

National Cyclone Risk Mitigation Project II

(A World Bank Funded Project)



Environment and Social Management Framework



National Disaster Management Authority
Ministry of Home Affairs,
Government of India

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Acronyms

APL	Adaptable Programme Loan
BCR	Benefit Cost Ratio
CBO	Community Based Organization
CRZ	Coastal Regulation Zone
CSMMC	Cyclone Shelter Management and Maintenance Committee
CSO	Civil Society Organization
DC	Direct Contracting
DEA	Department of Economic Affairs
DGM	Deputy General Manager
DIU	District Implementation Unit
DPR	Detailed Project Report
DRM	Disaster Risk Management
EA	Environmental Assessment
EC	Empowered Committee
ESMF	Environment and Social Management Framework
GIS	Geographic Information System
GM	General Manager
GoI	Government of India
GoAP	Government of Andhra Pradesh
GoO	Government of Odisha
GoG	Government of Gujarat
GoK	Government of Kerala
GoM	Government of Maharashtra
GoWB	Government of West Bengal
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HTL	High Tide Line
IA	Implementing Agency
IBRD	International Bank for Reconstruction and Development

ICZM	Integrated Coastal Zone Management
IDA	International Development Association
ISP	Implementation Support Plan
ISRO	Indian Space Research Organization
LARRA	Land Acquisition, Resettlement and Rehabilitation Act
M&E	Monitoring & Evaluation
MD	Managing Director
MHA	Ministry of Home Affairs, Govt. of India
MIS	Management Information System
NCRMP I	National Cyclone Risk Mitigation Project I
NCRMP II	National Cyclone Risk Mitigation Project II
NDMA	National Disaster Management Authority
PPR	Periodic Performance Review
SDMA	State Disaster Management Authority
SIL	Specific Investment Loan
SRM	Supervision, Reporting & Monitoring
ToR	Terms of Reference
TPQA	Third Party Quality Audit
UN	United Nations
VSCS	Very Severe Cyclonic Storm
WB	The World Bank
W&S	Water and Sanitation

Annexure 1

Environment and Social Profile of the Participating States

A. Gujarat

Gujarat came into existence as a separate State on 1st May 1960. It is situated on the west coast of India between 20°6' N to 24 ° 42' N north latitude and 68 ° 10'E to 74 ° 28'E east longitude. It is bounded by the Arabian Sea in the west, by the states of Rajasthan in the north and northeast, Madhya Pradesh in the east and Maharashtra in the south and southeast. Gujarat is largely flat with highlands towards its eastern part. It can be divided into four broad regions:

- Kachchh peninsulas
- Saurashtra peninsulas
- Northern Gujarat Plains
- Southern Gujarat coast.

The location map of the State is given below:



General Administration

Gujarat has 26 districts and 222 Talukas with 18,569 villages and 242 towns and 4 large cities (Census, 2001) and 18000 Gram Panchayats. The state government offices are located in Gandhinagar¹.

¹ Source: <http://www.gujaratindia.com/>

The areas proposed for investment in the state of Gujarat under NCRMP are the coastal areas the districts of Ahmedabad, Amreli, Anand, Bharuch, Bhavnagar, Jamnagar, Junagadh, Kachchh, Navsari, Porbandar, Rajkot, Surat, Vadodara and Valsad.

Climate

The climate of Gujarat is moist in the southern districts and semi-arid to arid in the northern region. The Arabian Sea and the Gulf of Khambhat help reduce regional temperatures and render the climate more pleasant. Gujarat has a winter season from November to February, a hot season from March to May and south-west monsoon season from June to October.

The average rainfall in Gujarat ranges from less than 200 mm in northwestern Kachchh to a maximum of more than 2000 mm in the southern Gujarat. While south-eastern Gujarat lies within the monsoon belt, the northwest is an extension of the Thar Desert. The average rainfall of the state is about 700 mm.

Coastal environment

Gujarat has the longest coastline (1600 km) among all Indian states. It has many islands located along the Gulf of Kachchh and area bordering Pakistan. It also has several creeks and estuaries, with highly diverse ecological conditions, several mangrove areas and bird sanctuaries. India's first marine national park was established in Gulf of Kachchh.

Soils

Gujarat has several types of soils derived from volcanic (basalts), plutonic (granites) as well as marine and alluvial sediments. The state's geological history indicates that most areas have a tectonic history indicated by earthquakes, and marine transgressions and regressions since the Late Cretaceous Period. Igneous rocks include Deccan Trap Volcanics, which form shrinking black cotton soils with high water holding capacity. These soils cover most of Saurashtra, small parts of Kachchh and parts of southern Gujarat. In Saurashtra, areas are covered by rocky shallow soils.

Forests

Gujarat has several forest types ranging from moist to dry deciduous forests. While extensively forested in the past, forests are now mostly found in the hilly and uncultivable areas. The state has significant diversity of landform, soil conditions and water availability, which has created diverse microenvironments, reflected in the 17 types of forest types found across state. Managing existing forests and enabling reforestation is a major challenge due to terrain, edaphic and water resource constraints.

Mangroves

Mangroves of Gujarat are largely found along the western Kachchh peninsula, the Gulfs of Kachchh and Khambhat and South Gujarat. Genus *Avicennia* is most common in high salinity environments, as in the Kachchh and Saurashtra. The less saline environments of South Gujarat are dominated by Genus *Rhizophora* and

associated species. *Avicennia* is most common with three species; *A. marina*, *A. officinalis* and *A. alba*.

Ecologically sensitive areas

Gulf of Kachchh: Gulf of Kachchh, the largest coastal habitat in the West coast of India is in the State of Gujarat (20°15' to 23°35' N and 69°05' to 70°22' E) is encompassing over 1000 km long shoreline covering an area of 7350 km. It is a shallow water body with depth extending from 60 m at the mouth to less than 20 m at the head of the Gulf. While the average depth is 30 m, the minimum depth is up to 5 m, around Lushington Island. The Marine National Park and Marine Sanctuary are situated along the southern shore of Gulf from Okha (22°30'N, 69°00'E) and extends eastwards to the vicinity of Khijadia (22°30'N, 70°40'E).

The spectacular Gulf of Kachchh is the home for more than 800 species of organisms; 32 hard (*Scleractinia*) and 12 soft (*Alcyonaria*) corals, 150-200 species of fishes, more than 100 species of algae, great diversity of sponges and worms, brittlestars, marine turtles and other reptiles, over 200 species of migratory and resident bird species and also the rare and endangered marine mammal, the dugong.

Gulf of Khambhat: Geographically, Gulf of Khambhat² located between 20°35'- 22°20'N and 72°05'-72°55'E. The climate is dry tropical monsoon with an average annual rainfall of about 800 mm. The monsoon commences on June or July and ends in September, but the rainfall is erratic in occurrence, duration, and intensity. The winters are generally cool and dry, with minimum temperatures around 10°C. The pre-monsoon period in March-June is very hot, with temperatures reaching 45°C.

The zonation of mangrove forests in the Gulf is: a seaward band of *Avicennia marina* gives way to a back-mangal consisting of *Salicornia brachiata*, *Suaeda* *urochondra setulosa*, which appears at the extreme eastern limit of its distribution.

Parasharya (1984) has recorded 62 species of water birds in the area. Other common breeding species include

Nycticorax nycticorax, *Ardeola grayii*, *Bubulcus ibis*, *Egretta garzetta*, *E. alba*, *Mycteria leucocephala*, *Threskiornis melanocephalus*, *Pseudibis papillosa*, and *Platalea leucorodia*. The heron colonies in this area are one of the few places where *E. garzetta* and *E. alba* nest side by side and interbreed. The most abundant shorebirds are *Recurvirostra amurensis*, *Charadrius mongolus*, *C. leschenaulti*, and species of *Tringa*, *Calidris*, and *Limicola falcinellus*. Numerous of crab plovers (*Dromas ardeola*) settles here in winter, and sighting of few Indian skimmers (*Rynchops albicollis*) have been reported. Large roosting flocks of *Grus*, *Anthropoides* and *Virgo* are often present. Two species of marine turtles, *Chelonia mydas* and *Lepidochelys olivacea*, nest in large numbers along the coast and on Piram Island.

² <http://www.annauniv.edu/ceg/iom/iomour/EIA's%20gujarat.htm>

Socio-economic Profile

Gujarat Population Census Data shows that it has Total Population of 6.03 Crore which is approximately 4.99% of total Indian Population. Literacy rate in Gujarat has seen upward trend and is 79.31% as per 2011 population census. Of that, male literacy stands at 87.23% while female literacy is at 70.73%. Located on the western coast of India, has the longest coastline of 1,600 Km. Urban Population of the State is 42.6%, which used to be at 37.4% in 2001. Rural population in the state in 2011 fell to 57.4% from 62.6% in 2001. 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.

Year		2011	
Actual Population	60,383,628	Males	31,482,282
Population Growth	19.17%	Female	28,901,346
Area km2	196,024	Sex Ratio	918
Area mi2	75,685	Literacy	79.31
Density/km2	308	Male Literacy	87.23
Density/mi2	798	Female Literacy	70.73

Seismic Zones

According to GSHAP data, the State of Gujarat falls in a region of moderate to high seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, this state also falls in Zones II, III & IV and V. Historically, parts of this state have experienced seismic activity in the M7.0. (A Richter Magnitude of 7.0 – 7.9 indicates a 'Major' earthquake which can cause serious damage over large areas.)

Existing infrastructure

1. Cyclone shelters and other Cyclone resistant buildings

Gujarat does not have a network of Cyclone and storm surge shelters unlike other risk prone states like Orissa and Andhra Pradesh. A network of cyclone shelters is proposed to be constructed under the NCRMP covering the most risk-prone settlements in two phases.

2. Coastal Canals and Embankments

There are several historical coastal embankments built using traditional techniques along the Jamnagar coast. They prevented ingress of saline water into coastal lands and also helped store rainwater on the inland side, which was used for agriculture and animal husbandry. The Gujarat Irrigation department has been building Check dams and Bhandaras to prevent saline water ingress in the Kachchh and Saurashtra region. These are implemented as per the recommendations of High Level Committee formed to control saline water ingress into coastal regions. The Khar

Land Development Board (KLDB) had also built several embankments. Due to closure of KLDB, most of them are falling into various stages of disrepair.

3. Shelter Belt Plantations

The Forest department has been planting coastal shelterbelts over last three decades under various programmes. Recent satellite imagery (2006) was studied to map coastal vegetation to understand the status of coastal tree cover. The results indicate that the coastal tree belt coverage is diverse across the state. While large patches of dense coastal belts are found along some patches of Saurashtra, most other areas have discontinuous coastal plantations. A qualitative assessment of the coastal forest belt is provided in the following Table (5).

The above table provides qualitative data on the basis of the width and length of the shelter vegetation patches. These may include wild growth of *Prosopis Juliflora*, which can be used as border fence for new plantations. The existence of vegetation indicates that the land is suitable for further afforestation

TABLE (5) : COASTAL VEGETATION ALONG GUJARAT COAST (in km)				
Type	Wide	Medium	Narrow	Total
Discontinuous	251	13	247	511
Continuous	155	9	23	187
Total	407	22	270	698
<i>Source: TARU analysis, 2007</i>				

With an average of about 2 ha per km length of coastal shelter belts, only about 13,000 ha of coastal plantation are found. In an ideal case about 50,000 ha of coastal shelterbelt is necessary to protect the coastal zone of Gujarat. The distribution of the coastal vegetation in Gujarat shown in Fig. below:

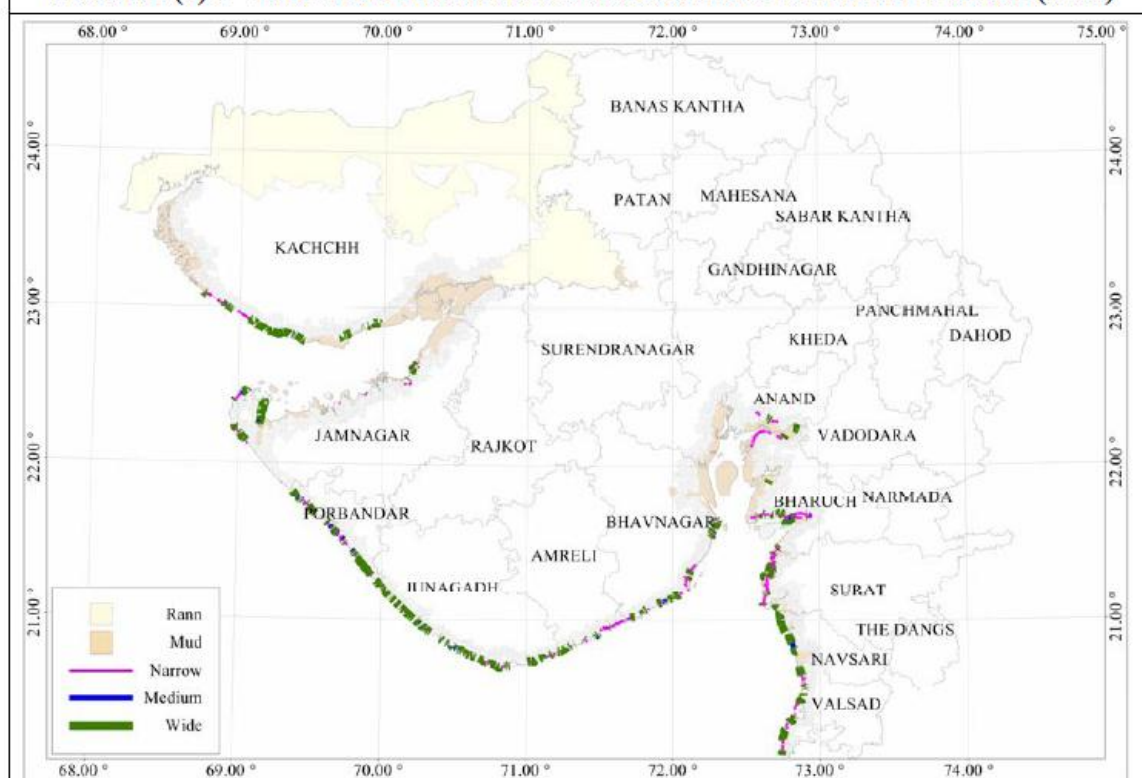
TABLE (6) : AVAILABILITY OF FOREST AND CULTURABLE WASTE LANDS IN GUJARAT VILLAGES (WITHIN 5 KM FROM COAST (BASED ON 2001 CENSUS)						
District	Coastal village Area (ha)	Forest Area (ha)	Area of Culturable waste, Gauchar and Groves (ha)	Forest Area to Geographical Area (%)	Wasteland to Village area (%)	Forest and wasteland to Village area (%)
Ahmedabad	93,870	1,621	10,710	2%	11%	13%
Amreli	34,600	1,737	3,888	5%	11%	16%
Anand	64,594	7	3,409	1%	5%	5%
Bharuch	221,655	1,755	18,154	1%	8%	9%
Bhavnagar	129,281	4,883	11,000	4%	9%	12%
Jamnagar	257,882	8,773	34,456	3%	13%	17%
Junagadh	114,074	3,928	16,665	3%	15%	18%

TABLE (6) : AVAILABILITY OF FOREST AND CULTURABLE WASTE LANDS IN GUJARAT VILLAGES (WITHIN 5 KM FROM COAST (BASED ON 2001 CENSUS)

District	Coastal village Area (ha)	Forest Area (ha)	Area of Culturable waste, Gauchar and Groves (ha)	Forest Area to Geographical Area (%)	Wasteland to Village area (%)	Forest and wasteland to Village area (%)
Kachchh	300,565	16,967	47,757	6%	16%	22%
Navsari	51,721	904	3,177	2%	6%	8%
Porbandar	74,041	5,655	9,072	8%	12%	20%
Rajkot	39,502	1,269	3,767	3%	10%	13%
Surat	64,296	35	7,064	1%	11%	11%
Vadodara	8,068	-	1,376	1%	17%	17%
Valsad	58,541	2,558	5,668	4%	10%	14%
Total	1,512,688	50,093	176,163	3%	12%	15%

Source: Census 2001, TARU analysis, 2007

FIGURE (7) : EXISTING SHELTER BELTS ALONG GUJARAT COAST (2007)



Source: TARU Analysis, 2007

This also shows that out of the total Gujarat coastal length of 1,640 km, only about one third length has permanent vegetation. More than 1,000 km of coastal belt plantation will therefore, be necessary to cover the entire coast. The existing coastal vegetation may also have to be improved to protect coastal settlements and agriculture.

4. Regeneration of Mangroves

Mangroves are tropical evergreen trees or shrubs having stilt-like roots that form dense thickets along tidal shores. The geomorphology of mangroves is typified by inter-tidal regions with clayish soils with high organic content facing shallow sea with low wave energy conditions in the tropical sub-tropical zones. Most mangrove habitats are located in areas with some input of fresh water, where salinity is variable across daily as well as annual cycles.

TABLE (20) : GUJARAT: DISTRICT-WISE STATUS OF MANGROVE IN (SQ. KM) (1998)						
District	Dense mangrove	Sparse mangrove	Total mangrove cover	Potential area for mangrove regeneration	Remaining intertidal mudflats	Total
Kachchh	344.2	383.2	727.4	327.3	1122.6	2177.3
Rajkot	1	4.6	5.6	28.3	152.7	186.6
Jamnagar	78.7	62.8	141.5	111.5	268.8	521.8
Junagadh	0.7	0.3	1	0.4	1.7	3.1
Bhavnagar	9.2	6.0	15.2	20	8.4	43.6
Ahmedabad	0.1	0.7	0.8	52.5	43.6	96.9
Kheda	-	-	-	16.2	251.8	268
Bharuch	5.7	9	14.7	37.3	88.7	140.7
Surat	7.4	6.8	14.2	20.7	42.9	77.8
Valsad	3.8	6.5	10.3	22.6	113.2	146.1
Total	450.8	479.9	930.7	636.8	2094.4	3661.9
<i>Source: Singh, 2006</i>						

5. Construction of Missing Roads and Bridges

Gujarat has a well-developed road network with 2,382 km of National Highways (NH); 9,761 km of State Highways (SH) and 30,019 Km of rural roads. It has a road density of 37.5 km per 100 sq km and is well connected with rest of India. A total of 2344 km of roads are located inside the potential surge zone. The coastal road network is of varying vintage, standards and level of maintenance. Except of the national and state highways, the other roads are built with lower specifications and suffer from inundation and damage during floods. Most of them are laid on surface less than 1.5m above terrain surface.

The State government has been implementing several road development projects across the state including the Pradhan Mantri Gram Sadak Yojana (PMGSY), which aims at providing all weather roads with prescribed standards to all settlements above 500 population before the end of 2007. During 2006-2007, about 1298 km of roads were built under this programme covering about 300 habitations. Villages with existing roads will not be covered under this programme.

The PMGSY envisages only single road connectivity to be provided. If a Habitation is already connected by way of an all-weather road, then no new work can be taken up under the PMGSY for that habitation. This excludes significant number of roads in the surge prone zones which are either damaged or flood/surge prone. While PMGSY includes cross drainage works, no flood/surge studies are done to ensure that new roads will be accessible during floods and surges. PMGSY also does not permit repairs to existing BT or Cement Roads, even if the surface condition is bad.

The cost of about Rs. 12 lakhs per km as per PMGSY specifications is insufficient to build flood and surge resistant roads in surge prone zones, which require raising the road levels above surge inundation depths and providing sufficient cross drainage. It is suggested that the NCRMP investments should be focused on developing and adoption of new surge/flood resistant road standards for rural roads in surge prone regions. There are 43 settlements (including three islands) with the population of less than 500 persons among the surge prone villages in the state. These would not be eligible for road improvement under PMGSY.

B. Kerala

Kerala, one of the smallest states of India, with an area of 38,852Km² lies between latitudes 8 ° 18'N & 12 ° 48'N and longitudes 74 52 E & 72 22E. It represents only 1.18 percent of the total area of the country but has 3.34% of the total population of the country. As per details from Census 2011, Kerala has population of 3,33,86,677 an increase from figure of 3.18 Crore in 2001 census, of which male and female are 16,021,290 and 1,73,66,387 respectively. Density of Kerala is 860 per sq km which is higher than national average 382 per sq km.



General Administration

For administrative purposes Kerala is divided into 14 revenue districts: Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Idukki, Ernakulam, Thrissur, Palakkad, Malappuram, Kozhikode, Wayanadu, Kannur and Kasaragod. On the basis of geographical, historical and cultural similarities, the districts are generally grouped into North Kerala (Kasaragod, Kannur, Wayanad, Kozhikode, Malappuram), Central Kerala (Palakkad, Thrissur, Ernakulam, Idukki) and South Kerala (Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam).

The 14 districts are further divided into 21 Revenue divisions, 63 Taluks and 1453 Revenue Villages. There are 14 District Panchayats, 152 Block Panchayats, 978 Grama Panchayats, 60 Municipalities, 5 Corporations and 1 Township. Out of these

14 districts 9 are coastal districts among these 7 district headquarters are located in the coastal zone. Four city corporations, namely Koshikode, Kochi, Kollam and Thiruvananthapuram and 19 municipal towns (including the district headquarters) are situated in this zone.

Climate

Geographically the State can roughly divide into three climatically distinct regions Viz., the eastern highlands (rugged and cool mountains terrain) the central midlands (rolling hills), and the Western lowlands (coastal plains). The topography consists of a hot and wet coastal plain gradually rising in elevation to the high hills and mountains of the Western Ghats.

Kerala's climate is mainly humid tropical due to the existence of Arabian Sea in the west of it and influenced by the seasonal heavy rains brought by the monsoon. The period March to the end of May is the hot season. This is followed by Southwest Monsoon season that continues till the beginning of October. From October to December is the Northeast Monsoon season and the two months January & February winter season. The climate is pleasant from September to February. Summer months March to May is uncomfortable due to high temperature and humidity.

The hydrodynamic regime of the coastal zone of Kerala depicts the typical features of a monsoon dominated tropical coast. The south west and north –east monsoons with their accompanying downpour keep the land soaked, for a period of five to six months in a year. The average rainfall in the State is about 3000mm of which about 60% of the rainfall occurs during southwest monsoon (June to August). The highest wave intensity is seen during the peak monsoon months of June and July due to proximity of the coast to the wave generating zones in the Arabian Sea.

Wind

The winds over the State are seasonal only in the region of Palghat Gap where winds are predominantly from the east in the period from November to March and from west in the rest of the year. In other parts of the State flow of wind is mainly governed by differential heating of land and water mass together with mountain winds. Winds have westerly component during the day and easterly components during the night through the year. In general winds are quite strong during afternoons when the thermal circulation is best developed and weak during night.

Temperature

Day temperatures are more or less uniform over the plains throughout the year except during monsoon months when these temperatures drop down by about 3 to 5°C. Both day and night temperatures are lower over the plateau and at high level stations than over the plain. Day temperatures of coastal places are less than those of interior places. March is hottest month with a mean maximum temperature of about 33°C. Mean maximum temperature is minimum in the month of July when the State receives plenty of rainfall and the sky is heavily clouded. It is 28.5°C for the State as a whole in July, varying from about 28°C in the north to about 29°C in the South. Inland stations experience higher maximum temperatures than the coastal stations. From May onwards both the maximum and minimum temperatures start falling, the latter very rapidly while the former slowly.

Humidity

As the State stretches from north to south with the Arabian Sea in its west, relative humidity is in general high over the State. In the period January to March afternoon humidity reduce to 60-63%, varying from 35% in the interior to 71 % in the coastal area. The diurnal variation in relative humidity during this period is maximum and ranges from 4 to 16%, depending upon the proximity of the sea. The relative humidity in the monsoon period rises to about 85% for the state. The variation in this period is minimum.

Rainfall

The total annual rainfall in the State varies from 360 cm. over the extreme northern parts to about 180 cm. in the southern parts. The southwest monsoon (June-October) is the principal rainy season when the State receives about 70% of its annual rainfall. Monsoon rainfall as percentage of annual rainfall decreases from north to south and varies from 83 % in north most district of Kasaragode to 50% south most district of Thiruvananthapuram. Northeast monsoon rainfall as percentage of annual rainfall increases from north to south and varies from 9% in north most district of Kasaragode to 27% in south most district of Thiruvananthapuram. The rainfall amount in the State decreases towards the south with decrease of height of Western Ghats. The southernmost district of Thiruvananthapuram where Western Ghats are nearest to the sea coast and its average height is also least in the State receives minimum amount of rainfall. The thunderstorm rains in the pre-monsoon months of April and May and that of monsoon months are locally known as 'EDAVAPATHI'. Rainfall during northeast monsoon season is known as 'THULAVARSHAM' in local language. The southwest monsoon sets-over the southern parts of the State by about 1st June and extends over the entire State by 5th June. June and July are the rainiest months, each accounting individually to about 23% of annual rainfall. Monthly distribution of Normal and Actual rainfall of Kerala state for last ten years.

The diversity of the geographical features of the state has resulted in a corresponding diversity in climate. The High Ranges have a cool and bracing climate throughout the year, while the plains are hot and humid. The average level of annual rainfall is quite high when compared to other Indian states. The state basically enjoys 4 types of climate such as Winter, Summer, South West Monsoon and North East Monsoon.

Coastal Environment

Kerala's coast runs about 580 Km. in length. The Coastal Zone in Kerala is the low land fringing the sea with a height of less than 8m from the MSL, covers about 10% of the State's total area. A chain of water bodies, locally known as Kayals running parallel to the coastline is a characteristic feature of Kerala coast. These are mostly interconnected by natural or manmade canals, facilitating internal navigation almost for the entire length of the coast. Numerous perennial rivers discharge into these Kayals. Southern half of the Kerala coast harbours more of larger backwaters. The Kayals of the Kerala coast are mostly separated from the sea by elongated sandbars and based on this they can be treated as "coastal Lagoons".

There are 44 rivers in Kerala, all originated in the Western Ghats and 41 of these are west flowing rivers and meet the Lakshdweep sea while the remaining three rivers are east flowing and discharge into Bay of Bengal. There are one major port and 14 intermediate and minor port situated along the coast. In addition to these ports, a series of fishing harbours and fish landing centres are also established along this coast.

Due to the high density of population compared to the other parts of the state the coastal zone has undergone substantial development, Out of the 9 coastal districts in the State 7 district headquarters are located in the coastal zone. Four city corporations, namely Kozhikode, Kochi, Kollam and Thiruvananthapuram and 19 municipal towns (including the district headquarters) are situated in this zone.

Kerala coast is described as a submergent coast. Lateritic cliffs, rocky promontories, offshore stalks, long beaches, estuaries, lagoons, spits and bars are characteristics of Kerala coast. The sand ridges, extensive lagoons and barrier islands are indicative of a dynamic coast with transgression and regression in the recent geological past. The central Kerala coast around Kochi is of recent origin. There are about 700 land-locked islands (including barrier islands) in Kerala. The mud banks of Kerala are unique transient near shore features appearing during monsoon. Though, there are 41 rivers bringing enormous quantity of sediments, deltas are not formed due to the high energy condition of the coast. Cochin-Vembanad is one of the largest estuarine systems in the country. The Kerala coast is left with just 17km² of mangroves (Basha, 1992).

Backwaters and Rivers

The backwaters are a peculiar feature of the state. Canals link the lakes and backwaters to facilitate an uninterrupted inland water navigation system from Thiruvananthapuram to Vadakara, a distance of 450 kms. The Vembanad lake stretching from Alappuzha to Kochi is the biggest water body in the state and is over 200 sq.kms. in area. Kuttanad in Alappuzha district alone has more than 20 per cent of India's total length of waterways.

The important rivers from north to south are; Valapattanam river (110 kms.), Chaliar (69 kms.), Kadalundipuzha (130 kms.), Bharathapuzha (209 kms.), Chalakudy river (130 kms.), Periyar (244 kms), Pamba (176 kms), Achancoil (128 kms.) and Kalladayar (121 kms.). Other than these, there are 35 more small rivers and rivulets flowing down from the Ghats. Most of these rivers are navigable up to the midland region, in country crafts.

Soils

Ten Broad groups of soils based on morphological features and physico – chemical properties have been identified in Kerala (Anon, 1978). They are red soil, laterite soil, coastal alluvial soil, riverine alluvial soil, grayish Onattukara soil, brown hydromorphic soil, hydromorphic saline soil, acid saline soil, black coil and forest soil. 122 major soils deries and 66 associations identified in the broad soil groups (Soil survey Organization, Kerala, 2007) most predominant being the laterite soil. Spatial Distribution and physical-chemical properties of the soils are mostly consistent with the lithological diversities of rocks as well as physiographic and vegetational distribution pattern. Soils are well drained over 77% of the total

geographical area of the State, moderately well drained in 6% are imperfectly drained in 6% area and somewhat excessively drained in about 5% area. Regarding soil depth, 2% of the total geographical area has moderately shallow soil, 2% has moderately deep, 25% has deep and 65% has very deep soils. With respects to soil erosion, 20% of the total area experiences slight erosion, 70% has moderate erosion and 4% has severe erosion (Natarajan et. Al., 2005)

The seasonal mudbanks of Kerala, a unique transient near shore feature, appearing during monsoon, are more prominent in the south Malabar region. Though, there are many large and medium size rivers bringing huge quantity of sediments, deltas are not formed due to the high energy condition of the coast. Though the Kerala coast is described as a mangrove forest in the resourced history, it is left with just 17 sq. kms of mangroves restricted mainly at Kannur and Ernakulam.

Seismic Zones

Kerala State is vulnerable to a multitude of disasters and is categorized as a multi hazard prone state. The state experiences various kinds of disasters of recurrent nature which result in loss of life, livelihood and property (public and private) and disruption of economic activity, besides causing immense misery and hardship to the affected population. Kerala falls under Earthquake Zone III, makes the state vulnerable to earthquakes of magnitude of 6.5 or more.

In kerala almost 96.9% of the State lies in High wind speed areas with a high density of population in the coastal areas, most vulnerable districts are Kozhikode, Kannur, Ernakulam and Malapuram. Heavy monsoon rains and backwater create flood situation in Kerala and about 0.82 million ha of the land is liable to flood. Continuous sand mining and loss of biodiversity in coastal areas has resulted into sea erosion causing damage to the houses and the livelihood resources for fishermen communities.

Forests

Kerala Forest Department (KFD) has evolved over last one and half century in response to change in Forest policy, priorities in five year plans and demands on the forests. However, it has by and large inherited the basic institutional framework of the colonial forest administration, with the emphasis on protection and management of government forests with limited involvement of the public. The total forest area is 11309. 5032 sq. Km among this Reserved Forests – 9107.2006sq.km. , Proposed Reserve - 364.5009 sq. Km., Vested Forests & Ecologically Fragile Lands – 1837.7957Sq. Km.

Mangroves

Mangrove forests of Kerala are highly localized, but the species diversity of these mangroves and its associates are comparatively rich. It is confined to the upper reaches of estuaries, lagoons, backwaters and creeks. In Kerala mangroves are distributed in all the districts except Idukki, Pathanamthitta, Palakkad and



Wayanad. Maximum extent is reported from Kannur district. The total extent of mangrove forests in the state is estimated to be less than 50km² (Mohan 1997). The important mangrove plants are *Acanthus ciliatolius*, *Acrostichum aureum*, *Aegiceras corniculatum*, *Avicennia officinalis*, *A. marina*, *Azima tetraacantha*, *Bruguiera gymnorrhiza*, *B. cylindrica*, *B. sexangula*, *Excoecaria agallocha*, *E. indica*, *Kandelia candel*, *Rhizophora apiculata*, *R. mucronata*, *Sonneratia caseolaris*, *Calophyllum* etc. Some of these species that disappeared from the Kerala coast are *Azima tetraacantha* and *Ceriops tagal*, *Heritiera littoralis* and *Flagellaria indica* have discontinuous distribution. *Calamus rotang* and *Syzygium travancoricum* are some of the rare and endangered species found in the mangroves. The major threats to the mangrove forests are land reclamation for urbanization, intensive aquaculture felling of mangrove trees for fuel and fodder, unsustainable land use, ambiguity in ownership etc.

Coastal Erosion Scenario of Kerala

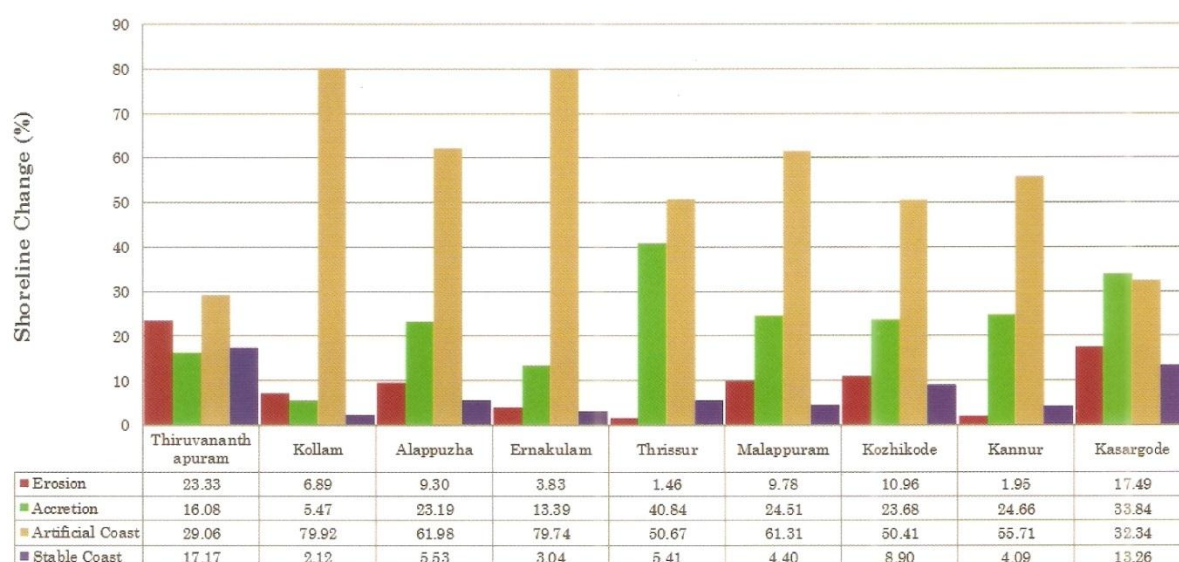
The 590 km coast of Kerala is one of the most densely populated land areas in the country. This coastline is exposed to high waves, rogue waves, 'Kallakadal' and Tsunami. These natural phenomena in turn results in rampant coastal erosion and consequent beach loss. The very recent 'Fact sheet of shoreline changes – Kerala, National Assessment of Shoreline Change' published by the Ministry of Environment and Forests, Govt. of India (NCSCM et al., 2011) shows that a major stretch of Kerala's coastline (~63%) is eroding rapidly. Figure 3.4.1 shows the erosion prone areas of the Kerala coast.

Of the nine coastal districts, the coastline of Thiruvananthapuram district is the most prone to erosion. About 23% of Thiruvananthapuram coastline is affected by erosion. About 310 km of the coastal stretch of Kerala has seawalls, riprap revetments, groynes etc. These are marked as 'Artificial Coast' in Figure 3.4.1. These artificial coasts are essentially eroding coasts and therefore it is appropriate to consider them as eroding coasts (NCSCM et al., 2011). Figure 3.4.2 shows district wise erosion/accretion characteristics of Kerala coast. The other districts that are highly prone to erosion, but are partly safeguarded by artificial means are Kollam and Ernakulam (80% of the coastline of the respective districts). The Department of Irrigation has identified coastal erosion prone zones, they being: Poovar-Vizhinjam, Kovalam-Valiathura, Perunnathuruthu to Neendakara, Kayamkulam, Ambalappuzha, Thumboli, Chellanam, Cochin Harbour, Azikkode, Kozhipram, Chavakkad, Ponnani, Kadalundi, Elathur, Tikkodi, Murad, PuthiyappaAngadi, Neelaswaram and Manjeswaram, spread along the nine coastal districts of Kerala.

Coastal erosion results in the loss of life and property of the coastal fisher population who are one of the most downtrodden communities of the state. One of the most apparent losses of property is the damages that come about to the dwelling spaces of the fisher population. Every year hundreds of houses are damaged due to the fury of the sea. Almost all fisher families prefer to live along the coast and very few of them tend to have landed property or houses further inland. The Tsunami of 2004 exposed the weakness of our coastal fisher population in terms of their resilience and coping capacity. Almost 13 lakh people in 187 villages of Kerala were affected by Tsunami with a death toll of 177 persons and 13735 of house damage. The waves also damaged livelihood of the fishermen

community. Thus every year when a coastal dwelling space is affected the family has to be accommodated in relief camps costing substantial loss to the exchequer.

District wise distribution of coastal erosion and accretion prone areas of Kerala (NCSCM et al., 2011)



Socio Economic Profile

Kerala is a coastal state with an extensive coastline of 580 km. with Arabian Sea in the west. Fisheries is one of the most important sectors of Kerala's economy providing livelihood to the fishermen population living in the 222 marine villages. The substantial growth of this sector is due to innovative and efficient fishing practices, government policies and increased demand for marine fish products in the domestic and international markets.

The state has an area of 38.86 lakh ha and has the highest Human Development Index in India, comparable with that of developed countries. The state has the highest literacy rate in India at 94 percent. As per 2011 census report, Kerala's total population is 333.87 lakh consisting of 160.21 lakh males and 173.66 lakh females. Almost 52% of the population lives in rural area. The sex ratio stood at 1084: 1000 (female:male). The per capita income is Rs. 67312/.

Existing Infrastructure

1. Availability of Cyclone shelter and other cyclone resistant buildings

The existing space available in public buildings such as schools Health Centres and other Pucca buildings for use as shelters in an emergency situation in Kerala coast is not sufficient to accommodate the vulnerable population in coastal areas. Although a number of anti disaster shelters were built with the support of European Community in the State during 1983-84, none of these are under usable condition. The state government had already constructed sea walls along 550 km of their 580 km. coastline.

2 Shelterbelt Plantation/Mangroves and their impact on mitigation of cyclone risks

Mangrove wetlands of the west coast of India is small in size, less in diversity and less in diversity and less complicated in terms of tidal creek network . This is mainly because coastal zone of the west coast is narrow and steep om slope due to the presence of Western Ghats and there is no major west – flowing river. The mangrove of kerala are under great threat due to anthropogenic pressure Kerala with a coastline of about 580km and 41 rivers emptying into the Lakshadweep sea, was once very rich in mangrove formations extending to more than 700km² (Ramachandran ,1987) However of late, mainly due to human interferences of various types including pollution, destruction and conversions, the mangrove area in the State has shrunken drastically to about 1,671 ha (Basha, 1991) . The study by Forest Survey of India (FSI, 2003) shows that mangroves vegetation in Kerala is confined largely to river mouths and tidal creeks and that htere has been no significant mangrove cover south of Cochin. The drastic depletion of mangrove areas is mainly due to the fact that almost 90 percent of the area is in the private holdings subjected to indiscriminate and drastic changes (Basha,1991), Further the present peculiar geomorphology of the estuarine area of Kerala, because of heavy sand mining from the rivers, pose problems for the natural regeneration of mangroves (Sunil Kumar, 2002)

The plant community in mangrove environment is classified into two types namely, true mangrove species and associate mangrove species. The total of 34 true mangrove plant species is present in India, of which about 18 species of true mangrove species have been recorded from Kerala.

The Forest Department has, however, played an active role in raising mangrove plantations along the extensive backwaters in this state to prevent rapid erosion of the riverbanks. Kerala state has approximately 3600 hectares of area under shelterbelt plantations and another 1800 hectares is planned to be brought under the green belt to address the escalating risk factors in the coastal regions. (K. G. Thara)

Conclusion

Hence Kerala region has been grouped as Category II A (Lower Vulnerability Zone) along with Tamil Nadu, Maharashtra, Goa, Karnataka, Daman & Diu, Pondicherry, Lakshadweep and Andaman & Nicobar Islands. However, the disaster events like inundation of sea water into land due to sea surge in association with a storm or other weather factors such as heavy rainfall, strong winds, etc. need proper consideration.

Experience with the cyclones and Tsunami in Kerala stressed the need for modernization and strengthening of existing infrastructure. It is essential to provide safe accommodation to the vulnerable population during any eventuality or disasters due to natural calamities such as cyclones and associated tidal waves and strom surges. Therefore it is proposed to construct new cyclone shelters as well aas mangroves/shelterbelt plantations and capacity buildings programmes.

From the statistics on the storms that stuck Kerala region during the past 35 years, it is seen that a total of 7 systems with intensity of Severe Cyclonic Storms originated over Bay of Bengal and crossed eastern coast of India and remerged into

Arabian Sea as depression. . These cyclonic storms are usually accompanied by tidal waves which, on occasions, enter the land up to a distance of 10 km. Heavy rains and winds with speeds exceeding 50km/h prevail during these cyclonic periods. People residing in habitations within a distance of 5km from the sea coast are generally the worst affected with the inundation (varying between approximately 2.5 to 5 m) lasting for over 5-6 days.

Further, the tidal surge accompanying the cyclone is a major cause for the loss of lives. A large number of people in these areas do not have access to safe shelters that are able to withstand the cyclonic fury. There are only few habitations beyond 10 km from the coast which are vulnerable to cyclone/storm surge effects.

It is essential to provide safe accommodation to the vulnerable population during any eventuality or disaster due to natural calamities such as cyclones and associated tidal waves and surges.

C. Maharashtra

Maharashtra is the second most urbanized (judged by the per capita income) and second richest state in India. Its area is 3,06,713 sq.km. It is located between 16°N and 22°N latitudes and 72°E and 80°E longitudes. Its 720 km long coastline stretches from Daman in the north to Goa in the south called the Western Plateau and Hill Regions of India. The location map of the state is given below:



General Administration

Maharashtra is divided into thirty-five districts, which are grouped into six divisions: Aurangabad Division, Amravati Division, Konkan Division, Nagpur Division, Nashik Division, and Pune Division. These are official revenue divisions of government of Maharashtra. Geographically, historically and according to political sentiments Maharashtra has five main regions: Vidarbha or Berar (Nagpur and Amravati divisions), Marathwada (Aurangabad Division), Khandesh and Northern Maharashtra (Nashik Division), Desh or Western Maharashtra (Pune Division), and Konkan (Konkan Division). In all there are 326 talukas and 41251 villages. Total population according to 2001 census was found out to be 90 million.

The investment area proposed under NCRMP II in the state of Maharashtra includes the districts of Thane, Ratnagiri, Sindhudurg, Raigad, Mumbai and Mumbai Suburban.

Climate

The climate of Maharashtra is typically tropical with hot, rainy and cold weather seasons. The months of March-April and May are hot, while the period between June to September attracts heavy monsoons accompanied with storm surges, rainfall and floods specially along the coast leading to days of inundation in many parts specially in the cities of Mumbai and Thane. From November to February there is a cool dry spell, with clear skies and pleasant weather, though the eastern parts of the state experience rainfall.

Coastal Environment

The Dudh, Vaitarna, Ulhas, Amba, Kundalika, Vashishthi, Savitri, Shastri and Terekhol rivers and their tributaries flows westward to drain in to the Arabian Sea in the west. The coastal areas of the Konkan region are populated and developed.. The coastal region is hilly, narrow, highly dissected with transverse ridges of the Western Ghats and at many places extending as promontories, notches, sea caves, embankment, submerged shoals and offshore islands. Some of the major problems faced by the littoral zone and the shore front areas of the coast are related to coastal erosion, siltation, pollution, destruction of mangrove swamps, salt marshes, sea level rise, landslides and slope failure, pressure of population, industrialization, road transport etc.³

As described by the Ministry of Environment and Forests, Government of India, the following are the eco zones in Maharashtra:

- Matheran and surrounding region – Matheran Eco-sensitive Zone
- Mahabaleshwar Tehsil & villages of Bondarwadi, Bhuteghar, Danwali, Taloshi and Umbri of Jaoli Tehsil of Satara District – Eco-sensitive Zone
- Dahanu Taluka, District Thane – Ecologically fragile area
- Murud-Janjira, Raigadh District – prohibiting industries

Soils

The soil and vegetation of the state are related to the climate and geology. The soil in the Deccan plateau is made up of black basalt soil, also known as black cotton soil which is rich in humus. The Wardha – Waliganga river valley has old crystalline rocks and saline soils which make the soil infertile. This type of soil can retain moisture making it suitable for irrigation. The vegetation are mainly in the forest region of the Western Ghats, Satpura ranges and Chandrapur region. The Konkan coast has paddy fields apart from mango and coconut trees as its main vegetation.

Forests

Maharashtra's forest cover in 1970s was 40,700 km², which reduced to 30,740 km² by 1980-82, and then increased to 46,143 km² by 1997 and 47,482 km² by 2001. The area under dense forest cover in Maharashtra was increased by 2,991 km² from 1997 to 1999 and a further 4,173 km²

³ <http://iomenvvis.nic.in/EIA's%20Maharashtra.htm>

Mangroves

The state's coastline is characterized by pockets of beaches, rocky cliffs flanked by estuaries and patches of mangroves. As per the State of Forest Report (published by Forest Survey of India in 2003), out of total 4482 sq. kms of Mangroves in the country, 118 sq kms (2.63%) are confined in the Konkan Region of Maharashtra. Following the landmark judgment of High court in the year 2005 on the issue of conservation of mangroves in the state, the Government of Maharashtra has initiated several steps to protect this resources. It is decided to declare all the mangroves on government land as "Protected Forests" and all those on private land as "forest to ensure better legal safeguards which at present are protected under the CRZ Notification.

Ecologically sensitive areas

Ratnagiri district is located on the west coast of India, bound by Arabian sea with flora and fauna along its estuaries and woody Mangroves. Birds in these estuaries include egrets, herons, sandpipers, plovers, oyster catchers, kingfishers, lapwings, stilts and moorhens. Fish species include *Ambassis Gumnocephalus*, *Batrachus grunniens*, *Caranx boops*, *Chateossus nasus*, *Chorinemus tolooo*, *Chrysophrys haffara*, *Echeneis naucratus*, *Equula dussumieri*, *E.fasciata*, *Gerres poeti*, *Gobius criniger*, *Hippocampus guttulatus*, *Mugil carinatus*, *Platycephalus macracanthus*, *Naucratus doctor*, and *Sardinella melanura*.

There are total 60 species of Mangroves in India out of which 33 species grow in western coastal area. The major species includes *Sonneratia Alba*, *Avicennia marina*, *Avicennia officinalis*, *Rhizophora mucronata*, *Salvadora persica*, *Bruguiera Cylindrical*. Mangrove ecosystem forms an important component of coastal biome in tropics. Due to its high productivity, the ecosystem supports a large diversity of faunal elements in addition to flora, which receive food and shelter from mangroves. Mangroves provide habitat for a wide variety of faunas including 77 species of fishes, prawns, oyster, crab, etc.

The Species being considered are *Avicennia*, *Rhizophora*, *Sonneratia* and *Candelia*. It has been found to be extremely suitable for plantation in the Konkan area. The species is suitable because these are indigenous species and are already planted in adjoining areas. These plantations have been found successful in terms of survival and growth.

Seismic zones

The State of Maharashtra falls in a region of moderate to high seismic hazard⁴. As per the 2002 Bureau of Indian Standards (BIS) map, Maharashtra also falls in Zones II, III & IV. Historically, parts of the state have experienced seismic activity in the M6.0 – 6.5 range. The seismic zone map of the state is shown in the Annexure 4.

Socio-Economic Profile

⁴ According to GSHAP data

The state covers an area of 307,731 km square and has a population of 112,372,972 (2011 census). Maharashtra is divided into 35 districts and 6 administrative divisions, namely; Mumbai (Konkan), Nashik, Aurangabad, Amravali and Nagpur. The 35 districts are divided into 109 sub-divisions and 357 taluks.

The Konkan division is an administrative sub-division of Maharashtra which comprises all the coastal districts of the state.

Length of coast line (Km) - 720

Continental Shelf ('000 sq km) - 112

Number of Fish landing centres - 152

No. of Fishing villages - 456

No. of Fisherman families - 81,492

Fisher-folk population - 3,86,259

The 6 coastal districts of Maharashtra (Thane, Raigad, Ratnagiri, Sindhudurg, Mumbai and Mumbai Suburban) fall under the Konkan sub-division of Maharashtra). The details of this coastal area are as follows:

As per 2011 data	Thane	Raigarh	Ratnagiri	Sindhudurg	Mumbai City	Mumbai (Suburban)
Sex Ratio (Female per 1000 male)	888	959	972	1079	838	860
Population Density (per sq km)	1157	368	197	167	19652	20925
Urban Population (%)	72.58			9.47		
Literacy Rate	86.18	73.65	74.26	80.3	88.48	82.5
Male Literacy	90.90		-	90.3		87.87
Female Literacy	80.78		-	71.2		75.8

History of Cyclones in Maharashtra

Date/ Year	Category	Effects
30 October - 2 November, 1854	Severe Cyclonic Storm	Crossed Bombay coast on 1 November Loss and damage: People killed: 1,000 Property worth crores of rupees perished within four hours.

Date/ Year	Category	Effects
18-23 November, 1948	Severe Cyclonic Storm	Crossed coast near Virar, 72 km North of Bombay on 22 November. Maximum wind: Colaba recorded 120 kmph (65 kts) and Juhu recorded 151 Kmph (81 kts) Loss and damage: Great havoc and heavy loss of life and property and all means of traffic and communication were completely paralysed for two days. A number of small vessels and crafts capsized in the water of the Bombay harbour. Thousands of big trees uprooted and hundreds of buildings and hutments were rendered uninhabitable.
23-25 May, 1961	Severe Cyclonic Storm	Crossed coast near Devgad on the night of 24 to 25 May. Loss and damage: 5 lakh fruit trees were reported to have been razed to the ground. 1,700 houses completely and 25,000 houses partially damaged
Phyan - November 11, 2009	Cyclonic Storm	'Phyan' crossed Maharashtra coast between Alibag and Mumbai on 11th November, 2009 Loss and damage: 'Phyan' caused damage to lives, crops and properties in Goa and Konkan region especially in Ratnagiri, Sindhudurg, Raigad and Thane districts. About 1000 houses in these districts suffered damages. Seven persons died and 44 are missing due to cyclone 'Phyan'.

Existing Infrastructure

1. Anti-Sea Embankments

Maharashtra State has a 720 km long sea coast. About 262 km length is subject to extreme vulnerability on account of wave action and proximity of habitation to the sea. Out of this, protection for 127 Kms has been tackled so far. The length 135 Km is yet to be protected. The works are mainly constructed by using large size rubble bunds. They are to be maintained properly. Rubble bunds are designed by carrying out scientific model studies for varying degree of acceptable damages. For very important and precious protection works are like Marine Drive at Mumbai, the criteria has to be "Zero order Damage" i.e., totally zero damage in the model study for continuous six hours attack of designed wave. For other works, depending on the area to be protected, the criteria can either be "First Order Damage" (0 to 1% damage in model study) or "Second Order Damage" (1 to 5% damage in model study). In no case, damages more than 5% are advisable.

On annual basis, the Maritime Board receives demand from the people for anti-sea protection works. These demands are validated by PWD by conducting field studies and visits with reference to vulnerability of the proposed villages to wave action and storm surges.

2. Saline Embankments

In view of improving the coastal saline lands by protecting them from the saline tidal waters, protective earthen bunds have been constructed under the Kharland Development Board established by the Govt. of Maharashtra, during the year 1949 to 1980. Since then, the Govt. of Maharashtra has been trying to maintain the schemes to their minimum requirements as per the meagre availability of funds through Kharland Development Circle, Thane, established specially for this purpose.

There are 565 Saline embankment Schemes in Konkan Region, where the agricultural lands and the village population are protected by saline embankments. However, due to the continuous daily tidal effects and heavy downpour during rainy seasons, most of them need considerable repairs.

3. Casuarina Plantations

Social Forestry Department has carried out extensive plantation of casurina along the seacoast. Since 1986 more than 477 ha sandy area has been brought under casurina cover. Most of this plantation has been successful and they have now become very effective shelterbelts. Cassurina plantations at places like Tarkoali in Malvan tehsil and Aravali in Vengurla Tehsil have definitely helped in increasing the tourists flow to the nearby beaches.

They have been successful in minimizing impact of wind velocity and saline ingress. It has provided benefits to agricultural crops, resulting in higher yield and protecting live stock, grazing lands and farms. It has benefited in reducing wind erosion, reducing evaporation from soil, reducing transpiration from plants. The important impact of casurina plantation is moderating temperature. They have definitely help in tourist flow near beaches such of Tarkarli of Malvan Taluka and Aravali of Vengurla Taluka.

4. Mangroves

As per the State of Forest Report (published by Forest Survey of Indian), out of total 4482 sq. kms of Mangroves in the country, 118 sq kms (2.63%) are confined in the Konkan Region. The report further states that 64 kms out of these 118 sq kms (around 54%) of the Mangroves are degraded.

Following is the status of existing mangroves in Mumbai and Raigarh district (in possession of Forests Department)

<u>S.No</u>	<u>Nature of Mangroves</u>	<u>Alibhag Div</u>	<u>Roha Div</u>	<u>Thane</u>
		<u>Raigarh District</u> <u>(in hectares)</u>	<u>Raigarh District</u> <u>(in hectares)</u>	<u>Thane and Mumbai districts</u>

<u>1</u>	Dense Mangroves	1153	415.55	3780
<u>2</u>	Sparse Mangroves	340	200	1000
<u>3</u>	Degraded mangroves and mud flats	150	100	620
	Total	1643	715.55	5400

Conclusion

Maharashtra State has a 720 km long sea coast, of which about 262 km is subject to extreme vulnerability on account of wave action and proximity of habitation to the sea. The State has attempted to protect parts of the vulnerable coastline in previously.

A summary of such past experiences, problems faced by the State and future considerations is as follows:

1. Anti-Sea Embankments

Almost all of the Anti-Sea Embankments in the State are located in the coast and therefore are in close proximity to the sea. CRZ applicability is a crucial issue in such constructions. Adequate approvals from the relevant authorities will be obtained in this regard to ensure compliance. The constructions will also necessitate Environmental Impact Assessments as wave patterns may be affected. Further, given the effect of wave action on anti-sea embankments, appropriate designs need to be selected to ensure longevity.

2. Saline Embankments

Most of the embankments are in close proximity to the sea and hence are within the CRZ zones. Also, these may impact the drainage patterns in the area. As an ordinary practice, sluices are usually provided by the Department. Given the importance of the construction of embankments, the State has already obtained the adequate clearances from the Ministry of Environment and Forests subject to certain conditions that need to be adhered to. The construction of embankments usually involves linear land acquisition. However, considering the benefits that accrue to the people from the structures, the local population have in the past voluntarily given up land for such construction.

The existing embankments have often not been repaired or maintained after construction. Hence, these have been eroded over a period of time. Accordingly, the State would need to separately address maintenance works and budgets as part of the DPR.

The prevalent practice has been to use local labour and hence setting up of labour camps is usually avoided.

3 Cyclone Shelters

The State has not constructed any Cyclone Shelters till date and hence will build on the experiences of Andhra Pradesh and Orissa in terms of design, alternate usage of

the structures during peaceful times, repair and maintenance provisions and funding mechanisms.

4. Shelterbelt Plantations

The Casuarina plantations are usually planted on private/community land. As part of routine procedures, the community is actively consulted and public resolutions are passed before any action is taken. The local population voluntarily agrees to give the land for these plantations because:

- these plantations are found to be extremely beneficial to the local community as they provide protection to the agricultural lands
- the ownership of the casuarina plantation continues with the private land owner. Hence, they are also interested in maintaining and protecting them.

The nature of the intervention is such that it requires regular watches and monitoring to ensure the survival of the plantations. Adequate management and maintenance plans need to be factored. It may be noted that certain plantation areas will be within CRZ zones and hence, wherever applicable, site specific assessments need to be obtained. As a practice, the department has not been taking any approvals from the CRZ authorities for its plantation works as this is an activity prescribed under the CRZ notification.

Also, the plantation plan drawn up usually is reviewed to ensure that the rights species of shelterbelts are planted such that they are both available locally and are able to withstand the impact of high wind velocities without breaking. Adequate provisions are also made to ensure the use of minimum amounts of fertilizers and pesticides during the first 2-3 years.

5 Mangroves

Almost all mangroves are located along the coastline and hence in close proximity to the sea. CRZ applicability is therefore a crucial consideration in such interventions. As a practice, the department has taken concerned approvals for 300 ha. from Maharashtra Coastal Zone Management Authority (MCZMA) for its plantation works. The presence of eco-sensitive areas in the nearby areas is also a critical factor. Hence, appropriate measures and approvals will be taken from the relevant authorities to ensure compliance with all environment norms and conditions.

Proper planning measures for addressing issues related to habitats and impacts on biodiversity will be undertaken. Adequate mechanisms will be put in place to ensure correct species selection and regular monitoring, especially in the initial growth period to ensure survival.

D. West Bengal

West Bengal was formed on May 1, 1960. It has Bangladesh on its eastern border, the states of Assam and Sikkim and the country Bhutan to its northeast and state of Orissa to its southwest. To the west it borders the states of Jharkhand and Bihar, and to the northwest, Nepal.

The State of West Bengal can be divided into four physiographic divisions:

1. The Himalayan Region - Districts of Darjeeling, Jalpaiguri and Koochbihar
2. The Eastern Fringe of Chotanagpur Plateau - District of Purulia and Western part of the districts of Bardhaman, Medinipur, Birbhum and northern part of Bankura
3. The Deltaic Zone - Sundarban area of the South 24 Parganas and small part of North 24 Parganas
4. Plains - Remaining areas of the State

The location map of the state is given below:



General Administration

There are 19 districts in West Bengal. Each district is subdivided into Sub-Divisions, and again into Blocks. There are 340 Blocks. Blocks consist of panchayats (village councils) and town municipalities.

The areas proposed for Investment in the State of West Bengal are located in the coastal areas of Purba Medinipur district, North and South 24 Parganas, better known as the Sunderbans.

Climate

West Bengal's climate varies from tropical savannah in the southern portions to humid subtropical in the north. Summer in the delta region is noted for excessive humidity up to over 100% with the highest day temperature ranging from 38 °C to 45 °C. The Darjeeling Himalayan Hill region experiences a harsh winter, with occasional snowfall at places.

Soils

The soils of West Bengal can be classified into six agro-ecological sub-regions. These are:

1. Warm Humid
2. Warm to Hot Humid
3. Hot Humid
4. Hot Moist Sub-Humid
5. Moist Sub-Humid
6. Hot Dry Sub-Humid.

The warm humid agro-ecological sub region covers the mountainous region of Darjeeling District. It occupies an area of 0.26 m ha, representing 2.9 percent of the total geographical area of the state. Soils of this sub-region are heterogeneous in nature. The soils developed on steep hill slopes are shallow, excessively drained with severe erosion hazard potential. The soils of the foothill slopes and valleys are moderately deep, well drained, loamy in texture with moderate erosion hazards. Soil acidity, high runoff rate and limiting soil depth (on steep hill slopes) are the most important problems of this region.

The warm to hot humid agro-ecological sub-region comprising of foothills of Bhutan Himalayas constitutes the northern fringe of Jalpaiguri district with Tarai soils. The sub-region covers an area of 0.17 m ha, representing 1.9 percent of total area of the state of West Bengal. The soils are partly developed and are mainly formed of young alluvium on alluvial fans of the foothills. These are shallow to moderately deep and at places deep with medium to fine texture. Mostly tea and horticultural plantation are supported by these soils. Severe flood hazards coupled with abrupt break in gradient and severe runoff poses serious water management problems.

The hot humid agro-ecological sub-region comprising of the level Teesta Plain (Duars) below the Bhutan Himalayas, covers the districts of Koch Behar, Jalpaiguri (southern part) and northern parts of West Dinajpur. This sub-region occupies an area of 0.85 m ha representing 9.6 percent of the total geographical area of the state. The soils of this region have developed from the alluvium deposited by the rivers Teesta, Mahananda and Jaldhaka. These are moderately deep to deep, coarse to fine loamy in texture. At places these soils are moderately well drained but

mostly they are imperfectly and/or poorly drained. The area is intensively cultivated for rice and jute. The major problems are water logging, severe flood hazards etc.

The hot moist sub-humid agro-ecological sub region comprises of the Ganga Plain (an eastward continuation of Indo Gangetic Plain covering the districts of Maldah, West Dinajpur (southern part), Murshidabad, Nadia, Haora, Hoogli, 24 Parganas (Northern Part), Bardhaman (eastern part), Birbhum, Bankura and Medinipur (eastern part). It covers an area of 4.39 m ha representing 55.7 per cent of the total geographical area of the state. The soils have been formed from the alluvium deposited by Ganga and its tributaries and sub tributaries viz. Ajoy, Damodar, Kansabati, Bhagirathi, Haldi, Rupnarayan etc. These soils are greatly variable in their morphological, physical and chemical properties depending upon the geomorphic situations, moisture regime and degree of profile development. The soils are intensively cultivated for rice, wheat, potato and oilseed crops. Frequent inundation of low lying areas result in stagnation of water for certain times of the year. Besides flood hazards also affect the normal dry land crop yields. The soils of this sub-region have high nutrient content and mineral resource with a high potential for a large variety of agricultural and horticultural crops.

The moist sub-humid agro-ecological sub-region encompasses the coastal parts of the districts of 24 Parganas comprising mostly Sundarban areas of south 24 Parganas and coastal Medinipur. It covers an area of 0.68 m ha, representing 7.6 per cent of the total geographical area of the state. The alluvium deposited by Matla, Haldi, Rupnarayan rivers have gradually developed into deep, fine loamy to fine textured soils, by and large salt impregnated due to tidal flow of sea water through creeks and sub-tributaries. These soils are imperfectly to poorly drain with moderate to very high salinity hazards. The soils remain wet and saline for considerable period of the year and are suitable particularly for salt resistant crops.

The hot dry sub-humid agro-ecological sub-region comprising the outlines of Chotonagpur Plateau includes the district of Puruliya and western parts of Bardhaman, Bankura, Birbhum and Medinipur. It covers an area of 1.98 m ha representing 22.3 per cent of the total area of the state. The soils have developed on parent materials of sedentary nature. They vary from shallow to deep reddish to yellowish red, loamy to clayey and are not fully drained. Relatively less aggregated red and laterite soils are prone to frequent development of surface encrustation. Poor capacity for retention of rainwater leads to severe runoff and soil loss. Soil infertility and limiting soil depth also pose problems.

Wetlands

These ecosystems encompass diverse and heterogeneous habitats ranging from rivers, flood plains and rain fed lakes to swamps, estuaries and salt marshes. The predominant wetland types of the State are marshes, jheels, terai swamps and char lands of the Gangetic plains, wetlands in Islands of Bay of Bengal and coastal brackish water wetlands. These wetlands harbour enormous diversity of floral and faunal species, many of which are endangered. Wetlands are a highly productive ecosystem, which serve as habitat for a variety of plants and animals. Wetlands perform essential functions including flood control, natural sewage treatment, and stabilisation of shorelines against wave erosion, recharging of aquifers and supporting rich biodiversity. Many wetlands serve as the winter habitats for

migratory birds. Wetlands are subjected to reclamation, agriculture runoffs, pesticides, construction of dams and barrages, etc.

Coastal and Marine Ecosystem

West Bengal has a coastline of 650 km in the northern part of Bay of Bengal within Medinipur and South 24 Paraganas districts. The available data on faunal diversity reveals that it represents more than 15% of the total fauna of the country. Such ecosystem in the State is located in Sunderbans in South 24 Paraganas district under Tiger Reserve and Biosphere Reserve areas.

The Sundarbans is the largest single block of tidal halophytic mangrove forest in the world covering some 10,000 sq. km of mangrove forest and water (of which some 40% is in India and the rest in Bangladesh). It is formed from sediments deposited by three great rivers, the Ganges, Brahmaputra and Meghna, which converge on the Bengal Basin. The whole Sundarbans area is intersected by an intricate network of interconnecting waterways, of which the larger channels are often a mile or more in width and run in a north-south direction. These waterways, apart from the Baleswar River on the eastern edge of the Bangladesh Sundarbans, now carry little freshwater as they are mostly cut off from the Ganges, the outflow of which has shifted from the Hooghly-Bhagirathi channels progressively eastwards since the seventeenth century. This is due to subsidence of the Bengal Basin and a gradual eastward tilting of the overlying crust. In the Indian Sundarbans, the western portion receives some freshwater through the Bhagirathi-Hooghly river system but that portion designated as the tiger reserve is essentially land-locked, its rivers having become almost completely cut off from the main freshwater sources over the last 600 years. Thus, waterways in the tiger reserve are maintained largely by the diurnal tidal flow, the average rise and fall being about 2.15m on the coast and up to 5.68m on Sagar Islands. Tidal waves are a regular phenomenon and may be up to 75m high. The land is constantly being changed, moulded and shaped by the action of the tides, with erosion processes more prominent along estuaries and deposition processes along the banks of inner estuarine waterways influenced by the accelerated discharge of silt from seawater. About half of the Sundarbans is under water and the rest of the landscape is characterised by low-lying alluvial islands and mudbanks, with sandy beaches and dunes along the coast. As with the rest of the Bengal Plain, alluvial deposits are geologically very recent and deep, sediment of just the last few million years being as much as 1,000m thick

Forests

Forests make up 14% of the geographical area of West Bengal, which is lower than the national average of 23%. Protected forests cover 4% of the state area. Part of the world's largest mangrove forest Sundarbans is located in southern West Bengal.

The predominant commercial tree species is *Shorea robusta*, commonly known as Sal and Casuarina. The coastal region of Purba Medinipur exhibits coastal vegetation with stretches of Casuarina plantations. The most valuable tree from the Sundarbans is the ubiquitous Sundri (*Heritiera fomes*) from which the forest gets its name. Vegetation in North West Bengal is dictated by elevation and precipitation. For example, the foothills of the Himalayas, the Dooars, are densely wooded with Sal and other trees of the tropical evergreen type. Above 1000 m, the forest type

changes to subtropical. In Darjeeling, which is above 1500 m, common trees typifying the temperate forest are oaks, conifers, and rhododendrons. There are five national parks in the state — Sundarbans National Park, Buxa Tiger Reserve, Gorumara National Park, Neora Valley National Park and Singalila National Park. Wildlife includes the Indian rhinoceros, Indian elephants, deer, bison, leopards, gaur, and crocodiles. The state is also rich in bird life. Migratory birds come to the state during the winter. The high altitude forests like Singalila National Park shelter barking deer, red panda, chinkara, takin, serow, pangolin, minivet and Kalij pheasants.

Mangroves

The largest stretch of mangroves in the country lies in the Sunderbans of West Bengal covering an area of about 4200 Sq.km. The predominant mangrove species are *Avisennia officinalis*, *Excoecana agallocha*, *Heritiera Tomes*, *Brugutera parviflora*, *Cenops decandia*, *Rhtzophora mucronata* and *Zylocarpus granatum*. Mangroves also harbour a number of molluscs, polychaetes and honeybees. The Sunderbans are noted for a reserve project conserving Bengal tigers. In addition to the Bengal tiger, the Sunderbans host many other endangered species like Gangetic dolphin, river terrapin, estuarine crocodile etc. The mangrove forest also acts as a natural fish nursery, supporting coastal fishes along the Bay of Bengal.

Seismic Zones

Western sections of the northern districts of Jalpaiguri and Kooch Bihar lie in Zone V. The remaining parts of these two districts, along with the districts of Darjeeling, Uttar Dinajpur, Dakshin Dinajpur, Maldah, 24 North Parganas and 24 South Parganas lie in Zone IV. The rest of the state along with the city of Kolkata lies in Zone III.

3.2.10 Socio-Economic Profile

The coastal area of West Bengal comprises of 3 districts – North 24 Parganas, South 24 Parganas and Purba Medinipur.

Over-view

The coastal area of West Bengal is the home of some of the poorest people, living in some of the least served and remote areas of the State. The 3 coastal districts i.e. South and North 24 Parganas and Purba (East) Medinipur are densely populated with around 2.47 million fisherfolk living here. Majority of this population is classified as scheduled castes and schedule tribes.

Transport and Communication

A major part of coastal West Bengal comprises the Sunderbans region, located in the estuarine section of the Ganga- Brhamaputra river system at the mouth of Bay of Bengal. This is a unique delta system with dynamic ecosystem. In the “Indian Sunderbans” these Scheduled Castes and Tribes population are in many ways, faced with additional burdens because of poor communications resulting from the innumerable creeks, canals and tidal rivers, which separate the islands from each other and from the mainland. Obstruction of water inflow by sedimentation and

embankments further increases the pressures on the waterways. The extremely poor transportation infrastructure (roads, bridges, jetties) and inland waterways transport has meant that often even basic social services are lacking. This also reduces access to markets

Population and Livelihood

The process of uncontrolled population growth has reduced the per capita cultivable land and created overcrowding and high rate of disguised unemployment. The consequent difficulties in ensuring livelihood have also led to a high rate of out migration among males. The per capita real income in these 3 coastal districts as per 1993-94 prices is South 24 Parganas: INR 8394.74, North 24 Parganas: INR 9440.25 and in undivided Medinipur: INR 9263.49 comparing to district like Bardhaman: INR 11445. (Human Development Report, Dept. of Development and planning, GoWB, 2004). A large part of the population of this coastal area is basically dependent on rain fed mono cropping and whatever subsidiary activities are available, this has led to an increasing dependence upon fishing and the collection of shrimp seed from the backwater saline rivers. Involvement in alternative employment is usually during August and October when the fry are less abundant.

Gender

Gender discrimination is common throughout the region. Women's life in the area is shaped by the patriarchal, patrilineal Society. The problems are compounded by extreme poverty, poor housing, health and sanitation, limited access to safe drinking water, low literacy rates, limited access to support services, resource opportunities and social exclusion.

In order to address the issues of poverty, backwardness and women's empowerment in the coastal districts of west Bengal, the government of West Bengal proposes to undertake a multi-sectoral developmental programme in the 80 community Development Blocks in 3 Districts i.e. South and North 24 Parganas and Purba Medinipur.

Existing Infrastructure

1. Existing Cyclone shelters and other Cyclone resistant buildings

There are 291 permanent rescue shelters in 16 out of 18 districts in the State. 131 of these are situated in six cyclone-affected districts, namely, Paschim Medinipur, Purba Medinipur, North and South 24 Parganas, Howrah and Hooghly. 13 are under construction. All educational institutions in all districts are used as temporary cyclone shelters. The District Disaster Management Plans document the names of all rescue shelter, both permanent and temporary.

National Disaster Management Authority (NDMA) is constructing 50 Multipurpose Cyclone Shelters in three cyclone prone coastal districts of West Bengal, namely, South 24 Parganas, 24 North Parganas and East Mednipur districts at an estimated cost of Rs. 138.65 Crore funded from the Prime Minister's National Relief Fund.

Department of Disaster Management, Government of West Bengal has been entrusted with the construction, operation and maintenance of the proposed Multi-Purpose Cyclone Shelters (MPCS) as envisaged in the ICZM Project. The estimated

cost of the project is 32 crores. Department of Disaster Management has been assigned this project.

Post Disaster damage assessment studies indicate that cyclone and consequential flooding claim many human lives and livestock in the coastal district of the state. Most of the housing stock in this region is made of temporary roof and wall material – thus being most vulnerable to the high velocity winds and flooding. Vulnerability of housing stock being the prime reason for loss of human life, there is a need to provide community cyclone/flood shelters to offset this situation

2. Other measures for cyclone risk reduction

West Bengal Disaster Risk Management Programme, a Ministry of Home Affairs and United Nations Development Programme sponsored programme, covers the districts of South 24 Parganas and North 24 Parganas along with eight other districts since 2003-04. The National Programme Implementation Committee for this Programme resolved years back to include the districts of Purba and Paschim Medinipur under the programme. This has not been implemented. Preparation of multi-hazard disaster management plans, capacity building of stake holders, formation of disaster management teams at the village level, etc. are some of the components of the programme.

Extensive trainings have been conducted at different levels for government officers, members of the three tier Panchayati Raj Institutions, members of the community and other stake-holders.

Specialized training in Search & Rescue techniques and psychological first aid has been provided to block level trainers.

3. Embankments

The original embankments (dykes) were constructed without any proper engineering guidelines and thus the slopes on the riverside and on the landside, embankment crest width and its elevation were all decided upon repeated human experiences. However, rising waters of the rivers cause failures of these embankments due to overtopping, sloughing, or slip failure due to erosion of the base due to river current at its base if it is too close to the river. It has been observed that during high tide period, mainly in the flood seasons, when synchronized with cyclonic storm of moderate or high intensity, the rivers become furious causing formation of severe waves which dash on these embankments and thereby considerable erosion of the embankments takes place and sometimes breaches occur causing serious concern of saline inundation and destruction of public utilities in the countryside of the embankments. Due to downpour in rainy season and due to the erosion as stated above, the embankments almost each year exist in skeleton section which are repaired and strengthened as far as feasible by only earth work to face the next flood season. The number of villages affected by the damaged saline embankments comes to 51 in total. It is necessary to provide immediate revetment protection to about 235 kms critical length of embankments in the Sundarbans out of a total of about 3500 kms

According to a report by Kanjilal, the Irrigation Department adopted a design crest level of 4.80+GTS. According to information collected from the office of the Irrigation Department in Gosaba, there are no Benchmarks on the islands of their

sub-division of which the levels have been established in relation to the Reference Level of the Sundarban.

For that reason the actual levels of the crests of the existing embankments and those of the embankments that need to be reconstructed cannot be established properly. Reliable and long ranging data about water levels in the rivers are also not available. Because of this a discussion about whether a crest level of 4.80+ is sufficient is not relevant.

Again, at many locations and over considerable lengths, the actual width of the crests is not according to the accepted standard. This is not because the embankments have been damaged by wave-dash or have been affected by slips initiated by bank failures including parts of the embankment, but simply because they are not constructed according to the standard specifications

4. Roads

A detailed look into the village level connectivity indicates that some of the villages are yet to have direct access through surfaced roads. Apart from these, culverts, bridges at key location are missing reducing the accessibility of these communities. These missing links are vital in the aftermath of cyclone/flood for emergency response as well as for faster restoration of normalcy. In addition to these, missing links will help induce economic development of these communities, often residing within the bottom most bracket of the socio-economic stratum.

Conclusion

The coastal districts of West Bengal are prone to frequent cyclonic storms and concurrent flood hazards causing considerable loss of human lives, domestic animals, agriculture and other properties. The resultant impacts of cyclonic depressions are breaches and embankment failures, over topping of saline water and flash floods. Such vulnerability is acute in the areas along sea coast and either side of estuaries.

The most recent calamity to have occurred was on May 25, 2009 when cyclone 'Aila' hit the State causing widespread damage and disruption. West Bengal will currently be proposing only the construction of Cyclone Shelters under NCRMP.

The Department of Relief and Department of Disaster Management under the State Government therefore has prior experience in creating cyclone risk mitigation infrastructure with the objective of protecting life during cyclone and strengthening community based disaster preparedness.

A summary of such past experiences, problems faced by the State and future considerations is as follows:

1. Cyclone Shelters:

In the past, Cyclone shelters have been constructed by the State within the premises of government schools in specific villages. This has precluded the need for private land acquisition and has ensured, at the same time, that community involvement and ownership of assets is maintained.

The primary issue faced by the State in the past has been that of ensuring adequate connectivity to the shelters. Due to an inadequately developed roads network connecting the shelter to its catchment population, accessibility is highly compromised. The situation is especially critical in the Sunderban region in which small yet densely populated islands are intersected by an intricate network of interconnecting waterways.

The existing shelters also ail from improper maintenance to a great extent. Thus, regular maintenance and upkeep needs to be given adequate consideration in the NCRMP proposal to ensure that proper funds are available and other suitable mechanisms are adopted for the same.

Some of the buildings proposed are located in close proximity to the sea and hence are within CRZ zones. Thus, adequate approvals will be taken from the relevant authorities to ensure compliance to CRZ norms and conditions.

The State will ensure that all the issues faced earlier (as mentioned above) are suitably addressed in the NCRMP proposal. It will also build on the experiences and practices of Andhra Pradesh and Orissa to ensure that all probable environmental and social issues resulting from the proposed constructions are avoided.

E. Karnataka

Karnataka is located in the southern part of India and is surrounded by other states like Maharashtra and Goa in the north, Tamil Nadu and Kerala in the south, Andhra Pradesh in the east and with the Arabian Sea in the west. The state of Karnataka is situated approximately between the latitudes 11.5° and 18.5° North and the longitudes 74° and 78.5° East.

The location map of the state is given below:



The state of Karnataka is part of two well-defined regions of India, namely the

1. Deccan Plateau
2. Coastal Plains and Islands

It can be further divided into four regions - the Northern Karnataka Plateau, Central Karnataka Plateau, Southern Karnataka Plateau, Karnataka Coastal Region.

General Administration

Karnataka has 27 districts divided in four divisions:

- Bangalore Division: Bangalore, Bangalore Rural, Chitradurga, Davanagere, Kolar, Shimoga and Tumkur
- Belgaum Division: Bagalkot, Belgaum, Bijapur, Dharwad, Gadag, Haveri and Uttara Kannada
- Gulbarga Division: Bellary, Bidar, Gulbarga, Koppal and Raichur

- Mysore Division: Chamarajanagar, Chikmagalur, Dakshina Kannada, Hassan, Kodagu, Mandya, Mysore and Udupi.

Climate

The state enjoys three main types of climates. For meteorological purposes, the state has been divided into three sub-divisions namely

- Coastal Karnataka (Dakshina Kannada and Uttara Kannada districts),
- North Interior Karnataka (Belgaum, Bidar, Bijapur, Dharwad, Gulbarga and Raichur districts) and
- South Interior Karnataka (the remaining districts of Bangalore Rural, Bangalore, Bellary, Chikmagalur, Chitradurga, Kodagu, Hassan, Kolar, Mysore, Mandya, Shimoga and Tumkur districts)

The Tropical Monsoon climate covers the entire coastal belt and adjoining areas. The climate in this region is hot with excessive rainfall during the monsoon season i.e., June to September. The Southern half of the State experiences hot, seasonally dry tropical savana climate while most of the northern half experiences hot, semi-arid, tropical-steppe type of climate. The climate of the state varies with the seasons.

The winter season from January to February is followed by summer season from March to May. The period from October to December forms the post-monsoon season. The period from October to March, covering the post-monsoon and winter seasons, is generally pleasant over the entire State except during a few spells of rain associated with north-east monsoon which affects the south-eastern parts of the State during October to December.

The months April and May are hot, very dry and generally uncomfortable. Weather tends to be oppressive during June due to high humidity and temperature. The next three months (July, August and September) are somewhat comfortable due to reduced day temperature although the humidity continues to be very high.

Coastal Environment

Karnataka coastline extends over a length of 320 kilometers with numerous river mouths, lagoons, bays, creeks, cliffs, sand dunes and long beaches. Karnataka has no major delta formations. The shelf off Karnataka has an average width of 80 kilometers and the depth of shelf break is between 90 and 120 meters. There are 26 estuaries with more than 70000 ha water spread area and 8000 ha of brackish water area, making the 3 coastal districts of Karnataka very rich in marine, estuarine and riverine biodiversity. 14 rivers which originate in Western ghats run westwards and join the Arabian sea. Karnataka Coastal soil is a mixture of laterite rock and clay.

There are few islands of the coast such as St.Mary's island, 4 kilometers from Malpe. Coastal areas are some of the most productive and important habitat of the biosphere including estuaries, backwaters and coastal wetlands. There are 14 coral species and 4 sponge species found in this region such as *Dendrophyllion* Sp. *Turbinana* Sp, *Goniastrea pectinatu* che. Small gaint clams (*Tridacna maxiona*) are protected under the Indian wildlife protection Act. There are about 62 phytoplankton; 78 species of sea weeds (*sangassam ilicifolium*), 2 species of sea grass, 115 zooplankton such as *Acartia clausii*, *Acrocalanus gibber*, *Euphausia diomedae*, *Stylocheiron armatum* etc are observed along the Karnataka coasts

apart from these 234 species of Molluscs out of which 3 are threatened such as *Tridacna maxima*, *Lambis chiragra* and *placenta*. 33 species of shrimps were first recorded from Karnataka coasts recently. 103 species of crabs, 5 species of star fish, 2 species of sea urchins, one species of sea cucumber have been observed along the coasts. 390 marine fish species, 3 species of sea turtles, 4 species of whales, 4 species of dolphins are commonly seen along the coasts. Existence of rich fringing coral reef ecosystem surrounding the Nethrani Island can be observed.

Forests

Karnataka, one of the Southern states of India has 3.83 Million ha of recorded forest area which is around 20 percent of its geographical area. Karnataka is endowed with most magnificent forests in the country ranging from majestic evergreen forests of the Western Ghats to the scrub jungles of the plains. The Western Ghats of Karnataka are one of the 25 global priority hotspots for conservation and one of the two on the Indian subcontinent. Several economically important species such as Sandalwood, Rosewood, Teak, White cedar grow naturally in these forests. Karnataka forest is endowed with rich wildlife, harbors 25 percent of the elephant population of India, 10% of the Tiger population. The state has 5 National parks and 21 sanctuaries comprising about 17.3% of total forest area as protected area for wildlife and biodiversity. The state ranks 4th among all the state and union territories in respect of area under tree cover.

Mangroves

Karnataka has a coastline of over 320 kilometers. Fourteen rivers and several small rivulets, which originate in the Western Ghats cut across the Coast to join the Arabian Sea. Towards the coast, the salt water tides from the sea travel several Kilometers interior through the river mouths providing congenial habitats for mangroves. Most Mangroves are of the fringing type in linear formations along the river or estuarine banks. Where the estuaries are wider, especially in Swarna Sita-Kodi, Gangoli, (towards the mouth of Haladi-Chakra-Kollur rivers), Aghanashini and Kali there are several remarkable locations for mangroves.

Mangrove swamps develop only where coastal physiography and energy conditions are favorable. Mangroves develop best in the region, experiencing abundant rainfall, evenly distributed throughout the year and when the climate is very much regular. The Coastal Karnataka is a region of high humidity. The rainfall here varies from 2500mm to slightly over 3000 mm, most of it is seasonal during June-September. Karnataka Coast soil is a mixture of laterite rock and clay. The coast has 14 species of mangroves belonging to 8 families. The Mangroves species available in the Coastal Zone of Karnataka are *Rhizophora mucronata*, *Acanthus elicifolius*, *Acrostichum aureum*, *Aegiceras corniculatum*, *Avicennia marina*, *Avicennia officinalis*, *Bruguiera cylindrica*, *Humanizenra*, *Racemosa*, *Excoecaria*, *Agallocha*, *Protersia*, *Coarctata*, *Bruguiera*, *gymnorhiza*, *Rhizophora apiculata*, *Sonneratia alba* etc.

F. Goa

Goa came into existence as a separate State on 30th May 1987. It is situated on the west coast of India between 15.4989° N north latitude and 73.8278° E east longitude, covering an area of 3,702 sq. km. It is bounded by the state of Maharashtra to the north and by Karnataka to the east and south, while the Arabian Sea forms its western coast.

The location map of the state is given below:



General Administration

For administrative purposes Goa is divided into 2 revenue districts: north Goa and South Goa. The 2 districts are further divided into 9 sub-divisions and 12 Talukas. The state government offices are located at Panaji, in the north Goa district.

Climate

Goa has a tropical monsoon climate, being located in the tropical zone and near the Arabian Sea; it is hot and humid for most part of the year. The temperature generally ranges from mean minimum of 20 °C to mean maximum of 35 °C. The month of May is the hottest, with day temperatures occasionally exceeding 35 °C, along with high humidity. Monsoon enters the state normally in the first week of June. The state receives rainfall on an average of 2500 mm. annually, mostly during June to September period. Goa has a short winter season between mid-December and February. The temperature during winter months ranges between 21 °C to 28 °C with moderate amounts of humidity.

Coastal Environment

The coastline of Goa is characterized by continuous stretches of sandy beaches, occasionally interrupted by rocky headlands which protrude as far as 2 - 3 km into the sea. Sandy beaches are found between rocky headlands. In general, the width of the beaches in this region varies between 50 and 180 meters and is generally fringed by 1 to 10 m high sand dunes which extend almost half a kilometer or more before merging with the hinterland coastal plain. Several places along the coastline are intersected by dynamic estuarine river systems which cut across hinterland formations and wind their way towards the Arabian Sea; these can be classified as tide dominated coastal plain estuaries. The coastal zone of the state comprises an intricate system of wetlands and lowlands, tidal marshes, cultivated paddy fields, intertidal beaches, all intersected by canals inland lakes, bays, lagoons and creeks, features which are governed by regular tides which raise or lower water levels by 2 or 3 meters daily⁵.

Soils

The soils of Goa are majorly of lateritic variety (i.e. around 81%). The texture of these soils vary from sandy loam to silt-loam; are well drained and highly acidic (5.5 to 6.5 pH). These soils have moderate organic carbon and are poor in potash. About 11% of the soils located along the seacoast and estuaries are sandy-to-sandy loam. The remaining 8% of the soils are alluvial in nature.

Forests

Goa has several forest types ranging from mangroves to moist mixed deciduous forests. The mixed moist deciduous forests cover more than half of the total forest area of the state. In North Goa Division, this type of forest occurs around Tudal, Ordofind, Butpal, Molem, Codal, Abiche Gol near Valpoi, and Anmode ghat. The other types of forests recorded in the state are strand and creek vegetation along the coastal belt, moist deciduous forests, Open scrub jungle and Semi-evergreen & evergreen vegetation along upper ghats.

Mangroves

The state has extensive mangrove vegetation, along the entire course of its 7 rivers and associated network of creeks and backwaters. The most prominent and extensive backwaters with mangroves are located along the East of the capital city of Panaji. The mangroves are found mainly in the sub-divisions at Durbhat, Panaji, Agassaim and Cortalim. The total area covered by the estuaries in Goa including the major Mandovi Zuari estuarine complex is approximately 12,000 ha, out of which the mangrove forests occupy 2000 ha. About 900 ha of mangroves are found along the Zuari estuary, 700 ha along the Mandovi estuary and 200 ha along the Cumbarjua canal. There are 12 species of mangroves, recorded in the state which are *Rhizophora mucronata*, *Rhizophora apiculata*, *Bruguiera gymnorhiza*, *Bruguiera cylindrica*, *Ceriops tagal*, *Kandelia candel*, *Avicennia officinalis*, *Avicennia marina*, *Avicennia alba*, *Sonneratia alba*, *Sonneratia caseolaris* and *Aegiceras comiculatum*⁶.

Ecologically Sensitive Areas

⁵ Source: Report on Coastal Sand Dune Ecosystems of Goa : Significance, Uses and Anthropogenic Impacts, National Institute of Oceanography, Goa

⁶ Source: goaenvs.nic.in

Estuaries: The Mandovi and Zuari river estuaries in Goa are coastal plain estuaries located between the Sahyadris (Western Ghats) and the Arabian Sea. Each estuary is about 50 km long, with a narrow channel, the Cumbarjua canal, interconnecting them.

It is about 10 km long in case of the Zuari and 5 Km is case of Mandovi. Throughout the course of these rivers an intricate system of wetlands, tidal marshes and cultivated paddy fields are found which are interconnected by canals, inland lakes, bays, lagoons and creeks governed by regular tides.

Socio-economic Profile

Goa Population Census Data 2011 shows that it has Total Population of 14.59 lakhs, which is approximately 0.12% of total Indian Population. The total male population is 7.39 lakhs and female population is 7.19 lakhs. Literacy rate in Gujarat has seen upward trend and is 88.70 % as per 2011 population census. Of that, male literacy stands at 92.65 % while female literacy is at 82.16 %.

Out of total population of Goa, 62.17% people live in urban areas, while 37.83% live in the rural areas. The urban population since last decade (i.e. 2001) has increased by 62.17 percent, while the rural population growth over the same period has been 37.83%.

Seismic Zones

According to GSHAP data, the State of Gujarat falls in a region of low seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map Goa falls in Zone III.

Existing Infrastructure

Cyclone shelters and other Cyclone resistant buildings: Goa does not have dedicated/separate network of Cyclone and storm surge shelters unlike other risk prone states like Orissa and Andhra Pradesh. However, in the District Disaster Management Plans (for both north and South Goa), it has been recognized that schools & community centres need to be identified for serving as cyclone shelters during emergencies. Further, it has been identified that dedicated multipurpose cyclone shelter need to be constructed, which during normal period can be put to use for community purposes as anganvadi, schools, hospitals, community centers and even social gathering centers by charging suitable user fee.

Coastal Canals and Embankments (Khazans): Goa has a historic & social system of coastal embankments called khazans, which are essentially lands recovered by reclamation from marshes and the tidal waters with the help of bunds (embankments). These khazans are owned by the village agricultural associations called comunidades. Khazan ecosystem consists of consists of outer protective dykes, inner embankments, sluice gates, a pit called poiem and a canal⁷. In recent years, khazan ecosystems have undergone degradation due to a combination of factors, such as salinization of fields, non-cultivation of lands, mining activities, use of chemical & fertilizers, etc.

Sand Dune Systems: Five key regions have prominent sand dune complexes (Mascarenhas, 1998) - Querim - Morjim with pristine beaches and turtle nesting

⁷ Source: Khazan Ecosystems of Goa by Sangeeta Monak

sites; Chapora – Sinkerim belt; caranzalem – Miramar (Mandovi estuary), the most prominent dune belt within the estuaries of Goa; Velsao – Mobor linear stretch being the longest strip of the most exquisite dune system of the entire coastal zone of Goa and Talpona - Galgibaga.

Regeneration of Mangroves: Mangroves are tropical evergreen trees or shrubs having stilt-like roots that form dense thickets along tidal shores. The geomorphology of mangroves is typified by inter-tidal regions with clayish soils with high organic content facing shallow sea with low wave energy conditions in the tropical sub-tropical zones. Most mangrove habitats are located in areas with some input of fresh water, where salinity is variable across daily as well as annual cycles. The mangrove cover assessment for Goa shows that there has been increase in the mangrove cover of 5 sq.km from 2001 to 22 sq.km in 2011⁸.

Construction of Missing Roads and Bridges: Goa has a well-developed road network with 262 km of National Highways (NH); 232 km of State Highways (SH) and 815 Km of district highway.

⁸ Source: Forest Survey of India (www.fsi.nic.in)

Annexure 2

List of Protected Areas

List of Wild Life Sanctuaries

Gujarat

Balaram Ambaji WLS	Banas Kantha
Barda WLS	Jamnagar, Porbandar
Gaga Great Indian Bustard WLS	Jamnagar
Gir WLS	Junagadh, Amreli
Hingolghadh Nature Reserve WLS	Rajkot
Jambugodha WLS	Godhra
Jessore WLS	Banas Kantha
Lala Great Indian Bustard WLS	Kachchh
Kachchh Desert WLS	Kachchh
Khijadiya WLS	Jamnagar
Marine (Gulf of Kachchh) WLS	Jamnagar
Mitiyala WLS	Amreli
Nal Sarovar WLS	Ahmadabad, Surendrnagar
Narayan Sarovar WLS	Kachchh
Paniya WLS	Amreli
Porbandar Lake WLS	Porbander
Purna WLS	Dangs
Rampura Vidi WLS	Rajkot
Ratanmahal WLS	Dahod
Shoolpaneswar (Dhumkhal) WLS	Bharuch
Thol Lake WLS	Mahešana
Wild Ass WLS	Kachchh, Rajkot, Mahešana, Banas Kantha

Maharashtra

Amba Barwa WLS	Buldhana
Andhari WLS	Chandrapur
Aner Dam WLS	Dhule
Bhamragarh WLS	Gadchiroli
Bhimashankar WLS	Pune, Thane
Bor WLS	Wardha, Nagpur
Chapralla WLS	Gadchiroli
Deolgaon-Rehkuri WLS	Ahmednagar
Dhyanganga WLS	Buldhana
Gautala WLS	Aurangabad, Jalgaon
Great Indian Bustard WLS	Solapur, Ahmednagar
Jaikwadi WLS	Aurangabad, Ahmednagar
Kalsubai WLS	Ahmednagar
Karnala WLS	Raigad
Karanjasohol WLS	Akola
Katepurna WLS	Akola, Washim
Koyana WLS	Satara
Lonar WLS	Buldhana
Malvan Marine WLS	Sindhudurg
Mayureswar Supe WLS	Pune
Melghat WLS	Amravati
Nagzira WLS	Bhandara
Naigaon Mayur WLS	Beed
Nandur Madhameshwar WLS	Nashik
Narnala WLS	Akola
Painganga WLS	Yeotmal, Nanded

Phansad WLS	Raigad
Radhanagari WLS	Kolhapur
Sagareshwar WLS	Sangali
Tansa WLS	Thane
Tipeshwar WLS	Yeotmal
Tungareshwar WLS	Thane
Yawal WLS	Jalgaon
Yedsi Ramlinghat WLS	Osmanabad
Wan WLS	Amravati

Kerala

Neyyar Wildlife Sanctuary	Thiruvananthapuram
Peechi-Vazhani Wildlife Sanctuary	Thrissur
Parambikulam Wildlife Sanctuary	Palakkad
Wayanad Wildlife Sanctuary	Wayanad
Idukki Wildlife Sanctuary	Idukki
Peppara Wildlife Sanctuary	Thiruvananthapuram
Thattekkad Bird Sanctuary	Ernakulam
Shendumey Wildlife Sanctuary	Kollam
Chinnar Wildlife Sanctuary	Idukki
Chimmony Wildlife Sanctuary	Thrissur
Aralam Wildlife Sanctuary	Kannur
Mangalavanam Bird Sanctuary	Ernakulam
Kurinjimala Sanctuary	Idukki
Choolannur Pea Fowl Sanctuary	Palakkad
Malabar Wildlife Sanctuary	Kozhikode

Periyar Tiger Reserve	Idukki
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West Bengal

Ballavpur WLS	Birbhum
Bethuadahari WLS	Nadia
Bibhutibhusan WLS	North 24-Paraganas
Buxa WLS	Jalpaiguri
Chapramari WLS	Jalpaiguri
Haliday Island WLS	South 24-Paraganas
Jaldapara WLS	Jalpaiguri & Cooch Behar
Jorepokhri WLS	Darjeeling
Lothian Island WLS	South 24-Paraganas
Mahananda WLS	Darjeeling
Narendrapur WLS	South 24-Paraganas
Raiganj WLS	North Dinajpur
Ramnabagan WLS	Burdwan
Sajnekhali WLS	South 24-Paraganas
Senchal WLS	Darjeeling

List of National Parks

Gujarat

Bansda NP	Valsad
Blackbuck NP	Bhavnagar
Gir NP	Junagadh
Marine (Gulf of Kachchh) NP	Jamnagar

Maharashtra

Chandoli NP	Ratnagiri, Sangli, Satara, Kolhapur
Gugamal NP	Amravati
Nawegaon NP	Gondia
Pench NP	Nagpur
Sanjay Gandhi (Borivilli) NP	Thane, Mumbai
Tadoba NP	Chandrapur

Kerala

Eravikulam National Park	Idukki
Silent Valley National Park	Palakkad
Pampadum Shola National Park	Idukki
Mathikettan Shola National Park	Idukki
Anamudi Shola National Park	Idukki

West Bengal

Buxa NP	Jalpaiguri
Gorumara NP	Jalpaiguri
Neora Valley NP	Darjeeling
Singhalila NP	Darjeeling
Sunderbans NP	North & South 24-Paraganas

List of Conservation Reserve

Bhorkada (Bhorgad)	Nasik, Maharashtra
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List of Biosphere Reserve

Sunderban Biosphere Reserve	South 24 Paragana District, West Bengal
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List of Community Reserve

Kadalundi	Kozhikode & Malappuram
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Critically Polluted Areas

Chembur	Maharashtra
Talcher	Orissa
Vapi	Gujarat
Visakhapatnam	Andhra Pradesh
Patancheru Bollaram	Andhra Pradesh
Ankleshwar	Gujarat
Tarapur	Maharashtra
Durgapur	West Bengal
Howrah	West Bengal

Notified Eco-Sensitive Areas

Dahanu Taluka	Thane District of Maharashtra
Murud-Janjira	Raigadh District of Maharashtra
Mahableshwar Panchgani Region	Satara District of Maharashtra

Wet Lands of National and International Importance

Wetland	State	Area (sq km)/ha.
Vambanad - kol Wetland	Kerala	23549 (ha)
Sasthamkotta Lake	Kerala	354 (ha)
Ashtamudi	Kerala	5598 (ha)
Chilka	Orissa	1165
Kolleru	Andhra Pradesh	901
Nalsarovar	Gujarat	184
Ujni	Maharashtra	357
East Calcutta Wetlands	West Bengal	125

Annexure 3

References / Accessing Key Information

Baseline Data

The baseline data for the different states can be obtained from various sources such as:

1. Official State Government Website
 - a. www.aponline.gov.in
 - b. www.gujaratindia.com
 - c. www.maharashtra.gov.in
 - d. www.orissa.gov.in
2. State of Environment Reports published by Environmental Information System (ENVIS) of Environment Protection Training and Research Institute (EPTRI)
3. State Disaster Management Authorities
4. Orissa Environmental Society – www.orissaenvironment.com/
5. Gujarat Ecology Commission – www.gec.gov.in/
6. Andhra Pradesh Information Commission – www.apic.gov.in/
7. Environmental Information System (ENVIS) Orissa – www.orienvis.nic.in
8. Building Materials & Technology Promotion Council – www.bmtpc.org
9. Maps of India – www.mapsofindia.com
10. National Disaster Management Authority:
<http://ndma.gov.in/wps/poratl/NDMAPortal>
11. State disaster Management Authority Website
 - a. www.disastermanagement.ap.gov.in
 - b. www.gsdma.org
 - c. www.mdmu.maharashtra.gov.in
 - d. www.osdma.org
12. http://ndma.gov.in/ndma/pressrelease/Press_Release-_west_bengal.pdf
13. http://www.iczmpwb.org/main/pea_dodm.php

Legislations

The legislations applicable to the different sub-project activities can be obtained from

1. Ministry of Environment & Forests - <http://envfor.nic.in/legis/legis.html> Contains legislations on:
 - a. Water Pollution

- b. Air Pollution
 - c. Environment Protection
 - d. Coastal Regulation
 - e. Environmental Clearance
 - f. Hazardous Substances Management
 - g. Loss of Ecology
 - h. Noise Pollution
 - i. Animal Welfare
 - j. Wildlife
 - k. Forest Conservation
 - l. Biodiversity
- 2. Department of Environment & Forests – <http://forest.and.nic.in/>
 - a. CRZ Notification
 - b. Forest Conservation Act
- 3. Department of Land Resources, Ministry of Rural Development – <http://dolr.nic.in/>
 - a. The Land Acquisition Act (LA)
 - b. National Rehabilitation and Resettlement Policy, 2007
 - c. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013
- 4. National Disaster Management, Ministry of Home Affairs – <http://www.ndmindia.nic.in/>
 - a. World Bank Guidelines for preparing Cyclone Risk Mitigation investments in States/UTs
- 5. World Bank Environmental Standards and Guidelines - <http://www.worldbank.org/html/fpd/em/power/standards/standards.stm>
- 6. India's international obligations - <http://coe.mse.ac.in/iio.asp>
- 7. Government of Orissa - www.orissa.gov.in/revenue/R&RPOLICIES/Relief%20and%20Rehabilitation/R&R,2006/r&R1.html

Environment Management Plan

The environment management plan for the various sub-project activities is based on different standards laid down by the Government of India. They can be accessed from the following sources:

- 1. National Building Code of India 2005 – <http://bis.org.in/sf/nbc.htm>
- 2. Indian Standards on Earthquake Engineering – <http://bis.org.in/other/quake.htm>

3. Indian Road Congress – <http://irc.org.in/>
4. Mandate (Mangrove Database) – www.mangroveindia.org
5. Wildlife Institute of India – List of threatened plants
 - a. http://www.wii.gov.in/nwdc/threatened_plants_andhra_pradesh.pdf
 - b. http://www.wii.gov.in/nwdc/threatened_plants_gujarat.pdf
 - c. http://www.wii.gov.in/nwdc/threatened_plants_maharashtra.pdf
 - d. http://www.wii.gov.in/nwdc/threatened_plants_orissa.pdf

Annexure 4

Environment and Social Screening Form

Part A: General Information

1. Name of the State	
2. Type of proposed sub-project activity (tick the applicable option)	
▪ Cyclone Shelter	
▪ Cyclone Shelter with Access Road/Culverts	
▪ Plantation of Mangroves	
▪ Roads/Bridges/Culverts	
▪ Shelter Belt Plantation	
▪ Saline Embankment	
▪ Coastal canal	
▪ Any Other (Please Specify)	
3. Location of the sub-project	
▪ Village	
▪ Taluka	
▪ District	
4. Size of the sub-project (approx. area in sq. mt/hac or length in mt/km, as relevant)	
5. Land Requirement (in hac./sq. mt.)	
▪ Total Requirement	
▪ Private Land	
▪ Govt. Land	
▪ Forest Land	

6. Implementing Agency Details (sub-project level)	
▪ Name of the Department/Agency	
▪ Name of the designated contact person	
▪ Designation	
▪ Contact Number	
▪ E-mail Id	
7. Details about the Screening Exercise	
▪ Date	
▪ Name of the Person	
▪ Contact Number	
▪ E-mail Id	

Part B (1): Environment Screening

Question	Yes	No	Details
1. Is the sub-project located in whole or part within the Coastal Regulation Zone?			If yes, specify the zone.
2. Is the sub-project located in whole or part in/near any of the following environmentally sensitive areas? ⁹			
a. Biosphere Reserve			If yes, mention name and distance.
b. National Park			If yes, mention name and distance.
c. Wildlife/Bird Sanctuary			If yes, mention name and distance.

⁹ The PIU should take adequate steps to ensure that there are no adverse impacts on the environment **within 1 km radius** of the listed protected areas during sub-project implementation. The Environmental Officers at the PIU/PMU need to ensure that the required avoidance, minimization and mitigation measures are taken care of during site selection, DPR preparation and implementation/construction stages of a sub-project. This will help facilitate project supervision and monitoring during the implementation stage as well.

Question	Yes	No	Details
d. Tiger Reserve/Elephant Reserve			If yes, mention name and distance.
e. Wetland			If yes, mention name and distance.
f. Important Bird Areas (IBAs)			If yes, mention name and distance.
g. Coastal area with corals			If yes, mention name and distance.
h. Mangrove area			If yes, mention name and distance.
i. Estuary with mangroves			If yes, mention name and distance.
j. Natural Lakes			If yes, mention name and distance.
k. Swamps/Mudflats			If yes, mention name and distance.
l. Habitat of migratory birds (outside protected areas)			If yes, mention name and distance.
m. Migratory Route of Wild Animals/Birds			If yes, mention name and distance.
n. Area with threatened/rare/endangered			If yes, mention name and distance.
o. Area with threatened/rare/endangered flora (outside			If yes, mention name and distance.
p. Reserved/Protected Forest			If yes, mention name and distance.
q. Zoological Park /Botanical Garden			If yes, mention name and distance.

Question	Yes	No	Details
3. Is the sub-project located within 500 meters from rivers, streams, estuaries or deltaic mouths?			If yes, mention name/s and distance/s.
4. Is the sub-project located in whole or part near any of the following sensitive features? ¹⁰			
a. World Heritage Sites			If yes, mention name and distance.
b. Archaeological monuments/sites (under ASI's central/state list) ³			If yes, mention name and distance.
c. Historic Places (not listed under ASI – central or state list but regionally/locally important)			If yes, mention name and distance.
d. Reservoirs/Dams			If yes, mention name and distance.
e. Public Water Supply Areas from Rivers/Surface Water Bodies/ Ground Water Sources			If yes, mention name and distance.

Part B (2) : Result/Outcome of Environmental Screening Exercise

1.	No Environment Impact Assessment Required	
2.	Environment Impact Assessment Required	

¹⁰ The SDMA should take adequate steps to ensure that there are no adverse impacts **within 1 km radius** of the listed sensitive features/areas during sub-project implementation. The Environmental Officers at the PIU/PMU need to ensure that the required avoidance, minimization and mitigation measures are taken care of during site selection, DPR preparation and implementation/construction stages of a sub-project. This will help facilitate project supervision and monitoring during the implementation stage as well.

³ In case of archaeological sites/monuments, the prohibited area is 100 mts and the controlled area is 200 mts.

3.	CRZ clearance required	
4.	Environmental Clearance Required	
5.	Forest Clearance Required	

Guidelines for updating the results/outcome of the Screening Exercise

- An EA/EIA is required if the sub-project is:
 - An embankment or a canal bund; or
 - Underground Electric Cabling Works or
 - Any other sub-activity but the answer to any question listed in points 2-4 is yes ; or
 - depending up on the nature and location specificity of the sub-project, as determined by the State Level Environment Impact Assessment Authority (SEIAA).
- Forest Clearance is required if the proposed activities under the project require temporary and or permanent use/diversion of forest resources to non-forest activities or tree cutting. The implementing agency / line department needs to take the necessary clearances from the Forest Department / MoEF
- Environment Clearance is required from Central / State Authorities as below:
 - The MoEF if the built up area for covered construction or facilities open to the sky (base area = base x width), referred hereunder as Construction Area for any sub-project is:
 - in excess of 150,000 sq m; or
 - $\geq 20,000$ sq. m and $< 150,000$ sq. m and the said built-up/construction area of the sub-project is within 10 km of sensitive area. The sensitive area is as defined below (based on MoEF Notification No. SO 1533 dated September 14, 2006).
 - The State Level Environment Impact Assessment Authority (SEIAA) if the sub-project's built-up/construction area as detailed above is $\geq 20,000$ sq. m and $< 150,000$ sq. m but lies outside 10 km of the sensitive area

Notes:

1. Sensitive Area = (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

2. No EC is required if the built up/constructed area is <20,000 sq.mt but will be subjected to obtaining other statutory clearances if any applicable to the sub-project as listed above.

Part C (1) : Social Screening

1. Does the sub-project activity require acquisition of private land?			
Yes		No	
Give the following details:	Private Land (sq mts/hac.)		
	Govt. Land (sq mts/hac.)		
	Forest Land (sq mts/hac.)		
2. Does the proposed sub-project activity result in demolition/removal of existing structures?			
Yes		No	
If so, give the following details:			
▪ Number of public structures/buildings			
▪ Number of common property resources (such as religious/cultural/drinking water/wells/etc)			
▪ Number of private structures (located on private or public land)			
3. Does the proposed Project activity result in loss of crops/trees?			
Yes		No	
4. Does the proposed Project activity result in loss of direct livelihood/employment?			
Yes		No	

5.Does the proposed activity result in loss of mangrove ecosystem/ community forest on which nearby residents/local population are dependent for fuel wood/grazing etc.?			
Yes		No	
If yes, give the details of the extent of area to be lost (in acres/hac.).			
6.Does the proposed Project activity affect schedule tribe/caste communities?			
Yes		No	
Part C (2) : Result/Outcome of Social Screening Exercise			
	Output	Outcome	
1.	Answer to all the question is 'No' and only forest land is being acquired	<input type="checkbox"/> No SIA/RAP required	
2.	Answer to any question is 'Yes' and the sub-project does not affect more than 200 people (i.e. either complete or partial loss of assets and/or livelihood)	<input type="checkbox"/> Abbreviated RAP is required	
3.	Answer to any question is 'Yes' and the sub-project affects more than 200 people (<i>i.e. either complete or partial loss of assets and/or livelihood</i>)	<input type="checkbox"/> SIA/RAP Required	

Annexure 5

Procedure for Conducting Environmental Assessment

The following process is to be followed for sub-project activities, wherein the requirement for an EIA has been determined,

1. As per The World Bank's operational policy OP.4.01, an Environmental Assessment study is required to be carried out for Category A and B projects only. However, if an EIA (which is same as 'EA' as per The World Bank's terminology) needs to be carried out as per the EIA Notification, 2006 of Government of India, the same needs to be carried out as per the requirements of the said notification and also complying to the requirements of OP 4.01.
2. An environmental assessment (EA) report should focus on the significant environmental issues of a project and should include an Executive summary concisely discussing significant findings and recommended actions. The other components of the EA report are indicated below.

Policy, legal, and administrative framework applicable for the project - Discuss the policy, legal, and administrative framework within which the EA is carried out such as applicable environmental regulations – EP Act, EIA Notification, Water Act, Air Act, CRZ Regulations, etc. and applicable World Bank policies such as OP 4.01, etc.

Project description - Concisely describe the proposed project (detailed description of the proposed components) and its geographic, ecological, social, and temporal context, including any offsite investments that may be required (e.g., dedicated pipelines, access roads, power plants, water supply, housing, and raw material and product storage facilities). Indicate the need for any resettlement plan or indigenous people's development plan. Also include a map showing the project site and the project's area of influence.

Baseline data - Assess the base line conditions of the study area and describe relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences. Also consider current and proposed development activities within the project area but not directly connected to the project. Since the proposed pilot studies are in coastal areas include necessary base line studies on ecology of the project area such as aquatic / estuarine/ marine ecology, flora/ fauna studies and benthal studies (depending on the project activities), migratory pattern of birds, nesting grounds of fish specific studies relevant to the coastal areas. Sampling and frequency of these studies should justify the reliability of the base line studies and associated impact predictions. Wherever, not feasible utilize available secondary data.

Environmental impacts - Predict and assess the likely positive and negative impacts of the project in quantitative terms to the extent possible with suitable modeling analysis. Identify mitigation measures and any residual negative impacts that cannot be mitigated. Explores opportunities for environmental enhancement. Identify and estimate the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specifies topics that do not require further attention.

Analysis of alternatives – Evaluate and compare feasible alternatives to the proposed project in terms of location, technology, design and operation--including the "without project" situation--in terms of their potential environmental impacts. The feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements should also be detailed out. For each of the alternatives, quantify the environmental impacts to the extent possible, and attach economic values where feasible. Justify the basis for selecting the particular project design recommended approaches to reduce possible environmental impacts. Since the projects are in coastal areas, the proposed projects should ensure that no adverse impacts are expected on the coastal resources (environmental, ecological, social and cultural resources)

Environmental Management Plan (EMP) – The EMP should include a set of mitigation, monitoring, and institutional measures to eliminate adverse environmental impacts to offset or reduce them to acceptable levels. The plan also should include actions needed to implement these measures. Specifically, the EMP

- identifies and summarizes all anticipated significant adverse environmental impacts (including those involving indigenous people or involuntary resettlement);
- describes--with technical details--each mitigation measure, including the type of impact to which it relates and the conditions under which it is required, together with designs, equipment descriptions, and operating procedures, as appropriate;
- estimates any potential environmental impacts of these measures; and
- Provides linkage with any other mitigation plans (e.g., for involuntary resettlement, indigenous peoples, or cultural property) required for the project.
- Identifies **monitoring** objectives and specifies the type of monitoring, with linkages to the impacts assessed in the EA report and the mitigation measures described in the EMP.
- The recommended monitoring program should provide a specific description and technical details of monitoring measures including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and
- **Monitoring and reporting procedures** to (i) ensure early detection of conditions that necessitate particular mitigation measures, and (ii) furnish information on the progress and results of mitigation.
- The EMP should also provide a specific description of **institutional arrangements**--who is responsible for carrying out the mitigatory and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training). To strengthen environmental management capability in the agencies responsible for implementation, EMPs may suggest (a) technical assistance programs, (b) procurement of equipment and supplies, and (c) organizational changes.
- For all the above three aspects (mitigation, monitoring, and capacity development), the EMP should provide (a) an implementation schedule for

measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) capital and recurrent cost estimates (c) sources of funds for implementing the EMP. All these cost estimates should be integrated into the total project cost estimates.

- The EMP should be integrated into the project's overall planning, design, budget, and implementation by including the EMP project contracts and establishing the EMP within the project plan to receive funding and supervision along with the other components.

The **record of stake holder consultation** carried out during the EA process shall be provided in the report along with the minutes of these meetings, views of stake holder agencies, affected people and local nongovernmental organizations (NGOs).

Annexure 6

Standard Terms of Reference for Environment Assessment

Environment Assessment (EA) is a decision support mechanism to ensure that the project design and implementation are environmentally sound and sustainable. During the preparation phase, the objective of the EA is to provide inputs to the selection of sub-projects, feasibility study; preliminary and detailed design as well as assist development of a holistic development of the project package. During the implementation phase, environmental management plans (developed as a part of the EA during the preparation phase) are used for executing the environmental mitigation, enhancement and monitoring measures.

In the preparation phase, the EA shall achieve the following objectives:

1. Identify and analyze upstream environmental issues that affect the entire development package;
2. Establish the environmental baseline in the study area, and to identify any significant environmental issue;
3. Assess impacts of the project, and provide for measures to address the adverse impacts by the provision of the requisite avoidance, mitigation and compensation measures;
4. Integrate the environmental issues in the project planning and design; and
5. Develop appropriate management plans for implementing, monitoring and reporting of the environmental mitigation and enhancement measures suggested

The environmental assessment studies and reporting requirements to be undertaken under these TOR must conform to the GOI and the Bank guidelines and regulations, which comprise of, inter alia: The Environmental Impact Assessment Notification, MOEF, 2006 with subsequent amendments; the operational policies, guidelines and the reference materials of the World Bank

Description of the Project

(Include description of the project; covering geographical location, type of development envisaged including a description of activities. Also include current status of the project. Provide brief information on any other study – already completed/ongoing/proposed.)

Scope of Work

The EA comprises the following 3 components – (i) environmental management framework (EMF) for the entire project; (ii) environmental assessments (EA) for the individual road subprojects, as required; and (c) environmental management plans (EMPs) for these individual sub-projects. The following section gives the detailed scope of work in each of these stages.

Inception

The Consultants shall use the inception period to familiarize with the project details. The Consultants shall recognize that the remaining aspects of the project, such as engineering and social, are being studied in parallel, and it is important for all these aspects to be integrated into the final project design to facilitate their successful implementation. The Consultants should also recognize that due care and diligence

planned during the inception stage helps in improving the timing and quality of the EA reports.

During the inception period the Consultants shall (a) study the project information to appreciate the context within which the EA should be carried-out, (b) identify the sources of secondary information on the project, on similar projects and on the project area, (c) carry out a reconnaissance survey on a few sample road corridors, and (d) undertake preliminary consultations with selected stakeholders.

Following the site visits and stakeholder consultations, as well as a review of the conditions of contract between the consultant and the Client, the consultant shall analyse the adequacy of the allocated manpower, time and budgets and shall clearly bring out deviations, if any. The Consultants shall study the various available surveys, techniques, models and software in order to determine what would be the most appropriate in the context of this project.

The Consultants shall interact with the engineering and social consultants to determine how the EA work fits into the overall project preparation cycle; how overlapping areas are to be jointly addressed; and to appropriately plan the timing of the deliverables of the EA process. These shall be succinctly documented in the Inception Report

Environmental Management Framework: The EMF will cover the entire project (inclusive of all phases of the project); shall identify all potential environmental issues in the project; and shall develop a management framework for addressing all these issues. To this end, the EMF shall consist of (i) overall environmental baseline; (ii) identified macro/regional level environmental issues that would need to be considered in the analysis of alternatives, planning and design of the sub-projects; (iii) a plan to address the identified macro/regional environmental issues; (iv) sub-project level environmental screening procedures, including exclusion criteria, if any; (v) procedure for environmental scoping; (vi) a framework to address environmental issues in the project, including procedures for undertaking detailed or limited EA for each subproject in Phase-II or in later phases; (vii) generic EMP for addressing known, common, or usual environmental impacts in the project; (viii) a plan for building adequate environmental management capacity in the implementing agency (or Client). Each of these is described below.

Overall Environmental Baseline: All regionally or nationally recognized environmental resources and features within the project's influence area shall be clearly identified, and studied in relation to activities proposed under the project. These will include all protected areas (national parks, wildlife sanctuaries, reserved forests, RAMSAR sites, biosphere reserves, wilderness zones), unprotected and community forests and forest patches, wetlands of local/regional importance not yet notified, rivers, rivulets and other surface water bodies. In the context of xxxxxx(add and remove locations from the indicative list that follows), sensitive environmental features will include wildlife corridors, biodiversity hotspots, meandering rivers, flood prone areas, areas of severe landslide and river erosion, flood embankments (some of which are also used as roads). Consultants shall consolidate all these information in a map of adequate scale.

Stakeholder Identification & Consultation: Consultation with the stakeholders shall be used to improve the plan and design of the project rather than as project information dissemination sessions. The consultants shall carry out consultations

with Experts, NGOs, selected Government Agencies and other stakeholders to (a) collect baseline information, (b) obtain a better understanding of the potential impacts and (c) appreciate the perspectives/concerns of the stakeholders, and (c) secure their active involvement during subsequent stages of the project. Consultations shall be preceded by a systematic stakeholder analysis, which would (a) identify the individual or stakeholder groups relevant to the project and to environmental issues, (b) include expert opinion and inputs, (c) determine the nature and scope of consultation with each type of stakeholders, and (d) determine the tools to be used in contacting and consulting each type of stakeholders. A systematic consultation plan with attendant schedules will be prepared for subsequent stages of project preparation as well as implementation and operation, as required.

Identification of Relevant Macro/Regional Level Environmental Issues:

Consultants shall determine the Valued Environment Components (VECs)¹ considering the baseline information (from both secondary and primary sources), the preliminary understanding of the activities proposed in the project and, most importantly, the stakeholder (and expert) consultations, which would need to be carefully documented. Use of iterative Delphi techniques is recommended. Based on the identification of VECs, Consultants shall identify information gaps to be filled, and conduct additional baseline surveys, including primary surveys. The consultants shall conduct a preliminary analysis of the nature, scale and magnitude of the impacts that the project is likely to cause on the environment, especially on the identified VECs, and classify the same using established methods. For the negative impacts identified, alternative mitigation/management options shall be examined, and the most appropriate ones suggested. The preliminary assessment should clearly identify aspects where the consultants shall also analyse indirect and cumulative impacts during all phases and activities of the project. For the positive measures identified, alternative and preferred enhancement measures shall be proposed.

Environmental Screening: Consultants shall summarise the known sub-projects (whether upgrading or maintenance) into different categories that relate to the magnitude potential environmental impacts. During such categorisation, consideration shall be paid to (i) location of the sub-project with respect to environmentally sensitive areas, and (ii) volume, nature and technology of construction. This screening framework should be able to categorise all future subprojects, based on a limited number of parameters. The parameters should be such that their identification and measurement is easy, and does not involve detailed studies. The screening criteria also shall contain exclusion criteria, for subprojects, which should not be taken up due to potential immitigable and significant environmental impacts (including but not limited to permanent obstruction to wildlife corridors, or opening up increased access to threatened biodiversity resource hotspots, or construction on top of eroded and vulnerable flood embankments).

Environmental Scoping: For each category of sub-project roads identified by the environmental screening, Consultants shall suggest the scope of environmental assessment to be undertaken. For higher impact category of sub-projects (located on or near environmentally sensitive areas and substantial volume of construction), the scope could be full and detailed EA (see Attachment III for details). For medium

impact category of projects the scope of EA could be limited (focusing on pertinent issues); for lower impact category of projects, the scope could be implementing a simple set of environmental management practices.

The scoping shall include that which will be covered in the sub-project EA (or limited EA, as required), along with the “how, when and where” of each activity recommended. It shall include a listing of other environment issues that do not deserve a detailed examination in the project EA (covering, for example, induced impacts that may be outside the purview of the client) along with a justification. The scoping needs to identify and describe the specific deviations or inclusions vis-à-vis the EA ToR provided in Annexure III, if any, along with a justification; modify this ToR for the sub-project EA, if required; and recommend studies that need to be conducted in parallel but are outside the EA process. For medium impact category of sub-projects, Consultants shall prepare ToRs for Limited Environmental Assessments (LEA), depending on the environmental issues identified during environmental screening and identification of issues (paragraphs 13-14 above).

Implementation Framework: The above works (described in paragraphs 10-16) shall result in a framework, which describes how the potential environmental impacts of all sub-projects will be managed during preparation, implementation, and in the post-implementation periods. This framework shall include (a) description of how feasible and appropriate mitigation and environmental enhancement measures would be identified and implemented; (b) institutional, training and monitoring requirements associated with the environmental impacts, mitigation measures and enhancements; and (c) effective monitoring, inspection and environmental auditing measures to be followed by the borrower; and, (d) the estimated budget for all the above, sufficiently detailed

The framework for monitoring, inspection and environment audit shall specify parameters, the responsible agencies, reporting procedures, budget and financing, and what other inputs (for example: training) are necessary. In addition, the framework shall specify what action should be taken and by whom in the event that the proposed mitigation measures fail, either partially or totally, to achieve the level of environmental protection expected.

Mechanisms for improved co-ordination between Client and Line departments: Consultants shall examine the various options available for improved and timely co-ordination between various state government departments. These could take the form of written MoUs for specific activities, apex co-ordination committee of top bureaucrats, or any such mechanism that can be effective in reducing delays in ancillary activities such as, but not limited to, tree cutting, shifting of utilities, etc.

Environmental inputs to feasibility study & preliminary project design: The EA consultants shall make design recommendations, related to alignment (major shifts, bypasses or different route alternative), road cross-sections, construction material use, and mitigation & enhancement measures. The EA consultants shall interact regularly with the Clients and familiarize themselves with the project’s overall feasibility analyses models, so that the EA inputs are in conformity to the needs of the overall feasibility study (for all the different alternative improvement proposals under consideration).

In the cases of very significant environmental losses or benefits, the consultants shall estimate the economic/financial costs of environment damage and the economic/financial benefits the project is likely to cause. In the cases, the impacts or benefits are not too significant, qualitative methods could be used. In addition, wherever economic and financial costs of the environmental impacts cannot be satisfactorily estimated, or in the cases of significant irreversible environmental impacts, the consultants shall make recommendations to avoid generating such impacts.

Generic Environmental Management Plan (Generic EMP): It is recommended that for the low impact sub-projects separate environmental assessments and separate EMPs would not be required. Local, limited and construction level environmental issues in these sub-projects could be identified using standard or pre-defined environmental screening checklists³, and these environmental issues could be addressed by implementing Generic EMPs.

Consultants shall identify, local and construction related issues, which are usually part of all infrastructure related projects. These could be based on a literature survey (including the EA documents of all recent Bank-supported projects in India). For each of these issues, Consultants shall prepare a menu of alternative avoidance, mitigation, compensation, enhancement and mitigation measures. This could also be done through a careful review of the environmental management plans (EMPs) of the recent Bank supported similar infrastructure related projects, and with an evaluation to the applicability to the context of (Name of state). Consultants shall organize consultations with line departments, and finalize this Generic EMP.

Consultants shall provide robust estimates of costs of generic environmental management measures like facilities required at campsite, cost of additional (to regulatory) monitoring of environmental components, etc. These costs shall be verified for common works items in line with the rate analysis for other works.

Building Environmental Management Capacity in the line department: Based on the preliminary findings of the environmental screening, stakeholder consultations, and institutional analysis of the implementing agency's capacity to manage environmental issues, consultants shall prepare a Capacity Building Plan to mainstream environmental management in the Implementing agency's activities by the end of project implementation period. Earmarking staff for environmental management and improving their skill-sets would be simultaneously pursued during project preparation and implementation. In addition, recommendations should be made concerning any changes to guidelines, standards and regulations, which would improve medium and long term environmental management in the Line Departments works.

Environmental Training Plan: A detailed training plan shall be prepared, (a) to ensure that the environmental management framework can be implemented; and (b) to develop and strengthen environmental capacities. The strategy should include a mix of hands-on training for key staff involved in project preparation, site visits to similar projects, and whenever required, full-fledged academic programs on environmental management at well-recognized institutions. The Consultants shall conduct orientation training for the key client as well as members of other consultant teams like survey, design, etc., early in the assignment. Periodic training at various levels will continue during project preparation to ensure that the

knowledge, skills and perspectives gained during the assignment are transferred to the Client and are utilized effectively during project implementation.

Recommendation for Further Work: The Consultant should make recommendations concerning any further studies of environmental issues, which should be undertaken during project implementation and financed under the project. Such studies could comprise, for example, the analysis of what action should be taken with regard to existing roads which traverse critical natural habitats and which have been excluded from improvement under the project due to potential significant environmental degradation.

Sub-Project Related Environmental Assessment

Consultants shall undertake necessary surveys, impact analyses, and prepare complete subproject EA (environmental assessment and environmental management plan) for all the subprojects included in the First Year Implementation Program. These would be prepared based on the environmental screening, environmental scoping and other relevant works described under EMF above.

If the relatively low impact sub-projects included in the First Year Implementation Program, necessary field-based screening shall be completed, issues identified, and a summary document shall be prepared describing how these issues would be addressed in these sub-projects, with reference to the Generic EMP, and other relevant applicable GOI specifications. For each of the medium and high impact sub-projects, Limited EA or detailed EA shall be prepared, respectively.

In the event that no "high impact" category subproject is included in the First Year Implementation Program, at least one such high impact sub-project (which would be implemented in later years) shall be selected by the Consultants, and detailed sub-project EA (environmental assessment and environmental management plan) should be prepared based on the terms of reference.

Public Disclosure

The Consultants are to provide support and assistance to the client in meeting the disclosure requirements, which at the minimum shall meet the World Bank's policy on public disclosure. The consultants will prepare a plan for in-country disclosure, specifying the timing and locations; translate the key documents, such as the EMF Summary in local language; draft the newspaper announcements for disclosure; and help the client to place all the EA reports in the client's website.

The consultants shall prepare a non-technical EA summary report for public disclosure.

Co-ordination among the Engineering, Social, Environmental & Other Studies

The consultants, with assistance from the Client, shall establish a strong co-ordination with the other project-preparation studies – engineering, social and/or institutional development. The consultants shall keep in mind the specific requirements of the project in general, and the engineering/design studies in particular, and shall plan their outputs accordingly. It is recommended that some of the consultation sessions may be organised in co-ordination with the social and engineering consultants, as feasible, and when the stakeholders consulted are the same.

The consultant shall review the contract documents – technical specifications, and rate analysis, to ensure that there are minimal conflicts between the EMP stipulations and specifications governing the execution of works under the project.

Consultants Inputs

The Consultants are free to employ resources as they see fit. Timing is an important essence for the study, which shall be closely co-ordinated with the works of the engineering and social teams, simultaneously involved in preparation of the project. Table 1 gives an indicative allocation of manpower for the study. (Modify, as required given the context of the project.)

Additional expertise, such as on hill ecology or other, shall be provided as demanded by the context of the project. The consultants are encouraged to visit the project area and familiarize themselves, at their own cost, before submitting the proposal; and propose an adequate number and skill-set for the senior specialists and technical support staff for this assignment. Further, the consultant will allocate adequate number of field surveyors, distinct from the technical support staff, to complete the study in time.

The consultants shall provide for all tools, models, software, hardware and supplies, as required to complete the assignment satisfactorily. These should be widely recognized or accepted. Any new model or tool or software employed should be field-tested before use for the purpose of this EA.

The consultants shall make formal presentations, co-ordinated by the client, at key milestones on the (a) proposed work plan after submitting the Inception Report; (b) recommendations from the environmental screening; and (c) design recommendations and details of EMP. The consultants shall co-ordinate with the other consultants working on project preparation for each presentation.

All supporting information gathered by the consultant in undertaking these terms of reference would be made available to the client.

Outputs

The consultant is expected to provide the following outputs, as per the schedule given in table 2. The Consultants are expected to allocate resources, such as for surveys, keeping this output schedule in mind. (Modify based on the number specified in, and schedule of outputs of the Engineering ToR)

Inputs to be provided by the client

(The client can provide office space as necessary. The client will provide no other logistic support – Modify as deemed fit in the context of the project and the client.) It is expected that the Client and the field offices will provide all ready and available information as requested by the consultant. *[Note – Include the list of data Clients will procure for the Consultants.]*

Further, the Client will provide all necessary and reasonable support to the consultant to collect secondary data, such as issuing authorization letters. The Consultant will be responsible for any translation of documents and for processing of data. The Clients will designate an officer to act as the main liaison officer and participate as possible in the study.

(The client may designate/depute a team of professionals to work within the consultants' team for long term capacity building within the client's organization.)

The client will ensure the timely flow of information and documents from one consultant to other. The client will also help in organizing the formal presentations from all consultants engaged in project preparation.

Annexure 7

Standard Terms of Reference for Social Impact Assessment

The social assessment document assists managers and leaders take conscious decisions to avoid social and resettlement impacts. SA in this context is seen as an impact assessment tool where the concerns to be addressed would go far beyond only social and resettlement issues. SA so prepared would take into account the policy implications of the central and state governments apart from the resettlement policies and regulation of the World Bank.

Objectives

The main objective of Social Assessment (SA) is to ensure that the project design and implementation are socially acceptable. Further, the objective of SA shall be to provide inputs for selection of sub-projects, preliminary and detailed design of the project. The Resettlement Action Plans to be developed as part of the SA are to be used during the implementation of the project for executing the resettlement and rehabilitation activities and monitoring measures. In the preparation phase, the SA shall achieve the following objectives:

- Establish the Socio-economic conditions in the study area, and to identify any significant social issues;
- Assess impacts of the project, and provide for measures to address the adverse impacts by the provision of the requisite avoidance and/or compensation measures;
- Integrate the social and resettlement issues in the project planning and design; and
- Develop Resettlement Action Plan for implementing, monitoring and reporting of the social and resettlement compensation measures suggested.

Scope of Work

The SA shall identify all potential social issues in the project; and shall develop management measures for addressing all these issues. To this end, the SA shall consist of

- (i) Socio economic baseline established through census surveys;
- (ii) Stakeholder Identification & Consultation
- (iii) project and regional level social issues that would need to be considered in the analysis of alternatives, planning and design of the sub-projects and establish their criticality in the context of the proposed project;
- (iv) A Resettlement Action Plan to address the project and regional social issues;
- (v) A training plan for building adequate capacity in the implementing agency (or Client) towards implementation of the plans produced.
- (vi) A Monitoring Plan encompassing the monitoring parameters and schedule for monitoring.

Key tasks in this part of the assignment include:

Define likely project impact zone (direct/indirect) based on project proposal

- Collect information through desk review and field visits on existing baseline conditions, include all land uses, structures and people (e.g., demography, socio-economic status, vulnerability, status of infrastructure and access to people, livelihood programs, market rate of assets, medical support for sexually transmitted diseases, its prevalence, awareness on HIV/AIDS, legal status of land through revenue records.) within the likely project impact zone.
- Identification of key stakeholders involved in various aspects of the project (project implementing and executing agencies and groups from civil society; description of socio-economic organizations of local communities that may affect project outcomes; carry out public consultation with the likely affected groups, NGOs, district administration and other stakeholders and document the issues raised and outcomes; and assessment of local capacities in terms of participation in planning, implementation and supervision, and evaluation
- Explore viable alternative project designs to avoid, where feasible, or minimize social impacts (displacement, impact on vulnerable community, cultural properties etc.)
- Identify major and minor social impact issues including loss of assets, livelihood, poverty, gender and health issues and estimate the economic and social impacts on people and land.
- A resettlement plan would be drafted based on the outcome of the SIA to aid minimize, mitigate, or compensate for adverse impacts on the affected communities. The mitigation or management plans developed should be consistent with the nature of the development and the nature of the impacts

Annexure 8

Suggested Structure for Preparing Resettlement Action Plan

Abbreviated Resettlement Action Plan

(Population affected is < 200)

An abbreviated plan covers the following minimum elements

- a. a census survey of displaced persons and valuation of assets;
- b. description of compensation and other resettlement assistance to be provided;
- c. consultations with displaced people about acceptable alternatives;
- d. institutional responsibility for implementation and procedures for grievance redress;
- e. arrangements for monitoring and implementation; and
- f. a timetable and budget.

Complete Resettlement Action Plan

(Population affected is > 200)

The scope and level of detail of the resettlement plan vary with the magnitude of land acquisition and complexity of resettlement. The plan is based on up-to-date and reliable information about (a) the proposed compensation payment and resettlement of adversely affected groups, and (b) the legal issues involved in resettlement. The resettlement plan covers the elements below, as relevant. When any element is not relevant to project circumstances, it should be noted in the resettlement plan.

- i. **Description of the sub- project.** General description of the project and identification of the project area.
- ii. **Potential impacts.** Identification of: (a) the project component or activities that give rise to land acquisition and resettlement (b) the alternatives considered avoiding or minimizing land acquisition and resettlement; and (c) the mechanisms established to minimize resettlement, to the extent possible, during project implementation.
- iii. **Objectives.** The main objectives of the resettlement program.
- iv. **Results of census socioeconomic surveys.** The findings of surveys to be conducted in the early stages of project preparation and with the involvement of potentially affected people, including:(a) the results of a census survey covering; (b)current occupants of the affected area to establish a basis for the design of the compensation payment and resettlement program and to exclude subsequent inflows of people from eligibility for compensation and resettlement assistance;(c)standard demographic and socio-economic characteristics of affected households,(d) the magnitude of the expected loss—total or partial—of assets, and the extent of impacts, physical or economic;(e) public infrastructure

and social services that will be affected; and(f)social and cultural characteristics of affected communities, including a description of formal and informal institutions (e.g., community organizations, ritual groups, nongovernmental organizations (NGOs) that may be relevant to the consultation strategy and to designing and implementing the resettlement activities.

- v. **Eligibility.** Definition of affected persons and criteria for determining their eligibility for compensation and other resettlement assistance, including relevant cut-off dates.
- vi. **Valuation of and compensation for losses.** The methodology to be used in valuing losses to determine their replacement cost; and a description of the proposed types and levels of compensation under local law and such supplementary measures as are necessary to achieve replacement cost for lost assets
- vii. **Resettlement measures.** A description of the packages of compensation and other resettlement measures that will assist each category of eligible affected persons to achieve the objectives of the policy. In addition to being technically and economically feasible, the resettlement packages should be compatible with the cultural preferences of the displaced persons, and prepared in consultation with them. Any measures necessary to prevent land speculation or influx of ineligible persons at the selected sites. The provisions of housing, infrastructure (e.g., water supply, feeder roads), and social services (e.g., schools, health services); plans to ensure comparable services to host populations. Additional measures to ensure that such vulnerable groups as indigenous people, ethnic minorities, the landless, and women are adequately represented.
- viii. **Income Restoration Measures.** Wherever the livelihoods are affected, appropriate measure for improvement or restoring of livelihoods including assistance during the transition period will be proposed which should be compatible with the cultural preference and skill of the affected people.
- ix. **Community participation.** Involvement of affected people for consultation with and participation in the preparation and implementation;(b)a summary of the views expressed and how these views were taken into account in preparing the resettlement plan;(c) a review of the alternatives presented and the choices made by affected persons wherever options available to them, including choices related to forms of compensation and resettlement assistance.
- x. **Integration with host populations.** Measures to mitigate the impact of resettlement on any host communities, including: (a)consultations with host communities and local governments;(b)arrangements for prompt tendering of any payment due the hosts for land or other assets provided to resettlers;(c)arrangements for addressing any conflict that may arise between resettlers and host communities; and (d) any measures necessary to augment services (e.g., education, water, health, and production services) in host communities to make them at least comparable to services available to resettlers.
- xi. **Implementation Arrangements:** The description of agencies responsible for implementation of compensation payment and resettlement activities should be outlined and an assessment of the institutional capacity of such agencies and

NGOs; and any steps that are proposed to enhance the institutional capacity of agencies and NGOs responsible for resettlement implementation.

- xii. **Grievance procedures.** Affordable and accessible procedures for redressal of disputes arising from resettlement; such grievance mechanisms should take into account the availability of judicial recourse.
- xiii. **Implementation schedule.** An implementation schedule covering all payments of compensation and other applicable resettlement activities from preparation through implementation, including target dates for the achievement of expected benefits to resettlers and hosts and terminating the various forms of assistance. The schedule should indicate how the resettlement activities are linked to the implementation of the overall project.
- xiv. **Costs and budget.** Tables showing itemized cost estimates for all compensation payments and associated resettlement activities other contingencies; timetables for expenditures; sources of funds; and arrangements for timely flow of funds, and funding for land acquisition and resettlement should be described.
- xv. **Monitoring and evaluation.** Arrangements for monitoring of compensation payments and resettlement activities by the implementing agency, supplemented by independent monitors as considered appropriate by the Bank, to ensure complete and objective information; performance monitoring indicators to measure inputs, outputs, and outcomes for resettlement activities; evaluation of the impact of resettlement for a reasonable period after all resettlement and related development activities have been completed; using the results of resettlement monitoring to guide subsequent implementation

Annexure 9

Resettlement & Rehabilitation Framework (Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement)

Definitions of some of the key words used in the Social Entitlement Framework are as follows.

- Project Affected Persons (PAP): People who lose land, livelihood, homesteads, structures and access to resources as a result of project activities.
- Encroacher: A person who has extended their building, agricultural lands, business premises or work places into public/government land without authority.
- Squatter: A person who has settled on public/government land, land belonging to institutions, trust, etc and or someone else's land illegally for residential, business and or other purposes and/or has been occupying land and building/asset without authority.

Definition of 'Affected Families' (RFCTLR&R Act 2013).

Land Owners

1. Family or company whose land/other immovable properties have been acquired;
2. Those who are assigned land by the Governments under various schemes;
3. Right holders under the Forest Rights Act, 2006

Livelihood Losers

1. Over the last three years, a family whose livelihood is primarily dependent on the land being acquired, including agriculture labourers, tenants or sharecroppers
2. Over the last three years, families which are dependent on forests or water bodies for their livelihoods when these are acquired; including forest gatherers, hunters, fisher folk and boatmen
3. Over the last three years, any family whose livelihood is dependent primarily on the land being acquired in the urban areas or any family who is residing on the land being acquired in the urban areas

As per Fair Compensation, Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013

Minimum Compensation for Land Acquisition

A Comprehensive Compensation Package (**First Schedule**)

1. Market value of the land

- a) the minimum land value, if any, specified in the Indian Stamp Act, 1899 for the registration of sale deeds in the area, where the land is situated; or
 - b) the average of the sale price for similar type of land situated in the immediate areas adjoining the land being acquired, ascertained from fifty per cent of the sale deeds registered during the preceding three years, where higher price has been paid; or
-

whichever is higher:

PROVIDED THAT THE MARKET VALUE SO CALCULATED FOR RURAL AREAS SHALL BE MULTIPLIED BY A MULTIPLIER FACTOR OF UP TO

'TWO' based on the distance of project from urban area, as may be notified by the appropriate government and in case of urban areas multiplier factor is 'One'.

- 2. Value of the assets attached to land:** Building/Trees/Wells/Crop etc as valued by relevant govt. authority;

Total compensation = 1+2

- 3. Solatium:** 100% of total compensation
- 4.** Where land is acquired for urbanisation, 20% of the developed land will be reserved and offered to land owning project affected families, in proportion to their land acquired and at a price equal to cost of acquisition and the cost of development. In case the project affected family wishes to avail of this offer, an equivalent amount will be deducted from the land acquisition compensation package payable to it
- 5.** The Company for whom land is being acquired may offer shares limited to 25% of the Compensation amount. In case the project affected family wishes to avail of this offer, an equivalent amount will be deducted from the land acquisition compensation package payable to it.
- 6.** Where the market value cannot be determined for the reason that-
- a) The land is situated in such area where the transactions in land are restricted by or under any other law for the time being in force in that area. or
 - b) The registered sale deeds or agreements to sell for similar land are not available for the immediately preceding three years.
 - c) The market value has not been specified under the Indian Stamp Act, 1899 by the appropriate authority.

The State Government concerned shall specify the floor price or minimum price per unit area of the said land based on the price calculated in the manner in sub-section (1) in respect of similar types of land situated in the immediate adjoining areas and as per sub-section (3) of 26.

3. Minimum R&R Entitlements

A Comprehensive R&R Package (Second Schedule)

- 1. Subsistence allowance at Rs. 3000 per month per family for 12 months;
- 2. The affected families shall be entitled to:
 - (a) Where jobs are created through the project, mandatory employment for one member per affected family **or**
 - (b) Rupees 5 lakhs per family **or**
 - (c) Rupees 2000 per month per family as annuity for 20 years, with appropriate index for inflation;

The option of availing (a) or (b) or (c) shall be that of the affected family

3. If a house is lost in rural areas, a constructed house shall be provided as per the Indira Awas Yojana specifications. If a house is lost in urban areas, a constructed house shall be provided, which will be not less than 50 sq mts in plinth area.

In either case the equivalent cost of the house may also be provided in lieu of the house as per the preference of the project affected family;

4. *One acre of land* to each family in the command area, if land is acquired for an irrigation project if possible BUT the same shall be in lieu of Compensation;
5. Rs 50,000 for transportation;
6. A one-time 'Resettlement Allowance' of Rs 50,000;
7. Whenever the appropriate Government withdraws from any such acquisition, the Collector shall determine the amount of compensation due for the damage suffered by the owner in consequence of the notice or of any proceedings thereunder, and shall pay such amount to the person interested, together with all costs reasonably incurred by him relating to the land.

4. Enhanced Role for Panchayati Raj Insitutions esp. Gram Sabhas

- **SIA in consultation with PRIs:** The Social Impact Assessment has to be carried out in consultation with the representatives of the Panchayati Raj Institutions.
- **SIA Reports To Be Shared:** Reports prepared under the Social Impact Assessment are to be shared with these individuals in their local language along with a summary.
- **Representation in Expert Group:** The Expert Group has to have two members belonging to the Panchayati Raj Institutions. This is a powerful body that has the power to reject a project.
- **Hearings in All Gram Sabhas:** In case where an affected area involves more than one Gram Panchayat or Municipality, public hearings shall be conducted in every Gram Sabha where more than twenty five per cent of land belonging to that Gram Sabha is being acquired.
- **Consent of Gram Sabha :** The Consent of Gram Sabha is mandatory for acquisitions in Scheduled Areas under the Fifth Schedule referred to in the Constitution
- **Representation of Panchayat Chairpersons on R&R Committee at Project Level:** The Rehabilitation and Resettlement Committee at Project Level has to have the Chairpersons of the Panchayats located in the affected area or their nominees as representatives.
- **Panchayat Ghars** have to be provided as per the list of Infrastructural amenities given in the Third Schedule.

Infrastructural Amenities under Resettlement & Rehabilitation

Infrastructural amenities to be provided/proposed to be provided in the Resettlement area as per Third schedule, including:

- Schools and playgrounds;
- Primary Health Centres and sub-health centre within two kilometres range;
- Roads and electric connections;
- Proper drainage as well as sanitation plans executed before physical resettlement
- Assured sources of safe drinking water for each family as per Govt. norms;
- Provision for drinking water for cattle.
- Grazing land as per proportion acceptable in the State.
- Appropriate seed-cum-fertilizer storage facility if needed
- Basic irrigation facilities to the agricultural land allocated to the resettled families if not from the irrigation project, then by developing a cooperative or under some Government scheme or special assistance.
- All new villages established for resettlement of the displaced persons shall be provided with suitable transport facility which must include public transport facilities through local bus services with the nearby growth centres/urban localities.
- Panchayat Ghars as appropriate;
- Anganwadi"s providing child and mother supplemental nutritional services as per Govt norms;
- School as per the provisions of the Right of Children to Free and Compulsory Education Act, 2009 (35 of 2009)
- Playground for Children
- One community centre for every hundred families.
- Places of worship and chowpal/tree platform for every fifty families for community assembly, of numbers and dimensions consonant with the affected area.
- Village level Post Offices, as appropriate, with facilities for opening saving accounts;
- Fair price shops and seed-cum-fertilizer storage facilities if needed.
- Burial or cremation ground, depending on the caste-communities at the site and their practices.
- Facilities for sanitation, including individual toilet points.
- Separate land must be earmarked for traditional tribal institutions.
- The forest dweller families must be provided, where possible, with their forest rights on non-timber forest produce and common property resources, they must continue to enjoy their earlier rights to the aforesaid sources of livelihood.

- Appropriate security arrangements must be provided for the settlement, if needed.
- Veterinary service centre as per norms

Specific Timelines

1. Compensation will be given within a period of **three months** from the date of the award;
2. Monetary R&R entitlements will be provided within a period of **six months** from the date of the award;
3. Infrastructure R&R entitlements will be provided within a period of **eighteen months** from the date of the award;
4. **No involuntary displacement will take place without completion of R&R.**

Annexure 10

Generic Activity-specific Environment Management Plans

GEMP for Roads/Bridges/Underground Electric Cabling Works

The Contractor will abide by the environmental, occupational health and safety measures listed in the Environment Management Plan (EMP) given in the table below. The Engineer's check and certification for payment shall also include the performance review of the Contractor with regard to Environment Management Plan compliance.

S. No.	Activity	Measures to be Implemented by the Contractor
1.	Work Plan for EMP implementation	The Contractor's Project Manager shall be responsible for implementation of EMP provisions and will coordinate the over-all implementation of the said plan. Along with the Work Programme, the Contractor shall submit a plan including method statement and timeline about specific actions that will be taken by him to implement the provisions laid out in the EMP.
2.	Regulatory Permissions and Consents	<p>The Contractor shall obtain all requisite statutory clearances prior to commencement of civil works, which includes obtaining permissions/consents for setting-up construction camp; plants and equipment; borrow areas and quarry operations. The Contractor shall abide by all conditions laid out in the said clearances. This includes:</p> <ul style="list-style-type: none"> ▪ Consents for establishment and operation of plants from State Pollution Control Board ▪ PUC certification for all vehicles/equipment used for construction ▪ Permission/consent of the District Administration/Mining Department/other agencies for quarrying and/or borrowing operations for materials like sand and earth ▪ Authorization for storage and transportation of explosive material.
3.	Consultation and Community Consent	<p>The Contractor shall consult and obtain written consents of landowners (individual/panchayat/govt. agency) for temporary use of land for all construction related activities including:</p> <ul style="list-style-type: none"> ▪ setting-up and operation of construction and labour camps;

S. No.	Activity	Measures to be Implemented by the Contractor
		<ul style="list-style-type: none"> ▪ borrow areas and ▪ disposal of debris and other waste material.
4.	Construction/ Labour Camp	<ul style="list-style-type: none"> ▪ Location: The location of camp and plant site/s shall be as per the environmental siting criteria given in the ESMF. Consent of the land owner/local authorities shall be required and needs to be submitted to the Engineer for approval. Construction camp sites (including plant sites, and material stock yards) shall be located (preferably in the downwind direction) at least 500 mts. from the nearest settlement and at least 1000 mts. away from designated/protected natural habitats (such as National Parks, Sanctuaries, Biosphere Reserves, Reserve Forests and Ramsar Sites). ▪ Accommodation and Basic Amenities: All weather shelter with the required tenement size and toilets shall be provided, as per provisions of Labour Laws. Separate toilet facilities shall be provided for women workers. If a common mess is not provided/operated, additional space for cooking shall be provided. The contractor shall ensure that hygienic conditions are maintained during the operation of such camps/facilities. ▪ Fuel for Cooking: The Contractor shall ensure that fuel wood is not used as a cooking medium in the construction/labour camp. ▪ Potable water supply: Drinking water supply of at least 40 lpcd with the required supply points shall be provided. ▪ Fire Safety: Adequate fire safety precautions shall be taken and the required fire safety equipment (such as fire extinguishers) shall be provided by the Contractor.
5.	Site Clearance	<ul style="list-style-type: none"> ▪ All required precautions/measures to prevent damage to road side vegetation outside the formation cutting and filling areas shall be taken. No tree cutting is to carried out without the written instruction from the Employer, who in turn will ensure that relevant regulatory permission/s

S. No.	Activity	Measures to be Implemented by the Contractor
		<ul style="list-style-type: none"> ■ The non-timber grade trees are to be stacked and possession is to be given to Employer/concerned Govt. Department. ■ The Contractor shall strip, store, preserve and reinstate top soil in work fronts.
6.	Protection of Properties and Resources	<p>The Contractor shall take due care to protect and prevent damages to the following resources during preparatory and construction work:</p> <ul style="list-style-type: none"> a. Water supply lines b. Irrigation canals c. Cart, cattle and/or foot trail/tracks d. Cultural properties and sites/structures of religious importance e. Houses, Farmlands, Pastures, Orchards and/or Trees <p>In case of damage due to construction activity, the restoration/repairs shall be carried out by the Contractor at his own cost.</p>
7.	Slope Stability	<p>The Contractor shall ensure that civil work and related activities such as clearing and grubbing, stacking of materials and debris disposal are carried out in a manner that minimises slope instabilities of near-by water bodies.</p>
8.	Quarry Establishment and/or Operations	<p>(a) The Contractor shall procure material from quarries that have been approved/licensed by the State Govt. A copy of such an approval shall be submitted to the Engineer prior to procuring material.</p> <p>(b) All requirements for ensuring health and safety of workers, including use of effective dust suppression arrangements at crusher sites and on haul roads; safety precautions prior to blasting operations; provision and enforcement of Personal Protective Equipment use and proper storage of blasting and</p> <p>(c) First-aid and Emergency Response Arrangements: First-aid facility and emergency response arrangements shall be maintained at the quarry and</p>

S. No.	Activity	Measures to be Implemented by the Contractor
		<p>(d) In the event of Contractor opening a new quarry for the project, the following additional conditions shall apply -</p> <ul style="list-style-type: none"> ▪ <u>Location</u>: Location of quarry site shall be at least 1000 mts. from the nearest settlement; archeologically/culturally protected/locally important sites; designated/ protected natural habitats (such as National Parks, Sanctuaries, Biosphere Reserves, Reserved Forests and Ramsar Sites); other ecologically rich sites with Forest and/or areas with Wildlife presence and; water supply sources. Other location selection criteria as defined under Govt. regulations/rules will also apply. ▪ <u>Site preparation</u>. Area shall be demarcated as approved in the permit and shall be reconfirmed by the Engineer. Site clearance shall take place only within the demarcated area. Top soil, if any, shall be stripped, stacked and preserved for re-use. ▪ <u>Operation</u>: The quarry shall be operated by adopting/implementing environmental, health and safety measures as specified in the permit conditions and as specified under Point 5 (b) of this table. ▪ <u>Closing and restoration</u>. Proper drainage provisions shall be provided prior to closure of the quarry. Restoration shall be done as per the permit conditions.
9.	Borrow Areas	<p>(a) Borrow areas for the project will be selected by the Contractor following the stipulations given below. The finalization of all such locations shall be dependent on the approval of the Engineer on technical and environmental grounds. This includes on-site verification to cross-check the accuracy of details provided by the Contractor. Only after receipt of the written approval from the Engineer, the Contractor shall enter into a formal agreement with landowner.</p> <p>(b) The Contractor shall not procure any kind of construction material (such as aggregates, sand and earth) from ecologically protected areas.</p>

S. No.	Activity	Measures to be Implemented by the Contractor
		<p>(c) <u>Identification and Selection</u></p> <ul style="list-style-type: none"> • The borrow area should not be located in agriculture field/s unless unavoidable i.e. barren land is not available. In case borrowing needs to be done on an agricultural land, top-soil stripping, stacking and preservation is a must. Damage to productive and fertile areas has to be minimal and this includes appropriate planning of haul roads. • Borrow pits shall not be located within a distance of 100 mts. from any NH, SH or other roads. • Borrow pits shall be preferably located 500 mts. away from settlements/ habitations. • No borrow pits shall be located within 500 mts. from schools, colleges, playgrounds, religious structures and health centers. • No borrow area shall be opened within 500 mts. from a reserved or protected forest area, protected sites, wildlife movement zone and cultural heritage site. <p>(d) <u>Operation</u></p> <ul style="list-style-type: none"> • Area up to which material will be extracted shall be clearly demarcated on ground. • A 15 cm topsoil layer will be stripped and preserved in stockpiles. • Borrowing of earth should be preferably limited to a depth of 1.5 mtr from the existing ground level. • <u>Slope at the edges will be maintained not steeper</u> <p>(e) <u>Rehabilitation of Borrow Areas</u></p> <ul style="list-style-type: none"> • Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon. • Preserved top soil has be spread uniformly over land (except in cases where borrow area is located near water body used as borrow area)
10.	Water Extraction/ Use	Water for construction and for use at construction camps (including labour camps) is to be extracted with prior written permission of (a) the individual owner, in case the source is private well/tube well; (b) Gram Panchayat in case the source belongs to community; and (c) Irrigation Department in case the source is an

S. No.	Activity	Measures to be Implemented by the Contractor
11.	Traffic Safety and Management	(a) In areas where traffic is to be diverted during construction, the traffic detour shall be planned and publicized to the local people. Necessary information signage shall be erected to inform the road users.
		(b) Traffic safety arrangements (including provision of warning signage, barricades and delineation) shall be made by the Contractor to ensure safety of road users, local people and workers.
		(c) Material shall be covered during transportation to prevent spillage, accidents and pollution.
12.	Worker's Safety	(a) All measures required for ensuring safety and health of the workers shall be taken up by the Contractor. This includes provision and enforcement of appropriate personal protective equipment; first aid facilities at camp, plant sites and work zones; emergency response arrangements; proper storage of hazardous/toxic and polluting materials and; measures for ensuring fire, electrical and mechanical safety arrangements in camps and in work fronts.
		(b) Material safety data sheet record of fuel and other inflammable chemicals shall be maintained at the site.
13.	Air Pollution	(a) Wind barriers or screens shall be provided in the downwind direction at air pollution causing sources like plant sites and fine material storage stock yards.
		(b) Fugitive dust emissions have to be eliminated or at least reduced by providing dust suppression/control measures, based on activity and site conditions..
		(c) All plants and equipment shall comply with pollution control norms.
		(d) Water shall be sprinkled at least twice during dry day on haulage roads passing through or near settlements (including at least 100 m before and after the settlement).
14.	Water pollution	(a) All measures (including provision of temporary silt fencing to control sediment run-off) required for

S. No.	Activity	Measures to be Implemented by the Contractor
		<p>avoiding adverse impacts to water bodies (such as ponds, streams, canals and rivers), water sources (such as hand pumps and wells) and adjacent farmland shall be undertaken by the Contractor.</p> <p>(b) Storage of materials like fuel, chemicals, cement and bitumen shall be done in a manner (with impervious layer on bottom and a covered shed on top) that does not contaminate land and ground/surface water.</p>
15.	Noise Pollution	<p>(a) All noise causing activities within 1km radius of settlements shall be stopped during night time (9:00 PM to 6:00 AM).</p> <p>(b) Ear plugs shall be provided to the labour facing risk from high noise pollution (such as plant sites, blasting zones and those working near generators, heavy equipment/machinery) in construction zone.</p>
16.	Disposal of Debris and Wastes	<p>(a) All debris and spoils generated during construction works are to be reused to the extent feasible (technically and economically). Residual debris and spoils, if any, shall be disposed in locations pre-approved by the Engineer in a manner that it does not contaminate the environment.</p> <p>(b) Location of Debris Disposal Sites: Debris disposal sites shall be located preferably away from farmlands, water sources and water bodies. In no case, debris shall be disposed within 500 mts. of ecologically sensitive areas, including forests, wetlands and protected natural habitats.</p> <p>(c) Site preparation and disposal method: Site will be prepared by stripping and storage of top-soil. The disposal shall be carried out as per the Engineer's approval. In case of bituminous waste, dumping shall be carried out over a 60 mm thick layer of rammed clay so as to eliminate any chances of leaching.</p> <p>(d) Closure: Disposal sites shall be properly dressed with top-soil re-laid on site surface; drainage provision to divert run-off water away from the site and; vegetation (grass/shrub) plantation, based on site conditions.</p>

S. No.	Activity	Measures to be Implemented by the Contractor
17.	Restoration and Rehabilitation of Sites	<p>All work sites and areas under temporary use (including construction and labour camps, plant sites, haul roads and borrow areas) shall be restored/ rehabilitated to a better condition (if not at least to its original condition) and to the satisfaction of the Engineer and land owner upon completion of construction work by the Contractor.</p> <p>Completion of work will also include completion of rehabilitation and clean-up of the work sites including camps, plants, in and along road and structure construction sites; disposal of debris/construction wastes at pre-approved locations and; restoration of borrow areas and other sites/locations used for material sourcing.</p>
18.	Liabilities	Any liability arising out of Contractor's agreement with landowners/ local people/gram panchayat (including those related to temporary use of land, water extraction and disposal of debris) shall be settled by the Contractor.

Generic EMP for Cyclone Shelters

S. No.	Activity	Measures to be Implemented by the Contractor
1.	Work Plan for EMP implementation	The Contractor's Project Manager shall be responsible for implementation of EMP provisions and will coordinate the over-all implementation of the said plan. Along with the Work Programme, the Contractor shall submit a plan including method statement and timeline about specific actions that will be taken by him to implement the provisions laid out in the EMP.
2.	Arrangements for temporary land	The Contractor as per prevalent rules shall carry out negotiations with the landowners for obtaining their consent for temporary use of lands for workers camp, construction sites etc. Written permission (no objection certificate) shall be taken from the Sarpanch/ Village Head and the land owner prior to location selection and a copy shall be submitted to OSDMA for approval. It is the responsibility of the Contractor to clean up the site prior to handing over to the owner (after construction or completion of the activity)

3.	Construction/ Labour camp – location	<ul style="list-style-type: none"> Construction camps shall not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Camp site shall not be located within 250 m from a water body including village pond. A distance of at least 500 m shall be maintained from designated/protected natural habitats (such as National Parks, Sanctuaries, Biosphere Reserves, Reserve Forests and Ramsar Sites, if any) and Coastal Regulation Zone.
4.	Labour Camp Management	<p>Accommodation:</p> <p>The Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.</p> <p>Potable water:</p> <p>The Contractor shall:</p> <p>a) Supply of sufficient quantity of potable water (at least 40 lpcd) in labour camp at suitable and easily accessible places and regular maintenance of such facilities.</p> <p>b) If any water storage tank is provided, the bottom of the tank shall be kept at least 1mt. above the surrounding ground level.</p> <p>Fuel for Cooking: The Contractor will be responsible for providing LPG Cylinder/Kerosene in labour camp to avoid cutting of trees for fuel wood from the adjoining areas.</p> <p>Sanitation and sewage system: The Contractor shall ensure that:</p> <ul style="list-style-type: none"> The sewage system for the camp shall be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. Separate toilets/bathrooms, shall be arranged for men and women Adequate water supply is to be provided in all toilets and urinals All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition Night soil (human excreta) is to be disposed off

		<p>by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight.</p> <p>Waste disposal: The Contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner.</p> <p>Fire Safety: Adequate fire safety precautions shall be taken and required fire safety equipment (such as fire extinguishers) shall be provided by the Contractor.</p>
5.	First aid	<p>The Contractor shall arrange for –</p> <ul style="list-style-type: none"> • A readily available first aid unit including adequate supply of sterilized dressing materials and appliances as per the Factories Rules in work zone • Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital
6.	Labour's Safety	<p>The Contractor shall provide:</p> <ul style="list-style-type: none"> • Protective footwear and protective goggles to all workers employed on mixing cement, concrete etc. • Protective goggles and clothing to workers engaged in stone breaking activities • Earplugs to workers exposed to loud noise, and workers working in concrete mixing operation. • Adequate safety measures for workers during handling of materials at site. <p>The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract.</p> <p>The Contractor shall make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p> <p>The Contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed on the work of painting with products containing lead in any form.</p>

		<p>The Contractor shall also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. He shall provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint is rubbed and scraped.</p> <p>The Contractor shall mark 'no smoking' in high risk areas. These shall be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and shall be approved by competent authority.</p>
7.	Labour requirements	<p>Local people shall be given preference for unskilled and other jobs created during construction phase of the project. The contractor would notify requirement of unskilled labours in nearby/surrounding villages. In case local labours are not interested/available then a certificate/letter shall be issued by the Panchayat officials to the Contractors in this regard.</p>
8.	Site Clearance	<p>Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from competent authority..</p> <p>The Contractor, under any circumstances shall not cut or damage trees. Trees identified under the project shall be cut only after receiving clearance from the State Forest Department or after the receipt of written permission from competent authority.</p>
9.	Preservation of top soil	<p>The topsoil from all areas of cutting and all areas to be permanently covered shall be stripped to a specified depth of 15 cm and stored in stockpiles. A portion of the temporarily acquired area shall be earmarked for storing topsoil. The following precautionary measures shall be taken to preserve them till they are used:</p> <p>(a) Stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile shall be protected by silt fencing</p> <p>(b) Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum to ensure that no compaction shall occur.</p> <p>The top soil shall be reinstated in the cyclone shelter compound after the construction is over. Residual topsoil, if there is any shall be utilized for the plantation.</p>

10	Construction vehicles, equipment and machinery	<p>All vehicles, equipment and machinery to be procured and brought to site for construction shall confirm to the relevant Bureau of India Standard (BIS) norms and the manufacturer's specifications. The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. Noise limits for construction equipment to be procured shall not exceed the value specified in the Environment (Protection) Rules, 1986. The equipment proposed to be used for construction and installed close to waterway/streams, must be checked and certified fit, especially with respect to the potential leakage of oil and grease. The inspection should verify that:</p> <ul style="list-style-type: none"> • Equipment is clean (free of mud, dirt and oil) • Equipment is in good working order. • A drip pan is available for equipment that shall be stored on site. • Contractor has a spill kit • Operator is trained on the re-fuelling, maintenance and emergency spill procedures. • Adequate inspections shall be conducted during the construction period.
11.	Quarry Operations	<p>The Contractor shall procure material from quarries that have been approved/licensed by the Orissa State Govt. A copy of such an approval shall be submitted to the competent authority prior to procure the material.</p>
12.	Construction water	<p>Water for construction and for use at construction camps (including labour camps) is to be extracted with prior written permission of (a) the individual owner, in case the source is private well/tube well; (b) Gram Panchayat in case the source belongs to community; and (c) Irrigation Department in case the source is an irrigation canal or a river. The Contractor shall take all precaution to minimize the wastage of water in the construction process.</p>
13.	Air pollution	<ul style="list-style-type: none"> • The Contractor shall take every precaution (water sprinkling etc.) to reduce the level of fugitive dust generating from construction site. • Water shall be sprinkled at least twice during dry day on haulage roads passing through or near settlements (including at least 100 m before the settlement).

		<ul style="list-style-type: none"> • Wind barriers or screens shall be provided in the downwind direction at air pollution causing sources like plant sites and fine material storage stock yards. • Truck carrying construction materials will be duly covered to avoid spilling. • The Contractor shall ensure that all vehicles, equipments and machineries used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of State Pollution Control Board (SPCB). • The Contractor shall submit PUC certificates for all vehicles/ equipment/machinery used for the project and maintains a record of the same during the contract period.
14.	Noise Pollution	<p>The Contractor shall confirm the following:</p> <ul style="list-style-type: none"> • All plants and equipment used in construction shall strictly conform to the CPCB noise standards. • All vehicles and equipment used in construction shall be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced. • At the construction sites within 150 m of the nearest habitation, noisy construction work shall be stopped during the night time between 9.00 pm to 6.00 am.
15.	Water Pollution	<p><i>Water pollution from construction wastes</i></p> <p>The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. He will avoid construction works close to streams or water bodies during monsoon.</p> <p>All measures (including provision of temporary silt fencing to control sediment run-off) required for avoiding adverse impacts to water bodies (such as ponds, streams, canals and rivers), water sources (such as hand pumps and wells) and adjacent farmland shall be undertaken by the Contractor.</p>

		<p><i>Water pollution from fuel and lubricants</i></p> <ul style="list-style-type: none"> • The Contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance sites are located at least 100 m away from any water body. The Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground. • If fuel storage and re-fuelling areas are located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such activities. • Storage of materials like fuel, chemicals and cement shall be done in a manner (with impervious layer on bottom and a covered shed on top) that does not contaminate land and ground/surface water.
16.	Solid Waste	<p>Solid waste from the project during construction will be mainly domestic scraps & wastes from the construction camp and construction spoils from construction sites.</p> <ul style="list-style-type: none"> • The small amount of construction debris will be disposed of in suitable preidentified or existing dumping areas in tune with the local condition to avoid land degradation & water logging due to indiscriminate dumping. • Dumping areas will be biologically reclaimed through top soil cover. • Regular inspection of haul roads, construction site & camp will be carried out to ensure regular and timely removal of construction debris to the dumping sites.
17.	Drainage & Flood Control	<p>The Contractor will ensure that construction materials like earth, stone are disposed off so as not to block the flow of water of any watercourse and cross drainage channels.</p>
18.	Restoration and Rehabilitation of Sites	<p>All work sites and areas under temporary use (including construction and labour camps, plant sites, haul roads and borrow areas) shall be restored/ rehabilitated to a better condition (if not at least to its original condition) and to the satisfaction of land owner upon completion of construction work by the Contractor.</p>

		Completion of work will also include completion of rehabilitation and clean-up of the work sites including camps, plants, in and around the construction site; disposal of debris/construction wastes at pre-approved locations and; restoration of borrow areas and other sites/locations used for material sourcing.
19.	Liabilities	Any liability arising out of Contractor's agreement with landowners/ local people/gram panchayat (including those related to temporary use of land, water extraction and disposal of debris) shall be settled by the Contractor.

Generic EMP for Saline Embankments/Bunds

S. No.	Activity	Measures to be Implemented by the Contractor
1.	Work Plan for EMP implementation	The Contractor's Project Manager shall be responsible for implementation of EMP provisions and will coordinate the over-all implementation of the said plan. Along with the Work Programme, the Contractor shall submit a plan including method statement and timeline about specific actions that will be taken by him to implement the provisions laid out in the EMP.
2.	Regulatory Permissions and Consents	<p>The Contractor shall obtain all requisite statutory clearances prior to commencement of civil works, which includes obtaining permission/consent for plants, water extraction and borrow areas operations. This includes:</p> <p>Consent for establishment and operation of plant (for concrete work) from SPCB</p> <p>PUC certification for all vehicles/equipment used for/during construction</p> <p>Permission/consent of the District Administration/Mining Department/other agencies for quarrying and/or borrowing operations for materials like sand and earth</p> <p>Permission for water extraction, if applicable in the local area context.</p> <p>The Contractor shall abide by all conditions laid out in the said clearances.</p>

3.	Consultation and Community Consent	<p>The Contractor shall consult and obtain written consents of landowners (individual/ panchayat/govt. agency) for temporary use of land for all construction related activities including:</p> <p>(a) setting-up and operation of construction and labour camps;</p> <p>(b) borrow areas and</p> <p>(c) disposal of debris and other waste material.</p>
4.	Construction /Labour camp	<p>(a) Location: The camp and plant site/s location and establishment shall be done in a manner that does not interfere or disturb the activities of local inhabitants, particularly those of schools and health facilities. Written permission (no objection certificate) shall be taken from the Gram Sabha and the land owner prior to location selection and a copy shall be submitted to the Engineer for approval.</p> <p>(b) Camp site shall not be located within 250 mts. from a water body including village ponds.</p> <p>(c) A distance of at least 500 mts. shall be maintained from designated/protected natural habitats (such as National Parks, Sanctuaries, Biosphere Reserves, Reserve Forests and Ramsar Sites) and Coastal Regulation Zone.</p> <p>(b) Accommodation and Basic Amenities: All weather shelter with the required tenement size and toilets shall be provided, as per provisions of Labour Laws. Separate toilet facilities shall be provided for women workers. If a common mess is not provided/operated, additional space for cooking shall be provided. The contractor shall ensure that hygienic conditions are maintained during the operation of such camps/facilities.</p> <p>(c) Fuel for Cooking: The Contractor shall ensure that fuel wood is not used as a cooking medium in the construction/labour camp.</p> <p>(d) Potable water supply: Drinking water supply of at least 40 lpcd with the required supply points shall be provided.</p>

		(e) Fire Safety: Adequate fire safety precautions shall be taken and required fire safety equipment (such as fire extinguishers) shall be provided by the Contractor.
5.	Site Clearance	<p>(a) No tree cutting is to be carried out without the written instruction from the Employer, who in turn will ensure that relevant regulatory permission/s (including those from Forest Dept., if required) are obtained prior to cutting of such trees.</p> <p>(b) The non-timber grade trees are to be stacked and possession is to be given to Employer/concerned Govt. Department.</p> <p>(c) The Contractor shall strip, store, preserve and reinstate top soil from the site of construction work and in the stock yards prior to stacking of materials. The top soil shall be reinstated in the cyclone shelter compound after the construction is over.</p>
6.	Protection of Properties and Resources	<p>The Contractor shall take due care to protect and prevent damages to the following resources during preparatory and construction work:</p> <ul style="list-style-type: none"> a) Water supply lines b) Irrigation canals c) Cart, cattle and/or foot trail/tracks d) Cultural properties and sites/structures of religious importance e) Houses, Farmlands, Orchards and/or Trees f) School and other existing buildings adjacent to the site of construction <p>In case of damage due to construction activity, the restoration/repairs shall be carried out by the Contractor at his own cost.</p>
7.	Quarry Operations	The Contractor shall procure material from quarries that have been approved/licensed by the State Govt. A copy of such an approval shall be submitted to the Engineer prior to procuring material.
8.	Borrow Areas	(f) Borrow areas for the project will be selected by the Contractor following the stipulations given below. The finalization of all such locations shall be dependent on the approval of the

		<p>Engineer on technical and environmental grounds. This includes on-site verification to cross-check the accuracy of details provided by the Contractor. Only after receipt of the written approval from the Engineer, the Contractor shall enter into a formal agreement with landowner.</p>
		<p>(g) The Contractor shall not procure any kind of construction material (such as aggregates, sand and earth) from ecologically protected areas.</p>
		<p>(h) <u>Identification and Selection</u></p> <ul style="list-style-type: none"> • The borrow area should not be located in agriculture field/s unless unavoidable i.e. barren land is not available. In case borrowing needs to be done on an agricultural land, top-soil stripping, stacking and preservation is a must. • Borrow pits shall not be located within a distance of 100 mts. from any NH, SH or other roads. • Borrow pits shall be preferably located 500 mts. away from settlements/ habitations. • No borrow pits shall be located within 500 mts. from schools, colleges, playgrounds, religious structures and health centers. • No borrow area shall be opened within 500 mts. from a reserved or protected forest area, protected sites, wildlife movement zone and cultural heritage site. • No tree cutting shall be undertaken. • Borrow area near any surface water body will be at least 100mts. away.
		<p>(i) <u>Operation</u></p> <ul style="list-style-type: none"> • Area up to which material will be extracted shall be clearly demarcated on ground. • A 15 cm topsoil layer will be stripped and preserved in stockpiles. • Borrowing of earth should be preferably limited to a depth of 1.5 mtr from the existing ground level. • Slope at the edges will be maintained not steeper than 1:3 (Vertical: Horizontal)

		<p>(j) <u>Rehabilitation of Borrow Areas</u></p> <ul style="list-style-type: none"> • Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon. • Preserved top soil has be spread uniformly over land (except in cases where borrow area is developed as a water body) used as a borrow area.
9.	Water Extraction/ Use	Water for construction and for use at construction camps (including labour camps) is to be extracted with prior written permission of (a) the individual owner, in case the source is private well/tube well; (b) Gram Panchayat in case the source belongs to community; and (c) Irrigation Department in case the source is an irrigation canal or a river.
10	Safety of Road Users and Local Residents	(a) Traffic safety arrangements (including provision of warning signage, speeds breakers etc.) shall be made by the Contractor to ensure safety of road users and local people, particularly in the internal village roads which will be used for transporting materials.
		(b) Material shall be covered during transportation to prevent spillage, accidents and pollution.
		(c) All required measures to ensure safety of local residents including children and other near-by residents shall be taken up by the Contractor. This shall include provisions to prevent unauthorized entry into the construction site and camp; fire and electrical safety measures: pre – cautions around excavation such as barricading and warning signs and safe storage of material.
11.	Workers Safety	(a) All measures required for ensuring safety and health of the workers shall be taken up by the Contractor. This includes provision and enforcement of appropriate personal protective equipment; first aid facility; emergency response arrangement; proper storage of hazardous/toxic and polluting materials and; measures for ensuring fire, electrical and mechanical safety

		arrangements in camp and in work site.
		(b) All methods, steps and measures required for ensuring safety of workers, particularly those needed while undertaking work in or around excavations; working at height; and; while handling inflammable, toxic and/or hazardous materials shall be ensured by the contractor.
		(c) Material safety data sheet record of fuel and other inflammable chemicals shall be maintained at the site.
12.	Air Pollution	(a) Wind barriers or screens shall be provided in the downwind direction at air pollution causing sources like plant sites and fine material storage stock yards.
		(b) Fugitive dust emissions have to be eliminated by providing dust suppression/control measures, such as water sprinkling and cover on materials, based on activity and site conditions.
		(c) All plants and equipment shall comply with pollution control norms.
		(d) Water shall be sprinkled at least twice during dry day on haulage roads passing through or near settlements (including at least 100 m before the settlement).
13.	Water pollution	(a) All measures (including provision of temporary silt fencing to control sediment run-off) required for avoiding adverse impacts to water bodies (such as ponds, streams, canals and rivers), water sources (such as hand pumps and wells) and adjacent farmland shall be undertaken by the Contractor.
		(b) Storage of materials like fuel, chemicals and cement shall be done in a manner (with impervious layer on bottom and a covered shed on top) that does not contaminate land and ground/surface water.

14.	Noise Pollution	(a) All noise causing activities shall be stopped during night time (9:00 PM to 6:00 AM). The Contractor shall schedule construction works in consultation with local Panchayat Authority and School Principal to ensure least disturbance to school children and other adjacent residents.
		(b) Ear plugs shall be provided to the labour facing risk from high noise pollution such as plant site and those working near generators, heavy equipment/machinery.
		(c) Appropriate noise controlling devices including acoustic generators shall be used to minimise noise during construction work and operation of camp.
15.	Disposal Debris/Wastes	(a) Debris and other construction waste, if any, shall be disposed in locations pre-approved by the Engineer in a manner that it does not contaminate the environment.
		(b) Location of Debris Disposal Sites: Debris disposal sites shall be located preferably away from farmlands, water sources and water bodies. In no case, debris shall be disposed within 500 mts. of ecologically sensitive areas, including forests, wetlands and protected natural habitats.
16.	Restoration and Rehabilitation of Sites	<p>All work sites and areas under temporary use (including construction and labour camps, plant sites, haul roads and borrow areas) shall be restored/ rehabilitated to a better condition (if not at least to its original condition) and to the satisfaction of the Engineer and land owner upon completion of construction work by the Contractor.</p> <p>Completion of work will also include completion of rehabilitation and clean-up of the work sites including camps, plants, in and around the construction site; disposal of debris/construction wastes at pre-approved locations and; restoration of borrow areas and other sites/locations used for material sourcing.</p>

17.	Liabilities	Any liability arising out of Contractor's agreement with landowners/ local people/gram panchayat (including those related to temporary use of land, water extraction and disposal of debris) shall be settled by the Contractor.
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Annexure 11

Construction Camps and Basic Amenities for Labour

Foreseeing the involvement of women, both direct and indirect in the construction activities, IA shall ensure certain measures that are required to be taken by the construction contractor towards welfare and wellbeing of women and children during the construction phase such as:

- (a) **Temporary Housing:** During the construction the families of labourers/workers should be provided with residential accommodation suitable to nuclear families.
- (b) **Health Centre:** Health problems of the workers should be taken care of by providing basic health care facilities through health centres temporarily set up for the construction camp. The health centre should have at least a doctor, nurses, General Duty staff, medicines and minimum medical facilities to tackle first-aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases. The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should provide with regular vaccinations required for children.
- (c) **Day Crèche Facilities:** It is expected that among the women workers there will be mothers with infants and small children. Provision of a day crèche may solve the problems of such women, who can leave behind their children in such a crèche and work for the day in the construction activities. If the construction work involves women in its day-night schedules, the provision of such a crèche should be made available on a 24-hour basis.

The crèche should be provided with at least a trained ICDS (Integrated Child Development Scheme) worker with 'Aya's' to look after the children. The ICDS worker, preferably women, may take care of the children in a better way and can manage to provide nutritional food (as prescribed in ICDS and provided free of cost by the government) to them. In cases of emergency, a trained ICDS worker can tackle the health problems of the children much more efficiently and effectively and can organise treatment linking the nearest health centre.

- (d) **Proper Scheduling of Construction Works:** Owing to the demand of a fast construction work, it is expected that a 24 hours-long work-schedule would be in operation. Women, especially the mothers with infants, should to be exempted from night shifts as far as possible. If unavoidable, crèche facilities in the construction camps must be extended to them in the night shifts too.
- (e) **Education Facilities:** The construction workers are mainly mobile groups of people. They are found to move from one place to another taking along their families with them. Thus, there is a need for educating their children at the place of their work. Wherever feasible, day crèche facilities may be extended with primary educational facilities or some kind of informal education facilities could be created at the construction camp.

- (f) **Control on Child Labour:** Minors, i.e. persons below the age of 14 years, should be restricted from getting involved in the constructional activities. It will be the responsibility of IA and social and environmental experts of DPIUs to ensure that no child labourer is engaged in the activities. Exploitation of women is very common in such camps. IA shall keep strong vigilance to ensure cessation of such exploitation.
- (g) **Special Measures for Controlling STD, AIDS:** Solitary adult males usually dominate the labour force of construction camps. They play a significant role in spreading sexually transmitted diseases. In the construction camps as well as in the neighbouring areas, they are found to indulge in high-risk behaviour giving rise to STDs and AIDS.

While it is difficult to stop such activities, it is wiser to make provisions for means of controlling the spread of such diseases. IA shall conduct awareness camps for the target people, both in the construction camp and neighbouring villages as well. IA shall have to tie up SACS for awareness and IEC materials, and supply of condoms at concessional rate (or free) to the male workers may help to a large extent in this respect.

Annexure 12

Supervision Protocol for implementing EMP/ESMF

The purpose of this annex is to assist the implementing agency in establishing a mechanism for effectively implementing environmental management tools for the project such as ESMF and EMP

Objectives

- Establish a system for environment management within the implementing agency.
- To ensure implementation of Environmental Management Plans (EMPs), judge effectiveness of EMPs, identify modifications required and implications such as variation orders on the Contractors agreements
- To ensure compliance of Bank's Safeguard Policies
- To ensure compliance of Government of India (GoI)'s regulatory conditions
- To identify other environment issues that may indirectly have arisen which may affect the project implementation or overall environment performance in the area. In this context, to explore the possibilities of sub-projects and to establish the institutional linkages with the primary implementing agency.
- To gather and document information on practices / issues that could provide feedback into project design for future projects.
- To help the implementing agency in developing strategies for improved environment management by:
- Facilitating improved coordination with other GoI departments,
- Facilitating better coordination between Supervision Consultants and Contractors teams
- Facilitating coordination between Non-Governmental Organizations (NGOs) implementing the RAP and the environment teams, especially in the case of identifying opportunities for enhancements and other environment management aspects of resettlement sites that may be created on relocation of displaced people, market / vendor areas, temples, ponds etc.
- Facilitating coordination with the engineering teams on ensuring the implementation of EMPs on aspects such as road safety, construction management at work site, construction management at contract camp and labor sites including gender and child labor issues.
- Facilitating better monitoring of EMPs
- Facilitating improved reporting systems by helping to develop formats for better coordination of corporate or head quarters (Project Implementation Units / PIUs or Environmental & Social Management Units / ESMUs) and field offices, suggesting internationally accepted systems on environment management such as ISO 14001.
- Facilitating and providing resource information on training and capacity building programmes on environment management.