13.62	MCV, Gajuwaka + 6 outgrowths
3	Greater Visakha Municipal Corporation (GVMC) – After 2005	515	14.5	MCV+ gajuwaka + 32 villages
4	Visakhapatnam Urban Development Authority (VUDA)	1701	22.02	Visakhapatnam dist + part of Vizianagaram district

Future Growth

The growth rate of population experienced by VMC during 1991 and 2001 will continue in future though at a lesser rate. The projections indicate that the Greater Visakhapatnam City area would have a population of 16.61 lakhs in 2011 and 20.99 lakhs in 2021 (Figure 2.4).

Table 2-4 Population Projections

Component	Area (sq.km)		Total Population (in lakhs)				Density (Population / sq. km)			
	2001	2006	2001	2006	2011	2021	2001	2006	2011	2021
Municipal Corporation	111	540	9.69	14.5	16.61	20.99	8765	2685	3075	5537
VUDA	1701	1701	22.02	26.21	30.58	34.99	1293	1540	1797	2057

Components of Growth

An analysis of composition of population growth indicates that natural growth contributed about 70 percent while migration contributed 30 percent between the years 1981-1991. However, the contribution of natural growth has come down significantly in the years 1991-2001 to 47 percent, mainly due to jurisdictional change. The contribution of migration has come down from 30 to 20 percent. This indicates that the urban growth in GVMC will take place even if measures are taken to control migration. Hence long term and strategic planning is necessary to promote equitable economic growth and service delivery. Table 2.5 gives the details on composition of population growth.

Table 2-5 Comparison of Population growth

Composition	Population increase during			
	1981-91	% of total	1991-2001	% of total
Natural increase	1,38,000	70%	2,32,000	47%
In-migration	47,360	30%	73,200	20%
Jurisdictional	0	0%	1,70,000	33%
Total increase	1,85,360	100%	4,75,200	100%

One of the key reasons for inadequate service delivery outcomes in GVMC is the overlapping arrangements in functions, roles and responsibilities of the institutions resulting in poor accountability. The absence of an effective coordination mechanism, amongst city and state level agencies has implications for orderly spatial development, coordinated infrastructure provision, local economic growth, development management, service delivery and expenditure effectiveness. There is an urgent need to ensure spatial and functional integration of service delivery process through innovative institutional arrangements for achieving better service outcomes. There is a need for widespread reform in governance and service delivery framework with a focus on city integration and co-ordination.

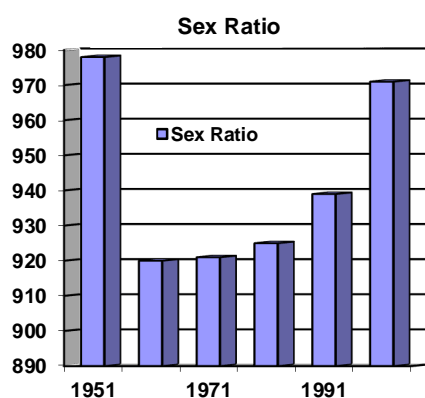
Slum population

The population in slum is highly vulnerable to disaster in comparison to the rest of the urban population since most slums are located on steep hill sides, in poorly drained areas, or in low lying zones. They usually also have poor infrastructure provisions and hence any disaster simply exacerbates their situation. Source UCD section GVMC.

Year	2011
Total population	5,58,859
Male	3,40,824
Female	2,18,035
% Male population	61%
% Female population	39%

Sex Ratio

Sex ratio in Visakhapatnam Municipal Corporation is 971 in 2001, which is substantially higher than the sex ratio in the year 1991. However, the sex ratio in 2001 is below the state average of 978 (Fig.2.4).



Year	Sex Ratio
1951	978
1961	920
1971	921
1981	925
1991	939
2001	971
2011	977

Figure 2-4 Sex Ratio

Literacy

Census figures for 1991 & 2001 for Visakhapatnam Municipal Corporation and the rest of the state reveal that general literacy and female literacy have improved. Visakhapatnam Municipal Corporation leads in literacy in Andhra Pradesh, with 76.60% in 2001. Male literacy in the agglomeration is approximately 83.46%, while female literacy is considerably lower at 69.59%. Table 2.6

Table 2-6: Literacy Rate

Year	Percentage of Literates		
	Male	Female	Total
1971	61.59	39.77	51.12
1981	65.57	45.65	55.96
1991	71.99	57.56	65.00
2001	83.46	69.59	76.60

Total 12, 98,896 persons i.e. 82.66% of literacy is been noted in the city. Males have highest with 88.02% is been observed.

Demography: Emerging Issues and Concerns

Visakhapatnam has experienced high growth in population and the same trend is expected to continue over the next two decades. It is projected that by 2021 Visakhapatnam would emerge as one of the major cities in the country. Most of this growth would take place in Greater Visakhapatnam area away from the city core. However, this has serious implications for service delivery both for city core as well as peripheral areas since the traffic and population flows occur between them. This calls for integrated planning of Greater Visakhapatnam with a focus on equitable provision of services to all the areas and all the sections of the population.

2.3. TOPOGRAPHY, CLIMATE and RAINFALL

Topographic details:

Visakhapatnam city has characterized by three rivers (thadava ,varaha, sarada) and three rivulets(Megadrigadda, Madhuravada drainage basin, Anakapalli drainage basin). The natural drainage of the city is towards east direction.

Climate

Visakhapatnam is located at Longitude 17.7oN & Latitude 83.2oE with a mean sea level of 5 M. The climate is hot and humid during summers that extend from March till the end of June followed by monsoons from July to September/October during which it experiences cyclones and heavy rain falls. The spell of winter extends from November till end of February during which the weather is comfortable. The variations of various climate parameters are shown in Figure 2.6

The climate of Visakhapatnam is moistures (humid) and rainfall is recorded for 54 days during the year 2011. The year is divided into four seasons. The winter from January to February, the summer from March to May. The Monsoon from June to September (South-West) and post monsoon from during October & December. Visakhapatnam experiences a [tropical savanna climate](#) with little variation in temperature through the year. May is the hottest month with average temperatures around 38oC (100oF), while January is the coolest month with average temperatures near 17.8oC (64oF).

The district has differing climatic conditions in different parts of it. Near Coast the air is moist and relaxing, but gets warmer towards the interior and cools down in the hilly areas on account of elevation and vegetation. April to June is warmest months. The Temperature (at Visakhapatnam Airport) gets down with the onset of South West Monsoon and tumbles to a mean minimum of 18.80 C by December after which there is reversal trend till the temperature reaches mean maximum of 37.40 C by the end of May.

Rainfall

The District receives annual normal rainfall of 1202 MM of which south-west monsoon accounts for 53.9% of the normal while North-East monsoon contributes 24.8% of the normal rainfall during 2001-2002. The rest is shared by summer showers and winter rains. Agency and inland Mandals receive larger rainfall from the South West Monsoon, while Coastal Mandals get similarly larger rainfall from North- East monsoon. But both the monsoons play truant, variations of South-west monsoon accounting for 15.3% of normal and North-west monsoon to 33.2% of normal. Since the variation for most periods is on the negative side of log 'Y' and since even the years of normal rainfall are characterized by long dry spells during one or more parts of the crop season, the district experiences drought conditions too often, as no major irrigation system exists to cushion the vagaries of the monsoon.

As the city is located on the Bay of Bengal, the humidity remains high throughout the year. The total annual rainfall is around 1202 mm, the bulk of which is received during the south-west monsoon.

September is the wettest month with around 208.8 mm of rain fall. The months from November to February are the best times to visit the city, with moderate temperatures and little precipitation.

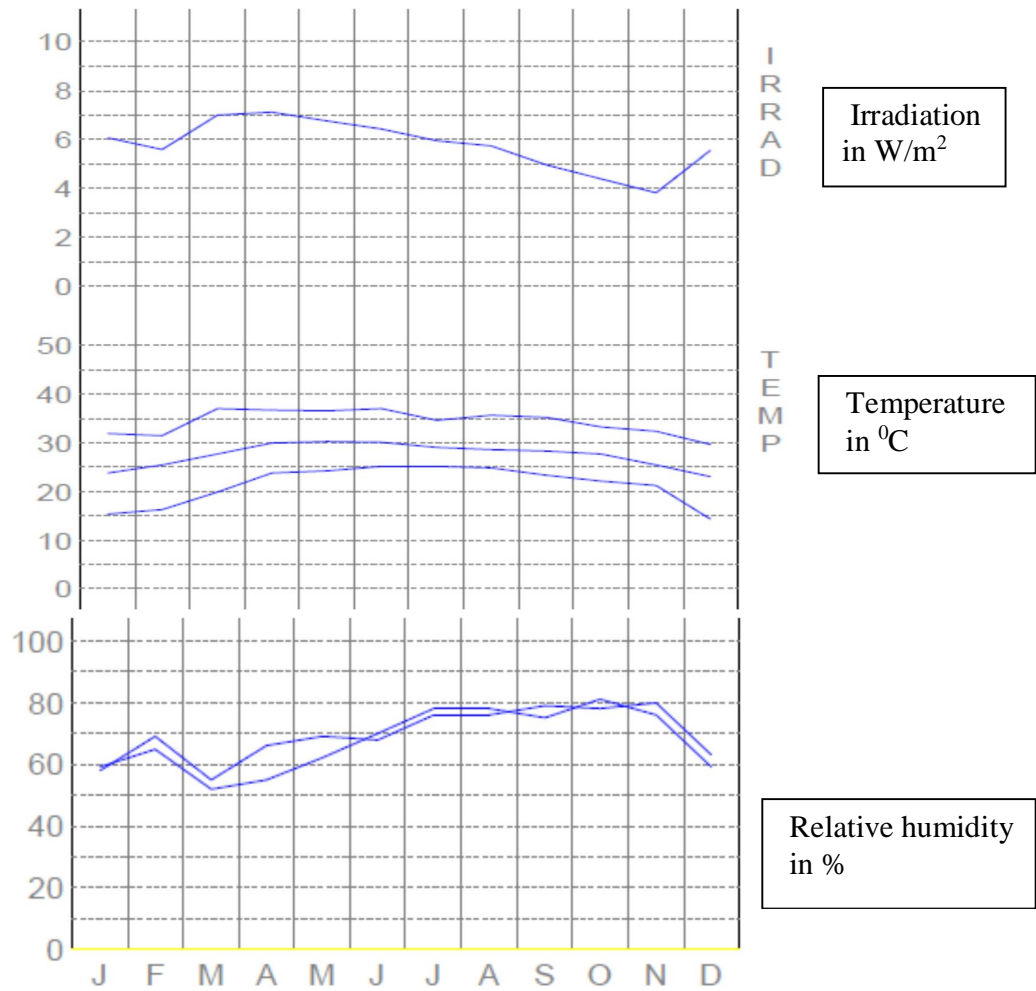


Figure 2-6 Climatic Data

Table 2-7 The details of climate conditions in the GVMC area

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
Max. temperature 0C	30.2	31.2	37.2	33.5	38.0	35.1	37.0	39.0	33.6	32.7	32.0	30.9	32.5
Min. temperature 0C	17.8	18.0	20.2	22.5	26.4	24.6	25.3	24.5	23.4	24.2	18.7	17.9	23.7
Average rainfall (in mm)	11.4	7.7	7.50	27.6	57.8	105.6	134.6	141.2	1742.8	204.3	65.3	7.9	945.7

SOURCE: IMD, Visakhapatnam

Table 2-8 Extreme weather events in the month of July

Year	Temperature(0C)		Rainfall (mm)	
	Highest Maximum(Date)	Lowest Minimum(Date)	24 Hours Highest (Date)	Monthly Total
2010	34.0(14)	23.6(25)	58.8(06)	215.2
2009	35.6 (13)	24.2 (15)	25.8 (14)	110.4
2008	36.5 (03)	22.9 (14)	37.6 (23)	167.6
2007	35.6 (06)	23.1 (09)	45.6 (29)	087.5
2006	37.0 (11)	22.8 (22)	23.3 (03)	106.1
2005	33.0 (03)	24.5 (04)	32.0 (24)	105.0
2004	33.6 (03)	23.4 (14)	48.4 (14)	233.7
2003	34.4 (03)	23.4 (26)	42.5 (15)	233.3
2002	38.9 (11)	24.6 (31)	58.3 (18)	075.4
2001	37.8 (04)	24.2 (5,6)	11.3 (07)	045.1
ALL TIME RECORD	41.4 (08)	21.0 (22)	145.0 (24)	350.8
YEAR	2002	1986	1951	1989

Table 2-9 Climatological Table for the period 1951 - 1980

Month	Mean Temperature(oC)		Mean Total Rainfall (mm)	Mean Number of Rainy Days	Mean Number of days with			
	Daily Minimum	Daily Maximum			HAIL	Thunder	FOG	SQUALL
Jan	18.0	28.9	11.4	0.5	0.0	0.2	0.5	0.0
Feb	19.9	31.3	7.7	0.5	0.0	0.5	0.2	0.1
Mar	23.0	33.8	7.5	0.5	0.0	1.8	0.1	0.1
Apr	26.1	35.3	27.6	1.2	0.0	5.0	0.0	0.8
May	27.7	36.2	57.8	3.0	0.0	8.6	0.1	2.1
Jun	27.3	35.3	105.6	6.4	0.0	10.2	0.1	2.3
Jul	26.1	32.9	134.6	8.7	0.0	6.9	0.0	1.1
Aug	26.0	32.7	141.2	9.3	0.0	8.0	0.0	1.5
Sep	25.6	32.5	174.8	9.9	0.0	11.4	0.0	1.2
Oct	24.3	31.7	204.3	8.7	0.0	8.2	0.0	0.9
Nov	21.6	30.4	65.3	2.7	0.0	1.5	0.0	0.2
Dec	18.6	28.9	7.9	0.6	0.0	0.0	0.0	0.0
Annual	23.7	32.5	968.8	52.0	0.0	62.3	1.0	10.3

Tidal information: Visakhapatnam has semi diurnal tides. The tidal levels as per naval hydro graphic chart no. 3012 are as follows:

Highest high water recorded	+ 2.38 m
MHWS	+ 1.50 m
MHWN	+ 1.10 m
M.D.L.	+ 0.80 m
M.L.W.N.	+ 0.50 m
M.L.W.S	+ 0.10 m
Lowest Low Water recorded	- 0.55 m

These levels are with respect to chart datum. The chart datum at Visakhapatnam is 0.8 m below mean sea level.

Cyclones

The city is a coastal city and is predominantly prone to hydrological events such as depressions, cyclones, sea storms, tsunamis etc. In the Bay of Bengal, depressions are likely to be encountered during all seasons of the year with a local fall in the pressure. On an average one cyclone per annum may occur. Cyclones are frequent during the month of November. Cyclones are also likely to occur during the month of May.

The Visakhapatnam city has experienced severe cyclonic storms several times since 1895 and its frequency has increased in recent times notably in 1965, 1965, 1983, 1985, 1995, and 1998. On an average the city is experiencing a cyclone almost every year. It gives a warning to the city that the severe cyclone may bring loss of destruction or damage to the city. In general the duration between September to November of every year will be important with reference to the floods or inundation due to the occurrence of significant amount of the rainfall events. The heavy rains during the months of September & October 2005 not only inundated the low-lying areas but also Visakhapatnam Airport.

Currents

From February to June, off shore current flow towards north east. From August to December, currents flow towards south-west. The velocity ranges from 0.5 to 1.0 knot. At Visakhapatnam coast, currents are neither related to wind or to tides in any appreciable way. The determining factor for the direction of current is the direction of predominant wave.

Waves

Deep water waves: the predominant direction of waves during April to September (south west monsoon period) is south-west whereas, during the period from November to February (north-east monsoon period), the predominant direction is north east. The months of March and October are transition periods with no definite predominant direction for the wave approach. Highest wave occurred during April to September. The deep-sea waves with highest and lowest periods frequent from south-west quadrant. Waves of over 1.5 mts. Height may be expected for 20% of the time. Wave periods of over 7 seconds may be expected 14 % of the time.

Shallow water waves: from March to October principal wave direction is predominantly from south-south-east. The predominant wave period is between 8 to 10 seconds. During the remainder of the year, wave direction is principally from the east and practically all wave directions are confined to the sector between east-north-east and south-east .

Land use:

The total geographical area of the district is 11.16 lakh hectares of this 36.45% alone is arable area while 39.53% is forest area. The rest is distributed among "Barren and uncultivable land" about 11.7% and "Land put to non agricultural uses" about 9.0%. Out of the arable area, the net area sowed form 27.2% while cultivable waste and fallow (current and old) lands constitute about 9.2% during 2006-2007 (Table 2.10).

Table 2-10 Area under different land use / land cover classes

S No.	Category	Area in Sq. Km	Percentage
1.	Urban Area	57	10.78
2.	Industry	94	17.77
3.	Green Area	226	42.72
4.	Barren Land & Un-cultivable land	64	12.10
5.	Water Bodies	44	8.32

Flora and Fauna:

More than the one third of the area in the District is covered by forest. The forests are of moist and dry deciduous type. Regarding fauna the district has a livestock of 12.02 lakhs as per 2003 livestock Census. In the Livestock, Cattle 29.4% Buffaloes 34.8% Sheep 16.5% and Goats 17.3% about wild fauna Boars and Bison's are found in Forest areas of the district and isolated instances of Cheetahs and tigers .examples of some birds, amphibians, reptiles with their scare listed in Table 2.11.

Table 2-11 Details of Flora and Fauna

S No.	Species	Scientific Name
1	Indian pitta	Pitta brachyura
2	Koel	Eudynamys scolopacea
3	Grey tit	Parus major
4	Hoopoe	Corvus splendens
5	Pied myna	Sturnus contra
	Amphibians:	
1	Fresh water turtle	Trionyx species
2	Indian starred tortoise	Testudo elegana
	Reptiles :	
1	Indian python	Python molurns
2	Rat snake	Ptyas mucosus
3	Wall lizard	Memicactylu species
4	Garden lizard	Caloteversicolor

Source: Forest department, Visakhapatnam.

Agriculture:

Agriculture is the main stay of nearly 70% of the households. Though Visakhapatnam city is industrially developing, the rural areas continued to be backward. Since there is no Major Irrigation system, only Minor Irrigation Tanks are feeding the agriculture activity. The area near Kapulluppada, Megradigedda, Gambhiram and some sub urban pockets are used for growing of vegetables and commercial crops. Horticulture is actively practiced in the regions in and around the water sources and near the reserve forest area of the city. The productivity of the crops is low.



Figure 2-7 Google Map of Visakhapatnam

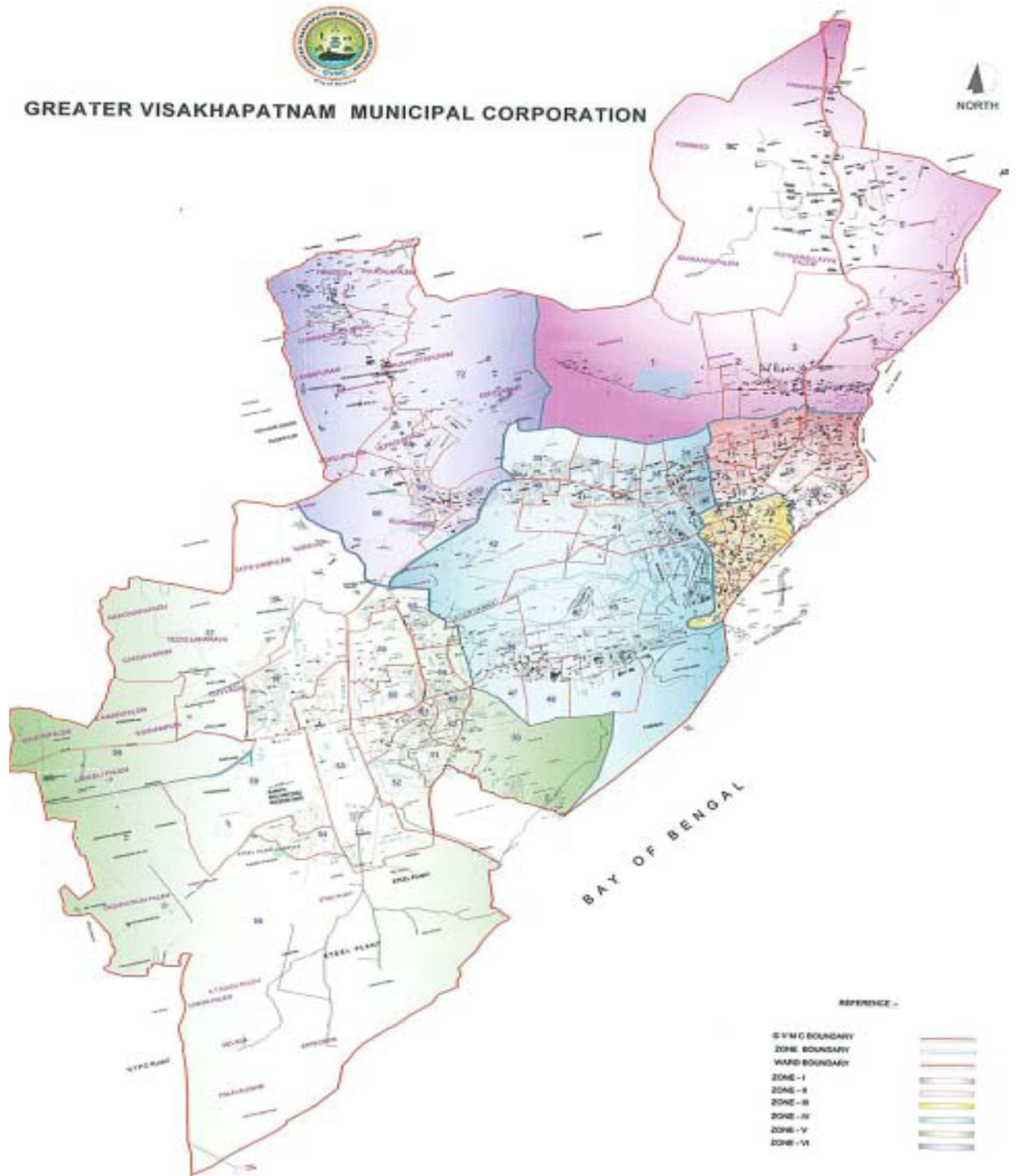
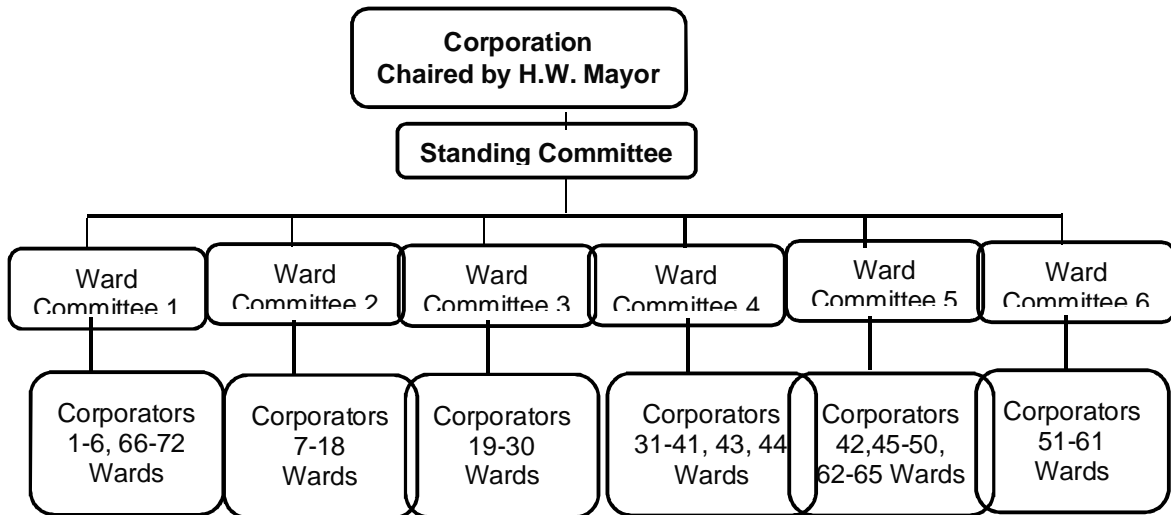


Figure 2-8 The GVMC jurisdiction before merger of Anakapalle and Bhimunipatnam Municipalities

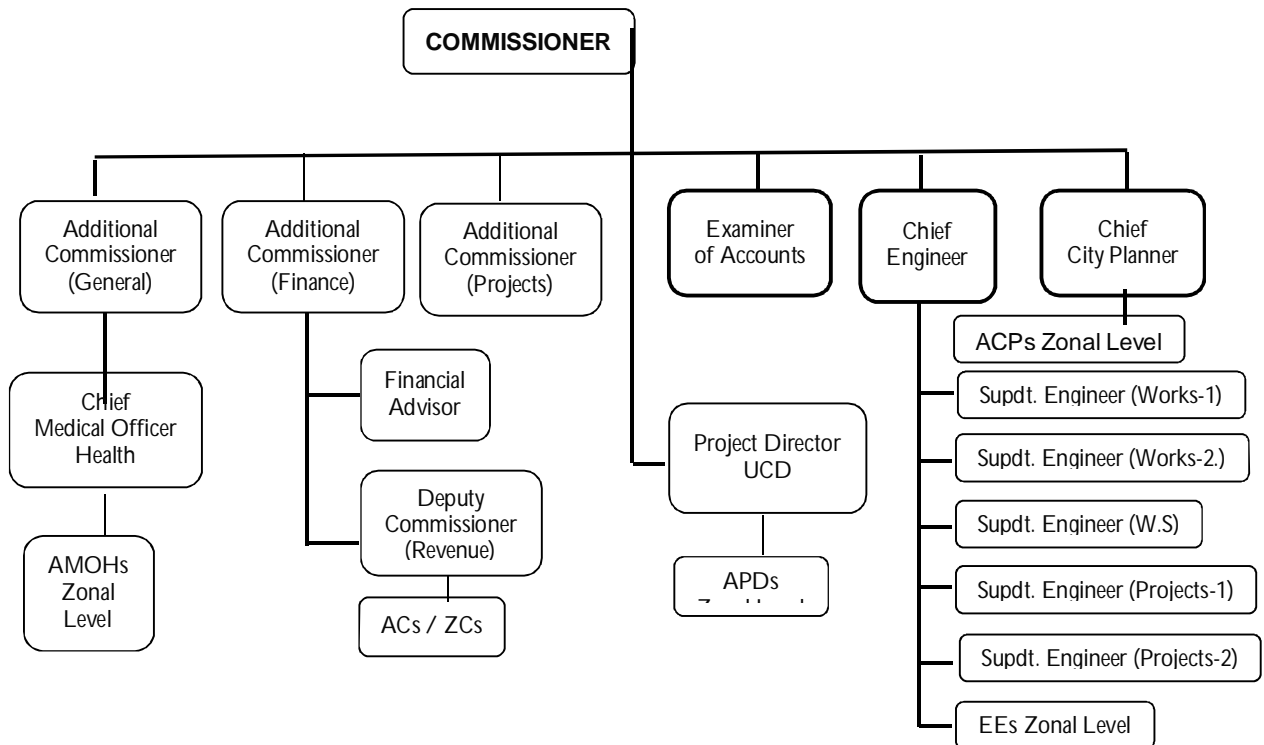
2.4. ORGANIZATIONAL STRUCTURE OF THE CITY GOVERNANCE

The governance of the GVMC comprises of political, administrative and zonal structures. All these structures are depicted pictorially in Figure 2.8 and 2.9.

Political Structure of the GVMC



Administrative Structure of the GVMC



Zonal Organizational Structure of the GVMC

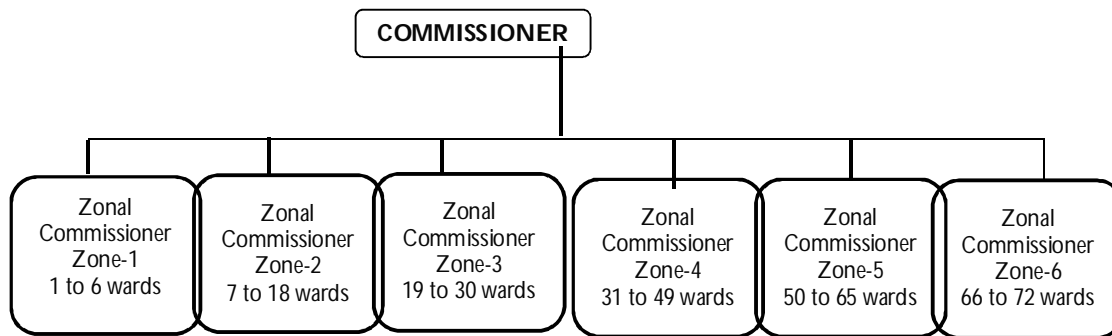


Figure 2-9 The Political, Administrative and Zonal structures of governance of GVMC

2.5.CITY DEVELOPMENT STRATEGY (CDS) FOR GREATER VISAKHAPATNAM MUNICIPAL CORPORATION (GVMC)

The main objective was to ensure a comprehensive growth of the city and to make Visakhapatnam as a better alternative to the other mega cities. The CDS makes basic policy choices and provides a flexible framework for adapting and to deal with emerging challenges over time. To achieve Vision Vizag 2020, the city has to move towards providing a healthy and sustainable environment to its people. This would be possible by minimizing the demand supply gap of the physical infrastructure sectors, encouraging optimum utilization of natural resources and also addressing the social infrastructure sectors. The CDS presents three goals as stepping-stones to realising the vision, addressing Vizag's strengths, dealing with its weaknesses and capitalizing the opportunities. The goals, and the projects identified under each, are designed to support the overall vision and impact of the goals and projects when combined. The goals set for the planners of the Visakhapatnam city are: 1) Economic growth and prosperity, 2) A clean healthy and safe environment, 3) Opportunities for all. It can be achieved only through proper planning of social, economic & environmental aspects.

The city has experienced rapid industrialisation with the growth of major industries such as steel works, petroleum refining, pharmaceuticals and fertiliser manufacture. More or less perpendicular to the coastline are a number of low lying hills, which create a number of natural topographical "bowls." These have implications for air quality through their impact on air pollutant dispersal. Visakhapatnam with score of 70.82 as per CEPI is considered as one of the critically polluted areas. The inadequate infrastructure level in the city reflects in poor sanitation ranking. As per the NUSP Sanitation Rating, city has been scored under 19 sanitation indicators. Vizag Falls into the Black Category with the rating of 40.49 out of 100 and

is the 91st cleanest city among the 423 ranked. The above shows the vulnerability of the city for various health related disasters in addition to the other natural and manmade disasters.

However, the city development strategy is more inclined towards provision of infrastructure with less emphasis on the safety and environmental attributes in the developmental project. It is necessary to think in a holistic way while planning the city as a safe, livable and lovable city. The city development strategy needs to reorganize through incorporation of DM attributes. It is necessary to recognize the synergies and constraints between disaster reduction, mitigation, resilience and the assets with reference to environmental aspects, institutional factors and sub-systems. A considerable amount of work has already been undertaken in Visakhapatnam with regard to the environment and urban development. However, through an integrated approach, there is an assessed potential to find new strategic CDMP perspectives for the short, medium and long term improvement of the disaster resilience in an urban context.

Water Supply

GVMC has undertaken proactive measures for augmenting the water supply system through the Visakhapatnam Industrial Water Supply Project (VIWSP). GVMC will be making investments to the tune of Rs 1675 million in the current financial year in VIWSP and will be creating infrastructure to off take water and transmit it to the City after treatment. This measure would facilitate GVMC to achieve its goal of providing citizens with water twenty-four hours a day, seven days a week.

Drinking Water	
Water Availability	Installed capacity 37 mgd
	Released/daily 37 mgd
Source of water supply	50-100 sq.km.
Water coverage	Population covered by public water supply 30 % per capita supply : 62 lpcd Supply of duration : 0.45 hrs
Wastewater Disposal	Wastewater generated daily: 67.5 mld Disposal (underground sewerage) Capacity: 25 mld Present operating capacity: 10 mld Households connected to underground sewerage: 6 %
Solid waste	Waste generation daily : 650 tones/day Collection daily: 650 tones/day
Stormwater Drainage	Annual rainfall 1080 cm Length of stormwater drains 1400 km

Sources of Water: The main surface sources of water for the city of Visakhapatnam are; Mudasaralova Reservoir, Gambheeram Gedda Reservoir, Gosthani River, Thatipudi Reservoir, Mehadri Gedda Reservoir, Raiwada Link Canal, Yeleru Left Bank Canal. The City was initially receiving 0.4 mgd of water from the Mudasarlova reservoir with subsequent additions of 3.60 mgd from Gosthani, 9.00 mgd from Thatipudi, 9.00 mgd from Mehadrigedda reservoir and 15.0 mgd from Raiwada and Yeleru systems totaling 37.00 mgd of water. The other sources of supply are the reservoirs built on minor streams like Gambheeram and others. All these sources are rain fed reservoirs. The failure of monsoon makes the water supply position in the City very critical forcing the Corporation to regulate the water supply so as to conserve and supply the available water for longer durations and to all sections of the society. The brief details of water supply at a glance is given in Table 2.12.

The total quantity of water that can be drawn from the above sources is 40.25 Mgd. In addition to the above 7.5 Mgd of ground water is also drawn through bore wells. Around 16 Mgd water is supplied to slums and industries. The Godavari Drinking Water Supply Project designed to supply 33 MGD of water taken up in 2003, is ready for commissioning. All above sources are not perennial and due to considerable reduction in the inflows to impoundments and rapid growth in the population, the city is experiencing shortage crisis in the summer seasons.

The present water supply service area of GVMC is 515 Sq.Kms which includes Gajuwaka and adjoining peripheral areas. The average per capita consumption is 63 lpcd on an average whereas the Manual on Water Supply and Treatment recommends a minimum of 150 to 200 Lpcd for all residences. For higher and higher middle income level houses, the per capita supply is fairly low, which is around 75 litres. This is far below what is usually encountered elsewhere. In case of poor households, the consumption is fairly high (51 lpcd) when compared to averages registered elsewhere in similar social conditions. This high level consumption comes from the fact that the water is supplied mostly free of charge for most of these people or at very low price. However most of them have affordability to pay marginal tariff rates.

Table 2-12 Details of water supply sources

SN	Source	Drawl quantity (in MGD)	Max. Water Level	Min. Water Level	Distance from the Town Service Reservoir
1	Mudasaralova Reservoir	0.40	168 Ft	152Ft	5 Km
2	Gambheeram Gedda Reservoir	1.80	126 Ft	107 Ft	30 Km

3	Gosthani	3.60	36 Ft	21.5 Ft	35 Km
4	Mehadri Gedda Reservoir	9.00	61 Ft	44 Ft	25 Km
5	Thatipudi Reservoir	9.00	297 Ft	251 Ft	65 Km
6	Raiwada Reservoir	15.00	114Mt	99Mt	75 Km
7	MGR Infiltration Wells	1.00			16 Km
8	K.B.R. 2 MGD Scheme	2.00			30 Km
	Total:	41.80			

Existing Transmission, Distribution and Storage Capacities

The transmission mains carry water from the source to the water treatment plants and subsequently towards the Master balanced reservoirs, subsequently to the reservoirs in the city by means of trunk distribution mains. The total length of the transmission mains is about 244 Km comprising of CI, RCC, and PSC pipes.

The water distribution system for the GVMC area is divided into zones and sub zones due to inadequate inflow as well as inadequate storage capacity. The sub zones are operated using control valves thereby making the operation of the system very complicated.

The total storage capacity available within GVMC is about 17.45 MG (79.5 ML) comprising of ground level reservoirs and elevated reservoirs. There are 161 reservoirs in total, both ground and elevated, supplying water to all the localities in the City. The total length of the distribution system is 1035 Km, comprising of pipes with diameter ranging from 75 mm to 700 mm of different materials.

Sewerage System

The Visakhapatnam City is divided into 14 drainage blocks according to topographical conditions. The Drainage Block 1 was executed in the year 1980 and commissioned in the year 1981, serving a population of 50,000 of Old City covering an extent of 141 hectares. The length of sewer lines provided is 18 km. One No. of pumping station and One Sewage Treatment Plant of 7 MLD capacity were constructed. No. of household connections are 1500.

Under phase-II, sewerage system was provided in ward Nos: 21, 22, 23, 24, 25 & 26 in the year 2001. The area covered is 9.43 sq.km and population benefited is 2,03,100 (2001). The length of sewer lines

provided is 96.32 km. Two No of pumping stations and One Sewage Treatment Plant of 25 MLD capacity were constructed. No of house hold connection are 13,000

Greater Visakhapatnam Municipal Corporation (GVMC) has taken up an initiative to strengthen sewerage system through private sector participation. The objective of this initiative is to improve the operation, maintenance and management of the existing systems and subsequently invest on system strengthening and augmentation to achieve complete coverage of the services in GVMC area and to meet the further demands. Sewerage facilities have been developed and are in use in the old parts of Visakhapatnam city. Phase I of the facility was completed in year 1980, while Phase II- Sub-phase I works have been recently completed in year 2002. Works under sub-phase II are being constructed and likely to be commissioned in totality shortly. A comprehensive plan of providing sewerage to the whole city has been prepared and forms the basis of sewerage schemes implemented so far and contemplated in future. This plan divides the whole city in 13 drainage blocks Table 2.13.

Table 2-13 Progress of implementation (1st Aug 2005)

Sl No.	Phase No.	Zone No.	Target	Applications Received	Connections given
1	I	I	1500	1572	1234
2	II (Sub Phase – I)	II	13,000	10,335	6238
	Total		14,500	11,907	7472

Storm Water Drainage

The Topography of the city is like a saucer surrounded by hillocks on 3 sides and sea on the other side. As the city is a coastal city, situated on East Coast of Bay-of-Bengal, it experiences heavy rains particularly between 'Aug-Dec' every year, under the influence of south west monsoon and also due to cyclones. Due to the terrain & Topographical conditions, the rain water collected from the hills and catchments flow at much higher velocity and gushes through the un-trained Major Drains, before reaching to the Sea.

In the course of its Journey to the Sea, the rain water during heavy cyclonic rains flows at much higher velocity through this un-trained water course and devastate the life of public and their properties situated all along the water course / stream. The population living along the banks of the stream courses essentially

belong to the weaker sections of the society are prone to flooding and their houses are getting damaged or inundated.

Annual rain fall	:	1080 mm
Length of storm water drains	:	1400 Km
Flooding	:	10%
Coverage	:	20%

And moreover, due to the rapid urbanization & un-precedent growth of the city in the past 2 decades, most of these Storm Water Drains were encroached upon by the public, 'narrowing' of the original stream. Further, most of the 'slum-dwellers' and people of weaker sections, occupy and reside on the banks of the drains and causing obstructions to the free flow of stream and narrow-down the width furthermore. It is observed that at many places, even the cleaning / De-silting of the drains during pre-monsoon season is not found to be feasible due to the inaccessibility.

Lack of proper Demarcation & fencing of Storm Water Drains, the near by residents / Slum dwellers, are habituated to throw the debris & other wastages in the Drains, which one causing obstruction to the free flow of rain water and finally over flows on the roads.

2.6. MAJOR WATER BODIES and DRAINS

There are 55 major water streams in the City. The most important reservoirs are Megadrigedda, Mudasarlova, Gambhiram, Nerella Koneru and tank at Chinna Mushidivada, Surya Bagh etc., There are about 3 tanks in the peripheral area of the city.

Primary Drains

Nearly all the major drains following through the city flows and drains in to the sea. There are in all 22 major Geddas and 20 primary drains passing through the GVMC.. These primary drains or nallahs carry the storm water finally draining into either in to the sea or nearby water bodies. The length of the primary drains is around 110 Km.

Tertiary Storm Water Drains

The tertiary drains are roadside drains discharging storm water into the primary drains and water bodies. The total length of tertiary drains In GVMC area is about 750 Km, comprising 450 Km of pucca drains (lined with brick or stone masonry and pre-cast RCC sections) and about 300 Km of kutcha drains (un-lined).

Flood Prone Areas in GVMC

The major flood prone areas in twin cities are the low lying areas in the catchment areas of Velemapeta, Poorna Market, Kota Veedhi etc., in the Old City comprising of wards 1 to 20 and some parts in the 30 to 40 divisions. The Air Port area is a complete Flood Prone area and affects the city normal life tremendously in the Floods. The areas in the 45 to 50 divisions and the Gajuwaka are commonly affected with the flash floods which occur during the cyclonic rains.

3. METHODOLOGY FOR PREPARATION OF CDMP

3.1. GVMC PLANS AND PROGRAMMES FOR CDMP:

Greater Visakhapatnam Municipal Corporation has an unwritten plan for the disaster management particularly with reference to GVMC jurisdiction. The engineering, public health and the UCD departments of GVMC used to participate actively in the evacuation, restoration and reconstruction activities of any event of disasters due to flooding or cyclones. There used to be some sort of coordination with the district administration, Power Distribution Corporation and the NGOs in the city. In order to make a well prepared CDMP under USAID–GOI-UNDP project the GVMC has initiated the process on 30th April 2013 through the organisation of a workshop.

The purpose of this workshop is to agree on the (1) Implementation strategy, (2) relevant stakeholders, (3) roles and responsibilities of various line departments and other partners in project implementation, (4) focal point for the project from the state government and (5) project monitoring mechanism. The initial deliberations were held on CDMP, Hazard Risk and Vulnerability Analysis (HRVA), Capacity Building, Early Warning System (EWS), sectoral plans to mainstream Disaster Risk Reduction (DRR) and knowledge management. Since then modest progress was made in the direction of the preparation of CDMP.

Later in the year 2014, GVMC engaged consultants for the preparation of the HRVA and Climate Change and Early Warning Systems (EWS). Both HRVA and EWS need to be synchronised with the proposed CDMP as they are important inputs for the CDMP. GVMC envisages designating a nodal officer for the City's DM activities with a team drawn from different domains. It proposes to include Hospital Emergency Management Plan including mass casualty management plan. Police and Fire Services role is sought in DM and include simulation and mock drills for testing the plan. GVMC is does not have plans for organising programs in schools, colleges, and at ward level to create awareness on disaster preparedness, response and mitigation. It may be achieved through representatives, website and social networking for public access. All the above need a CDMP beforehand to help the civic body authorities to make the city a safe and disaster resilient city.

3.2. BASIC CITY DISASTER MANAGEMENT PLAN and METHODOLOGY:

The disaster management is an applied science which seeks, by the systematic observation and analysis of disasters, to improve measures relating to prevention, mitigation, preparedness, emergency response and recovery. The Disaster Management Act 2005 brought a paradigm shift from the Response and relief centric approach to Proactive and comprehensive approach. It leads to the development of the CDMPs

for the cities in India. The general principles of disaster management are Risk & Hazard Assessment, Planning, Organization, Resource Utilization, Need for Specialists, and Training. Most of the CDMPs will consider the above principles in the process of their development. The CDMP should address all the possible hazards the city may experience. The past lessons and experiences should be considered and build on good existing systems at different levels. The roles of various governmental and non-governmental organizations, designated public corporations, and other relevant public organizations should be specified during the development of operational and management procedures.

In general a CDMP consists of sectoral plans covering preparedness, rehabilitation, emergency response, prevention, mitigation, recovery, reconstruction and capacity building plans. CDMP should be holistic, proactive, and multi-disaster based and the objective may be achieved through a culture of prevention, mitigation and preparedness to reduce the impact of disasters. The CDMP will propose a “Disaster Preparedness Team” along with main officials Municipal Commissioner and the Heads of other departments in the city. They meet on a routine basis and is responsible for the necessary intra-jurisdictional coordination of government actions to ensure that DMP and all supporting documentation has been maintained as current and other actions needed to ensure readiness of the city for DMP implementation. City personnel should be trained in their respective roles for implementation of the DMP. Evaluation is done continuously on the adequacy of equipment, facility and supplies to implement DMP. The City’s emergency preparedness will be consistent with local, state and Central government requirements. When required, the city will seek assistance from District Collector and neighbouring cities and the State government. The city has to implement public information and preparedness awareness programme through website and social networking along with community based education efforts. City has to plan for providing services to the marginalised during evacuation and equal distribution of aid materials among the needy.

3.3. CDMP- Methodology:

The basic CDMP will be prepared using the methodology specified in the TOR as the guiding system. The overall methodology specified below will be followed for the preparation of the sectoral plans.

- Stakeholder consultations/Meetings
- Field visits
- Departmental interactions
- Primary/Secondary source of information gathering
- Review of existing plans/systems

- Data Collection
- Collation and finalization for plan

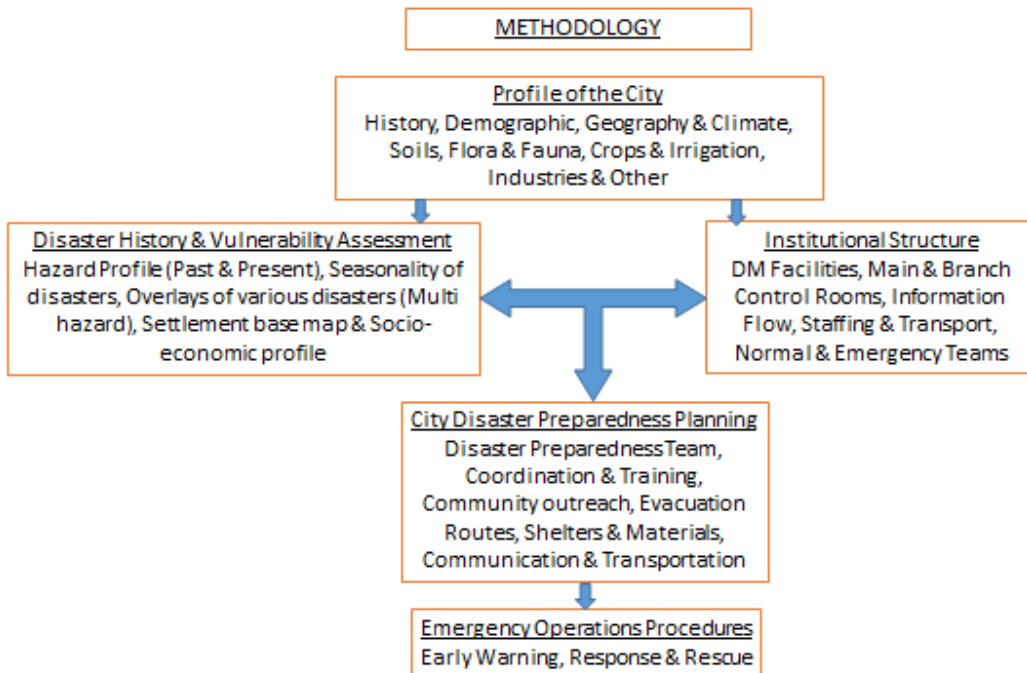


Figure 3-1 Brief framework of methodology for the preparation of basic CDMP

A brief frame work is depicted pictorially in Figure.3.1. In addition the methodology for preparation of Municipal Disaster Management Plans specified in “A Manual for Development of Municipal Disaster Management Plans for Floods, Cyclones, Earthquake and fire hazards for Urban Local Bodies of Andhra Pradesh prepared by Urban Management Centre (UMC) for Centre for Good Governance (CGG) Andhra Pradesh will be used for the development of basic CDMP for the GVMC. The basic CDMP to be prepared for the GVMC will consists of Preparedness Plan, Response plan, Mitigation Plan, Recovery Plan and Capacity Building Plan.

3.4. PROPOSED STUDY FOR BASIC CDMP of GVMC:

Following the aforesaid methodology the sub-plans for Preparedness, Response, Mitigation, Recovery, and capacity building plans will be incorporated in the proposed basic CDMP for the GVMC. The proposed project also designed to identify existing gaps in key disaster risk management areas/components and to suggest activities that would enhance disaster resilience and adaptive capacities of the cities and its residents. Consideration will be given for the climate change and climate variability induced hazards and their impact on natural and built environments.

Preparedness Plan:

The main objective is to identify key agencies both governmental and non-governmental that form an action group for all phases of the disasters: Pre, during and post-disaster operations. Responsibilities and roles of these agencies with necessary equipment, materials, supplies communication and transportation will be prescribed in lines to state and national disaster plans for efficient institutional mechanism. Following the early warning system for various disasters, evacuation routes are to be formulated for the respective disasters along with typical manual for regular mock drills and exercises.

Response plan:

Response measures are usually those which are taken immediately prior to and following disaster impact. Unbiased and situational organization structure may be formulated establishing lines of authority. It details out the various phases from early warning to rehabilitation and the roles that agencies play in reaching the vulnerable to identified disaster support infrastructure located in the city. Response plans include formation of functional teams and providing plans for transportation, evacuation, search and rescue, and rehabilitation. They are supported by supervisory zone based teams assuring food, shelter, water, medicine to the vulnerable in order to uphold physical and psychological health. Survey and assessment should be the part of response activity.

Recovery Plan:

The methods and activities to restore life line support infrastructure like water supply, power, communication and transportation are to be described in recovery plan. Villages and communities that have bearing on specific infrastructure for their livelihood should be identified and methods to restore them in short/medium/long term will be described mentioning necessary funding requirement and speedy decision making process.

Mitigation Plan:

Short, Medium and Long term mitigation measures for various hazards will be identified for structural and non-structural risks and damages. How these adverse impacts on life, assets, infrastructure loss etc. can be minimized with advance proactive measures will be mentioned. Intervention and corresponding departments in preparation of these are identified. Further, suggestions to translate these plans into development plans will be made for fool proof disaster management.

Capacity Building Plan:

Capacity building of all the stakeholders of the city is crucial in bringing awareness on disasters along with safety and evacuation measures that needs to be adopted. Vulnerable areas are identified for training the people. Participatory approach is adopted. Training modules for each category of disaster will be designed for reference and training needs periodically. Financial resources requirement and resource person identification is to be mentioned to enhance capacity building in disaster management. Capacity building particularly in First Aid, Shelter management, Water & Sanitation, Rescue & Evacuation etc. especially in cyclone, submerged areas, Industrial accidents, landslides and forest fire prone areas is essential.

3.5. DISASTER RISK REDUCTION (DRR)

DRR is the systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society, to avoid or to limit adverse impact of hazards within the broad context of sustainable development.

DRR strategies include firsts and foremost, vulnerability and risk assessment, as well as number of institutional capacities and operational abilities .The assessment of the vulnerability of critical facilities, social and economic infrastructure, use of effective early warning systems, and the application of scientific methods are essential features of a disaster reduction strategy. The sharing of information and experience both for the purpose of public information and for education and professional training are as important for creating a safety culture , as are the crucial involvement of local communication action and new forms of partnership motivated by cooperation and shared responsibilities.

3.6. RISK MANAGEMENT FRAMEWORK:

Risk management is a systematic process for undertaking risk reduction measures .it relates to a wide array of quantitative and qualitative factors requiring insight and input from many sources.

Australia and New Zealand defined risk management as the culture possesses and structures that are directed towards effective management of potential opportunities and adverse effects.

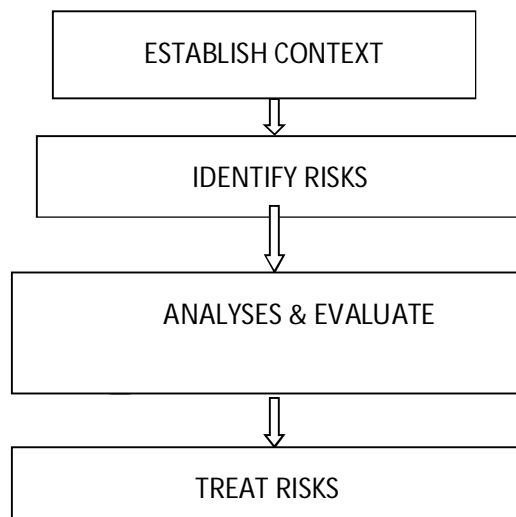


Figure 3-2 Risk Management Framework

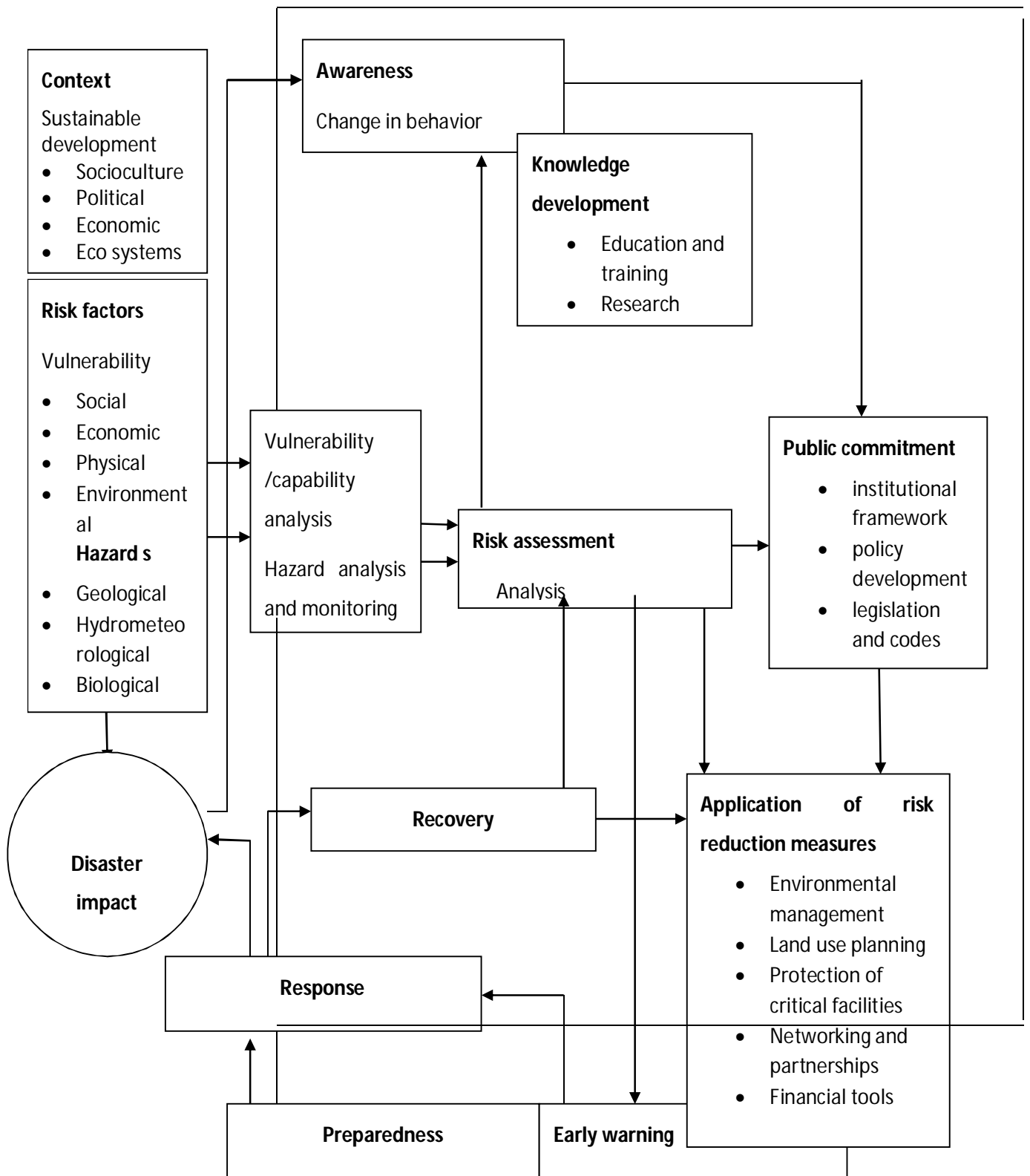


Figure 3-3: Rajib Shaw and Krishnamurthy R.R. (2009)

The key issue is to repeat the process at different levels. In the context of community managing risks arising from natural hazards, it is clear that it is not a single management process, but consists of many processes within which the risks must be considered. These include public sector processes as well as private sector processes. It is important that all of these processes are strategically aligned.

3.7. VULNERABILITY and CAPABILITY ASSESSMENT

Capacity vulnerability analysis is a frame work for planning and evaluation .the basic of CVA frame work is a simple matrix for viewing people vulnerability and capacities in three board, interrelated areas physical/ material, social/organization, and motivational/ attitudinal. Each of these three areas covers wide range of features.

Physical/Material: This is most visible feature of vulnerability. It includes land, climate, environment, health, skills and labour, infrastructure, finance and technology.

Social/Organization: It includes social strata, internal conflict and external linkages.

Motivational/Attitudinal: This includes how people in a society view themselves and their environment .it includes ideology, belief systems, awareness and traditional wisdom.

3.8. HYOGO FRAMEWORK OF ACTION (HFA: 2005-2015):

HFA is an action frame work for the disaster risk reduction in the next decade. The conference has the following five priorities for action.

Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.

- Identify, assess and monitor disaster risks and enhance early warning.
- Use knowledge innovation and education to build a culture of safety and resilience at all levels.
- Reduce the underlying risk factors.
- Strengthen disaster preparedness for effective response at all levels.

3.9. RESPONDING TO NATURAL DISASTER

Response to Natural Disaster includes three specific phases:

Intermediate relief

Damage and need assessment and

Post disaster recovery consisting of recovery planning reconstruction and technical training.

Post disaster response start from day 1. it is often said that relief period continues from day one ten, which, in fact depends on the scale of damage. Damage and need assessment start after that, and continues for first 2-3 months. Long term recovery starts thereafter and usually lasts of the three years. Therefore the average period of long time recovery is from day 100 today 1000. Donor and stake holder coordination is required at each stage.

During the relief operation, following are the basic requirements:

Immediate information flow and customization of information based on different sources.

Coordination with government and UN disaster relief team, who are experts in relief operation.

3.10. FLOOD RISK MANAGEMENT

Floods are natural phenomena which results from the precipitation and form an essential source of fresh water. In case of extreme precipitation, melting of snow, rise of ground water, storm surges and tsunami, we water flows normal limits of the water bodies, their by causing flooding.

Assessing Flood Risk:

The major parameters of assessment are discussed in the following section are understanding flood risks, Typology of flood risks, How to assess flood risks, Flood hazard assessment, Flood impact assessment, flood risk analysis are the basic parameters in assessing flood risk.

Flood Hazard Assessment:

Flood hazard assessment starts with the identification of the sources of flood hazard followed by a measuring the physical level of peril at a particular location and the associated probability their intensities. Each of the causes of flooding has to be assessed based on the hydrological processes that govern the flooding. Well-developed and tested scientific methods are used for hazard assessment. They involve various steps such as data collection and analysis, hydrological and hydro dynamic modeling.

Identification flood hazards is often carried out in conjunction with other related hazards such as mud flows, debris flows and landslides in order to produce multi-hazard maps and management programs, essentially taking the river basin as the unit for assessment.

Hazard assessment is presented in the form of flood hazard maps, which are tools that help to organize and present the information for use by decision makers and the public. In addition to the general objective of a flood map, special uses like tools for evacuation routes, which may be of utmost importance in cases of tsunamis and floods in large flatlands, require related supplementary information. Some other functions of flood maps would be:

- Regulatory: Land use regulation and building codes.
- Spatial planning: Impacts of urbanization, other land uses and climate change.
- Rescue operation: Building shelters and earmarking escape routes.
- Flood insurance
- Vulnerability index
- Informational/educational: record of flood magnitude in an area.

Flood Impact Assessment

Impact assessment is an important and integral part of risk assessment and management. An understanding of the impact of an event is required in assessing the benefit/cost ratio of various operations of risk management strategies. Different methods to assess potential impacts are used depending upon the type of impacts to be assessed.

Flood Risk Analysis:

Flood risk analysis starts with the construct of the flood risk in each given situation. All the major factors –flood magnitude, exposure and vulnerability–that determine the risk need to be identified. It helps to understand with different stakeholders. It also involves understanding of the different flood risk scenarios, based on various development alternatives, social and economic conditions, and climate change, for which the risk assessment has been carried out.

Managing Flood Risk:

Flood risk management involves reductions of the risks, transferring the risks, sharing the costs of accepting the risks and ultimately living with the risks. It has implications for the design of flood management policies, response to the emergency situations and also the willingness of the society to pay

for these responses through individual community or state action. Managing flood risks involves the following functions.

- Risk perception and awareness
- Flood risk reduction options
- Risk sharing and risk transfer
- Uncertainty
- Adaptive management

3.11. CYCLONE RISK MANAGEMENT

Every cyclone begins as tropical, low pressure depression created by oceanic temperature rising above 26 0 C, which rotates clock wise in southern hemisphere and anti-clock wise in northern hemisphere, forming a gigantic and highly volatile atmospheric system. More often the cyclone blows over and dissipates by its own momentum without causing much damage due to reduction of moisture and increase in surface friction, but sometimes it landfalls on the coastal settlements with very high wind velocity, torrential rain and massive storm surges, resulting in devastating damages to life and property Figure 3.4.

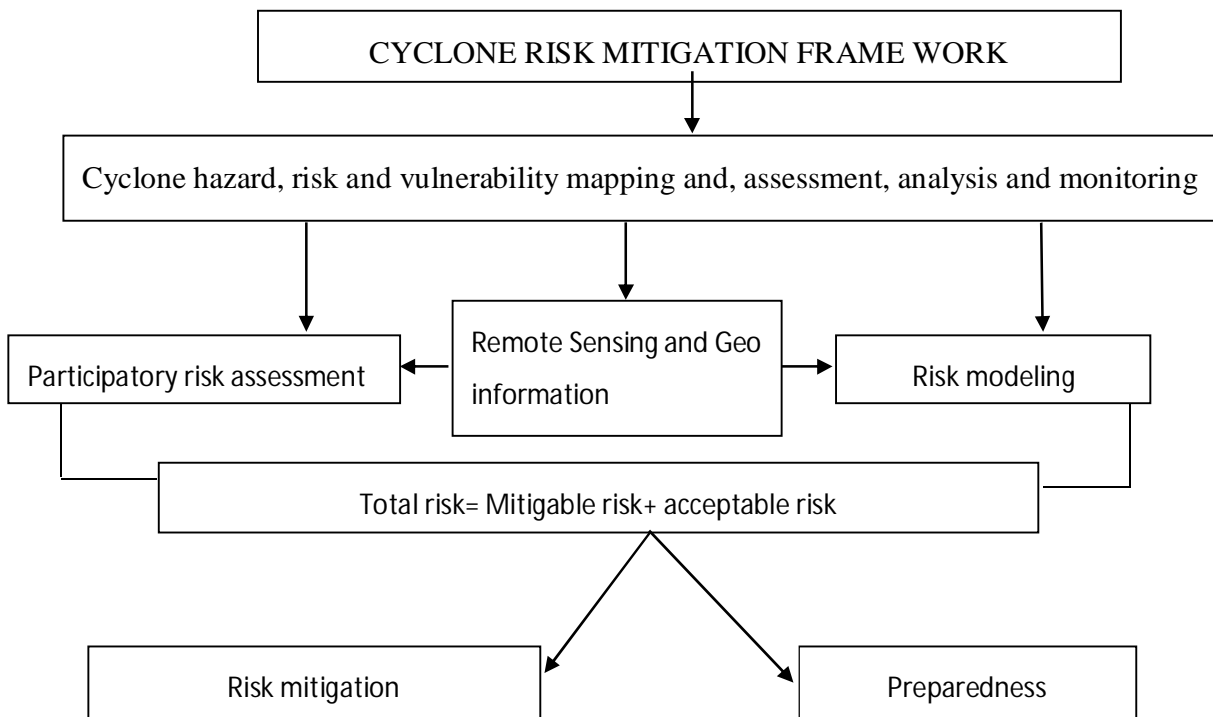


Figure 3-4 Framework for Preparedness and Mitigation:

Risk mapping, assessment and analysis:

The first and probably the most complex task of cyclone mitigation is to map the hazard, risks and vulnerabilities of cyclone at all levels, analyze and assess the levels of risks and monitor it continuously. It is only on the basis of such a knowledge base that a proper and effective strategy for cyclone risk mitigation and preparedness can be developed. Atmospheric studies and remote sensing have helped immensely in the understanding of the phenomenon of cyclones. Satellite images can spot the development of low pressure zones; Doppler radars can track them down and instrumented aircrafts can reach the cyclone eye, eye walls and spiral bands to transmit data on wind velocity, pressure and moisture content. Powerful software tools are available to analyze the data to make fairly accurate forecasts on the intensity, direction and location of the land fall and the likely areas to be affected by winds, rain and storm surges.

Contingency Plans:

In the not too distant past whenever a severe cyclone storm struck, the coastal areas in the developing countries, the communities and government have mostly been caught unawares and often they have been so overwhelmed by the all-round damage and destruction that it took quite some time for them to recover from the initial shocks and to plan and act in a coordinated manner, resulting in considerable chaos and confusion not only among the decision makers but also the emergency responders and other key stakeholders. Coordination among the agencies became a casualty in a crisis situation which greatly affected the relief and reconstruction operations.

The disastrous consequences of an absence of a pre-disaster contingency plan have been demonstrated repeatedly in many countries on a number of occasions. Therefore, one of the most critical elements of cyclone risk management is to have contingency plan in readiness, which would clearly delineate the roles and the responsibilities of various agencies within and outside the government, define the exact functions to be performed by them, the process to be followed in the performance of these functions, the tools and equipments to be kept in readiness, procurements to be made, evacuation drill to be followed. even with all these mitigation and preparatory measures in place the cyclones would continue to strike the coastal settlements and probably these would strike with more frequencies and greater intensities in future.

4. CITY DISASTER MANAGEMENT PLAN FOR VISAKHAPATNAM

4.1. City in Its Regional Setting:

Visakhapatnam is second largest city in Andhra Pradesh with an area of 682 km². It is primarily an industrial city, apart from being a port city. It is also home to the Eastern Naval Command. Visakhapatnam has seen rapid development in the past decade.

The Visakhapatnam Urban Development Authority (VUDA) will get a new master plan consequent to the increase in its purview from 170 km² to 682 km². The earlier master plan was approved by the government in 2006. VUDA's jurisdiction has been expanded in mid-2008 (Figure 4.1 and Table 4.1).

The city sometimes goes by its now mostly defunct colonial British name, Waltair. During the colonial era, the city's hub was the Waltair railway station, and that part of the city is still called Waltair. Visakhapatnam is often referred to as The Jewel of The East Coast or The "City of Destiny" and is sometimes referred to as the "Goa of the East Coast." Just like its west coast counterpart, it has beautiful virgin beaches, laterite hillocks, smooth roads and stunning landscape.

Visakhapatnam is home to several state-owned heavy industries; one of the most advanced steel plants and has one of the country's largest ports and its oldest shipyard. It has the only natural harbor on the eastern coast of India. Visakhapatnam is a major sea port on the south east coast of India. With a population of approximately 1.3 million, it is the second largest city in the state of Andhra Pradesh and the third largest city on the east coast of India after Kolkata and Chennai. It is located 625 kilometers (388 miles) east of state capital, Hyderabad. It is the administrative headquarters of Visakhapatnam district and is also home to the Eastern Naval Command of the Indian Navy.

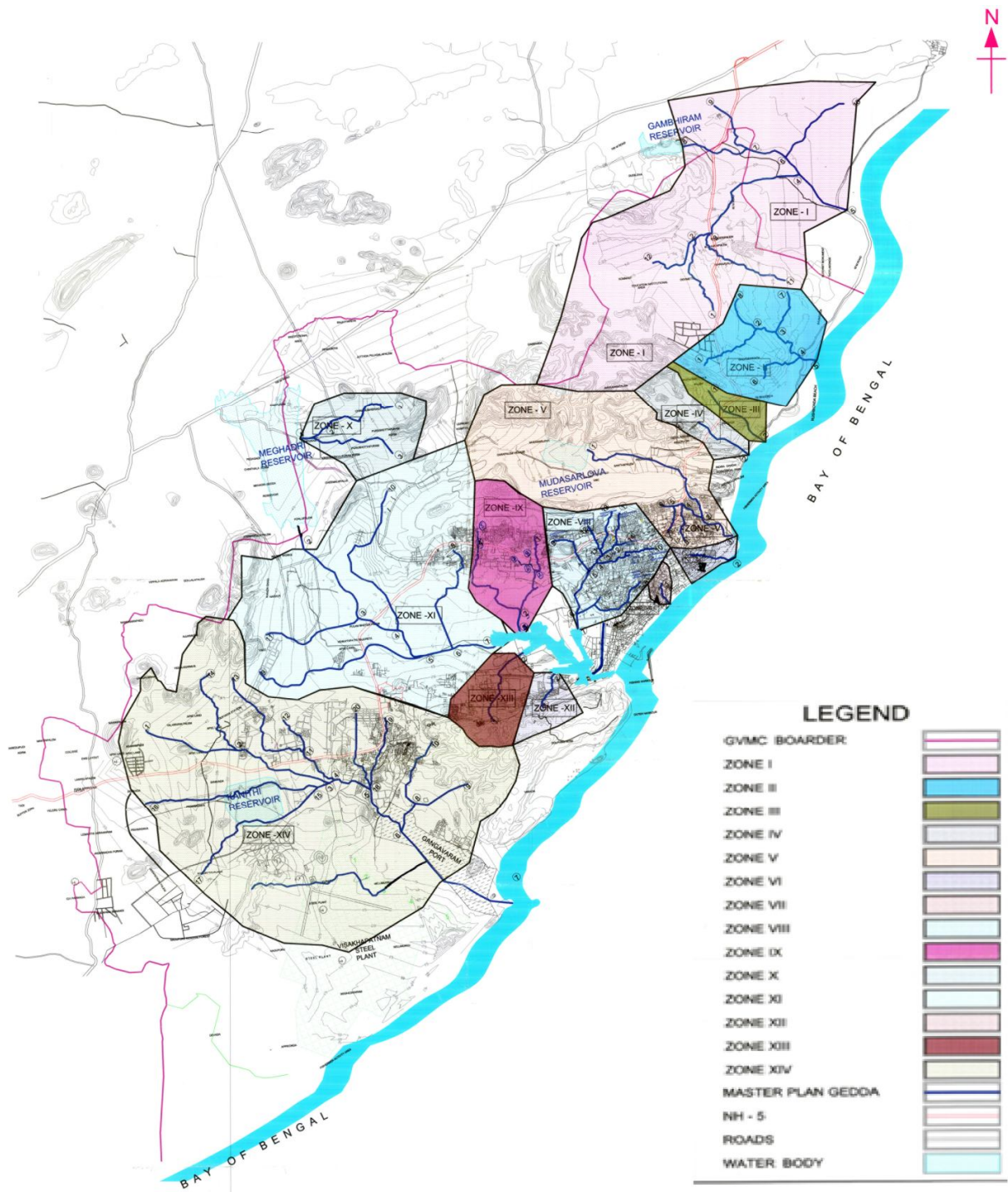


Figure 4-1: Areas covered within the zones in the City

Table 4-1 Areas Covered Within the Zones in the City			
Zone no.	Name of the Zone	Areas Covered	Area (hectares)
1	Marikavalasa	Marikavalasa,Gambhiram,Paradesipalem,Ko mmadi, Bakkannapalem	8530
2	Madhurawada	Madhurawada,Rushikonda,Poti nalamallayampalem	1820
3	Yendada	Yendada,AdibhatiaNagar, Mussalayypalem, Gayatri College	435
4	Indra Gandhi Zoological Park	Indra Gandhi Zoological Park, Kambala Hills,ZooArea,partlyVisalakshi Nagar,Jodugullapalem,SagarNagar, Chinnagadili	660
5	Mudasaarilova	Mudasaarilova,Arilova,Pedda Gadagadili, Santhapalem, Dairy form Quarters, Dharapalem, Rama Krishnapuram, Central Jail, Pine Apple Colony, seethammadhara, SFS School Area, APHB Colony, Iskathota, Maddilapalem, Patha Venkoji Palem, AU Engg. College, Pithapuram Colony, MVP Colony, Pedda Waltair, Chinna Waltair, Mangapuram	2504
6	Vidya Nagar	Vidya Nagar, Old CBI, Pandi Matta, VUDA Park	270
7	Siripuram	AIR, Century Club, Jagannadha Swamy Temple Area, Pandi Matta, Grand Bay Hotel, Taj Hotel, RK Beach Road Area	100
8	DabaaGardens	Lakshminarayana puram, Sanjeev Nagar, Nandagiri Nagar, Ganesh nagar, Narasimha Nagar, Radha Krishna Layout, Balayya sastri layout, Port Stadium Area, Akkayapalem, Dondaparthi, Nakkavanipalem, Resvanipalem, Bala nagar,Siddhardh Nagar , Ramnagar, Allipuram, Gnanapuram, Lalitha Nagar, New Nagar, Madhura Nagar, Seetammapeta, Abid Nagar, Tadichetla palem	1660
9	Madhavadhara	Madhavadara , Industrial Estate, Old ITI Area, Kancharapalem, Kapparada, Karasa,104 area,Kendria Vidyalayam, DGNP officers colony, Ramakrishnapuram, Surya Nagar, DLB Quarters, Pedakottur, Malakonda, Ramamurthy pantulu peta and RCL Area	1500
10	Chinna mushidivada	Pendurthi, Chinamushiriwada, Pulagalapalem, Sujatha nagar, Purusottapuram, Lakshnipuram and krishnarayapuram	1230

11	Gopalapatnam	Vepagunta, Gopalapatnam, Chemalapalli, Adavivaram part, Simhachalam, Narva, Sativanipalem, Lakshmipuram, Airport area, Sheela Nagar, BHPV	7300
12	Malkapuram	Yarada Hills, Ex Service Men Colony, Malkapuram, Kantri Nagar, Chinta valasa, Hundusthan Shipyard Colony, Ramakrishnapuram, Prakash Nagar, Eastern Naval Head Quarters	430
13	Mulagada	Hindustan Zinc Township, Gollapalem, Pilakavanipalem, Codesipalem, Yeduruvanipalem, Nakkavanipalem, Mulagada, Pedamulagada, Coramandal	845
14	Gajuwaka	Mantripalem, E Marringalem, Vedula, Narva, Gangavaram, Duvvada, Kanith, Steel Plant, Deshpattrunipalem, Angampudi, Lankalapalem, Gajuwaka, Steel plant township, Vadlapudi, Kurmanapalem, Pedagantada, China gantada, Gajuwaka town, Auto nagar, Pakir takiya	12800

4.2. Disasters in Visakhapatnam Context:

Across the world, the disasters triggered by hydro-meteorological events outnumbered all other disasters combined. Hence, in GVMC area also the disaster due to hydro-meteorological events needs special focus as they are the major important disaster to be taken into account for the preparation of CDMP. Meteorological events result from extreme climate events e.g. floods, lightning strikes and resulting fires, droughts, thunderstorms, tropical cyclones, tornados, waterspouts, hailstorms, etc. need special focus. Among the geological events resulting from land surface processes or land use/cover changes may be considered during planning.

The impacts of the recent tsunami events in Asia triggered by under-sea earthquake in Band Aceh (Indonesia) in December 2004 enlighten the city administration the importance of preparedness for such Tsunami events. In addition the biological disasters in the form of disease epidemics and epizootics like malaria should be taken into consideration for the CDMP of the city. Anthropogenic hazards particularly originated from major industries and the defence activities also need special attention during the preparation of the CDMP for the GVMC as it is being one of the highly industrialised city and strategic defence location. The possible major disasters, both natural and manmade, that may affect the city based

on geographical setup, past history and future developmental trends in the region are presented in Table 4.2 and Figure 4.3.

The city is known for its spoon shaped topography or topographical bowl with hills on three sides and the sea on other. The promontory of Dolphin Hill has protected the city from the natural disasters through time. Though this unique picturesque profile has attracted tourists from all over India and abroad, the city also has a tag of hotspot for pollution as it is identified as “Critically Polluted city. Figure 4.2 shows some of the sources of pollution that made the city as one of the critically polluted city of India.



Figure 4-2: Some of the sources of pollution in the city

Table 4-2: The possible disasters that may affect the Visakhapatnam city

NATURAL	MANMADE
Cyclone	Fire and Explosions (Especially Industrial and defence establishments)
Floods	War and Terrorism
Tsunami	Strikes and Agitations
Climate Change	Failure of Grids (Transport, Power & Communication)
Earthquake	Forest Fires
Landslides	Reservoirs, Tanks
Drought	Nuclear disasters
Heat and Cold waves	
Epidemics	
Coastal Vulnerability	

Composite Vulnerability map of the city based on risk due to various hazards is shown in the figure below.

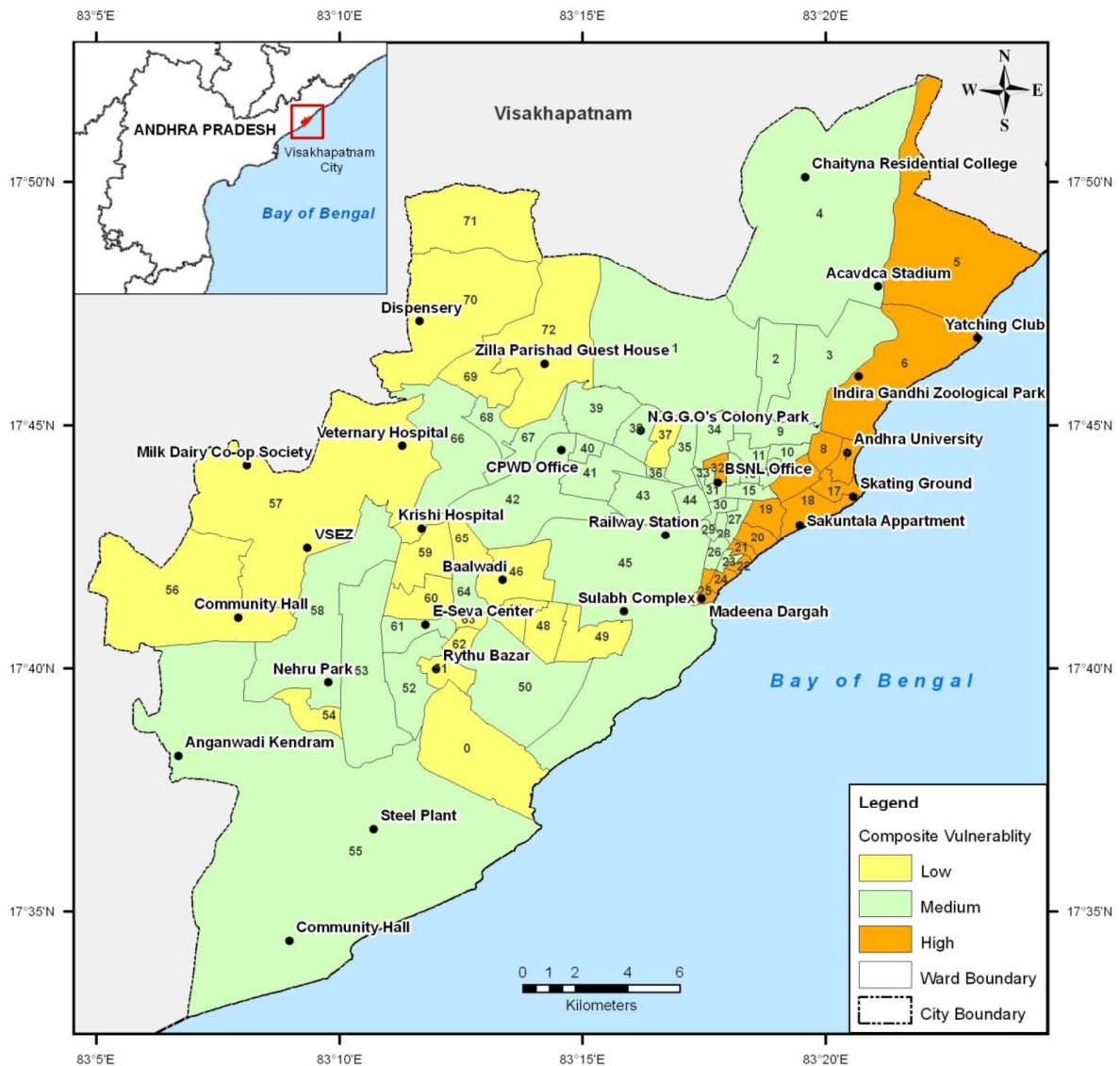


Figure 4-3 Composite Vulnerability Map of Visakhapatnam
SOURCE:UNDP 2014

The built up area is approximately 27% out of the total GVMC area of 534 sq. km. Total city population is concentrated in 25% of area i.e. 146 sq. km. It was projected that the city population may cross 20lakhs by year 2020 and 29.5lakhs by year 2030. The average population density is 16,000 persons/ sq. km. In approximately 50 km² of the core area, 50% of city population is living resulting in a average population density of 27,000 persons/km² (UNEP Risoe Centre, 2014). The classification of land use is presented in Table 4.3. The distribution of the population and the land use pattern of GVMC based on the master plan growth are shown in figure 4.4. It clearly shows that the infrastructure and the population are

concentrated only in the core area of approximately 50km². Moreover majority of the population and the infrastructure falls under the catchment area of the streams as shown in figure 7. Hence, it is important to concentrate more on the core area for DRR and other disaster related management plans. In addition, the core area is in proximity to the coast line and strategic defence establishments. It is an additional challenge to plan the DM activities in this bowl area sandwiched between the sea, industries and defence establishments. GVMC has more than 50km long coast line stretching from Anakapalli region to Bhemunipatnam. The shore line is hub for most of the fishermen habitat.

The existing infrastructure may be enough to cater to the present population of the city but within few years it will not be sufficient even under normal conditions and the stress would manifest during disasters in the form of either flooding during monsoon, water stagnation or outbreak of water borne disaster, epidemics etc. Even the city air port was under submergence for several days disrupting the air linkage to the city during the year 2004. Such impacts would get accelerate if the frequency of hydro met hazards increase due to impacts of climate change. Therefore, it is important to identify the potential hazards that could affect the city, kind of exposure to these, vulnerabilities and accordingly plan for risk reduction initiatives. Apart from the data available with the city administration, the information available with the irrigation department for flooding, police or transport department for list of accident prone spots, environment departments for polluted areas, pollution and plantation to be undertaken which may acts as coastal shelter belt and so on will be collected. Such secondary data will be used for the preparation of the CDMP of the GVMC.

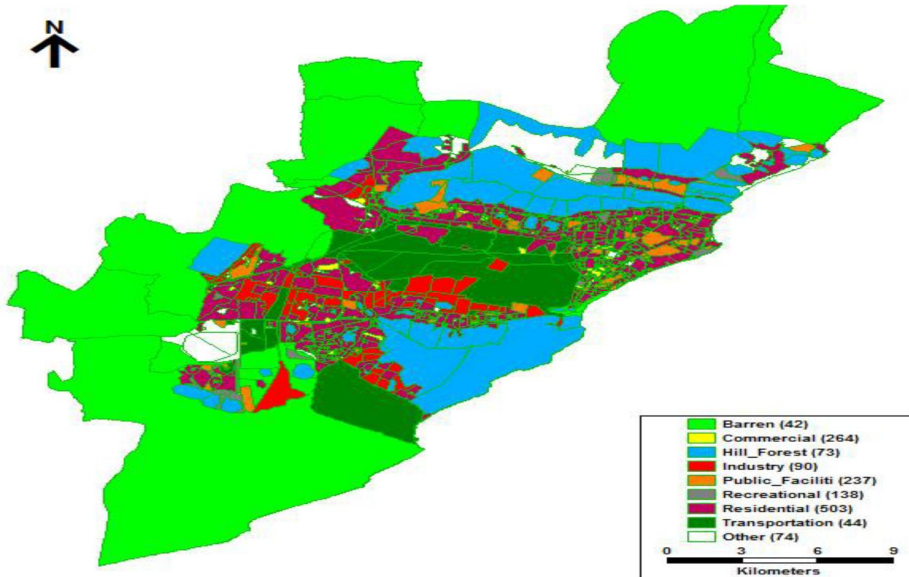
Table 4-3: Area under Different Land Use/Land Cover Classes

S No.	Category	Area in Sq. Km	Percentage
1.	Urban Area	57	10.78
2.	Industry	94	17.77
3.	Green Area	226	42.72
4.	Barren Land & Un-cultivable land	64	12.10
5.	Water Bodies	44	8.32

In addition the GVMC area is hosting a variety of major industries and there are past industrial disaster experiences. Some of the Industrial accidents in Visakhapatnam that occurred in the past are shown in Table 4.4. GVMC has a pharmacy city, a hub of pharmaceutical and other related chemical industries. Out of 45 units in Jawaharlal Nehru Pharma City, only five units have no objection of Fire Safety from Fire Services Department. There is need for the development of offsite DM plan by each of the industries.

Visakhapatnam Port Trust (VPT) and office of Inspection of Industries, Visakhapatnam has individual DMPs. Such DMPs need to be integrated with CDMP. The offsite industrial DM plans also need to be integrated with the CDMP.

Land Use pattern



Population Distribution

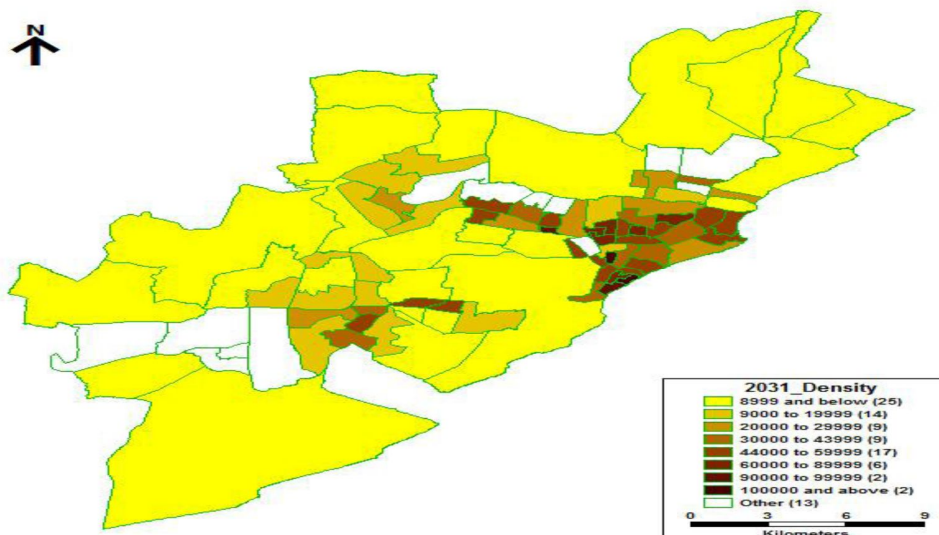


Figure 4-4: The distribution of the population and the land use pattern based on master plan growth of GVMC

(Source: Low Carbon Mobility Plan of Visakhapatnam, UNEP Risoe Centre, Denmark 2014)

Table 4-4: The Industrial accidents in Visakhapatnam that occurred in the past

Accident	Place	Year	Casualty
Vapour Cloud Explosion	Visakha Refinery	1997	60
Blast in Boiler	Heritage Foods Limited, Bayyavaram	2012	3
Slag contact to Water (Blast)	Furnace-3, Visakhapatnam Steel Plant	2012	5 Injured
Fire Accident	Glochem Industries Limited, Parawada	2013	NA
	Hetero Drugs Limited		

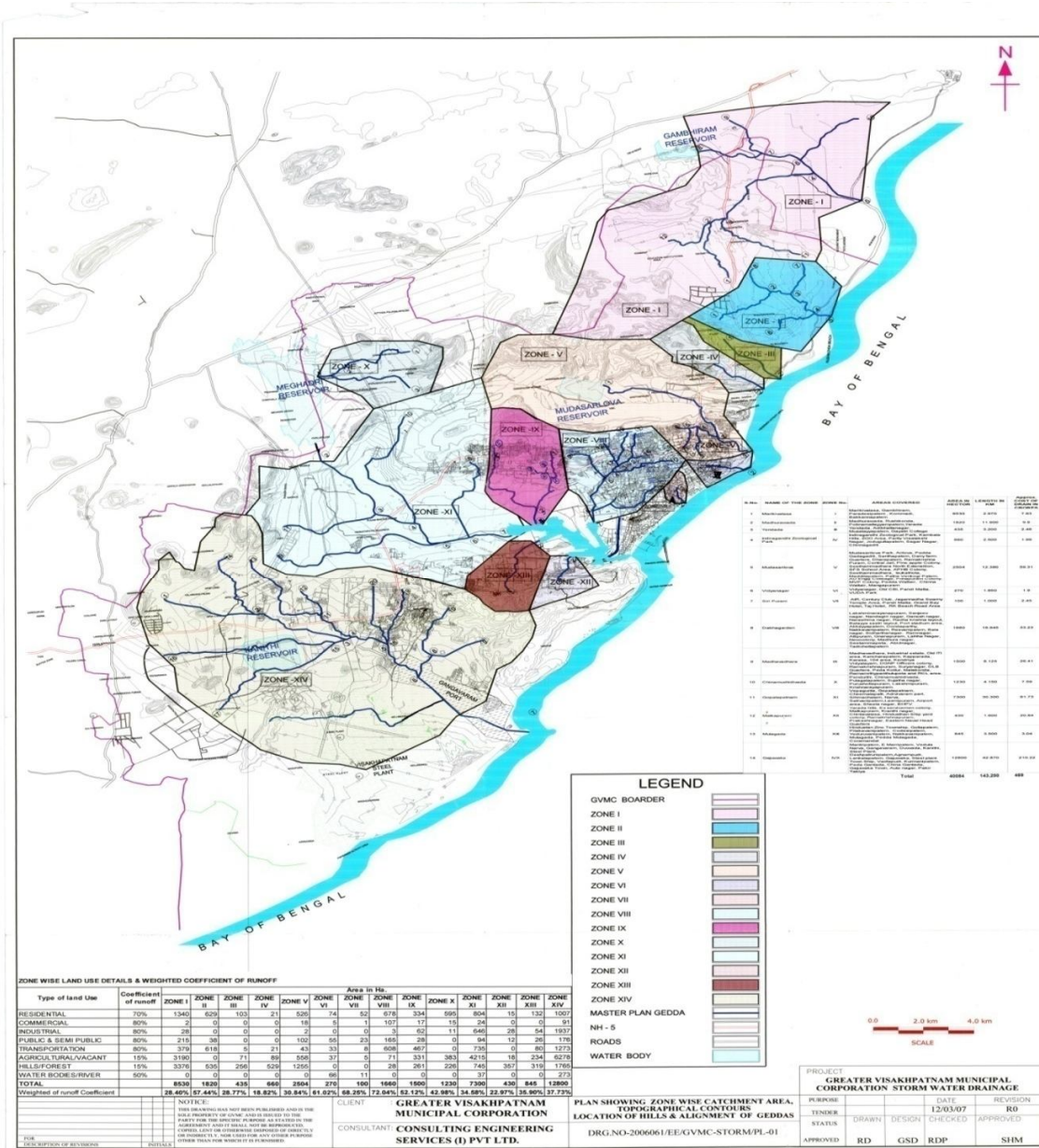


Figure 4-5: The drainage area map showing the catchment area of the streams in the city



Figure 4-6: Some of the major fishermen Habitat in the shore area of GVMC
 (Source: Tim Greenhow: Sustainable Coastal management Review, Sipu international)

The best way to confront natural disasters, in a coastal city like GVMC, is to create a culture of safety among the communities at risk and enhance the aptitude of the people living in vulnerable areas towards disaster resilience. Preparedness is the key in helping communities manage the inevitable disasters when they do occur. This can only be achieved by having cross-sectoral approach in putting up early warning systems. Any sustainable management of disasters in the coastal areas will require the integration of climate information in all aspects of planning.

4.3. Disaster Operations Centre:

A disaster operations centre needs to be established in GVMC to cater the needs of DM activities in the city limits. Constitution of Disaster Management Teams should have task based sub-teams each for Early Warning, Search & Rescue Operation, First-Aid and Water & Sanitation, Shelter Management, Trauma Counselling and Damage Assessment. Committees at Ward level of GVMC should have local people with sufficient knowledge or training and adequate representation of women.

A dedicated website with public domain and employee login caters to public to create awareness and building capacities of various stakeholders on disaster management. It also gives information on community response teams of various wards in GVMC limits. Programmes on mock drill during various situations to schools, colleges and community can be displayed in the website periodically and encourage their participation. The employee of various departmental organizations in the city may contribute to update information relating to DM. The website operates at two levels of Normal operations and Emergency Operations shown in Figure 4.7 and 4.8. The data of day-today functioning of various sectoral level activities can be put under Normal Operations which could be helpful in assessing mitigation or prevention plans of short, medium and long term and also response and rescue plans during and after disasters.

It is essential to have good coordination among various organisations located in the city that participate in its planning and governance. Apart from various wings of GVMC, some of the key departments or organisation or agencies identified for intra and inter networking DM operations are district administration city police, communication (telecom operations, radio, wireless, HAM), Fire, Factories department, Irrigation, Transport (Public & Private operators), Hospital Services, NGOs etc within the city and the departments or organisation concern at the regional, state and national level.. They need to coordinate under the common control centre for all the phases of the disaster management including emergency evacuation. Evacuation route maps for various disasters are maintained and accessible through the website and also in location specific hoardings or kiosks. Rehabilitation areas are designated

based on the same criteria as evacuation plans. Proper rehabilitation areas can also be located on vast hills with proper access for people, transport and supplies. Educational institutions of various levels from schools to universities are apt infrastructure to bring awareness of disasters in preparedness and response. Capacity building to the citizens' right from school children to young generation along with general public and disaster teams can be organized in these educational institutes through seminars and mock drills on regular basis.

GVMC as the governing body of the city is an important functionary in maintaining data and information of the cities infrastructures that would be affected and also how to restore the same during disasters. Another organization could be Civil Defence Organization (CDO) which has expertise in training teams for various hazards even involving NCC, NSS, NGOs and other community based voluntary organizations. Details of Vulnerable people and areas in Visakhapatnam in terms of various disasters especially Industrial, Cyclones and submergence, Landslides, Forest fires may be maintained by both the GVMC and probably CDO.

During Normal Operations

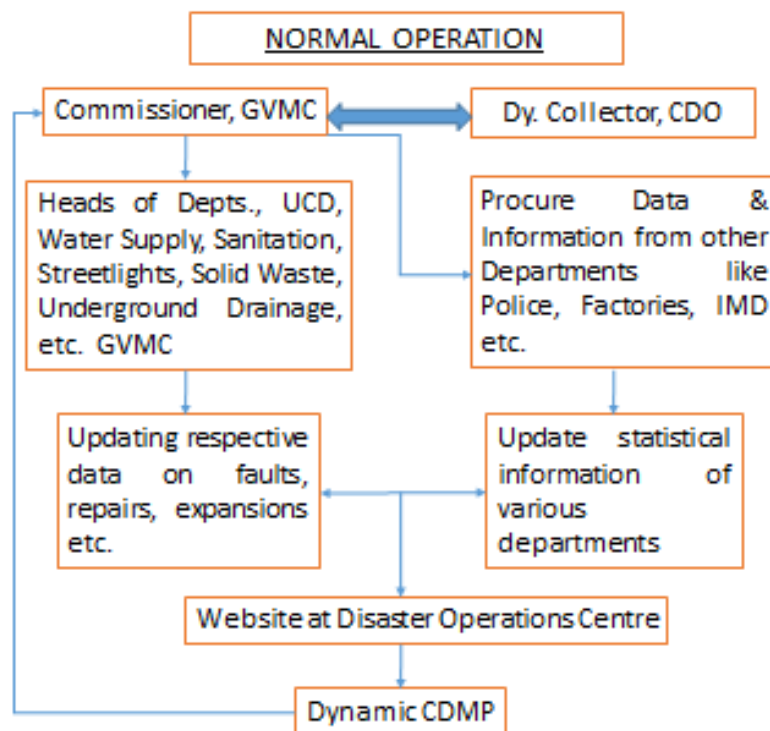


Figure 4-7: The Organizational structure during normal operations

During Emergency Operations

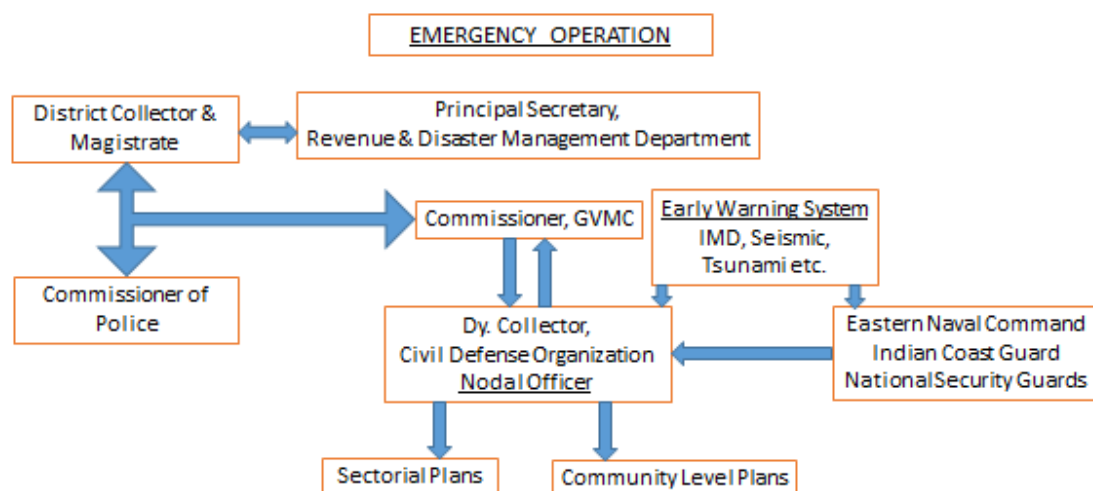


Figure 4-8: Organizational structure during Emergency operations

Further life line services such as Hospitals, Communication modes of radio, walkie-talkie users from various organizations and HAM operators, Transport authorities like RTA, APSRTC and other Private operators should be integrated with response and rescue operations. Certain departments which already have trained personnel for specific requirements of safety and security like the Police, Fire, Civil defence, Navy and paramilitary forces can actually help in formulating prevention and response strategies during disasters. The same can be effectively used to train ward level disaster teams.

4.4. Cyclone hazard profile of the City:

Visakhapatnam District is one of Coastal District on the Coast of Bay of Bengal in Andhra Pradesh. Severe Cyclonic storms emerge more frequent in Bay of Bengal. These cyclones likely to occur in the Bay of Bengal in the months of May October and November of each year.

Cyclones sometimes are accompanied by heavy rains and tidal waves which inundate Coastal areas causing huge loss to human life huts houses crops cattle and damages to irrigation sources roads public and private buildings and other properties. It is difficult to forecast much in advance with definiteness the occurrence of cyclone or tidal wave and the exact area that would be affected. Preparedness is more essential as precaution is out of bounds. The city is divided into Visakhapatnam (urban) and Visakhapatnam (suburban) parts for easy operation of the disaster response and recovery activities. The urban zone include the commercial district consists of the old and new city centers and the Gajuwaka. The sub-urban zones include Pendurthi, pedagantyada, Paravada, Bheeminipatnam and Anakapalli. However

it is essential to have intra connectivity and inter connectivity among the parts of the city during actual operation.

4.5. Forecasting Centers at Visakhapatnam:

The Visakhapatnam Centre is designated as Cyclone Warning Centre and is entrusted with storm or Depression warnings and keeps round the clock watch over Bay of Bengal. As soon as a storm or depression is detected, it issues advance warnings by land line telegram to the Chief Secretary to Government, Commissioner for Disaster management Collectors of all Coastal districts, Police Wireless at Hyderabad, Ports, Fisheries Officials, State and other Central Government officials connected with the public services such as Railways, Posts and Telegraphs etc., It also disseminates the progress cyclone through frequent storm bulletins on Radio and Press for Information to public. Round the clock broadcast of warnings including advice for evacuation of affected people threatened by tidal waves is, also made through AIR Stations during the cyclone season (April – May & October – November). A very high frequency wireless set has been installed in the Storm Warning Centre Visakhapatnam to transmit messages to the Police Wireless Station Visakhapatnam which in turn immediately transmits to the Police Wireless Station at Hyderabad.

4.6. Stages of warning and their importance:

There are two stages of warnings. The first warning is issued as soon as cyclonic storm is located at such a distance from the coast that it is expected to cause bad weather over the coast during the next 48 hours. The second stage warning and subsequent warnings are given by telegrams which run as “cyclonic warning”. From second stage onwards the expressions “cyclone”, severe cyclone and hurricane will be used to indicate the 3 stages of the growth of the storm. All such warning shall be communicated to the authority concerned.

Expected Wind Speed	Wind	Expected Damage
60-90 (cyclone)	Kmph	Tree branches broken off; some damage to Kutcha houses.
90-120 (Severe cyclone)	Kmph	Trees uprooted, pucca houses damaged, power and communications disrupted. inundation of low areas

120-220 Kmph (very severe cyclone)	Big trees uprooted, wide spread damage to houses and installations total disruption of communications and power, inundation of low areas
> 220 kmph (Super cyclone)	Big trees uprooted, wide spread damage to houses and installations total disruption of communications, power, transportation; Damage of the water distribution systems. Collapse of high rise buildings, ecological damage and loss of live stock, inundation of low areas

Figure 4-9: Cyclone Vulnerability index map

4.7. Earthquake hazard profile:

Visakhapatnam is in comparatively safer zone as per the seismic map of India, the experience of earthquake. An Earthquake of magnitude of 5 or more is likely to cause deaths and injuries to human beings and damages total kinds of property both private and public. Unfortunately there is very little warning available preceding the earthquake. Therefore planning should cater for a quick response at all levels to reduce the effects of the earthquake to the minimum. The occurrence of an earthquake may be reported by the Indian Meteorological Department (IMD)/the National Geophysical Research Institute (NGRI) APSRAC to the commissioner for Relief by the fastest means. The district Level be activated immediately on the occurrence of any major earthquake (Major earthquake being defined as one where there is damage to property and/or loss of life).

4.8. Disaster preparedness planning:

Disaster preparedness planning involves identifying organizational resources, determining roles and responsibilities, developing policies and procedures and planning activities in order to reach a level of preparedness to be able to respond timely and effectively to a disaster should one occur. The actual planning process is preliminary in nature and is performed in a state of uncertainty until an actual emergency or disaster occurs. After a disaster occurs, plans must be adapted to the actual situation. Different Departments have different roles to play in the disaster period. The Police, Fire Fighting Force ,Home Guards, Forest Department, Health Department, Local NGOs are ready to take up the rehabilitation measures, at short notice with the available resources. Therefore the line departments of the city are also necessary to know priory .The Line departments divided as Effected and Supporting functionaries during calamities. The plans prepared accordingly.

Figure 4-10: List of Effectible & Supporting Functionaries

S No.	Effectible Functionaries	S No.	Supporting Functionaries
1	Revenue	1	APSRTC
2	Highways	2	Police
3	Roads and buildings	3	Fire
4	Irrigation	4	Civil supplies
5	Transport	5	NDRF/paramilitary
6	Communication	6	Medical/EMRI
7	Women and child		

	Welfare		
8	VUDA		
9	Industries		
10	Fishery		
11	Power		
12	Agricultural		
13	Animal husbandry		

4.9. Revenue Department:

Measures to be taken during the time of Cyclone / Heavy Rains are

On receiving the Cyclone warning message from the Cyclone Warning Center, Visakhapatnam and Flood warning from Irrigation Department the Tahsildar Visakhapatnam urban should be stay at the Head Quarters and open Control Room at their head quarters to get instructions from the District Administration and pass on the instructions to the field machinery to watch the situation from time to time.

The Revenue Officer should be in their head quarters and record the Rain Fall time to time and to inform the same to the concerned Tahsildar. The Tahsildar should inform the rain fall time to time to the Revenue Divisional Officers without fail. During the time of Cyclone and heavy rains the precautionary measures are to be taken up on war foot basis and sit at Telephone wireless set and receive telephone calls and communicate message to Concerned.

4.10. Roads and Buildings Department:

The field officers such as Executive Engineer/Assistant Engineers at Visakhapatnam Division directed to monitor the action plan during cyclones

1. No's of power saws will be kept ready which are in department. In emergency private power saws will be utilized at head quarters.
2. Action will be taken to engage inspection vehicles in addition to the vehicles available in department. The JCBs will be engaged as and when required to clear the fallen trees and to restore traffic at each sub division, All the field officers will be instructed to verify the water levels of canals and drains in respect of over flows if occurs to guide the public and to avoid traffic Instructions will be given to report the damages for roads bridges, causes ways in form-20 On receipt of second warning Flood control rooms will be opened in division office and sub division

offices duly given turn duties for monitoring the cyclone information The field officers instructed to engage men and material to attend the road clearance and repairs The officers will be instructed to be in touch with all police stations and bus depots to get information for any interruption in traffic Tippers will be engaged to mobilize the labour at different location to attend damages.

4.11. Integrated Child Development Services Project:

The following services have taken up in the constituency

- Supplementary Nutrition Programme
- Immunizations
- Health checkups
- Referral Services
- Nutrition and Health Education
- Pre-School Educations

The above services are implementing in the central constituency among the eligible beneficiaries of 0-6 years children, Pregnant and Lactating women.

The field staff CDPOS, Supervisors, Angan wadi workers of ICDS will teach and guide the target people of the disaster prone areas about the precautions and during the disasters like floods, cyclone, etc.

Suggest the people to vacate and stay in safe shelters which will be provided by the Corporation and other allied departments.

Supply the food to Pregnant, children below 5 years in the shelters as per the guidelines.

Staff will remain stay in shelters till the situation come to normal.

4.12. Civil Defense (CD):

The Civil Defense being a community based voluntary organization can, in addition to rescue, and rehabilitation, also play a stellar role in the field of public awareness and also community capacity building to face any disaster situation. The present role of Civil Defense, in terms of the Civil Defense Act, is to provide protection to individuals, properties and establishments against any hostile act. However, wide order dated 5 September, 2003 the MHA conveyed its approval to the state governments to utilize the services of Civil Defense volunteers for mitigation, prevention and preparedness for disaster as also for

response and relief after a disaster has struck. In pursuance of this order, Civil Defense is already being utilized by some of the states not only in response activities during disaster, but also in pre-disaster activities, particularly in the field of community capacity building and generating public awareness.

Existing Civil Defense structure

In its instructions issued from time to time, the GoI has authorized the scale of permanent Civil Defense staff at state, district and town levels. The smallest unit of Civil Defense is a Division, per 2,00,000 of population. The existing staff authorization at different levels of the administrative units in the states is:

Town Level: One Division, per 2,00,000 of population, or part thereof, consisting of two Civil Defense instructors, one clerk and one messenger. The Civil Defense instructors in the divisions are the primary trainers of the enrolled volunteers.

District Level: One Deputy Controller of Civil Defense with support staff (12 persons). The Controller of Civil Defense at district level is District Magistrate, ex officio.

State Level: Directorate of Civil Defense is headed by Director Civil Defense. While in some of the states, there are separate Directorates for Home Guards and Civil Defense in many states, a combined Directorate of Home Guards and Civil Defense is authorized.

In view of the new policy measures, following changes are made to the existing structure of Civil Defense. The district headquarters will be the hub of all CD related activities; the reach of the Civil Defense at the grass roots level is expected to be achieved through proper selection of persons with commitment for community service as Wardens by the district level CD officers assisted by Chief Wardens, Divisional Wardens and Post Wardens. Some of the target groups, from among whom Wardens may be selected are ex-service personnel, office bearers of PRIs/RWAs and professionals, etc. These Wardens, after basic training, would become the key resource persons for training the community and raising a cadre of volunteers. In consonance with the new role envisaged for Civil Defense, the capability of the Civil Defense staff wardens and volunteers to deal with disaster situations will be enhanced through training, to be eventually utilized during disasters. Quick Response Teams (QRTs) will be set up for specific functions such as search and rescue, fire rescue and first aid. The concept of QRT would not only ensure the active involvement of Civil Defense in emergency management activities, but would also enhance its profile by allowing it to act as the first responder to disasters. The composition of QRTs (for districts) will comprise of 2 Leaders; 4 Members (Wardens/Volunteers) and 1 Driver (A van/SUV to be authorized).

Andhra Pradesh has two categorized Civil Defense towns at present: Hyderabad-Secunderabad (Category II) and Visakhapatnam (Category II). With the inclusion of Disaster Management as the primary responsibility of the Civil Defense, the concept and orientation of Civil Defense coverage will change from 'town specific' to 'district specific' with the area of responsibility covering the entire district. In this changed concept, in the long run, all the twenty-three districts of the state will have Civil Defense coverage because no district in the state may be considered to be fully safe from disasters. The existing central training institute (for civil Defense and home guards), Hyderabad will be further strengthened and expanded to impart training to district based civil Defense teams.

4.13. Synergizing efforts and resources of various agencies involved:

The youth organizations namely, NCC, NSS, and NYKS have the inherent advantage of reach at the grass-roots level and also have the advantage of ready availability for immediate assistance at the ground level in the event of any disaster. In the present system, the District Collector, in the capacity of controller of Civil Defense, invariably gets in touch with the concerned NCC/NSS/NYKS authorities for pooling of resources in the event of occurrence of a disaster. To synergize and consolidate the efforts and resources of the various agencies, following actions will be undertaken:

(i) Establishment of reliable and speedy communication channels between the concerned authorities (DDMA/Deputy Controller of Civil Defense) and chief coordinators of these organizations in the districts in view of the special requirements arising out of emergency situations.

(ii) Preparation of a district-wise directory of the concerned authorities of NCC/NSS/NYKS and Civil Defense, giving complete details of the officer's in-charge.

4.14. Capacity building measures for developing trained human resource for civil Defense:

The cadres of NCC/NSS are essentially voluntary comprising school and college students. In both cases students are part of these organizations for a limited period of 2 to 3 years. Further, it is not advisable to enlist the junior segments of these organizations for Disaster Management operations. The availability of the services of the senior segment of NCC/NSS is purely voluntary exercise. The NYKS, on the other hand, can provide the most stable volunteer group for Disaster Management efforts. In this back drop, efforts will be focused primarily towards capacity building measures of these organizations. In other words, the NCC/NSS/NYKS cadres will be given appropriately designed modules on Disaster

Management in order to train them and equip them suitably for assisting in Disaster Management efforts as responsible citizens.

In order to achieve this preparedness measure, the following measures will be undertaken:

Specific training modules designed by the National Institute of Disaster Management (NIDM) on Disaster Management along with relevant training aids/material/ literature for the NCC/NSS/NYKS trainers and coordinators taking into consideration the specific requirement of each organization will be procured and widely made available. Based on the training modules designed by the NIDM, capsule courses on Disaster Management and community capacity building for the trainers/coordinators of NCC, NSS and NYKS will be held at the training institutions of NCC/NSS/NYKS or at the state Civil Defense Emergency Relief Training Institute, Hyderabad. These capsule courses will mainly be on the following subjects:

- a) Search and rescue
- b) Medical first aid
- c) Community capacity building and
- d) Public awareness.

NCC/NSS/NYKS will be strongly advised to include training in Disaster Management as a part of their curriculum/ calendar of activities. Existing training arrangements on the subject will be reviewed to suggest improvements.

Disaster Management training will be included in the schedule for the camps of NCC/NSS/NYKS where the services of trainers/coordinators of these organizations trained by CDERTI, Hyderabad will be utilized. In these efforts, the thirteen multi-hazard districts/areas (shown in table below) will acquire priority. The multi-hazard districts are those which are vulnerable from at least three major hazards. For these districts, at least one annual training camp on Disaster Management will be organized with the participation of NCC/NSS/NYKS/Civil Defense and NIDM.

Training, capacity building and other proactive measures:

Proactive measures such as strengthening community defense, training and enhancing capacities of non-government stakeholders in disaster management will supplement SDMAs efforts in achieving risk reduction and well prepared civil society. There are several institutions such as NCC, NSS, NYK, NGOs, and

SHGs that are active in the state. While the mandate of these groups is specific, their activities transcend the preparedness measures.

National Cadet Corps (NCC)

National Cadet Corps is a Tri-Services Organization comprising the Army, Navy and Air Force, engaged in grooming the youth into disciplined and patriotic citizens.

The National Cadet Corps came into existence with following aims:

Development of leadership, character, comradeship and the ideals of service.

Stimulation of interest in the defense of the country, to the widest possible extent.

Building up of a reserve of potential officers to enable the Armed Forces to expand rapidly in a national emergency. Induction into the NCC is voluntary; boys/girls join at the age of 13 years in junior division (generally Class VIII to X) and in senior division from 11th class onwards.

NCC is known to extend help during natural and other calamities and accidents. NCC has internalized extending help during natural and other calamities and accidents. Over the years, NCC cadets have rendered service during floods, earthquakes, cyclones, tragic train accidents and provided the healing touch in riot affected areas. Their response to situations during floods in Andhra Pradesh is well recorded. Recently, NCC cadets actively assisted in the relief operations during the tsunami impact in the state. Streamlining NCC training to include disaster management tasks and identifying NCC cadets as ambassadors of disaster management in their respective schools will be encouraged; concerted efforts will be undertaken to harness trained NCC cadets in disaster management in the state.

National Social Service (NSS)

National Social Service (NSS) was set up to strengthen the idea of involving students in the task of national service. NSS volunteers generally work with villages, slums and voluntary agencies to complete 120 hours of regular activities during an academic year. As per the fundamental principles of National Service Scheme, a volunteer is expected to remain in constant touch with the community. The basic principle of the programme organizing volunteer work by the students themselves and both students and teachers through their combined participation in social service, get a sense of involvement in the tasks of national development. Colleges and Universities in Andhra Pradesh have adopted NSS as integral to learning and undertake several village development activities. Between 2001 and 2003, approximately 2,96,802 volunteers from Andhra Pradesh colleges and Universities participated in various social service

activities state wide. Andhra Pradesh received on average Rs. 2.0 crores for NSS related activities. In 2003-04, the funds were to the tune of 2.06 crores. Expanding the activities covered under NSS to include disaster management awareness in the villages and training youth from the villages by NSS volunteers in the field of mitigation and risk reduction measures would strengthen the mission of disaster-free state. Concerted efforts will be undertaken to harness trained NSS volunteers in disaster management in the state.

Nehru Yuva Kendra (NYK)

The National Advisory Board on youth recommended taking up of national programme for non student youth. It also recommended setting-up of one district youth centre and two block centers in every district. As part of Silver Jubilee Year of India's Independence Nehru Yuva Kendra centers at the district level were established in 1972-73. The NYKs objectives are to provide rural non-student youth avenues to take part in the process of national development and

opportunities for the personality and skill development. Expanding the activities covered under NYK to include disaster management awareness in the villages and training the youth in the field of mitigation and risk reduction measures would strengthen the mission of disaster-free State. Concerted efforts will be undertaken to harness trained NYK youth in disaster management in the state.

Home Guards

Home Guards are a voluntary force, first raised in India in December, 1946, to assist the police in controlling civil disturbance and communal riots. Subsequently, the concept of the voluntary citizen's force was adopted by several States. The role of Home Guards is to serve as an auxiliary to the police in maintenance of internal security, help the community in any kind of emergency such as an air-raid, fire, cyclone, earthquake, epidemic etc., help in maintenance of essential services, promote communal harmony and assist the administration in protecting weaker sections, participate in socio-economic and welfare activities and perform Civil Defense

duties. The concept of Civil Defense owes its origin to erstwhile ARP Organization raised and operated during World War II. Training plays an important role for human resource development

in Civil Defense, Home Guards and Fire Services. Expanding the trainings imparted to Civil Defense and Home Guards to include disaster management; training on recovery and relief operations would strengthen the mission of disaster free state and will yield significant results in mitigating disasters in

Andhra Pradesh. State government will identify appropriate courses and nominate line department officials for training at National Civil Defense College and National Fire Services College at Nagpur.

Self Help Groups (SHGs):

Self help groups (SHGs) are community-based development groups formed principally to microfinance entrepreneurial initiatives. Women predominantly are the members, although there are mixed groups. The Government of Andhra Pradesh has taken up the theme of women's empowerment as one of the strategies to tackle poverty and undertake developmental activities in the villages. A primary function of SHGs is self promoting thrift savings. Government of Andhra Pradesh under the aegis of different development programmes has promoted the SHGs. Similarly, banks have tied up with SHGs in promoting SHGs and linking their loans schemes to SHGs. Development Agenda of the State in the last few years placing people, especially women in the forefront; has enabled formation of a large number of Self Help Groups (SHGs).

Currently, there are approximately 4.52 lakhs SHG groups in Andhra Pradesh covering nearly 6.17 million poor women throughout the state. The SHGs are synonymously grouped as DWCRA groups since majority of women's groups were assisted initially through Development of Women and Children in Rural Areas (DWCRA) programme. The group corpus consists of savings, government assistance and also bank loans. Members are loaned on the recommendation of the core committed for entrepreneurial and personal uses. Since inception approximately an amount of Rs.1,556.90 cores have been mobilized as corpus by these groups. Self help groups and its members in villages command great influence in developmental activities. Streamlining these groups in disaster preparedness is a logical and prudent measure. Since their outlook is micro financing and entrepreneurial development, concerted efforts will be initiated by SDMA to identify their training needs; train them in disaster preparedness and mitigation efforts. Women are known to assume the leadership role during hazardous situations especially if their family safety is at stake. A collective effort of the women at village level will have a long way to go in disaster management; strengthening SHGs, utilizing the financial independence of SHGs through State Disaster Response and Mitigation Fund (SDRMF) will prepare the community to meet emergencies efficiently.

4.15. National Disaster Response Force

NDRF is a special Response Force to tackle disasters. This is a multidisciplinary, multi-skilled; high-tech force which will respond for all types of disasters. This Force is constituted of eight battalions, two each

from the BSF, CRPF, CISF and ITBP. Each battalion consisting self-contained specialist search and rescue teams of 45-65 personnel each including engineers, technicians, electricians, and medical/paramedics. These NDRF battalions are located at 10 different locations in the country based on the vulnerability profile of the area Figure 4.11.

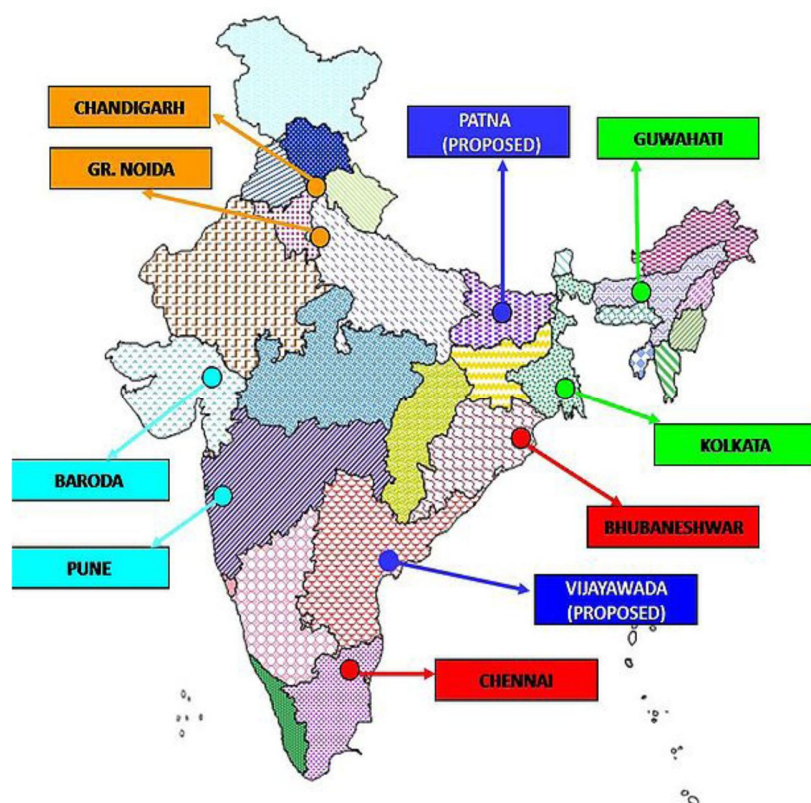


Figure 4-11: Locations of NDRF in the country (Source: NDMA, New Delhi)

4.16. Media preparedness in disaster management:

The media plays a critical role in information and knowledge dissemination in all phases of disaster management. The versatile potential of both electronic and print will be fully utilized at the state as well as districts level. Role of media in post disasters or reporting extent of damages is well recognized. Media – electronic as well as print media has great potential in raising general awareness and preparedness. Print media – Telugu, English as well as Urdu can carry special series on state’s vulnerability to different disasters. Similarly, the print media can also carry summarized and succinct preparedness measures that civil society could follow. Electronic media especially TV and cable have greater impact in every-day life in the state. SDMA and GoAP will engage electronic media in developing disaster-based feature films or

programmes, these measures will prove beneficial in the long-run. Media will also play significant role in collaborating with the schools by promoting essay competitions on disaster management.

4.17. Legislative support at the Local/ Municipal/ Panchayat Level:

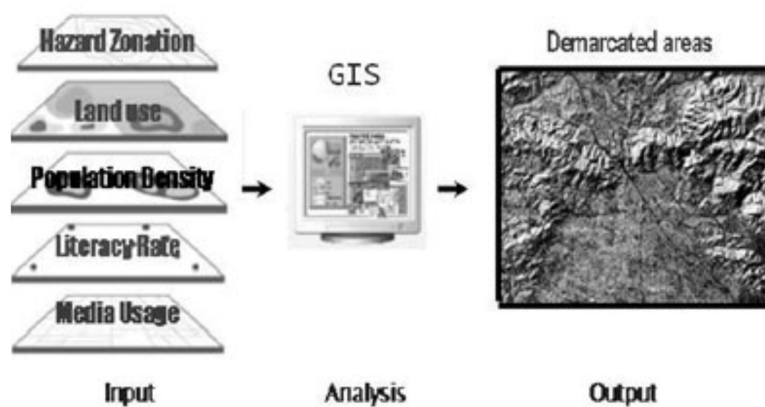
At the local level, the Municipal authorities and Panchayat regulate the development/construction of buildings through the building regulation/building bye-laws as followed in their respective areas. The State Government from time to time issues directions/guidelines for safety against natural hazards, which are followed by local bodies while granting permission for construction of buildings/structures. Appropriate modifications in consultations with legal, professional and administrative authorities shall be undertaken to meet disaster management preparedness.

4.18. Application of Geospatial information in Disaster Management:

Disaster management is a multi-sectorial and multi-disciplinary effort. As much as community participation and government involvement both at state and local is essential, the role of Geographic Information Science (GIS) and Remote Sensing is equally paramount in achieving fool-proof preparedness in disaster management. While GIS and Remote Sensing are technology based tools, these technologies have significant role in raising awareness and preparedness. In designing awareness and preparedness programmes as part of SDMP action plan, use of spatial data becomes imperative. Disaster preparedness needs thorough understanding of geospatial, socio-economic and scenario and intensity based computer simulations. Geographical Information System (GIS) and Remote Sensing tools are appropriate technical tools to achieve this objective. GIS allows spatial analysis of parameters such as population density, economic losses, and loss of infrastructure due to disasters along with the progression of hazards such as cyclones, floods and winds. A pictorial representation of GIS can be used in disaster management is presented in figure 4.12.

Andhra Pradesh State Remote Sensing Applications Center (APSRAC), Planning Department has the capacity to undertake extensive GIS and Remote Sensing based modeling. APSRAC will be strengthened to prepare intensity and scenario based computer modeling and simulations in disaster management preparedness and mitigation efforts.

Figure 4-12: Use of different parameters (in shape files) as GIS-enabled layers for spatial analysis



4.19. Knowledge Management:

Disaster preparedness is achieved among others by developing strong knowledge base on the subject. Andhra Pradesh has high quality educational and research institutions spread across the state. While dispersed and non-coordinated knowledge generation related to state specific hazards is going on, there is a need to develop DM specific knowledge management center. The state Administrative Training Institute (Dr. MCR HRD IAP) conducts wide range of trainings to state as well as other stakeholders. The Dr. MCR HRD Institute will be strengthened to develop as a knowledge resource center in disaster management. The Center for Disaster Preparedness at Dr. MCR HRD IAP is currently specialized to train state government officials on disaster preparedness. The center will be further strengthened as a knowledge hub of disaster management.

5. CITY DISASTER PREPAREDNESS PLANNING

5.1.Preparedness, Response and Action Plan

The city disaster management plan can be prepared after identification of city's vulnerability and various probable risks the city may face. The HRVA will be the first step in arriving at the vulnerability profile of the city. RMSI made the HRVA studies for the city of Visakhapatnam. The recommendations of the study are as follows (RMSI, 2014).

Using the recommendations the basic CDMP for GVMC will be prepared. The basic plan consists of Preparedness, Response, Rescue, Recovery, Rehabilitation and Mitigation plans which may be based on the practices already in vogue at various levels of National, States & respective Districts in India. It is important to adopt the existing strategies tailored to the city in context for better adaptation. This would result in a comprehensive and synchronized modus operandi across all levels. It reduces or extricates procedural delays that often occur during multi-organizational and hierarchical organizational structures, that exists in the governance system especially during emergency operations. This also helps the officials who often change to have Unity in Process. It is strongly proposed that a Department of Public Safety and Security (DPSS) or Department of City Disaster Management(DCDM) be established in GVMC under direct executive command of the Commissioner to which perform the emergency and follow up activities during disasters along with day-to-day operations. The Department constitutes four teams namely Operations Team, Planning Team, Resource Team and Finance Team. The Operations Team will be headed by Additional Commissioner (General) and convened by Project Director (UCD) and will be looked after by their team. The Planning Team will be headed by Chief Engineer, GVMC convened by Chief City Planner, GVMC and looked after by their team. The Resource, Rescue and Rehabilitation (RRR) Team is headed by Fire Department of GVMC and is responsible to maintain close coordination with other organizations both governmental and non-governmental, especially that of Civil Defence Organization in procuring material and men for various disasters. The Finance Team is headed by Additional Commissioner (Finance) and looked after by their team. The Zonal Commissioners of the Eight Zones of GVMC follow the instructions of the Department during normal and emergency operations and give necessary feedback and reporting in prescribed formats to the Commissioner who further shares with the rest of the DM teams for necessary

further action. The DPSS or DCDM administrative structure and the operational fields is presented in Figure 5.1

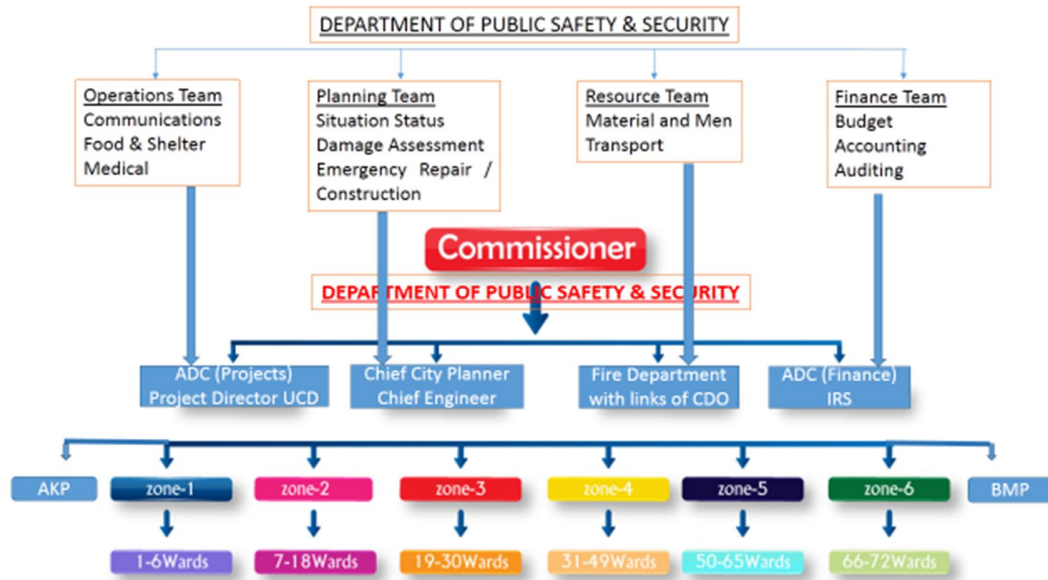


Figure 5-1: The DPSS or DCDM administrative structure and the operational areas of the five operation teams

The Department of Public Safety and Security or DCDM should consist Disaster Operation Centre (DOC) for normal day-to-day operations and assumes as Emergency Operation Centre during disasters. It is essential to maintain hard copies of the contacts of all key people at the city and zonal level with all the members of the DCDM. Further it is proposed to have a web link of Disaster Operation Centre (DOC) embedded in GVMC website. The websites of the key organizations at national level, state level and district level should be linked with DOC web link of GVMC. However, the key lies in constant updating and up gradation of DOC web link of the Department of Public Safety & Security or DCDM in ever changing scenario of the city to come out with good short, medium and long term plans. The layout of the DOC web to be incorporated in the GVMC official web page is shown in Figure 5.2. The official domain needs to be scrupulously updated on day-to-day basis in lines of various national, state and district level DM departments. All the information on procedures and data bank those are required for various disasters are dealt with these organizations. The staff of the Department of Public Safety and Security should be trained as part of capacity building and be well acquainted with retrieving the necessary information from these different websites that could be utilized in context to the city and disaster in question. The department should maintain continued close coordination with CDO of

Visakhapatnam. Brief functionalities of various organizations at National, State and District levels are described in the following section.

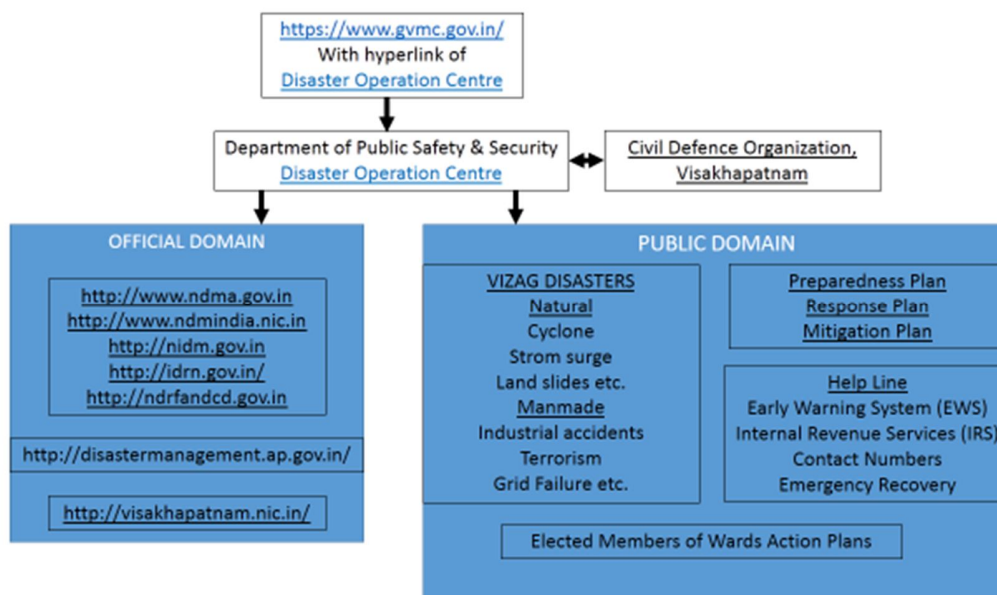


Figure 5-2. The layout of the DOC web to be incorporated in the GVMC official web page
 The official domain needs to be scrupulously updated on day-to-day basis in lines of various national, state and district level DM departments. All the information on procedures and data bank that are required for various disasters are dealt with these organizations. The staff of the Department of Public Safety and Security should be well acquainted with retrieving the information from these different websites that could be utilized in context to the city and disaster in question. The department should maintain continued close coordination with CDO of Visakhapatnam. Brief functionalities of various organizations at National, State and District levels are described in the following section.

1. National Level Organizations

- National Disaster Management Authority (<http://www.ndma.gov.in>)

NDMA, is the apex body that is mandated to lay down the policies, plans and guidelines for Disaster Management. It lays down guidelines to be followed by SDMA's in drawing up State Plans and such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with threatening disaster situations or

disasters as it may consider necessary. It further coordinates the enforcement and implementation of the policy and plans for disaster management.

- DM Division, Ministry of Home Affairs (<http://www.ndmindia.nic.in>)

Disaster Management (DM) Division is working under Ministry of Home Affairs and is responsible for response, relief and preparedness for natural calamities and man-made disasters (except drought and epidemics). The Division is also responsible for legislation, policy, capacity building, prevention, mitigation and long term rehabilitation. The website gives useful links of India Meteorological Department (IMD), Indian National Centre for Ocean Information Services (INCOIS), Central Water Commission (CWC) and Geological Survey of India (GSI) that give forecast and other details on various natural hazards. It has several manuals that can be used for assessment of damage, mitigation measures, disaster developmental plans etc. viz. Disaster Management Division Acts (The Civil Defence Act 1968, The Disaster Management Act 2005), Disaster Management Division Rules and Regulations (The Civil Defence Rules 1968, The Civil Defence Regulations 1968, The Disaster Management (Annual Report of National Authority) Rules 2006, The Disaster Management (National Institute of Disaster Management) Rules 2006, The National Institute of Disaster Management Regulations 2006, The Notification of National Disaster Response Force (NDRF) Rules 2008 etc. should be made available so as to know the rules and regulations and compliance requirements.

- National Institute of Disaster Management (<http://nidm.gov.in>)

The Institute is a statutory organisation under the National Disaster Management Act 2005 with a vision to play the role of a premier institute for capacity development and nodal responsibilities for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management. It believes in promotion of a "Culture of Prevention" involving all stakeholders in DRR with strategic partnerships with various ministries and departments of the central, state and local governments, academic, research and technical organizations in India and abroad. It has state-of-the-art facilities like class rooms, seminar hall, a GIS laboratory and video-conferencing facilities etc. along with a well-stocked library exclusively on the theme of disaster management and mitigation. The Institute provides training in face-to-face, on-line and self-learning mode as well as satellites based training. In-house and off-campus face-

to-face training to the officials of the state governments is provided free of charge including modest boarding and lodging facilities.

NIDM provides technical support to the state governments through the 30 Disaster Management Centres (DMCs) in the Administrative Training Institutes (ATIs) of the States and Union Territories. Six of these centres are being developed as Centres of Excellence in the specialised areas of flood risk management, earthquake risk management, cyclone risk management, drought risk management, landslides risk management and management of industrial disasters. Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and Odisha have been provided with additional centres to cater their needs in this area.

NIDM provides assistance to the State Governments and State training institutes in the formulation of State level policies, strategies, disaster management framework and any other assistance as may be required for capacity-building of stakeholders, Government including its functionaries, civil society members, corporate sector and people's elected representatives.

- India Disaster Resource Network <http://idrn.gov.in/>

IDRN is a nation-wide electronic inventory of resources that enlists equipment and human resources, collated from district, state and national level Government line departments and agencies. IDRN is a web based platform, for managing the inventory of equipment, skilled human resources and critical supplies for emergency response. The primary focus is to enable the decision makers to find answers on availability of equipment and human resources required to combat any emergency situation. This database will also enable them to assess the level of preparedness for specific vulnerabilities. The online inventory of resources is hosted in the National Informatics Centre (NIC), New Delhi. Authorized Government officers have the access to the Portal and the district authority is responsible for the updating of data received from various line departments.

- National Disaster Response Force (<http://ndrfandcd.gov.in>)

The constitution of National Disaster Response Force (NDRF) is a statutory provision of DM Act for the purpose of specialized response to natural and man-made disasters. As on date NDRF is having strength of 10 Battalions consisting of 1150 personnel in each battalion that are formed from BSF, CRPF, ITBP, CISF and SSB. Following are the various other organizations involved in disaster response related assignments and duties.

Civil Defence Organizations

To safeguard the life and property of the civilian population and maintain the continuity of productive and economic activity of the nation during the event of hostile attacks. To meet the challenges of the day, the Civil Defence Act was suitably amended by the Civil Defence (Amendment) Act, 2009 that included disaster management as an additional role.

Home Guards

Home Guards is a voluntary force to assist the police in controlling civil disturbance and communal riots. The role of Home Guards is to serve as an auxiliary to the police in maintenance of internal security, help the community in any kind of emergency such as an air-raid, fire, cyclone, earthquake, epidemic etc., help in maintenance of essential services, promote communal harmony and assist the administration. Rural and Urban Home Guards assist the police whereas Border Wing Home Guards battalions serve as an auxiliary to the Border Security Force.

Fire Cell

Fire prevention and fire fighting services are organised by the States and UTs. Ministry of Home Affairs (MHA) and other Central Ministries renders technical advice on Fire Protection, Fire Prevention and Fire Legislation. MHA also arranges soft GIC loans through the Ministry of Finance, (Insurance Division) for the purchase of capital firefighting equipment and also for construction of buildings. While training of junior level fire professionals are conducted by the respective State and UT at Fire Training Schools, training of officers is conducted by National Fire Service College, Nagpur. Standing Fire Advisory Council (SFAC) constituted by the Ministry is the apex body of Fire & Safety experts comprised of Heads of Fire Services of all States & UTs that advises GOI on various aspects on fire and safety.

2. State Level Organizations

- Revenue (DM) Department (<http://disastermanagement.ap.gov.in/>)

State Disaster Management Authority (SDMA) is headed by the Chief Minister. Following the national policy in the relief centric approach to overall Disaster Management involving preparedness, mitigation, relief & rehabilitation, the Government of Andhra Pradesh renamed the department as Revenue (Disaster Management) Department in the State of Andhra Pradesh. The various functions of the Department is to monitor the seasonal conditions, preparation and updating of calamity contingency plans for cyclone, flood, drought, earthquake, etc., dissemination of early warnings in case of threat of calamities such as cyclone and flood, coordination of evacuation, rescue, relief and rehabilitation activities during natural calamities, submission of memorandum for assistance from National Calamity Contingency Fund (NCCF) of the Central Government and coordination with Planning Department in preparation of disaster mitigation plan by various line departments.



Figure 5-3 The District wise map of the Andhra Pradesh

3. District Level Organizations

District Disaster Management Authorities are headed by respective 13 District Collectors of Andhra Pradesh who are responsible to spearhead and implement a holistic and integrated approach of Disaster Management in the state of Andhra Pradesh.

All the organizations contact information should be made available at the office of the DCDM. It enables the disaster management administration at city level to seek assistance if necessary from external agencies. Visakhapatnam has been experiencing from the past and is prone to various natural and manmade disasters throughout the year. The magnitude of various hazards ranges from low to high intensity affecting the people and property of the city incurring huge expenditure to bring it to normalcy. There is a potential danger for Visakhapatnam due to the hazard profile making it vulnerable even for Multi-hazard in character. The hazard profile of the city is given in the Table 5.1 below.

Table 5-1: The hazard profile of the Visakhapatnam city			
Disaster	Occurrence	Magnitude	No. of people/ property affected
A. Natural			
Coastal Erosion	Regular	High	High
Cyclones	Seasonal	High	Medium
Floods	Seasonal	High	Medium
Landslides	Seasonal	Medium	Low
Heat wave	Seasonal	Medium	Medium
Forest Fires	Seasonal	Medium	Low
Drought	Seasonal	Low	Low
Earthquake	Periodical	Low	Low
Epidemics	Seasonal & After Affects		Medium
B. Manmade			
Fire Accidents	Seasonal	High	High
Industrial Accidents	Periodical	Medium	High

Defence Vulnerability	Classified		
Nuclear	Classified		
Strikes & Agitations	Periodical	Medium	Low
Terrorism	Exceptional	Low	Low
Reservoir/Tank Vulnerability	Seasonal & After Affects		Low
Grid Failure (Power, Communication, Transport etc.)	Seasonal, After Affects & Exceptional		High

Situation raised during natural or man-made disasters are of two categories, one being predictable in nature with fair time to respond, rescue and necessary plan for rehabilitation by the Department of Public Safety & Security or DCDM. Another being unpredictable during which the Department assumes charge of EOC. During any of the situations the Department should coordinate with other specialized departments and vice-versa share their resources of knowledge and expertise in preparation of fool proof plans for different disasters. The departments to be incorporated for various disasters are represented pictorial in Figure 5.4.

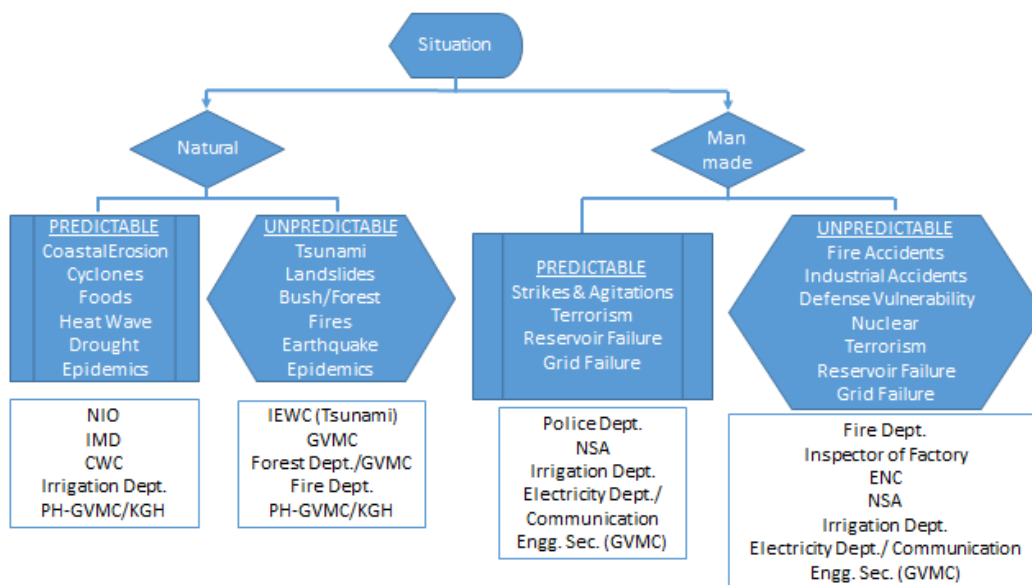


Figure 5-4: The necessary departmental dependence for different predictable and unpredictable disaster events

Predictable disasters are predictable only when constant efforts are made to gather information on day-to-day basis from different monitoring agencies. Periodical discussions and deliberations are made to acquaint the staff of the Public Safety & Security Department in having comprehensive know-how of the situations when arisen. It will also help in building strong, reliable and responsible relations between the governors of the city and experts of the disaster behaviour and nature. Various modes of communication are used to inform the public with evacuation routes and rehabilitation stations. Unfortunately all the cyclone shelter in the GVMC jurisdiction is in either bad shape or already occupied. Hence, it is necessary to rehabilitate the existing cyclone shelter and build new ones at elevated places in the city specifically near the coast line.

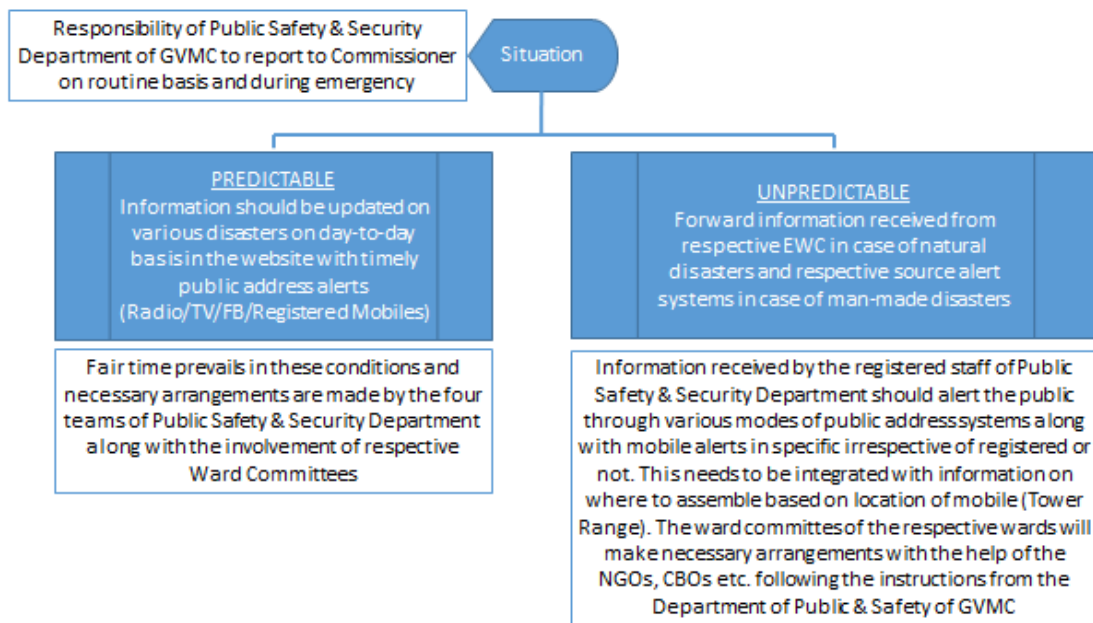


Figure 5-5: Types of Situations of Disasters

The responsibility of the Department of City Disaster Management is to procure and maintain all necessary data in coordination with other organizations relating to listed hazards, risks, vulnerabilities along with those added later when found necessary for the purpose of Preparedness, Prevention, Response, Recovery and Mitigation Plans. The Department assumes the protocol as Emergency Operation Centre (EOC) during and just before the occurrence of hazards for Preparedness and Response. During normal operations of the Department of Public Safety and

Security, Additional Commissioner takes the charge for organizing awareness programmes and mock drills assisted by respective governmental and community based organizations. Necessary programmes are organized at community level through Eight Ward Committees of the GVMC. Corporators of the respective wards in GVMC who have good understanding of their wards should be involved to trickle down management plans to household level. Community Based Organizations and other NGO's would also take part in awareness programmes. The website with public domain create awareness and building capacities of various stakeholders on disaster management. It also gives information on community response teams of various wards in GVMC limits. Programmes on mock drill during various situations to schools, colleges and community can be displayed in the website periodically and encourage their participation.

Apart from the Department of GVMC, some of the other key organisation and agencies identified for intra and inter networking DM operations are district administration, city police, communication (telecom operations, radio, wireless, HAM), Fire, Factories department, Irrigation, Transport (Public & Private operators), Hospital Services, NGOs etc within the city and the departments or organisation concern at the regional, state and national level. They need to coordinate under the common control centre for all the phases of the disaster management including emergency evacuation. The most important amongst them are Emergency Disaster Nodal Centre of the Inspector of Factories which has off-site emergency plans for various industries in Visakhapatnam. The existing Preparedness, Response, Recovery and Mitigation plans of Inspector of Factories should be linked with DOC of GVMC. Similarly, the apex body of APEPDCL needs to be linked for restoration of power immediately after the disaster. Meanwhile ample substitutes of power through generators, solar should be relied on. Another most important grid network before, during and after disaster is Communication network. DOC should have proper coordination with BSNL and other Private Service providers to ensure emergency operations information dissemination. Preparedness for PDS and water storage should be linked with identified rehabilitation centres (cyclone shelters, schools, community or function halls, open grounds and parks etc.) for securing the health and wellbeing of the citizens. The interdepartmental communication is essential and the transfer of disaster & hazard related information should be continuous. The major departments in and around the city that should be connected to the DCDM is shown in Figure 5.6.

The water supply network and the sewerage system must be designed as disaster resilience distribution system. The GVMC should have at least two bore wells (hand operated) in each of the colonies in the city to cater the water demand during failure of the regular water supply system. Evacuation route maps for various disasters are to be maintained and made accessible through the website and also placing hoardings or kiosks in specific location. Rehabilitation areas are designated based on the same criteria as evacuation plans. Proper rehabilitation areas are also located on vast hills with proper access for people, transport and supplies. Details of Vulnerable people and areas in Visakhapatnam in terms of various disasters especially Industrial, Cyclones and submergence, Landslides, Forest fires are maintained by both the GVMC and CDO. Further life line services such as Hospitals, Communication modes of radio, walkie-talkie users from various organizations and HAM operators, Transport authorities like RTA, APSRTC and other Private operators should be integrated with response and rescue operations. Educational institutions of various levels from schools to universities are apt infrastructure to bring awareness of disasters in preparedness and response. Capacity building to the citizens' right from school children to young generation along with general public and disaster teams can be organized in these educational institutes through seminars and mock drills on regular basis.

5.2. Disaster Response Plan (DRP):

Providing public safety, minimizing damages to property and protecting public lives are the primary goals of disaster response plan. The Disaster Management Act, 2005 requires that the State Disaster Response Plan (SDRP) incorporates the results of vulnerability and risk assessment of the state. The response plan includes 'plans, procedures and identification of support functions and the agencies that will be responsible for the support functions. The response plan also provides framework for the standard operating procedures to be further developed by the state government departments.

At the time of situations arising out of disasters and hazards, villages, mandals or municipality are worst affected; the first line of defense and response mechanism at this level will be developed. If the response required exceeds available resources at the local levels, support will be sought in the order: Villages/mandals/municipality with the district; districts with the state and finally state with the central government. In the event of multi-state disasters, optimal utilization of resources and coordination between states is essential.



Figure 5-6: The interdepartmental connectivity for flow of information connected to the Disaster management

Some of the open spaces available near the coast line are shown in Figure 5.6. These open spaces may be used for rehabilitation purpose in the event of any disaster. The drain or small streams flowing through GVMC and the existing ponds in the GVMC should be made free from occupations and encroachments. It will reduce the risk of inundation of the areas around them or in their respective catchments. It enables the GVMC to reduce the affected population or property in case of flood events. The major ponds identified are presented in Table 5.2. Some of the that were clogged or altered channel sections should be rejuvenated so as to free flow of the storm water without any stagnation. Visakhapatnam is known for its green cover. In fact the GVMC won Euro-Asia award because of the extensive green cover of the city. Hence, it is necessary to protect from forest fires and cyclones. The Zoo and Kambalakonda ecopark should construct cyclone

resistant open shelters/sheds to protect the animals or wild life from either forest fires or severe cyclones.

CYCLONE	Preparedness	Response	Recovery
<p>General: The city administration, irrespective of the nature of calamity should be able to assess the intensity and possible threat on life and property of the citizens. Depending on the necessity it should have the authority on all the organizations (Public/Private/Institutional) in the jurisdiction to declare emergency employment conditions and precautionary holiday (could be substituted later) for students and the like that do not cause any threat to functionary and thereby property. At the same time all the organizations should reciprocate with equal responsibility by declaring emergency employment condition and precautionary holiday and thus cooperate with city administration.</p>			
<p>Agency Primary Secondary</p>	<p>GVMC should take necessary steps in coordinating with Cyclone Warning Centre of the City situated near Kirlampudi area, China Waltair.</p>	<p>GVMC in coordination with DDRF, SDRF and NDRF that includes Civil Defence Organization and Fire Department. Voluntary organizations like NSS, NCC and other NGO's. Community participation at ward levels with proper prior training and awareness programmes are important human resource. Community participation is a greatest advantage due to the fact that they are very much aware of the problem in their area.</p>	<p>Along with supervisory directions and operations by various response forces Community participation has a great deal to involve as they are very much aware of the problems in their area and hence better immediate local and popular solutions can be made till longer mitigation measures are adopted.</p>
<p>Early Warning System (Organisation Link)</p>	<p>EWS is telecast by Cyclone Warning Centre, Vizag. However, GVMC should share the information to vulnerable and underprivileged sections, especially fisher folk, and all those residing in immediate coastal stretch in the city. GVMC should create awareness by providing details of possible cyclone intensity and its behaviour along with</p>	<p>Based on the designated level of intensity and dynamic behaviour of cyclone frequent communications are made through fool-proof systems to bring resilience and adapt to situations appropriately without causing any loss to life and property.</p>	

	probable threat on life and property.		
Action Main Plan Alternate Activation De-activation	Depending on the different levels (intensity) of warning of the cyclones in Vizag Evacuation of the vulnerable, Security to the property of public and private, Alternate employment or compensation for the livelihood of the marginal are important to be dealt with. Arrangements needs to be made for alternate power supply through generators. Ward level information systems linked overall action plans needs to be coordinated.	Based on anticipated intensity of the cyclone a main plan is made for evacuation – rehabilitation – supplies of basic materials. Due to power shut down generators are arranged for basic utility at community level for cooking, lighting, charging mobiles and such important functions. The dynamic nature of the cyclone based on previous experiences and AAR alternate plans are made at ward level. Line of authority needs to be very clear in close coordination with local communities for activation and or deactivation of various tasks that are followed by main or alternate plans.	Sector and inter-sector assessment on the impact of the disaster is made in detail by respective organizations. After-Action-Reports are made by involving field experts. Necessary short-medium and long term actions are taken up. Especially in restoration of transport network, power and water supply, procuring of food supplies.
Resources	After-Action-Reports (AAR) that are prepared during the previous disasters play a critical role in substantially improving preparedness.	Main and alternate plans with line of control and unity of command manuals. To check chaos and to perform smoothly.	Secondary data from the periodical studies conducted by various organization like NIO, AU, GITAM etc. And primary findings during response operations.
Personnel	DDRF, Revenue, Police, APSRTC, Infrastructure personnel, APEDCL for Electricity, BSNL and Private operators for communication, GVMC for Water supply, roads and drainage.	All the DRFs, VOs, 108 service (ambulance) staff with community support.	Researchers, Field officers and personnel and community reviews and meetings after the disaster.

Equipment	Buses are required to evacuate. Temporary Shelter materials are required to construct in identified public or private open spaces and parks apart from Schools and other similar buildings. Cyclone shelters that are in dilapidated construction needs to be revamped. Trucks are required for supplies of food, water, blankets, medicine to these shelters. Storage facility for water and medicine are required.	Storage facilities at ward level for food, water and medicine. Vehicles that are feasible to operate in view of the cyclone (on road/air-lift) are required as ambulance service in case of emergencies beyond preparation level.	
Supplies	Food, Water, Medicine, Blankets etc.	Food, Water, Medicine, Blankets etc.	
MITIGATION	GVMC being located (1) at district headquarters, (2) cyclone prone and (3) well connected to surrounding vulnerable places needs a station for Police or Special Battalions trained at NDRF. The District Revenue authority should establish the battalion in close coordination with District Police and Fire Department under its control and operation of this DDRF.		

FLOODS	Preparedness	Response	Recovery
<p>General: The city of Visakhapatnam is bestowed with number of natural drains that act as storm water drains during excess rainfall. The natural drains are linked up with surface drainage water wherever UG drains were not constructed. Often these drains are encroached upon by neighbouring settlements. The low lying areas along these drains are also occupied by various constructions including squatter settlements. The topographical nature of Visakhapatnam with undulating terrain of hills and basins form many low lying areas that attract surface runoff during excess rainfall.</p>			
Agency Primary Secondary	GVMC: Engineering Department of GVMC	Various DRF personnel that includes CDO and Fire Dept. Of GVMC.	Along with supervisory directions and operations by various response forces and GVMC engineers the problems in the area are set right. Repair works of damaged pipelines both UG drainage and water supply, desiltation of storm water drains.

Early Warning System (Organisation Link)	With past record available with GVMC the administration should inform vulnerable people in low lying areas through ward members. Irrigation Department should convey information well in advance for any release of water from upper sources of reservoirs.		
Action Main Plan Alternate Activation De-activation	Engineering Department of GVMC should review the UG and storm water drainage of the city and make necessary repair works well in advance before monsoon duration. Blockages that arise due to dumping of garbage in open drains and uncontrolled grease and solid wastes into UG drainage needs to be cleared. Manholes need to be checked and open potholes to be covered. Water supply pipelines to be reviewed for any leakages that could cause percolation of drain water especially during floods. Evacuation of people from low lying areas along the storm water drains and low lying areas.	Floods in Visakhapatnam are relatively low intensity. However, personnel should make field trips in flooded areas to look for options to drain off flood water. UG drainage should be checked for unwarranted mix of storm water into UG drainages causing burst of UG system. Supply of municipal water should be regulated during floods with necessary precautionary measure of testing water quality.	Sector and inter-sector assessment on the impact of the disaster is made in detail by respective organizations. After-Action-Reports are made by involving field experts. Necessary short-medium and long term actions are taken up.
Resources	Financial resources to complete repair works. Contractors	Main and alternate plans with line of control and unity of	Secondary data from the periodical studies conducted by various

	and other private parties to undertake the work.	command manuals. To check chaos and to perform smoothly.	organization like NIO, AU, GITAM etc. And primary findings during response operations.
Personnel	Staff of GVMC from Engineering Department.		Researchers, Field officers and personnel and community reviews and meetings after the disaster.
Equipment	Construction equipment.	Storage facilities at ward level for food, water and medicine.	
Supplies	Food, Water, Medicine, Blankets etc.	Food, Water, Medicine, Blankets etc.	

TSUNAMI / STORM SURGE	Preparedness	Response	Recovery
<p>General: Tsunamis that are triggered by earthquakes measuring more than 7.0 in Richter scale. Visakhapatnam is 215 km off the subduction zone at Port Blair. The coast is far from subduction zone, and most of the energy released after the quake would be absorbed by the water bodies and the earth crust before it reaches here. Further, The offshore bathymetry or slope of Visakhapatnam coast is steep and is practically resistant to storm surge created by super cyclone intensity. However, offshore activities of construction of jetties and other activities could change the bathymetry. Periodical studies are required on the changes of bathymetry along the coast to carry out regular dredging to make the coast resistant to tsunami and storm surge.</p>			
Agency Primary Secondary	INCOIS GVMC		Along with supervisory directions and operations by various response forces Community participation has a great deal to involve as they are very much aware of the problems in their area and hence better immediate local and popular solutions can be made till longer mitigation measures are adopted.
Early Warning System (Organisation Link)	INCOIS telecasts the threat of tsunami or storm surge during cyclones. GVMC should alert the fisher folk and all the vulnerable groups along the coast line.		

Action Main Plan Alternate Activation De-activation	<p>The vulnerable settlements are evacuated and situated in higher altitudes. The city has the advantage eastern ghats that can provide for such rehabilitation areas.</p>		<p>Sector and inter-sector assessment on the impact of the disaster is made in detail by respective organizations. After-Action-Reports are made by involving field experts. Necessary short-medium and long term actions are taken up.</p> <p>Especially in restoration of transport network, power and water supply, procuring of food supplies.</p>
Resources			<p>Secondary data from the periodical studies conducted by various organization and institutes along with primary findings during response operations.</p>
Personnel	<p>DDRF, Revenue, Police, APSRTC, Infrastructure personnel, APEDCL for Electricity, BSNL and Private operators for communication, GVMC for Water supply, roads and drainage.</p>	<p>All the DRFs, VOs, 108 service (ambulance) staff with community support.</p>	<p>Researchers, Field officers and personnel and community reviews and meetings after the disaster.</p>
Equipment	<p>Buses are required to evacuate. Temporary Shelter materials are required to construct in identified upper levels of hills Trucks are required for supplies of food, water, blankets, medicine to these shelters. Storage facility for water and medicine are required.</p>	<p>Storage facilities at the rehabilitation areas at higher level are required for food, water and medicine. Vehicles that are feasible to operate in view of the tsunami (on road/air-lift) are required as supply or ambulance service in case of emergencies.</p>	
Supplies	<p>Food, Water, Medicine, Blankets etc.</p>		

EARTHQUAKE	Preparedness	Response	Recovery
<p>General: Tremors of low to moderate intensity (3.0 to 5.5) are recurrent over the last century in and around coastal and shelf regions of Visakhapatnam. There is presence of land-ocean tectonic lineaments that cause tremors. Two land lineaments NW-SE and E-W traversing across Visakhapatnam district at 17O 45'N and extending into Bay of Bengal. Kandivalasa river fault is another aspect for tremors felt at Vizianagaram which is around 50 KM from Visakhapatnam. Visakhapatnam is relatively low in intensity of seismicity which is in Zone-II. However, measures needs to be taken to adapt the structures for any eventuality.</p>			
<p>MITIGATION GVMC: Town planning department needs to stringently regulate the building and construction norms to satisfy building standards to withstand the intensities that arise in Visakhapatnam region.</p>			

LANDSLIDES	Preparedness	Response	Recovery
<p>General: Due to abundant hill slopes in the city that lay vacant with inaction of concerned authorities in regulating their jurisdiction has lead to encroachments. The haphazard growth pattern that is a common feature in Visakhapatnam needs to be regulated. The settlements pose a threat during heavy rainfall in monsoon. The hill slopes are precarious with possibility of landslide.</p>			
<p>MITIGATION GVMC: Town planning department needs to stringently regulate the building norms to restrict on hill slopes.</p>			

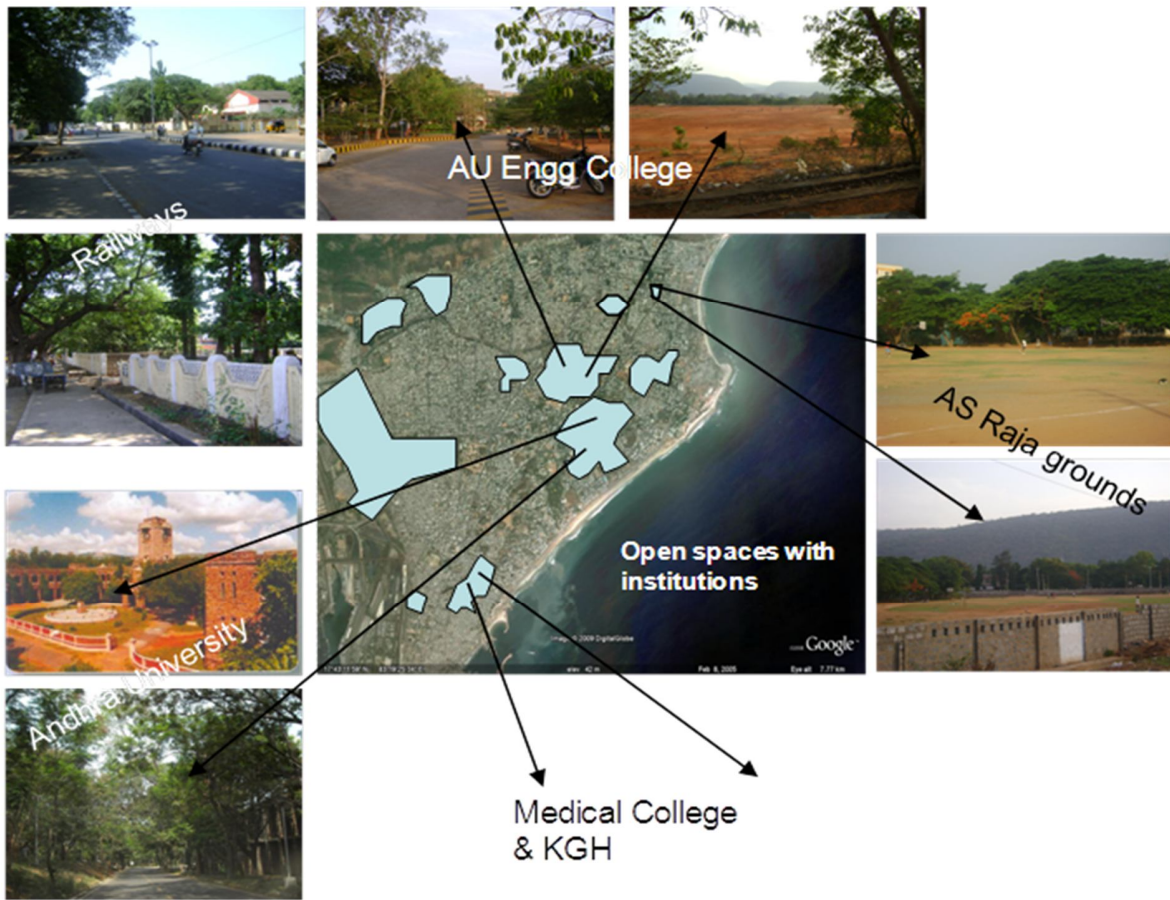


Figure 5-7: Some of the open spaces available near the coast line of GVMC

Disaster Response Plan – Nine Core Elements:

The State Disaster Response Plan is based on the following key elements that are instrumental in making the response plan fail-proof. Activation mechanism, Levels of disasters, Response management arrangements, Disaster support functions (DSF), Emergency operations center (EOC), Incident Command System (ICS), Disaster response structure Delegation of powers Personnel safety,

Division of work among the GVMC Functionaries:

Engineering personnel:

The engineering personnel of all cadres shall react to the emergency situation in their respective responsible duties. Some preventive measures and immediate actions on attending the emergency works will be very helpful and useful in preventing the preventing the damages to minimum level.

The city is facing are recurring problem of inundation in some low lying areas during rains. The following are the inundation prone areas in the city.

Table 5-2: Inundation prone areas in the city

S No.	Zone No.	Ward No.	Names of the localities
1.	Zone-1	2	Suryateja Nagar
		4	Sampat Nagar
2.	Zone-2	7	M.V.P colony-sectors 10&11
		10	K.R.M. Colony
3.	Zone-3	26	Velamapeta, Prasad gardens, Panda veedhi, poorna Market area, Ramakrishna Veedhi & around Muicipal stadium
		29	Bhupeshnager, Lakshmidvipeta, Ambedkar colony & Netajinagar
4.	Zone-4	31 & 33	Railway New colony
		43	Dayananda Nagar
		44	Gnanapuram
		46	Mulagada
5.	Zone5	52	H.B Colony
		65	Sheelanager Area
6.	Zone-6	67	Viman Nagar

The following emergency steps are to be taken by various wings of engineering department of GVMC. The responsible departments are indicated below against each.

1. Dewatering from low level inundated orders with the help of suitable dewatering pumps.

Action: Engineering Department – Water Supply

B) The duties and responsibilities among and the engineering department are allocated as below.

PUBLIC WORKS WING:

a) Asst.Exe Engineer/Asst. Engineer (Public works):

He/She should rush to the location of inundation prone areas in his jurisdiction immediately. He/She need not wait for any instructions from his superiors to attend the situation. He/She should report the situation of water stagnations or inundations to the Dy.E.E and the E.E. He/She should report about the needs of work or assistance from engineering wing of GVMC. He/She should prepare a culverts etc., some

contractors shall be identified in advance and they shall be kept ready to attend any emergency work during rainy season without any delay.

b) Deputy Executive Engineer (Public works):

He should co-ordinate Vizag P.H department in connection with blockages of drains, culverts, streams and report to the E.E concerned. HE should be always available to the E.E concerned to pass on the necessary instructions to the A.EEs/A.Es during the entire emergency period.

c) Executive Engineer (Public works):

He should monitor the entire situation in his zone. He should report the situation to the S.E (w) and C.E. He should co-ordinate with the Vizag respective AM & HO, ACP, EE (WS-M). He shall instruct his AEEs/AEs and Deputy EEs to arrange the dewatering pumps, for deployment of machinery or me depends on the actual need. The advance action taken for the works having financial involvement shall be got ratified by the Commissioner within 3 days.

WATER SUPPLY MAINTENANCE WING:

a) Ass.Ex.Engineer/Asst. Engineer (Water Supply Maintenance):

He should rush to the low lying areas whenever rainfall occurs and study situation of inundation or water stagnation. He shall take every step to close the HSCs and Public Taps those are prone to submerge during inundation time. Entry of stagnated water, over flown drain water in to the water supply mains shall be averted by taking advance steps. He shall prepare a contingent plan for every location and submit to the Se (WS&S) in advance and get it approved. Residual chlorine at all tail ends of pipe line shall be maintained and go tested during every supply period and report to the higher authorities. All the scour valves shall be kept intact.

b) Deputy Executive Engineer (Water Supply Maintenance):

He should co-ordinate with concerned EE (public Works) and concerned AM & HO. Water Supply distribution hours shall be monitored properly depends up on the ground situation in inundation prone areas. Reservoirs, so as to maintain residual chlorine at the tail ends. He should take reports from the concerned AEE/AE and act according to the need.

c) Executives Engineer (Water Supply Maintenance):

He should monitor the entire water supply to the inundation prone areas duly synchronizing the regular supplies to the normal sufficient buffer stocks of chlorine cylinders, bleaching powder etc. rehabilitation

centers through water tankers when ever water supply through pipe line is not feasible due to various reasons lie possible contamination, failure in water supply due to non-supply of power, insufficient source etc.

He is responsible to get electrical power supply uninterruptedly from APEPDC Ltd. He should be in touch with the engineers of APEPDC Ltd.

STREET LIGHTING WING:

Executive Engineer (Electrical):

He should take every necessary action to restore the damaged street lights during heavy rains and cyclones. He should prepare a contingent plan for entire city to maintain the street lights properly during emergency situation and got it approved by the SE (W&QC). He should instruct the street lights maintenance contractors to maintain buffer stocks of all types of materials like lamps, chokes, starters, fixtures, brackets, service wire, switch controls etc. He should ensure the availability of buffer stocks with the contractors to meet the emergency situation. They shall visit the every nook and coner in their jurisdiction and report to the E.E (Ele.). All the steps for the every nook and corner in their jurisdiction and report to the E.E.(Ele.). All the steps for making temporary lighting are to be taken at the rehabilitation centers where they are needed.

UNDER GROUND DRAINAGE WING:

a) Executive Engineer UGD) :

He should take immediate all steps to restore the trenches dug for lying of UGD pipelines and construct of man holes to normal. The settled down portion of all the trenches due to the rains shall be filled up back with the suitable earth or filling materials immediately. A contingent plan is to be prepared to attend the above type emergency works so as to make the roads traffic worthy and to avert the inconvenient to the road commuters. The E.E (UGD) is totally responsible to prepare the contingent plan and to implement properly in appropriate time. Care shall also be taken close the mouths of all the newly laid UGD pipes at the end of every day with a tight cover so as to prevent the entry of rainwater carrying silt and mud in to the pipes. The E.E (UGD) is to extract the work from all his sub-ordinate staff.

WATER SUPPLY PROJECTS WING:

a) Executives Engineer (P.D-1) & Executive Engineer-2 (W.S.P):

He should take immediate all steps to restore the trenches dug for laying of water supply pipelines under projects to normal. The settled down portion of all the trenches due to the rains shall be filled up back with the suitable earth or filling materials immediately. A contingent plan is to be prepared to avert the inconvenience to the road commuters. The E.E (P.D-1) & E.E-2(W.S-P) are totally responsible to prepare the contingent plan and to implement properly in appropriate time. Care shall also be taken close the mouths of all the newly laid water supply pipes at the end of every day with a tight cover so as to prevent the entry of rain water carrying silt and mud in to the pipes. The E.E (P.D-1) & E.E-2(W.S-P) are to extract the work from all their respective sub-ordinate staff.

Health Section:

Pre Disaster Phase:

Prepare a list of precautions to be taken by the public before, during and after the disaster.

Keep observe what are the normal diseases situated in the area and take precaution to prevent them.

CMO to prepare a list of precautions to be taken by the public before, during and after the disaster and circulate in vulnerable areas to ensure that they maintain normal health under adverse conditions.

Plan methods for quick transportation of seriously injured and sick persons from disaster areas to specialty hospitals for effective treatment.

During Disasters:

After receiving the first flood/cyclone warning, CMO in association with District/Division Medical Officers to plan and keep in readiness mobile hospitals, emergency field medical teams, Para medical teams, surgery facilities, first aid kits, drugs, disinfectants, vaccines, inoculations and chlorination equipment etc., with sufficient equipments and medicines at Municipal Hospitals and PHCs.

Ensure availability of adequate doctors, trained personnel, medical stores and equipment for movement at short notice to vulnerable areas. Make provision of sufficient number of ambulances and transport vehicles. Plan additional space for extra beds in hospitals/PHCs.

Plan for establishment of field medical centers, mobile clinics, emergency operation centers and trauma counseling centers at vulnerable areas and in relief shelter on short notice.

Plan for stocking sufficient quantities of blood of different groups at nearby Blood banks. Update the list of Govt./private doctors and supporting staff whose services can be utilized during emergencies. Instruct them to be in readiness to move at short notice.

Keep communal diseases record and conduct medical camps in flood affected areas. Deploy the medical staff from the unaffected areas for medical assistance in affected areas.

Duties of persons in Rehabilitation Centers:

List out the Rehabilitated people time to time.

Information pass on to Control Room for No. of people joint in the Rehabilitation Centers.

Arrange the food, water and accommodation to Rehabilitated people.

Sanitation to the Rehabilitation Centers and need for the additional requirement of temporary toilets.

Arrange the sufficient lighting in Rehabilitation centers.

General Instructions:

(1) The mobile phones of all the officers and staff be kept always "on" and the information shall be transmitted through them to save the delay.

(2) Any action taken in advance with financial involvement shall be got rectified with in 3 day within 3 days from the commissioner

(3) These are standing orders to all the officers and staff and are subject to modification from time to time.

(4) Lapses found in attending from the duties of above order shall be viewed seriously and necessary disciplinary action will be initiated against the individuals who failed to attend. These orders are applicable for any natural calamities during all the periods.

(5) Sanction of leaves is restricted till the effect of the cyclone recedes. Leave for any emergency shall be got sanctioned from the commissioner.

There is possibility of inundation of low laying areas and therefore there is every need to take precautionary steps to minimize loss of properties of both Public & Private and also to human life during and after the heavy rains/ natural calamities

The probable areas of inundation in the city are identified and the following officers are kept as nodal officers for co-coordinating and attending emergency duties during heavy rains / Natural calamities as detailed below.

Table 5-3: list of Nodal Officers to inundation prone areas

S No	Zone No	Ward No	Names of localities	Nodal Officer
1.	Zone-1	2	Suryateja Nagar	SE(W-1)
		4	Sampatnagar	
2.	Zone-2	7	M.V.P Colony – Sectors 10 & 11	Additional Commissioner(Project)
		10	K.R.M.Colony	
3.	Zone-3	26	Velampeta, Prasad Gradens, panda Veedhi, Poorna Market area Ramakrishna Veedhi & around Municipal Stadium	Additional Commissioner (Finance)
		29	Bhupeshnagar, Lakshmidivi peta, Ambedkar Colony & Netajinagar	
4.	Zone-4	31 & 33	Railway New Colony	Se(WSM)
		43	Dayanandanagar	
		44	Gnanapuram	
		46	Mulagada	
5.	Zone-5	52	H.B.Colony	Additional Commissioner (General)
		65	Sheelanagar Area	
6.	Zone-6	67	Vimannagar	SE-2(w)

The emergency duties are to be attended by the Engineering, Health and Town Planning wings of the GVMC with coordination among all the wings. The duties and responsibilities of all the Officers / Staff pertaining to each wing in the GVMC were already communicated for attending the emergencies duties without waiting for any instructions from the higher authorities. The personal of every department in all cadres shall react to the emergencies situations in their respective jurisdictions in time of natural calamities.

The Additional Commissioners & Superintending Engineers shall therefore monitor with the Zonal Commissioner of the respective zone and also with the department officers of Engineering, Public Health & Town Planning in that particular zone and to issue instructions from time to time in case of emergencies till the emergency situation eases out.

5.3. Shelter Management:

1. Departments Women and Child welfare, Revenue, Civil supplies and Municipal Corporation must play a major role in Shelter management.
2. Adequate numbers of buildings or open space shall be identified where relief camps can be set up during emergency and updated in the plan.
3. The relief camps should provide with adequate provision of drinking water and bathing, sanitation and essential health-care facilities.
4. Adequate securing arrangements shall be made by local police.
5. Adequate lighting arrangements shall be made in the camp area including at water points, toilets and other common areas by the Municipal Engineering Department.
6. Explore the possibility of provision of food through community kitchens, provision of education through the restoration of schools and anganwadis in affected areas.

Co-ordination meeting with City Disaster Management

There shall be a co-ordination committee consisting of Commissioner, Addl. Commissioners, Chief Engineer and Super tending Engineers. The committee shall meet twice in a year and discuss on the Preparedness for any contingency.

Ward Level Disaster Management Committee:

14 Ward level Disaster Management Committees are being formed in each ward with the following objectives:

- To monitor and manage the volunteers activated for disaster preparedness.
- To update the database or information of their respective ward.
- To refer the timely guidance to the ward level disaster management club.
- To coordinate with govt. functionaries with regard to vulnerability and hazard risk reduction.

Ward disaster Response groups

A Quick Response Team (QRTs) or ward disaster Response groups were formed in 14 vulnerable wards they will be trained with first aid and search & rescue skills. Also there will be a back up force which will be assisting in emergencies. The backup force will be useful during a major disaster where search and rescue operation will continue for 24 hours.

5.4. Structural Mitigation Measures:

Mitigation measures are very important phase of disaster management. They will help to reduce the loss and increase the capacity of people in managing the disasters. Mitigation measures range from community awareness campaigns to increase knowledge of how to deal with disaster situations, land use planning and design decisions to stop development which may be dangerous in the event of a disaster, to capital works such as levee bank construction to reduce the impacts of flooding. All mitigation measures are important as they can not only reduce the cost of disasters to the community, but they help save lives.

Prevention and mitigation plans will be evolved for vulnerable areas to reduce the impact of disasters. Extent of prevention and mitigation strategies will vary depending on the hazard and degree of vulnerability of specific areas. These strategies will be concentrated more towards the social and economically backward communities.

The key tasks in risk reduction are:

Identify areas vulnerable to specific disasters

Prevent development/construction along the flood zones/hazard locations

Avoid habitation in hazardous areas

Develop structures resistant to the onslaughts of hazards

Promote and construct flood resistant housing

Practicing the beach nourishment program and construct barriers to prevent occupation of the beach.

Develop the ability to rapidly evacuate hazardous areas or to shift residents to hazardous resistant structures.

Reduce or eliminate natural hazards thorough technological intervention

5.5.Mitigation strategy:

There is a definite frequency and pattern in the occurrence of hazards such as cyclones and floods. Technological advances and increased understanding of natural phenomenon is making it possible to combat the disasters scientifically and efficiently. Conventional knowledge followed by the local communities in cyclone warning and flood level predictions will be integrated with the scientific methods being put in place in the state. Strategies to mitigate natural disasters will be achieved with the backing and support of all stakeholders such as the government machinery, research institutions, non-government agencies and the community. Imperative steps of having built-in institutional arrangements and legislative backing along with power delegation will be integral in the development of fail-proof mitigation strategy in the state.

The main steps in mitigation strategy include:

Risk assessment and vulnerability analysis.

Applied research and technology transfer.

Public awareness and training.

Promoting institutional mechanisms.

Incentives and resources for mitigation.

Main streaming land use planning and regulations to disaster management.

Monitoring mechanisms set up by the early warning centers etc. do not look at historical trends.

Mitigation strategies evolved based on previous disasters' data analysis are crucial in regions/areas where monitoring mechanisms are poorly developed. Reliable feedback information on warning systems, public reception, response and susceptibility of the warning systems to damage will be collected to strengthen the mitigation strategy at the state level.

In this regard, there is a great need to Upgrade or set up observation equipment and networks.

Monitor trends in the loss of property due to hazards.

Strengthen quality of forecasts and warning systems.

Disseminate warnings quickly through different means.

Undertake disaster simulation exercises by tying up with research/technology institutions.

With the capability Space technologies such as remote sensing, satellite communication and Geo-Position System (GPS) have wider use in early warning and monitoring mechanisms of different types of disasters. Remote sensing is extensively used in tracking and monitoring the progress of hazards especially cyclones and floods. National Remote Sensing Agency (NRSA), National Geographical Research Institute (NGRI) and Indian Institute of Chemical Technology (IICT) located in the state will be utilized in augmenting the emergency monitoring mechanisms in the state. Technological tie up with these institutes in mitigating disasters in the state will be initiated as a priority. Similarly, Andhra Pradesh State Remote Sensing Center (APSRAC), a premier remote sensing center located in Hyderabad has state-of-art technology and capacity in identifying areas of potential exposure to hazards. Concerted efforts in building strong network of these institutes will be undertaken; such a network of institutions will bode well in mitigating natural as well as human-caused disasters in the state. Apart from monitoring and observations through the use of GPS and remote sensing, applied research on formulating various mitigation strategies specific to a district or a local area, will be carried out through educational institutions or universities located in the region. Universities and technical educational institutions will be encouraged to include disaster mitigation as a part of graduate training programmes. The contents of such a course can be location-specific to the intuitions. For example, institutions located in areas of high seismic risk (like the Deccan plateau) can have earthquake mitigation as specialization where as flood-prone areas (coastal districts) can have flood mitigation topics. Similarly, Acharya N.G.Ranga Agriculture University and its research centers will supplement existing drought mitigation efforts with undertaking specialized drought mitigation courses. Engineering and architectural institutions will be encouraged to introduce disaster management courses as part of structural engineering and civil engineering curriculum.

5.6. Action Plan

- City development plan needs to integrate disaster responsiveness strategies to make the future city resilient. Community needs should be elaborately addressed. The mitigation and adaptation measures need to be phased appropriately and integrated into city's short, medium and long term plans.
- Cyclones: Loss to grids especially power and communication is high along with loss of nature is high. Stringent enforcement of building byelaws for various types of buildings is very much essential. Conversion of overhead power and communication lines to underground is necessary at least in phased manner. Restoration of wind breakers along the coastline with casurina that existed in past needs to be taken up at the earliest.

- Tsunami and Storm surge: Though the incidence of tsunami rare occurrence the city needs to be vigilant for worst scenarios. The presence of hills is an advantage to the in case of the incidence. Proper access roads needs to be identified or built and shelters provided at these locations. They should be located above 8M from mean sea level. Regular monitoring of erosion and deposition of sand should be carried out for proper dredging to reduce surges.
- Flood: The presence of numerous natural drains needs to be protected as they are formed naturally over a period of time. The developmental plans should earmark these reserved for parks and such public utility and check encroachments. The storm water drains needs periodical maintenance to ensure free flow of water without stagnation. Quality solid waste management and sanitation network can further improve storm water drainage system.
- Epidemics: Health and hygiene is a concern especially after a disaster. Slum areas are the most vulnerable and measures should be taken along with awareness campaigns for the dwellers. Water logged areas especially during rainy season should be properly linked with storm water drainage network.
- Climate Change: Scientific approach of land use and developmental plans taking into consideration geological, hydrological and flora and fauna characteristics would ensure address climate change aspects. Incentives and disincentives for climate proofing buildings and infrastrucutur through tax-subsidies and penalties should be implemented.
- ICT: City's information and data management is the key for good governance. Tools like GIS, SCADA etc. should be used in day-to-day administration. The data would also be useful during disasters in preparedness, response and recovery.

5.7. Community level training and public awareness activities:

The impact of disasters is heavy on the community; economic impact and infrastructural damage further cripples marooned families. A better prepared community through awareness on the degrees of impact; do's and don'ts of specific emergencies that are known to impact the community; and leadership that take charge during the emergency will lead to lower damages.

Community based organizations as well as NGO's play significant role in preparing the community. In order to strengthen the community in preparedness, following general guidelines will be followed:

Developing programs that include awareness, training manuals in Telugu outlining the Do's and don'ts of all-hazards. The programs shall also include evaluation and monitoring mechanisms that will help in revision and improvement of training and awareness measures.

Encouraging community drama enacting, organizing skits and making disaster management as central to village/community level social gatherings.

Developing capacity building and technical training programs targeted at state and local elected officials to encourage the development of legislation and administrative policies that support hazard mitigation.

Promoting strategies encouraging public-private partnerships, to educate employees and customers about mitigation.

Developing training programs for teachers to ensure that they understand disasters, likely effects and the precautions to be taken.

Organizing disaster simulations within schools; organize mock drills in evacuation; review with staff and students emergency procedures in the event of disasters/emergencies.

The community will be helped to determine ways to avoid or reduce the impact of the next disasters. Local administration shall promote following suggestions of mitigation efforts to encourage local communities engaged in mitigation and relief efforts either at individual/household or community level to avoid loss of life, reduce damage to property and crops.

Assist in disposal of properties located in disaster-prone areas e.g., flooding areas, landslides prone areas etc. and purchase of safe sites in return.

Integrate traditional knowledge and guidance of village elders in rebuilding or retrofitting houses that can sustain earthquake and high winds.

Ensure availability of required material (for retrofitting etc.) through local government, hardware dealer or private building contractors.

Encourage households to undertake not only corrective repairs, but also preventive repairs; explain options for flood-proofing houses, like elevation, drainage etc.

Encourage compliance in construction with local building codes that pertain to seismic, flood, fire and wind hazards. Encourage compliance by the contractors and inspection by local authorities. Include local building regulations as part of training and awareness efforts designed for community to encourage compliance.

Determine ways to prevent hazards such as securing light fixtures, moving heavy or breakable objects to low shelves, etc.

Make sure documents such as local disaster management plans, zoning and building norms, DDMPs are available to local communities.

5.8. Insurance:

Insurance is a mechanism for spreading the cost of losses over time that are known to impact the community. Introduction of disaster linked insurance will be actively pursued and insurance cover will be made available not just for life but also for household goods, livestock, structures and crops. Apathbandhu scheme currently in operation will be strengthened and expanded to include fishermen, landless laborers, hutment residents who get affected during disasters. Since insurance premiums are based on the location of a structure within the disaster-prone areas; and are determined essentially on the extent of risks, different slab rates may be developed where higher rates may be applied to structures with high risk.

Strategies for introducing disaster insurance for structures will include:

More stringent enforcement by lenders of the mandatory purchase/construction requirements.

Increasing public awareness of the hazard.

Imposing risk disclosure requirement on real estate agents.

Offering special insurance converge and policy riders.

Maintaining premiums at affordable rates.

5.9. Coastal Mitigation Measures:

Quasi-natural methods such as beach nourishment or artificial sand dune building are used to attempt to restore an eroding beach as well as protect development. However, these methods provide only temporary solutions. Periodic beach nourishing is required to prevent chronic long term erosion caused by the diminishing supply of sediments in the littoral system. Structures like sea walls, bulkheads and revetments protect development, but are not intended to nourish or widen the beach. Erosion can occur in front of them because the natural movement of the shoreline gets affected. Proofing of structures such as breakwaters and jetties, which are designed to protect harbors and navigation channels with sand bypassing system will be required to prevent erosion on the down drift side.

Shelter belt plantations:

As a long-term plan to combat coastal erosion, cyclone and sea level rise and reduce the impact of possible tsunami and cyclone sea surges, greenbelts are viable solution. Shelterbelts or greenbelts are natural plantations that break the wind and wave force; reduce the impact on the shore reducing the coastal erosion. Shelterbelts are also proven barriers in mitigating salt water inundation into horticultural plantations and agricultural fields. In coastal districts, Pandanus, Callophyllum and cashew plantations are common on sand dunes to protect the villages from the sea wind during monsoon. These plantations have

the ability to break the wind force and reduce the intensity. The plantation efforts as wind shelters will be scaled up keeping in view the importance of these plantations along the coastal villages. A staggered plantation with first line of Ipomea and Sinifex (creepers) followed by bushes such as Pongamia and Pandanus and alter tree forms like Callophyllum and Cashew plantation will to be undertaken especially along the coast line of vulnerable villages. Forest department has specific role of undertaking wind break plantations. The entire work of green belt formation will be carried out incrementally by the Forest Department (FD) in association with the community and NGOs specialized in this activity. As action steps, FD will spearhead the exercise of identification of species and plantation areas; quantifying, preparation of saplings in the nursery and distribution; generating awareness about importance of shelterbelts.

Wind breaks and shelter belts:

Creating wind breaks and shelterbelts is a long-term process (at least 5-10 years before the plantations fully establish to offer protection). To meet emergency situations, in addition to shelterbelts, constructing sea walls using local material will mitigate sea surge and cyclonic winds. Villages that are highly vulnerable to frequent sea surges and cyclonic winds will be identified before executing sea wall construction efforts.

5.10. Cyclone mitigation:

Cyclone mitigation and preparedness depend on community's preparedness. Cyclones are natural phenomenon; mitigating cyclone impacts entails preparing to face and minimize the damages when cyclones land fall. An important factor that influences people's attitude to cyclone preparation is the emotion they associate with cyclones. Proactive measures by civil society and other stakeholders will prepare the community and assuage the anxieties experienced by the communities.

Based on the technical knowledge and community volunteering, a community preparedness program (CPP) will be devised. Through the technical expertise accurate information on impending cyclone land fall, accurate path, wind speed etc. will be communicated to vulnerable villages at least 48 hours in advance. Through CPP a mechanism of collecting information from Cyclone Warning Center, Visakhapatnam and IMD, Hyderabad including designated warning signals of approaching cyclones will be developed. Bulletins will be prepared based on the information collected and transmitted to all coastal district administration for necessary action. Evacuation warnings depending on the intensity will also be included in the bulletins. Each vulnerable village will be encouraged to form a team of volunteers headed by a team leader or local CBO or NGO. The bulletins prepared will be transmitted to these teams; the team leaders and volunteer's in turn will relay the information door to door using megaphones, hand sirens and public address system.

5.11. Training of Volunteers:

For maintaining a high level of efficiency the volunteers shall be given training on the Red Cross and Red Crescent movement, cyclone and its behavior, warning signals and their dissemination, evacuation, sheltering, rescue, first aid and relief operation. The first aid volunteers are given first aid training by CPP officers. Training of volunteers could be handled by the trainers trained at Dr. MCR HRD IAP. Traditional cyclone warnings and local villagers wisdom will be included as part of the trainings.

5.12. Public Awareness:

Public awareness is integral and important part of cyclone mitigation and preparedness activities. Keeping this in view, the CPP will implement following public awareness activities in cyclone prone coastal areas:

- Cyclone drills and demonstration
- Film/ Video Shows/folk songs
- Publicity campaign
- Radio and Television
- Posters, leaflets and Booklets
- Staging of street acts/drama

5.13. Requirement of equipment and machinery for disaster management in the district:

Equipment carried by Rescue Party are Iron shod levers of 10 ft long, Heavy Block for Fulcrum, Crowbars, Picks, Shovels (or Phawrahs), half round files, Sledge Hammer, Heavy Axe, Light Axe, Two handled cross-cut saw, Hand Saw, 100 ft. length 3 inch fiber rope, 100 ft. length 5/8" wire rope, 40 ft. length 1 1/2" fiber lashing lines, Chain tackle, Single sheave snatch block, 20 ft. bamboo ladders, Petromax lamp, Torches electric, Hurricane lanterns, Tarpaulin 12' x 12', Box of miscellaneous tools, Set of rope tackle-3 sheaves-2 sheaves, Jack with 5 ton lift, 20 ft. length of fibred ropes 1 1/2", Rubber gloves (pair, tested up to 25000 voltage), 200 ft. length fibred rope 3" or 4" (when needed), Stretcher harness (set), Scaffold poles for sheer legs, Debris baskets, Fireman's axes (with carrying pouches), Short ladder (8 or 10 ft.), Buckets, Tarpaulins or stout canvas sheets 12'x12' (to protect trapped persons from falling debris until released), Leather gloves, First aid pouches, First aid box, Stretchers.

Contents to be part of rescue team bag are Bandages triangular, Canes for tightening improvised tourniquets, Dressing Shells, Dressing First- Aid, Labels, casualty identity (packets of 20), Safety pins (large) Cards of 6, Scissors, Tourniquet.

Earthquake rescue equipments are Concrete cutters, Steel cutters, Wood cutters, Emergency Lights, Hand Held Cutters, Spreaders, Combtools and Mini Cutters, Lifting Kit, Head Torch, Helmet and Search Lights,

Leather and Rubber Hand gloves, Insulated Firemen Axe, Pneumatic Jack with air cylinders with compressor, Breathing apparatus set, Binoculars (2-3 Kms range).

Fire rescue equipments are Proximity suit, Water CO2type, Foam Type, DCP Type, Thermal image camera, High pressure portable pumps with pipes, Ropes (manila), Chargeable Torches, Generators with flood light stand with wire 2.4 Kv, Breathing Apparatus Set.

Flood rescue equipments are bore well camera/under water searching camera, Inflatable Boat with OBM & Without OBM (10 HP), FRP Boats with OBM & without OBM(10 HP), Life Buoys, Life Jackets, Gumboots, Helmets, Stretchers, Safety Goggles, Chain Pulley Block, Global Positioning System, Rope ladders, Diamond Saw Cutter, Search Lights, Hi-Power Torches, Hydraulic or Petrol Driven Wood Cutter, Diving suits with air cylinder, Petrol operated compressor.

6. RECOMMENDATIONS AND CONCLUSION

Disasters both manmade and natural are one of the most challenging problems faced by the city. It is true that we cannot prevent the occurrence of many of the disasters. But by taking appropriate steps, we can definitely reduce their effects. The frequency and the irregularity of the occurrence of these disasters, an attempt to develop capacity to undertake disaster mitigation strategies is very important. The ultimate end of all these strategies should be to reduce the vulnerability of the disasters.

The introduction behind the project is discussed in chapter -1; it includes the brief history of the city and disasters. Here, it includes the scope of the plan, need of the plan; objectives of the plan are explained. The project included the details of the Visakhapatnam city i.e., history of the city, its location, demography profile, literacy details, sex ratio, slum population, topographic details, climate and rainfall profile, details of temperature, wind direction, land use, flora and fauna, agriculture, industrial profile, irrigation etc. these details are used in the preparation of the plan.

The various equipment, organizations, mitigation measures, preparedness plan for the disaster management is included in the plan. So the prepared disaster management plan is very useful for the management of disasters.

Annexure

Annexure-1: Fire Statistics of the city for the December, 2013

Fire Calls:

S No	Name of the Fire Station	No. of Fire Calls Attended				Property		Lives	
		Serious	Medium	Small/Falls	Total	Damaged	Saved	Lost	Saved
1.	Visakhapatnam	1	1	15	17	7615000	1397000	0	0
2.	Marripalem	0	0	3	3	11000	27000	0	0
3.	Anakapalli	0	0	13	13	872000	4278000	0	0
	TOTAL	1	1	31	33	8498000	57202000	0	0

Rescue Calls:

S No.	Name of the Fire Station	No. of Rescue Calls Attended	property		lives	
			Damaged	Saved	Lost	Saved
1.	Visakhapatnam	0	0	0	0	0
2.	Marripalem	0	0	0	0	0
3.	Anakapalli	0	0	0	0	0
	TOTAL	0	0	0	0	0

Lives Lost & Saved:

S No	Name of the Fire Station	During Fire Accidents		During the Rescue/Emergency Calls		Animal/ Birds	
		Lives Lost	Lives Saved	Lives Lost	Lives Saved	Lives Lost	Lives Saved
1.	Visakhapatnam	0	0	0	0	0	0
2.	Marripalem	0	0	0	0	0	0
3.	Anakapalli	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0

Causes of Fire:

S N o	Name of the Fire Station	Cause of Fire											
		Ele. Ori gin	Nak ed Lig ht	Chi mney	Gas coa l Fur nac e	Misc ellan eous	Arso n	Spon tane ous com busti on	Oven stove s open fire	Carel ess Smok ing	Che mical Reac tion	Me cha nic al He at Spa rks	Expl osive s Fire Wor ks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Visakhapatnam	8	0	0	2	1	0	1	1	4	0	0	0
2.	Marripalem	0	0	0	0	0	0	0	2	1	0	0	0
3.	Anakapalli	5	0	0	1	5	0	0	0	2	0	0	0
	TOTAL	13	0	0	3	6	0	1	3	7	0	0	0

Number of Hazardous premises inspected/deficiencies communicated during the month of February, 2014:

S. No	Hazardous premises	Total No. Of Hazardo us Premises in the District	Total No. of Hazardous Premises Inspected in the District during the month	Total No. Of Hazardous premises inspected so for(Up to Jan,13)	Balance of Hazardo us premises to be inspecte d	No. of premises where deficiencies Noticed in the district during the month	No. of premises where communicatio n made to the licensing Authority during the month
1	2	3	4	5	6	7	8
1	Multi –Storied Buildings	204	10	73	121	0	0
2	Cinema Theatres	78	01	10	67	0	0

3	Multiplexes	04	0	04	0	0	0
4	Schools	882	09	540	333	0	0
5	Colleges	61	00	20	41	0	0
6	Hotels	17	01	00	16	0	0
7	Godowns	19	0	01	18	0	0
8	Temporary Structures/Exhibitions	01	0	01	0	0	0
9	Function Halls	81	0	0	81	0	0
10	Small Scale Industries	334	0	09	325	0	0
11	Petroleum Retail outlets	190	00	61	129	0	0
1	2	3	4	5	6	7	8
12	Medium and Large Scale Industries	51	00	05	46	0	0
13	L.P.G. Godowns	76	0	07	69	0	0
14	Cold Storages	30	0	08	22	0	0
15	Whole Sale Shops	0	0	0	0	0	0
16	Timber Depots	120	0	0	120	0	0
17	Fire Cracker Storage	44	00	44	00	0	0
18	Pharmaceutical Industries	67	05	62	0	05	05
19	Chemical Industries (Rubber & Plastic)	0	0	0	0	0	0
20	Commercial Showrooms	04	0	01	03	0	0
21	Jute Mills	01	0	01	0	0	0
22	Bulk Storages of Electronic & Electrical Equipment	01	0	0	01	0	0

23	Hospital and Nursing Homes below 15 meters height	55	0	04	51	0	0
24	Hospital and Nursing Homes above 15 meters. height and below 30 meters. height	28	0	05	23	0	0
Grand Total		2348	26	856	1466	5	5

Progressive Total of Fire Calls for the month of December, 2013:

Description	NO.OF FIRE CALLS ATTENDED					PROPERTY		Lives	
	Seri ous	Mediu m	Small	Rescu e & Emerg ency	Total	Damaged	Saved	Lost	Saved
1	2	3	4	5	6	7	8	9	10
Total for this month 01/2014	3	8	93	1	104	16116700	35034800	0	0
1	2	3	4	5	6	7	8	9	10
Previous Total (01.04.13 to 31.01.2014)	26	64	626	29	743	770390007	7036715508	16	48
Progressive Total	29	72	719	30	847	786506707	7071750308	16	48

Annexure- 2: Contact Details of the ULBs

Table 1: City government officials of the ULBs

S No.	Designation	Office address & Phone No.	Residence No.	Cell No.
1.	Municipal Commissioner	Tenneti Bhavan, Ram Nagar 2746300 2568545(F)	2562278	9010715555
2.	ADC (Projects)	Tenneti Bhavan, Ram Nagar 2746306		9490447044
3.	ADC (General)	2746320		9948667895
4.	ADC (Education)			9640472999
5.	Chief Officer- Fire Brigade			9912349484
6.	Chief Town Planning Officer	2706169		9849901475
7.	Chief Engineer			9112255228
8.	Superintending Engineer (Projects)			
9.	Superintending Engineer (Electricity)	2562258	2550616	9440812487
10.	Executive Engineer (Projects)			9848497464

11.	Executive Engineer			9912349473
12.	Chief Medical Officer			
13.	VUDA Secretary	2754189	2562278	9866076930
14.	Daffadhar to commissioner			9848388883
15.	Daffadhar to commissioner			9848308831
16.	PA to commissioner			9848388884
17.	CC to commissioner			9848882586

Table 2: Fire Brigade

Designation	Office No.	Office Fax No.	Residence Phone No.
District Fire Officer	2568905	2561461	9949991050
Asst. District Fire Officer	2568905		9949991051
Fire Officer (GVMC)			9912349484

Table 3: Visakhapatnam urban Development Authority (VUDA) Officials

Designation	Contact No.
Vice- Chairman	
Secretary	9866076930
Supertending Engineer	9866076917
Chief Urban Planner	9866076913
Chief Accounts Officer	9866076911
Divisional Forest Officer	9866076914
Estate Officer	7702333569
Public Relations Officer	9866076932

Table 4: Doordarshan (HPT) & Aakashvani

Designation	Office No.	Office Fax No.	Residence No.	Address
Deputy Director	2549109	2010480	2700557	All India Radio Campus, VSP

Table 5: Forest Department at the circle level

Designation	Office Phone No.	Office Fax No.	Residence No.
Conservator of Forest(CF)	2563001	2569923	2754697
DFO(T)	2563784	2569923	
Forest Range Officer	9440810194		9440810194

Table 6: District Officials

Designation	Office Phone	Residence Phone	Email
Collector	2526999	2754106	collector_vsk@ap.gov.in , collectorpeshivizag@gmail.com
Joint Collector	2565252	2562565	jc_vsk@ap.gov.in
Superintendent of Police	2551104	9440796000	
D.I.G./I.G./ Additional D.G. of Police	2754535		

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