

NIDM

# **Gujarat**

*National Disaster Risk Reduction Portal*



Map of Gujarat State<sup>1</sup>

# **1. STATE PROFILE**

## **1.1 Area<sup>2</sup>**

On May 1, 1960, Gujarat was created out of 17 northern districts of the former state of Bombay. The Gujarat state is located on the western coast of India, has the longest coastline of 1,600 Km. The state is bounded by the Arabian Sea to the west and south west and by Pakistan in the North. It has States of Rajasthan and Madhya Pradesh towards the north east and east, Maharashtra and the Union Territories of Daman, Diu and Nagar Haveli, towards the south. The state has diverse climatic conditions with mild and pleasant winters and hot and dry summers and heavy monsoon. Gandhinagar, the capital city of Gujarat is located close to Amdavad (Ahmedabad), the commercial capital. Ahmedabad is the most populated District in the State, with 7.20 million people.

## **1.2 Administration <sup>2</sup>**

The state currently has 26 districts (226 talukas, 18,618 villages, 242 towns).

### **Gujarat Fact File<sup>2</sup>**

<b>Area</b>	<b>1,96,024 sq km</b>
<b>Capital</b>	Gandhinagar
<b>Principal Language</b>	Gujarati
<b>Other Languages</b>	English, Hindi and other Indian languages
<b>Rainfall</b>	93.2 cm
<b>Temperature</b>	<b>Summer:</b> min 25 degrees to 45 dig's <b>Winter:</b> min 15 degrees to max 35 dig's
<b>Season</b>	November to February
<b>Eco System</b>	Ranges from deserts, scrublands, grasslands, deciduous forests, and wetlands to mangroves, coral reefs, estuaries, and gulfs.

## **1.3 Topography/Physiography <sup>3</sup>**

- Situated on the west coast of India.
- Total geographical area 1, 96,000 sq.kms.
- Coastal length over 1600 kms. One third of the coastal length of India.
- Cultivable area 1, 24,000 sq.km. – Two third of total area of the State.
- 17 river basins in Gujarat main land, 71 river basins in Saurashtra region and 97 river basins in Kachchh region

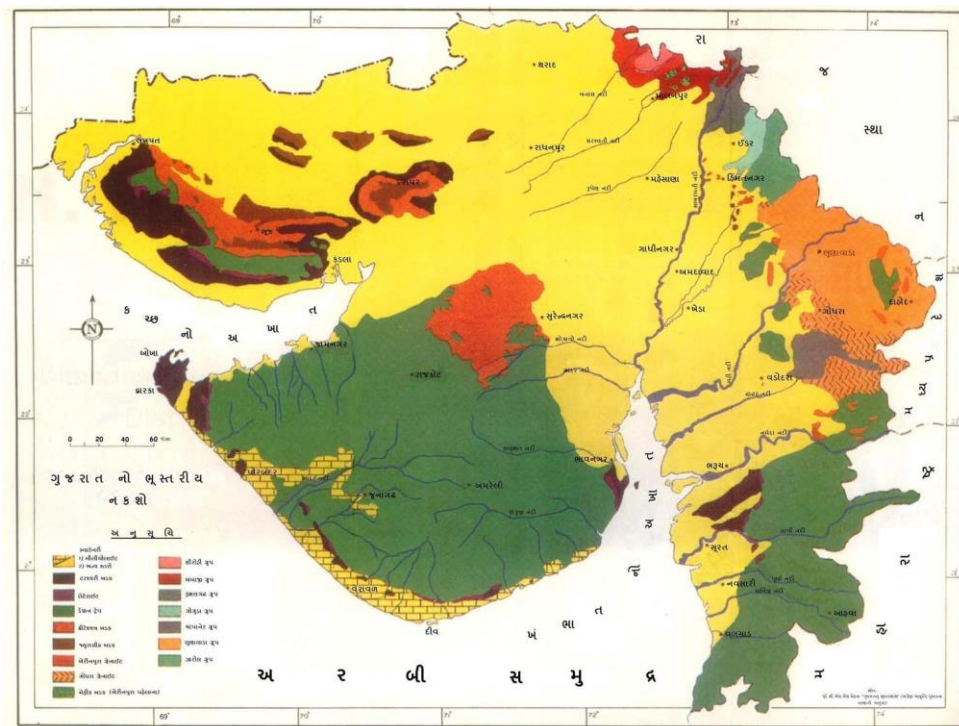
## 1.4 Geology<sup>4</sup>

The state of Gujarat comprises an area of approximately 1,96,000 sq.km and is enclosed within the North Latitude 20°10' to 24° 50' and East Longitude 68° 40' to 74° 40'. Geologically Gujarat provides a wide spectrum of rock types of different ages. Whereas the Aravallies in the NE is as old as 2500 million years, the unconsolidated alluvium and beach material in its Central and Western parts date back to a few thousand years only. All the important litho logical types Igneous, Sedimentary and Metamorphic occur within the state.

Physiographically the state of Gujarat comprises the following three distinct zones.

- 1) Mainland Gujarat
- 2) Saurashtra and
- 3) Kachchh

The Gujarat state exposes rocks belonging to the Pre-cambrian, Mesozoic and Cenozoic era. The hard rocks cover about 49% of the total area of Gujarat, the rest being occupied by sediments of Quaternary period. The hard rock comprises Pre cambrian metamorphosed and associated intrusive, sedimentary rocks of Mesozoic and Cenozoic eras and the traps/flows constituting Deccan volcanic of Cretaceous Eocene age. The different geological formations occurring in various parts of Gujarat are shown in the "**Geological Map of Gujarat.**"



## 1.5 Soil<sup>3</sup>

The Gujarat State is divided in four regions with distinct the soil physical conditions

- North
- Central
- South
- Saurashtra & Kachchh

### **North Gujarat Region**

North Gujarat Region consists of Banaskantha, Patan, Mahesana, Sabarkantha, Gandhinagar, Surendranagar and Ahmedabad districts of Gujarat State.

In this region, major area falls into 'very deep' soil. However, 'deep' soil is in major area of Surendranagar district and in few area of Ahmedabad and Patan district. There are 'moderately deep' soils in few area of Surendranagar, Patan and Ahmedabad district and in North-East of Sabarkantha district. There are 'very shallow' to 'shallow' soil in North-East part (Sabarkantha district) and South West (Surendranagar district) part of the region. Rock outcrops are also found in some part of the region especially in North-East (Banaskantha and Sabarkantha district) & South - West (Surendranagar District) of the region.

A major texture of the soil in the region is 'Loamy'. However, in South-West part (in Ahmedabad and Surendranagar district) a soil texture in few areas is found to be 'Clayey'. It is also 'Sandy' soil in some area of the Northern part (Banaskantha district) of the region.

Major area of the region is having well drained soil. However, in some area of region especially in central part (Adjoining area of Mehsana, Sabarkantha and Gandhinagar district.) and eastern part of Banaskantha and Western part of Surendranagar district is representing 'Some what excessively' drained soil. A very few area of southern part of the region (Adjoining area of Ahmedabad and Surendranagar district) and in Western part (Patan district) is showing 'moderately well' drained soil.

In few area of middle part of Ahmedabad district and Eastern part of Surendranagar district is 'Slightly Saline'. A considerable area of Eastern part of Patan and Western part of Mahesana, a southern part of Ahmedabad district and North-West part of Banaskantha district is representing 'Moderate' salinity of the soil. 'Strongly' saline soil is observed in South-West part of Banaskantha and Western part of Patan district. Very few areas have 'Severe' saline soil in Southern part of Ahmedabad district.

Slight sodicity is found in central part of the region (In Patan, Mahesana and Ahmedabad district) and in North-East part of Surendranagar district. In west part of the region (Banaskantha, Patan, Surendranagar and Ahmedabad district). 'Moderate' to 'Strong' sodicity of the soil is found.

### **Central Gujarat region**

Central Gujarat comprise of Vadodara, Kheda, Anand, Dahod and Panchmahal districts. The Soils of central Gujarat varies from shallow to deep soil depth class. The deep & very deep soil depth is found in western part, where as shallow soil depth belongs to eastern part. The soils are fine to coarser and well to moderately drain in general and observed somewhat excessive drained also. The Soils are slight to moderate saline having slight sodicity.

The Soils of Vadodara, Panchmahal and Dahod district belong to shallow to deep in soil depth class where as they vary from moderately deep to very deep in Anand & Kheda district.

The Soils of Central Gujarat belongs to fine to coarser in general. The soils of Anand, Kheda, Panchmahal, Dahod districts are dominantly medium textured (Loamy) followed by fine textured (clayey). The soils adjoining to Anand, Kheda, Panchmahal & Dahod districts are coarser (Sandy). In Vadodara district the soils are dominantly fine textured (clayey) followed by medium textured (loamy) and towards adjoining Vadodara & Dahod district boundary the soils are coarser (sand). Soil drainage in Anand, Kheda and Panchmahal are well to moderately drained where as in Vadodara & Dahod district varies from well drained to moderately drained followed by some what excessively drained. The soils of western parts of Anand districts are medium saline in nature and towards north slightly saline in nature. Whereas towards Khambhat creek the soils are moderately saline. The soils in Kheda district belong to slight to moderate saline and the soils of Vadodara district towards western part ranges from slight to moderate saline. The Soil Salinity in Vadodara, Anand, Kheda are Slighter to moderately saline where as in Panchmahal & Dahod the Soil Salinity belongs to moderately saline. The Soil Sodcity in general is slight sodic in all districts of Central Gujarat.

### **South Gujarat region**

South Gujarat region compries of Bharuch Narmada, Surat, Tapi, Navasari, Valasad and Dang Districts. Dominantly the Soils are very deep, well drained and fine and medium textured. They are slightly alkaline, slight to strong saline.

Soil depth in South Gujarat is well distributed in two parts. The Soils in western side are dominantly very deep followed by moderately deep and in eastern part soils are dominantly shallow followed by moderately shallow.

The Soils in Bharuch, Narmada, Surat, Navasari and Valasad District dominantly distributed to very deep soil depth class followed by shallow depth Moderately deep soil are also observed, Where as in Tapi district the soil depth are dominantly shallow followed by very deep. In Dang district the soils are dominantly distributed in shallow soil depth class.

Soils in South Gujarat in general varies from fine to medium textured. (Clayey to loamy clay), except in Dang District. In Dang the soils are medium textured.

Soil salinity in South Gujarat varies from slight to strong salinity class. In Bharuch District soil salinity belongs to slight to moderate and severe towards coastal. In Narmada, Tapi and Dang district soil salinity is moderate. The Soil salinity in Surat, Navasari and Valasad belongs to slight to strong salinity class.

The Soil Sodcity in South Gujarat in general belongs to slight sodicity class except in Navasari where soil sodicity varies from slight to moderate.

### **Saurashtra and Kachchh Region**

Saurashtra and Kachchh Region consist of Rajkot, Junagadh, Porbandar, Jamnagar, Bhavnagar, Amreli, & Kachchh District.

Accordingly most of Soils in Saurashtra region is having shallow (25-50 cms.) to moderately shallow (50 to 75 cm) depth Soils whereas Soils of Kachchh region have moderately deep (75-100 cm) to deep (100 to 150 cm) Soils Mostly Northern part of Saurashtra region comprises of shallow depth Soils, whereas Southern part have moderately shallow to moderately deep depth Soils, Gir

area has very shallow (10-25 cms) depth Soils. Some part adjoining Rann of Kachchh have very deep (more than 150 cm) Soils.

Soil texture acts as a guide to many Soil characteristics directly or indirectly related to plant growth. Three textural groups used are clayey (fine), Loamy (medium) and Sandy (Coarse). The majority of Soils in Saurashtra region are clayey (fine textured), whereas in Kachchh region, Soils are Loamy (medium textured). Some scattered parts of Saurashtra region have Loamy Soils and some parts of Kachchh have sandy Soils.

Majority of the Soils are well drained in Saurashtra and Kachchh region. Some Scattered parts have somewhat excessive drainage.

Coastal area of the Saurashtra and Kachchh region are saline. Some parts of Kachchh near Rann, coastal area of Porbandar and Bhavnagar district are strong to very sever saline. North-Western part of Kachchh and costal part of Bhavnagar district are moderately strong saline. Some part of Rajkot district near little Rann of Kachchh, some coastal part of Jamnagar, Junagadh, Porbandar, Amreli and Bhavnagar are slightly saline.

Some interior parts of Amreli and Bhavnagar district, some coastal parts of Rajkot, Jamnagar, Junagadh, Amreli and Bhavnagar district and western part of Kachchh are having slight sodicity in soils. Bhal area of Bhavnagar district has strong sodicity in soils. The coastal part of Porbandar district has moderate sodicity in soils.

## 1.6 Socio-Economic Profile<sup>5</sup>

The population of the Gujarat State was 50,671,017 as per the 2001 census data. Gujarat Population Census Data 2011 show that Gujarat has Total Population 6.03 Crores. Literacy rate in Gujarat has seen upward Trend and is 79.31%. Its official and primary language is Gujarati.

Ahmedabad is the most populated District in the State, with 7.20 million people, up 11.94% from 2001, followed by Surat with 6.07 million people, up 10.07%, as per Gujarat's Directorate of census operations.

Description	2011
<b>Population</b>	60,383,628
<b>Population Growth</b>	19.17%
<b>Density/km<sup>2</sup></b>	308
<b>Density/mi<sup>2</sup></b>	798
<b>Male</b>	31,482,282
<b>Female</b>	28,901,346
<b>Sex Ratio</b>	918
<b>Percentage of total Population</b>	4.99%
<b>Literacy</b>	79.31%
<b>Male Literacy</b>	87.23%
<b>Female Literacy</b>	70.73%
<b>Total Literate</b>	41,948,677
<b>Male Literate</b>	23,995,500
<b>Female Literate</b>	17,953,177



## 2. Disaster Risk Profile<sup>6</sup>

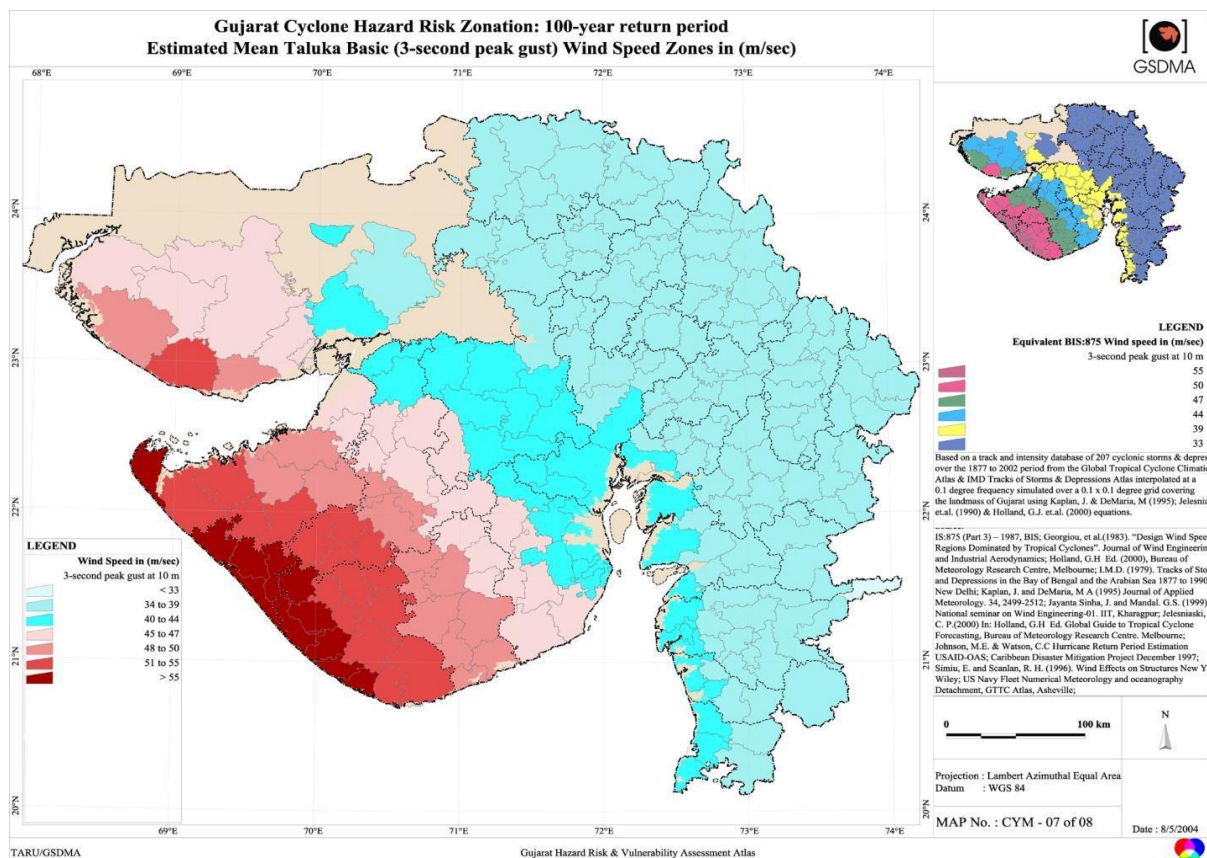
Owing to its geo-climatic, geological and physical features, Gujarat is vulnerable to all-major natural hazards (Drought, Flood, Cyclone, Earthquake, Tsunami etc.). The State is also under constant threat of industrial (chemical) disasters which is well supported by the fact that 35% of the total Major Accident Hazard (MAH) units of the country are located mostly at Vapi, Hazira, Ankleshwar, Dahej etc. In addition, occurrence of biological disasters and other technological/human caused hazards such as transportation accidents, terror attacks, radiological accident etc. are most likely in the State.

GSDMA has developed Gujarat Hazard Risk & Vulnerability Atlas. This is the first geographically explicit Level 1 assessment of its kind outside the United States that integrates six hazards viz. earthquake, flood, cyclone, tsunami, drought and industrial (chemical) accidents, covering whole State of Gujarat. The vulnerability of the State to six major hazards as per this Atlas is described below in brief:

### 2.1 Vulnerability to Cyclone:

- Gujarat falls in the region of tropical cyclone. With the longest coast line of 1600 km in the country, it is highly vulnerable to associated hazards such as floods, storm surges etc.
- Most of the cyclones affecting the State are generated in the Arabian Sea. They move North-East and hit the coast particularly the Southern Kutch and Southern Saurashtra and the Western part of Gujarat.
- Two cyclonic storm seasons are experienced in Gujarat: May to June (advancing southwest monsoon) and September to November (retreating monsoon).
- The Hazard Risk and Vulnerability Atlas prepared by GSDMA shows the Cyclone hazard zonation along with the basic wind speed at the Taluka level (Figure 1). Over 120 cyclones originating in the Arabian Sea had passed through Gujarat over a period of 100 years. Figure 1 shows a maximum wind.
- Figure 1 shows a maximum wind speed class of more than 55 m/sec along the Saurashtra coast, specifically in Porbandar, Jamnagar and Junagadh districts, which are exposed to high intensity cyclonic and storm impact. The 51 to 55 m/sec class extends further inland to cover much of Jamnagar, part of Rajkot, Junagadh and Kutch districts. The 48 to 50 m/sec class extends to most of Rajkot, part of Amreli and Jamnagar districts including Jamnagar, Rajkot cities and parts of Kutch. The 45 to 47 m/sec class covers much of Saurashtra and all of Kutch. This is followed by the 40 to 44 m/sec class that gets its swathe from Kutch through northern Saurashtra all the way to the coast of Gulf of Kambhat and southern Gujarat. The rest of the State falls into the 34 to 39 m/sec class.





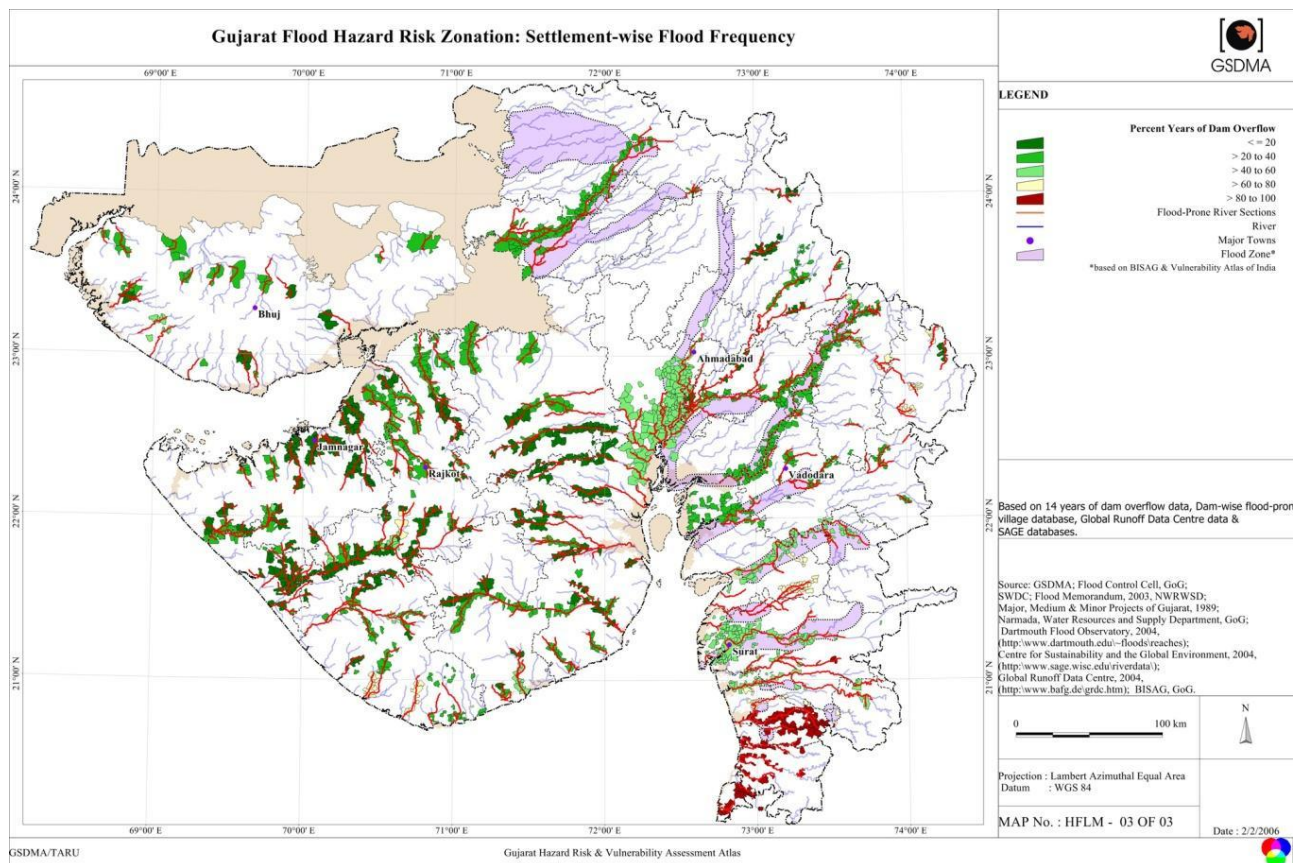
## 2.2 Vulnerability to Drought:

- Gujarat is one the chronic drought prone State of India, with an average annual rainfall about only 700 mm with more than half of the Talukas of Gujarat receiving rainfall within the range of 200-400 mm.
- Substantial portions of the State are arid to semiarid. With large parts of North Gujarat and Saurashtra having no sources of alternate irrigation, drought vulnerability increasing with groundwater overexploitation. Falling water tables put added stress on crops and water supplies.

## 2.3 Vulnerability to Flood:

- The climatology of Gujarat is influenced by the Arabian Sea in the West and three hill ranges along its Eastern border. A long coastline makes parts of arid Saurashtra and Kutch occasionally experience very high rainfall. These occasional heavy rainstorms are responsible for most of the floods in the State. While the Northern part of the State is mostly arid and semi-arid, the Southern part is humid to sub-humid. Extremes of climate, be it rainfall or temperatures are quite common in this region.
- All major rivers in the State pass through a wide stretch of the very flat terrain before reaching the sea. These flat lowlands of lower river basins are prone to flooding. Cities like Ahmedabad, Surat and Bharuch are located on the flat alluvial plains of large rivers.

- Concentrated runoff resulted by heavy rainfall cause flash floods in the small river basin of Saurashtra and Kutch because of their fairly impervious catchments (rocky or black cotton soils) and steep sloping upper catchments.
- Figure 3 shows the majority of the area of Gujarat is flood prone, irrespective of the size of the catchment.
- The flood prone river sections were identified from settlement level analysis. Flood prone river sections in Saurashtra extend to the upper basins due to the presence of dams which have to resort to emergency discharge during heavy rainstorms. Even small valleys in Saurashtra are used for agriculture. Hence flooding in these zones impacts both residents and settlements.

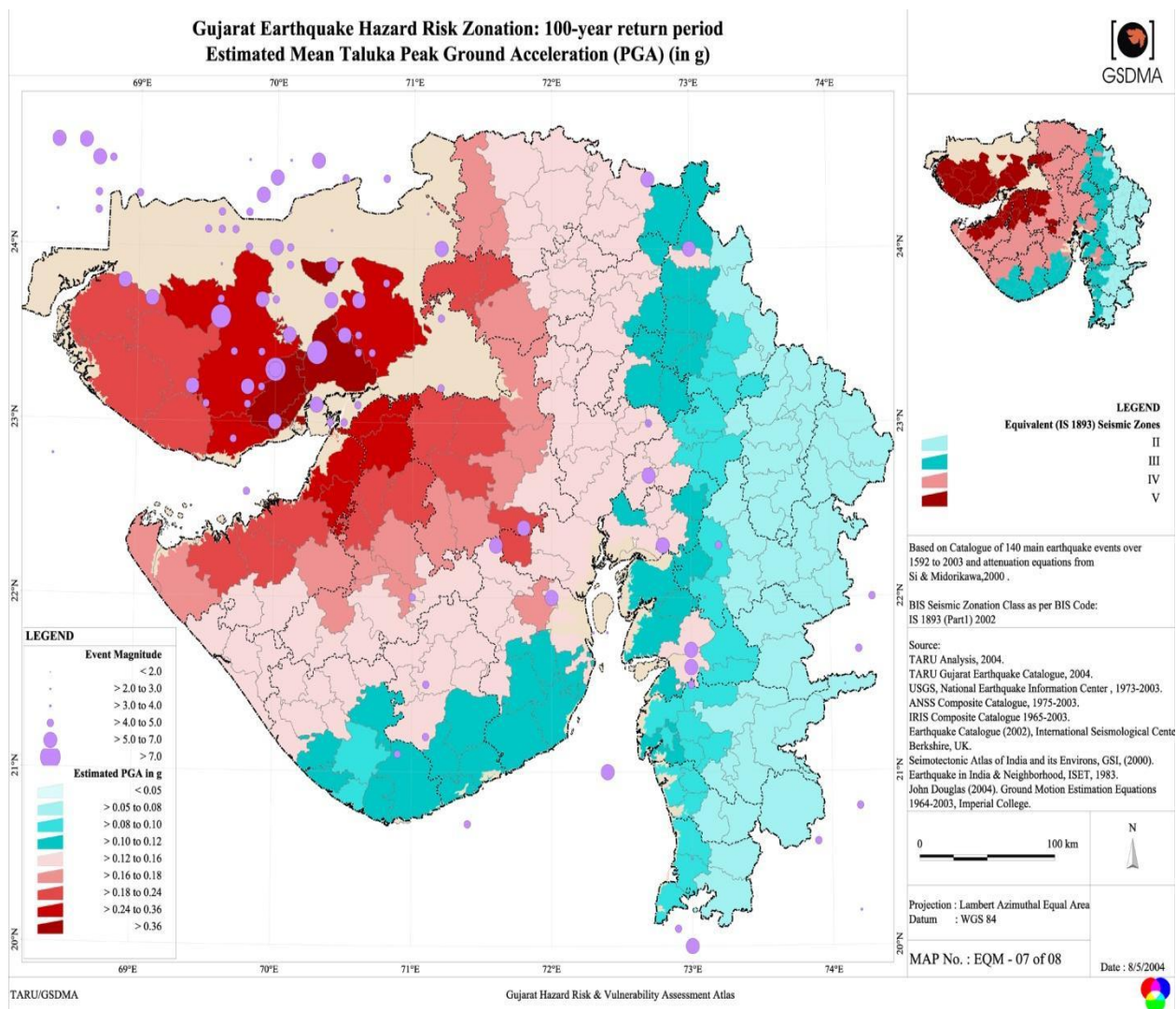


## 2.4 Vulnerability to Earthquake:

- Whole of Gujarat region has earthquake hazard of different levels from moderate to high as zones III to V are assigned to it in the seismic zoning map of India.
- In the Seismic Zoning Map of India the Gujarat region is divided into three zones. Kachchh region (about 300km x 300km) is assigned zone V where earthquakes of magnitude 8 can be expected. A belt of about 60-70km width around this zone covering areas of North Saurashtra and areas bordering Eastern part of Kachchh are assigned zone IV where intensity VIII can be expected mainly due to earthquakes in Kachchh and some local earthquakes along North Kathiawar Fault in Northern Saurashtra. Rest of Gujarat

lies in zone III where intensity VII can be expected due to moderate local earthquakes or strong Kachchh earthquakes.

- The estimated mean taluka earthquake PGA zonation for a 100-year return period is presented in the figure 4. All of Kachchh, almost the entire coastline of northern Saurashtra that adjoins Kachchh and a small area in Patan district fall into the very severe intensity zone over a 100-year return period.
- The cities of Ahmedabad, Bharuch, Rajkot, and Bhavnagar fall into the severe intensity zone, while Bhuj and Jamnagar fall in the very severe intensity zone over this time frame. A Powerful Earthquake of magnitude 6.9 on Richter-Scale rocked the Western Indian State of Gujarat on the 26th of January, 2001. It caused extensive damage to life & property.

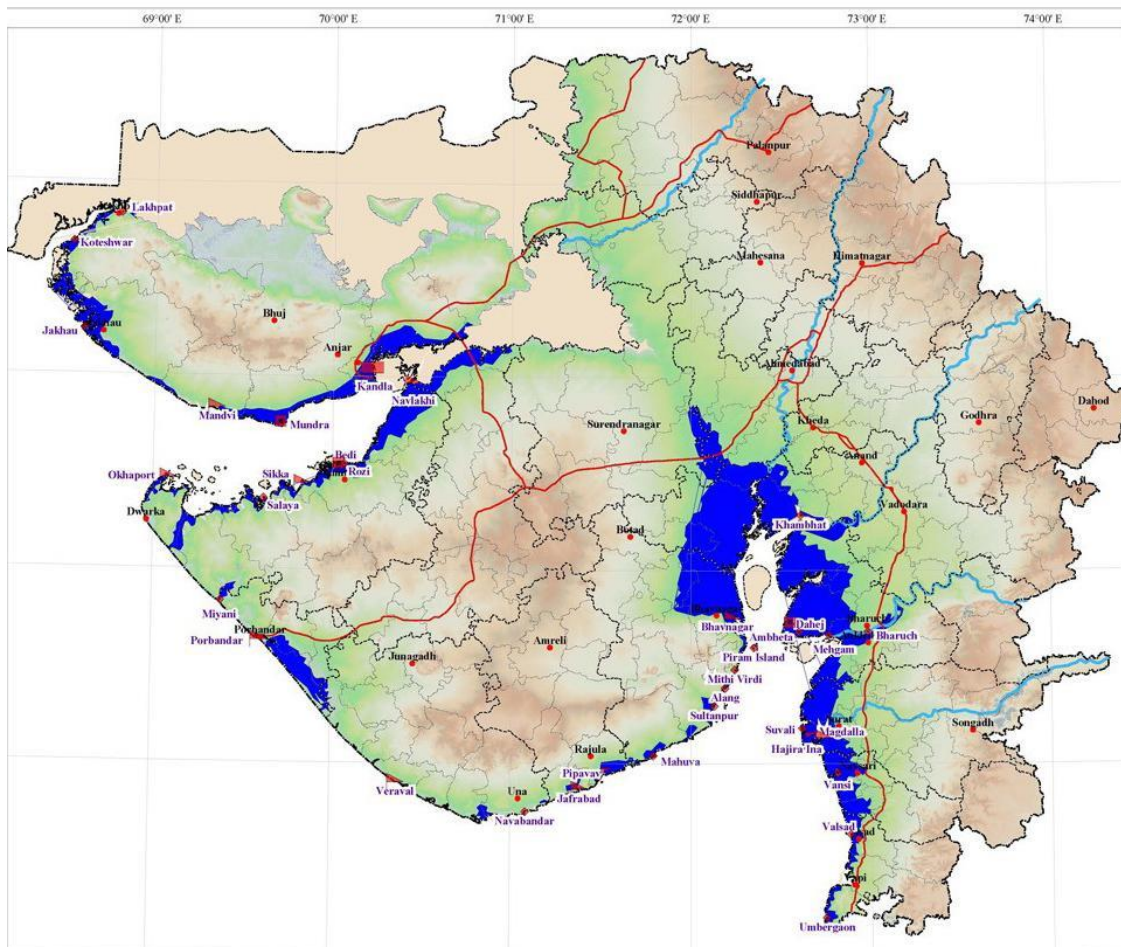




## 2.5 Vulnerability to Tsunami:

- Gujarat is prone to Tsunami risk due to its longest coastline and probability of occurrence of near and offshore submarine earthquakes in the Arabian Sea.
- Makran Subduction Zone (MSZ) -South West of Karachi is an active fault area which may cause a high magnitude earthquake under the sea leading to a tsunami.
- In past, Kandla coast was hit by a Tsunami of 12 mtrs height in 1945, due to an earthquake in the Makran fault line. Tsunami prone areas in the State include coastal villages of Kutch, Jamnagar, Rajkot, Porbandar, Bhavnagar, Anand, Ahmedabad, Bharuch, Surat, Navsari and Valsad districts.
- The Hazard Risk and Vulnerability Atlas prepared by GSDMA shows (Fig. 5) the estimated inundation based on Probable Maximum Surge (PMS) at highest high tide level.

Gujarat Tsunami Hazard Risk Zonation : Indicative Inundation based on PMS at Highest High Tide level



## **2.6 Major Disaster Events<sup>7</sup>**

A Powerful Earthquake of magnitude 6.9 on Richter-Scale rocked the Western Indian State of Gujarat on the 26th of January, 2001. It caused extensive damage to life & property. This earthquake was so devastating in its scale and suffering that the likes of it had not been experienced in past 50 years. Leaving thousands seriously injured, bruised and handicapped; physically, psychologically and economically.

The epicenter of the quake was located at 23.6 norths Latitude and 69.8 easts Longitude, about *20 km Northeast of Bhuj Town* of the Kutch district in Western Gujarat. At a depth of only 23 kms below surface this quake generated intense shaking which was felt in 70% region of India and far beyond in neighboring Pakistan and Nepal too. This was followed by intense aftershocks that became a continued source of anxiety for the populace.

The Seismicity of the affected Area of Kutch is a known fact with a high incidence of earthquakes in recent times and in historical past. It falls in Seismic Zone V, the only such zone outside the Himalayan Seismic Belt. In last 200 years damaging earthquakes occurred in 1819, 1844, 1845, 1856, 1869, 1956 in the same vicinity as 2001 earthquake.

Twenty-one of the total 25 districts of the state was affected in this quake. Around 18 towns, 182 talukas and 7904 villages in the affected districts have seen large-scale devastation. The affected areas even spread up to 300 km from the epicentre. In the Kutch District, four major urban areas – Bhuj, Anjar, Bachau and Rapar suffered near total destruction. The rural areas in the region are also very badly affected with over 450 villages almost totally destroyed.

In addition, wide spread damages also occurred in Rajkot, Jamnagar, Surendranagar, Patan and Ahmedabad districts. Other Urban areas such as Ganhidham, Morvi, Rajkot and Jamnagar have also suffered damage to major structures, infrastructure and industrial facilities. Ahmedabad the capital was also severely affected.

## **3 INSTITUTIONAL SETUP**

### **3.1 Gujarat State Disaster Management Authority (GSDMA)<sup>8</sup>**

Immediately after the 26<sup>th</sup> January 2001 earthquake, Gujarat State Disaster Management Authority (GSDMA) was established and registered as a ‘Society’ under the provisions of the Societies Registration Act and the Bombay Public Trust Act on 8 February 2001. GSDMA was initially mandated to implement the gigantic task of rehabilitation and reconstruction programme in the earthquake affected areas of the State and simultaneously act as a nodal agency to plan and implement pre-disaster preparedness and mitigation activities including training and capacity building of all the stakeholders involved in disaster management. After the passage of Gujarat State Disaster Management Act – 2003, the Society constituted earlier as GSDMA was dissolved under Section 49 of the Act, and the Statutory Authority under Sub-Section 1 of the Section (6) came to an existence with effect from 1st September, 2003.

### **3.1.1 Constitution & History<sup>9</sup>**

Section 7 of the GSDM Act 2003 provides the constitution of the Authority. Accordingly the Authority shall consist of chairperson and not more than fourteen other members as follows, namely.

- (a) The Chief Minister of the State, ex- officio, who shall be the Chairperson.
- (b) Two Ministers nominated by the Chief Minister by virtue of their office from amongst the Council of Ministers of the State.
- (c) The Chief Secretary of the State, ex-officio.
- (d) The Secretary to the Government of Gujarat, Revenue Department, ex officio.
- (e) The Chief Executive Officer of the Authority, ex-officio.
- (f) The State Relief Commissioner, ex- officio.
- (g) The Director General of Police of the State, ex-officio;
- (h) Such other officers of the State Government as may be appointed by the State Government by virtue of their office:

Provided that when a proclamation made under Article 356 of the Constitution is in force in the State, the Central Government may appoint three persons, in place of the Chief Minister and other two Ministers, to be the Chairperson and members of the Authority and the persons so appointed shall vacate their office upon the revocation or cesser of operation of such proclamation.

The members of the Authority shall hold office during the pleasure of the State Government and shall receive such remuneration as may be prescribed.

### **3.1.2 Vision<sup>9</sup>**

To go beyond reconstruction and make Gujarat economically vibrant, agriculturally and industrially competitive with improved standards of living and with a capacity to mitigate and manage future disasters.

### **3.1.3 Objective<sup>9</sup>**

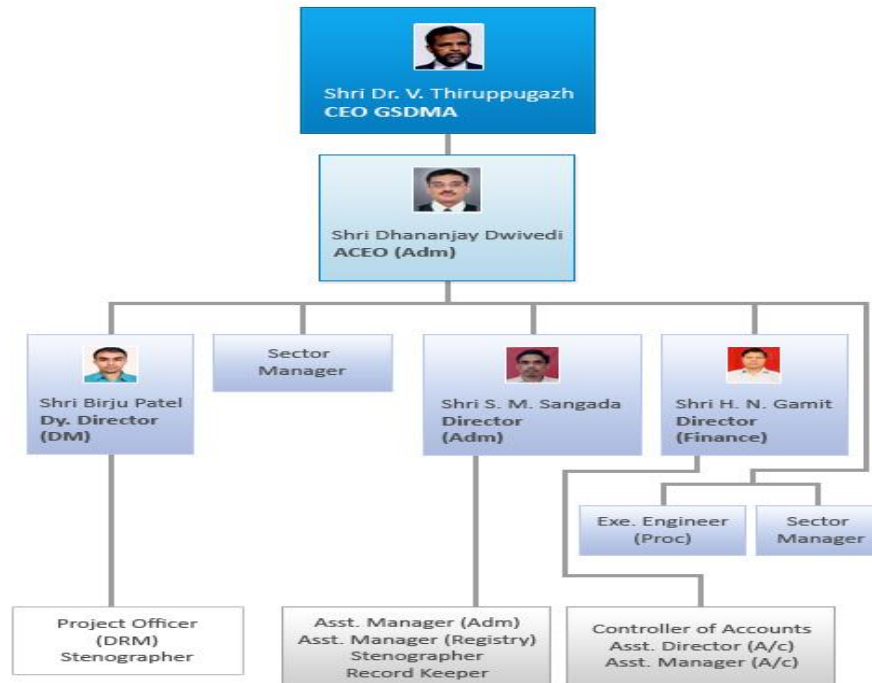
The Government of Gujarat (GOG) established the Gujarat State Disaster Management Authority (GSDMA) on February 8, 2001 to co-ordinate the comprehensive earthquake recovery program. The GSDMA is registered as a society under the Societies Registration Act. The objectives of GSDMA are:-

To undertake social and economical activities for rehabilitation & resettlement of the affected people that would include new Housing, Infrastructure, Economics Rehabilitation, social Rehabilitation and other related programme.

- To prepare programmes and plans to mitigate the losses on account of disasters as a strategy for long terms disaster preparedness.
- To undertake research and study regarding causes for losses on account of natural disaster and to suggest remedial measures for minimizing the same.
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- To obtain funds for rehabilitation and resettlement and to ensure optimum utilization of these funds obtained in the form of grant, aid, assistance or loan from Government of Gujarat, Government of India, World Bank and ADB, USAID, DFID, IFRC, and donors, NGOs, and from financial institutions, Public and private trusts or any other organizations.
- To manage Gujarat Earthquake Rehabilitation and Reconstruction Fund.
- To act as a nodal agency and to co-ordinate various issues relating to the deserving victims out of the funds, either directly or through a common fund created for these purpose in any other feasible mode.
- To provide to arrange financial assistance so as to achieve the objects of the society.
- To raise money through financial instruments, bonds, deposits or such other manner may be permissible under the provision of Societies Registration Act, 180 and the Bombay Public Trust Act 1950.
- To develop approach, philosophy, policy guidelines and action plan and other relevance aspects for meeting out disaster of any kind; Management , Administration, Investment & Reinvestment of funds out of sale proceeds received from the sale of land, buildings, Equipments, furniture, fixtures, debris or any other things or articles or infrastructure.
- To act as a nodal agency and to coordinate various issues related to the maintenance of hygienic living conditions, welfare of victims, environmental maintenance and such other welfare measures, as may be assigned to the deserving authority.
- To do all the acts and things conducive for the attainment of the above objects in the most possible manner, which are relevant to fulfill the objects of SOCIETY.

### 3.1.4 Organizational Chart<sup>10</sup>





### 3.2 Gujarat Institute of Disaster Management (GIDM)<sup>11</sup>



The Gujarat Institute of Disaster Management was established as the research and training wing of the Gujarat State Disaster Management Authority (GSDMA) on 26th January 2004 by the Government of Gujarat with the aim of Human Resource Development in the state. With state of the art facilities, the main thrust of the institute is to provide proper insight, knowledge and skills to stakeholders at various levels in the state, so that they can accomplish appropriate disaster management tasks.

The Governing Body of GSDMA in its meeting dated 12.03.2002 decided to establish Gujarat Institute of Disaster Management (GIDM). The GIDM was established in the year 2004. The NDM Cell of SPIPA that was providing Disaster Management Training to Government Officers in the State has also integrated in the GIDM since 1st April, 2004 vide Govt. of Gujarat Resolution (GAD R&R Division) No. NDM-102004-488-81 dated 9th April, 2004. Further the Govt. of Gujarat in Revenue Department vide its Resolution No. NDM-102005-488-PU-NI declared the erstwhile “Disaster Management Cell” as “Gujarat Institute of Disaster Management”.

The Government of Gujarat allotted land for establishing the Institute at Village Raisan near Koba-Gandhinagar and the construction work has been completed. The Authority has also made

yearly provision of Rs. 10.00 Crores in the State budget of the year 2012-13 and subsequent years under the head 101 Natural Calamities – Asst. to Disaster Management Authority – Gujarat Institute of Disaster Management (GIDM). Presently funds are available with GSDMA.

The Gujarat Institute of Disaster Management (GIDM) is registered as an autonomous body on 10.07.2012 under the provisions of the Societies Registration Act, 1860 and Bombay Public Trust Act, 1950 to allow and function “GIDM” as an autonomous body to carryout various functions for implementation of Disaster Related Programmes on training and capacity building of the stakeholders.

Since April 1, 2004, Gujarat Institute of Disaster Management was functioning in the premises of the Sardar Patel Institute of Public Administration (SPIPA), Ahmedabad but under the administrative control of GSDMA. In August 2012, Gujarat Institute of Disaster Management shifted to its newly constructed building at Raisan, Gandhinagar. The Institute has trained Government Officials, PRI members, people from NGOs etc. by conducting training programmes in different aspects of Disaster Management.

### **3.2.1 Vision**

“Make available to all stakeholders the knowledge and skills required to develop their individual competencies, gain appropriate understanding and accomplish appropriate disaster management tasks, while establishing and strengthening overall disaster management institutional capacities at the state level and below.”

### **3.2.2 Aim**

To establish GIDM as a state of the art premier institute for training, education and research related to disaster management within the state of Gujarat. It will also serve as a model for the rest of India. GIDM will focus upon enriching the capacities (In specific areas of prevention, mitigation, preparedness, relief, recovery, rehabilitation, reconstruction and sustainable development) of the officials and other functionaries of the state and district administration for response to emergencies and in the longer run, it will take up similar capacity building for other stakeholders.

### **3.2.3 Mission & Objectives**

- To serve as the apex institute in the state for Disaster Management capacity building.
- To provide Disaster related training to all the stakeholders.
- To assess the training needs of the different Government Departments, Offices, Boards, Corporations, Local Bodies and Non Government Organizations and others who may consent to be associated with it.
- To undertake activities for Human Resource Development, public education and community awareness, safety etc. in disaster education and management.
- To undertake quality research projects on Disaster Management and Mitigation covering both Natural and Human induced Disasters.

- To act as a resource centre and clearing house of information on Disaster Management by documentation of field experiences including case studies, lessons learnt and best practices.
- To establish and maintain Libraries and spread knowledge of Disaster Management.
- To facilitate partnerships with willing eminent national & international organizations, universities, institutions, bodies & individuals specialized in Disaster Management.
- To serve as a centre of excellence on Disaster Mitigation and Management.
- To arrange for financial assistance, to raise money through financial instruments, bonds, deposits etc. permissible under the provisions of Societies, Registration Act 1860 and the Bombay Public Trust Act, 1950 and management, administration, investment and reinvestment of funds so raised or available with the institute.
- To run and award Degree/Diploma/Certificate Courses on Disaster Management at its own or with the affiliation of any other Institute/Universities, Local/National/International.
- To undertake Publication of Newsletters, Journals, Reports, Occasional Papers, Study Reports etc.

### 3.3 State Emergency Operation Centre (SEOC)<sup>12</sup>

Currently, in Gujarat, there is a State Control Room manned by the Revenue Department situated at Sachivalaya. Control Room plays an important role in emergency response, rescue and relief as known from the experience of the State Government in responding to the 26th January 2001 earthquake at Kutch.

The latest concept in disaster management all over the World is about conversion of Control Rooms in to Emergency Operation Centres. Emergency Operation Centre (EOC) responds immediately during an emergency situation and is equipped with State of the Art communication equipment which enables it to communicate quickly to the affected area and provide immediate support during the Golden Hour of the disaster. Hence the State Government decided to look at the prospect of converting the existing Control Room in to an EOC.

A decision was taken by the State Government to build a new SEOC at Sector-18 in Gandhinagar. An exhaustive list of the facilities ideally required for State EOC was worked out in consultation with the Revenue Department based on the recommendations of the report prepared by Dr. Richard Sharpe and Mr. Charles Kelly.

The funding came from the World Bank funded Gujarat Emergency Earthquake Reconstruction Project (GEERP) as well as the State Government funds. The design of the SEOC was prepared considering the guidelines provided by Dr. A. S. Arya, the then National Seismic Advisor to the Government of India looking into the Seismic Zones in Gujarat.

A plot size of **8,000 Sq.Mtrs.** was provided by the State Government for construction of State EOC in Sector – 18, Gandhinagar. The total area for the construction work comes to **2,231 Sq.Mtrs.**

The construction work for SEOC started in December 2007 and completed in February 2010.

A list of facilities / utilities provided in the State EOC at Gandhinagar is as shown below:-

1. Control Room

2. Reception Room
3. Waiting Room
4. Display Room
5. Media Room
6. Room for Hon'ble Ministers and officers
7. Chamber for Relief Commissioner
8. Chamber for Director of Relief
9. VIP Conference Room (with provision for video-conferencing facility)
10. Facility Management Room State Alert & Warning Room
11. Conference Room
12. Staff sitting Room
13. Department Room – 5
14. UPS Room
15. Rest Room (with toilets) – 2
16. Ladies and Gents Toilet Rooms – General
17. Pantry Room
18. Electric Room

Apart from the above mentioned facilities, additional facilities which have been provided in the compound of State EOC are as shown below:

1. Garden
2. Fire Fighting System
3. Parking
4. Generator Rom – 160 KVA
5. Security Cabin and main gates
6. Water Harvesting System
7. Sump Room
8. Electric and Transformed Room – 315 KVA

Each room has been provided with air conditioning system and CCTV cameras. The main building also consists of announcing system, fire extinguishers, smoke detectors and sensors.

### **Information Communications Technology System (ICTS) Network For Emergency Response**

The State Emergency Operations Center (SEOC) has been designed to be the central operations center for coordination of all District and Taluka Emergency Operation Centers.

It will be the central hub for all communication and emergency management for the state of Gujarat. The SEOC is envisaged to have state of art communication facilities for communicating with all stakeholders during the time of an emergency or a disaster.

Natural disasters such as floods, earthquakes, cyclones etc. cause damage and result in disruption of Information and Communications infrastructure, which is necessary for effective and efficient

disaster management activities.

Hence, GSDMA has proposed to establish Information and Communications Technology System for effective disaster response.

The robust network would extend to State, District, Taluka and the local incidence point with a well defined control and coordination structure supported with adequate and appropriate Information and Communication Technology (ICT) resources tools. This network would be designed for integrating State Emergency Operation center (SEOC) at Gandhinagar with 26 District Emergency Operation centers (DEOCs), 5 Emergency Response Centers (ERCs) and 226 Taluka Emergency Operation centers (TEOCs).

Administration (State Emergency Management Authority / agency) need a secure centralized location, with adequate communications for planning, decision support and coordination during a disaster or emergency. Hence the proposed Gujarat State Disaster Response - Information and Communications Technology System (GSDR-ICTS) is expected to be of robust design to survive the disaster situations.

The proposed Information and Communications Technology System (ICTS) infrastructure will be set up on Build Own Operate and Transfer (BOOT) basis to support disaster response system.

A technical committee under the chairmanship of CEO - GSDMA has been constituted to oversee the process of finalizing the agency as per the procurement guidelines of the State Government.

The proposal is awaiting the final approval of Chairman of the State Disaster Management Authority.



**State Emergency Operation Center**

### **3.4 District Emergency Operation Centers (DEOCs) <sup>13</sup>**

Immediate first response to any disaster has to be from the district administration. Hence it is necessary to ensure that District EOCs are strengthened / constructed with state of the art emergency communication equipment to communicate with State EOC as well as other local level functionaries.

In order to assess the present condition of the District EOCs, a survey was carried out by

GSDMA for all the districts in the State. A detailed format was prepared and sent to the District Collectors listing out the details about the present status and requirement of infrastructure in the District EOCs. A list of minimum facilities required in an EOC was also prepared by GSDMA and circulated with the format to all the 26 districts. The minimum facilities required in an EOC are as shown below:

1. Chamber for district Collector (with attached toilet)
2. Small meeting room (with video-conferencing facilities)
3. Communication Room (with TV, Radio, Wireless, Telephone and other communication equipments)
4. Workstations for line departments (with 2 or 3 local phone facilities)
5. Visitor's Room / Waiting Room
6. Store Room
7. Pantry
8. Rest Room / Retire Room (with toilet) for 2 people
9. General toilets

As per the information collected from all the District Collectors, it was found that in 25 districts viz. Ahmedabad, Anand, Patan, Navsari, Amreli, Banaskantha, Bharuch, Dahod, Dangs, Gandhinagar, Jamnagar, Junagadh, Kheda, Valsad, Tapi, Kutch, Mehsana, Narmada, Panchmahal, Porbandar, Rajkot, Sabarkantha, Surat, Surendranagar and Vadodara, there was a need for constructing new EOCs. Only in case of Bhavnagar district, it was indicated that there is no need to construct a new EOC but will require adding some more basic facilities in the existing EOC. Hence it was strengthened accordingly.

It was also decided by the State Government that districts in high risk areas should have EOCs of comparable physical capability to the model for State EOC. Moreover, the District EOCs had to be made more resilient than the State EOC as it will be the first principal responder in the case of a major local emergency. Hence it was decided to construct the District EOCs in all the districts having the capabilities implied by the Government of India specifications for a State EOC. Hence the designs and drawings for all the District EOCs were prepared considering the Seismic Zone - V as base.

Currently, construction / strengthening work of **25 District EOCs** is completed. For Surat EOC, land suitable for construction (at higher ground) has been identified and work for preparing the estimates is under progress through the R & B Department.

### **3.5 Taluka Emergency Operations Center (TEOCs) <sup>14</sup>**

Gujarat State Disaster Response and Communications Technology Systems (GSDR-ICTS) architecture is designed to operate on a reliable communication network backbone that will be operational on 24\*7 basis.

The proposed communication network is expected to facilitate effective disaster response by maintaining continuous communication between the Emergency Operations Centers (“**EOC**”) at state, district (“**DEOC**”), taluka (“**TEOC**”), Emergency Response Centers (“**ERC**”) and

command centers specifically set-up at disaster sites using specially designed Emergency Response Vehicles (“**ERC**”) or portable emergency communication systems.

The network will be used for information management (data, video and voice communications) and to support incident and information management systems during all stages of disaster management. The process of land / room identification in various government buildings in the talukas for TEOCs is ongoing. The architect has also been appointed for preparation of designs of TEOCs wherever a new building needs to be constructed.

The construction of TEOCs shall be done through R&B, which has been identified as the implementing agency.

### **3.6 Establishment of Regional Emergency Response Centers (ERCs) <sup>15</sup>**

Based on the experience of the Kutch earthquake of 26th January 2001 which occurred on a massive scale spreading over 12-13 districts, it was realized that in order to respond effectively within the golden hour of occurrence of a disaster, there is a need for sophisticated equipments and trained personnel at a regional level.

In countries which are frequently prone to major disasters, specialized Regional Emergency Response Centers (ERC) have been set up, which houses trained personnel and response equipments.

The need for such advanced ERCs was also felt during several occasions (especially during floods and cyclones) wherein the services of Army and Air Force was rendered due to shortage of adequate trained personnel and sophisticated equipments for search and rescue operations.

Gujarat being one of the most vulnerable States to disasters such as earthquake, floods, cyclones, chemical and industrial disasters, the State Government therefore decided to establish five such Regional Emergency Response Centres (ERCs) at strategic locations across the State.

These ERCs are strategically located at Gandhinagar/Ahmedabad, Surat, Vadodara, Rajkot and Gandhidham.

Based on the recommendation of the technical committee constituted for establishment of ERCs and the consultant who was entrusted with the study, a list of vehicles / equipment required for emergency response was finalized and procurement was initiated under the World Bank funded Gujarat Emergency Earthquake Reconstruction Project (GEERP). The vehicles / equipment for all the five ERCs have been procured.

A consultative process with Chief Fire Officers of various Municipal Corporations and officials from Director of Relief, Revenue Department was also initiated for finalizing the plan for Operation and Maintenance (O & M) of ERCs and its associated equipments. It was decided that the responsibility of O&M of ERCs and its equipments be given to the concerned Municipal Corporations and the State Government should provide the necessary grant to each Municipal Corporation through the State Budget.

It was also decided that a Memorandum of Understanding (MoU) must be signed between, CEO-GSDMA, Relief Commissioner - Revenue Department and concerned Municipal Corporations in this regard. A meeting was held with the Urban Development & Urban Housing Department



(UD & UHD), Government of Gujarat to finalize the draft MoUs with the respective Municipal Corporations after which approval of Hon'ble Minister - Disaster Management was taken by Commissioner of Relief, Revenue Department for signing the MoUs.

Physical construction work at Gandhinagar / Ahmedabad, Gandhidham and Rajkot ERC is completed in all respects. For Surat and Vadodara ERCs, Phase-I (Administrative Block) work is completed and Phase – II (Parking & Workshop) work is under progress.

The MoU for Rajkot ERC was signed on 17.11.2011, for Surat ERC on 21.12.2011 and for Gandhinagar ERC on 1.6.2012. For Vadodara and Gandhidham ERC, the process for signing the MoU is underway.

### **3.7 State Disaster Response Force (SDRF) <sup>16</sup>**

As per the recommendations from National Disaster Management Authority (NDMA), Government of India, New Delhi, the State was requested to set up State Disaster Response Force (SDRF) teams in the State on similar lines of National Disaster Response Force (NDRF) teams set up by the Central Government.

GSDMA, through the Home Department, initiated the task of carving out SDRF teams out of the existing SRPF companies in the State.

Home Department has already finalized 11 companies specially earmarked for disaster management having strength of 100 members each to be designated as SDRF teams.

These companies will be trained jointly at Vadodara by NDRF teams based at Gandhinagar and Vadodara Municipal Corporation.

List of equipments to be procured for these SDRF teams was worked out by the 06 Battalion of NDRF stationed at Gandhinagar and the procurement is currently under progress through Vadodara Municipal Corporation.

## **4 INITIATIVES**

### **4.1 Disaster Management Plan/Policy/Act <sup>17</sup>**

#### **4.1.1 State Level Disaster Management Plan**

As per the provisions of the Gujarat State Disaster Management Act, 2003, the State has to prepare a State Disaster Management Plan (SDMP) keeping in mind the vulnerability of State to various hazards. Further, National Disaster Management Authority (NDMA), Government of India has also issued guidelines for preparing the SDMP.

Hence, GSDMA had prepared the SDMP and sent to NDMA for comments / suggestions. Comments received from NDMA have been incorporated and the SDMP has been finalized.

[State Level Disaster Management Plan - Volume 1](#) (attached)

[State Level Disaster Management Plan - Volume 2](#) (attached)

#### **4.1.2 State Level Earthquake & Tsunami Management Plans**

Till the 2001 earthquake, whenever a disaster occurred, the State Government had only one document i.e. the Relief Manual for undertaking the relief measures. Contingency Plans were available only for cyclone and flood.

Now, the State Government has prepared comprehensive State Level Earthquake as well as Tsunami Disaster Management Plans covering various phases of the disasters right from emergency response, relief, recovery to mitigation and preparedness. The roles and responsibilities of every stakeholder are mentioned in the Plans and copies of the Plans have been shared with the stakeholders for its implementation.

[Tsunami Management Plan](#) (attached)

[Earthquake Management Plan](#) (attached)

#### **4.1.3 Action Plan for Nuclear & Radiological Disaster**

The growth in the application of nuclear science and technology in the fields of power generation, medicine, industry, agriculture, research and defence has led to an increase in the risk of occurrence of Nuclear and Radiological emergencies in the State. Gujarat has Kakrapar Atomic Power Station (KAPS) in Surat District and is vulnerable to nuclear disaster.

Hence, the State has prepared an Action Plan for Nuclear & Radiological Disaster with an aim to work towards minimum risk to human health, life and environment, in case of an occurrence of a nuclear or radiological disaster. The plan defines the roles and responsibility of different stakeholders to be prepared and respond to such emergencies.

[Nuclear And Radiological Action Plan](#) (attached)

#### **4.1.4 State Level Cyclone Preparedness and Response Plan**

Gujarat, having the longest coast line of 1600 Kms. in the country is highly vulnerable to cyclone and storm surge. With several ports and innumerable large and small scale industries, Gujarat's coastline attracts and supports huge population. This population is exposed to daunting risk of cyclones originating every year in the Arabian Sea.

Cyclone and storm surge not only affect the economic growth of the State but also jeopardize the livelihood of coastal communities. GSDMA has therefore prepared a State Level Cyclone Preparedness and Response Plan to mitigate the effects of cyclone, associated floods and storm surge hazards.

The plan provides the cyclone vulnerability and risk assessment, preparedness measures to be undertaken by each and every department of the State Government, the existing system of cyclone forecasting and warning dissemination to various stakeholders and the measures to be taken by the concerned departments for emergency response. The plan has been circulated to all the relevant line departments of the State Government for its implementation.

[Cyclone Preparedness and Response Plan](#) (attached)

#### 4.1.5 State Level Chemical & Industrial Disaster Management Plan

Gujarat, one of the most industrialized States in the country, is known for its large concentration of chemical industries, particularly in a stretch of 400 kilometers from Ahmedabad to Vapi, known as the ‘Golden Corridor’. In Bharuch district, Ankleshwar, situated on the Narmada estuary, is Asia’s largest chemical zone.

Due to its high vulnerability to chemical and industrial hazards, the State needs to prepare itself for any emergency situation by strengthening the emergency response system at the local level and by ensuring that the units adhere to the various existing acts and rules regarding safe handling and transportation of chemicals. Hence GSDMA has prepared a comprehensive “Chemical and Industrial Disaster Management Plan for the State”.

For preparation of plan, a study the existing capabilities and thereafter a research and gap analysis for the state was conducted. Post this, a study of the existing system of response mechanism in the wake of chemical and industrial hazards in the State was conducted and steps were recommended to improve the response and recommend measures to minimize loss of life and property.

The Plan also includes measures for disaster prevention and mitigation related to chemical and industrial hazards

[Gujarat State Chemical Disaster Management Plan](#) (attached)

[Emergency Response Guidebook](#) (attached)

#### 4.1.6 Disaster Management Plan at other levels

As part of the Technical Assistance project of the Asian Development Bank funded Gujarat Earthquake Rehabilitation & Reconstruction Programme (GERRP), GSDMA had prepared a model disaster management plan for Jamnagar District with inputs from internationally renowned Disaster Management experts.

The model plan was circulated to all the other districts for preparing their District Disaster Management Plans (DDMPs). District Disaster Management Plans for all the **26 Districts** have been prepared. In addition to this, GSDMA had also developed formats for preparing the Taluka, Village and City Disaster Management Plans through State Disaster Resource Network (SDRN) portal. SDRN is a web based portal hosted on the Gujarat State Wide Area Network (GSWAN) and is a repository of resources available at the local levels for disaster management. Plans for **186 Talukas, 137 Cities and 18000+ villages** have been prepared and are regularly updated through the SDRN. The Village, City and Taluka level Plans can also be accessed by general public online through SDRN.

## 4.2 Publication <sup>18</sup>

- <sup>1</sup><http://www.mapsofindia.com/maps/gujarat/#>
- <sup>2</sup><http://gujaratindia.com/state-profile/demography.htm>
- <sup>3</sup><http://guj-nwrws.gujarat.gov.in/showpage.aspx?contentid=1451&lang=English>
- <sup>4</sup><http://guj-nwrws.gujarat.gov.in/showpage.aspx?contentid=1459&lang=English>
- <sup>5</sup><http://gujaratindia.com/state-profile/demography.htm>
- <sup>6</sup><http://ndma.gov.in/en/gujarat-sdma-office>
- <sup>7</sup><http://saarc-sdmc.nic.in/pdf/Earthquake3.pdf>
- <sup>8</sup><http://www.gsdma.org/about-us/introduction.aspx>
- <sup>9</sup><http://www.gsdma.org/about-us/constitution-history.aspx>
- <sup>10</sup><http://www.gsdma.org/about-us/organisational-chart.aspx>
- <sup>11</sup><http://www.gsdma.org/gidm/institute.aspx>
- <sup>12</sup><http://www.gsdma.org/emergency-response/seoc.aspx>
- <sup>13</sup><http://www.gsdma.org/emergency-response/deoc.aspx>
- <sup>14</sup><http://www.gsdma.org/emergency-response/teoc.aspx>
- <sup>15</sup><http://www.gsdma.org/emergency-response/erc.aspx>
- <sup>16</sup><http://www.gsdma.org/emergency-response/sdrf.aspx>
- <sup>17</sup> <http://www.gsdma.org/disaster-management-plans/state-level-disaster-management-plan.aspx>
- <sup>18</sup> <http://www.gsdma.org/reports-publication/reports-publication.aspx>