Gujarat State Disaster Management Authority

Executive Summary – EIA/EMP

Consultancy Services for Conducting Environment Impact Assessment (EIA), Social Impact Assessment (SIA) And Preparation of Environment Management Plan (EMP) & Resettlement Plans for Underground Electrical Cabling Works at Gandhidham and Adipur Cities Of Kutch District, Gujarat

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Royal HaskoningDHV
Enhancing Society Together

Submitted by:

HaskoningDHV Consulting Pvt. Ltd.
Green Boulevard, Plot B 9A, Tower B, 4th Floor, Sector 62, Noida - 201301, India
T +91 120 4016100, F +91 120 4260165, Email: info.india@rhdhv.com

Executive Summary

1.0 Background

The "National Cyclone Risk Mitigation Project" (NCRMP II) is being implemented by the National Disaster Management Authority (NDMA) with support from the Ministry of Home Affairs (MHA), GoI. It includes states of Gujarat, Maharashtra, Kerala, Karnataka and Goa on the west coast and West Bengal on the east coast. The project seeks to achieve its objectives by undertaking structural and non-structural measures under its four main project components:

Project Development Objective (PDO)

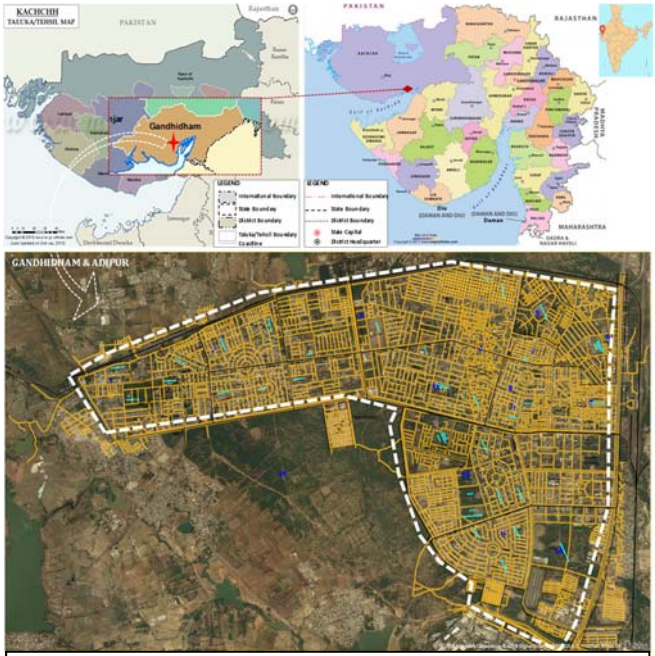
To reduce vulnerability to cyclones and other hydro-meteorological hazards of coastal communities in project states and increase the capacity of the State entities to effectively plan for and respond to disasters.

A. Early warning Dissemination Systems
B. Cyclone Risk Mitigation Infrastructure
C. Technical Assistance for Multi-Hazard Risk Management and
D. Project Management and Implementation Support

The Gujarat Disaster Management Authority (GSDMA) is the nodal agency for the implementation of the NCRMP II project in Gujarat.

2.0 Sub-Project

The sub-project "underground electrical cabling works at Gandhidham and Adipur cities of Kutch district, Gujarat" is covered under sub-component B1 (Cyclone Risk Mitigation Infrastructure in Gujarat) of Component B (Cyclone Risk Mitigation Infrastructure), NCRMP II.



Sub-project Location - Gandhidham & Adipur, Kutch, Gujarat

The impact of climate change hazards & natural calamities is threatening the economic growth of the State and is also disproportionately affecting the vulnerable who are least equipped with the resources to adapt to changing conditions.

In the past, Gandhidham and Adipur cities were severly affected by :

- the cyclonic storm that made landfall on the coast of Kandla (Kutch) near the city of Gandhidham on June 09, 1998. At the time of landfall, the estimated maximum sustained surface wind speed associated with the cyclone was about 180-220 kmph and height of the waves up to 6 meters. The tide gauge at Kandla reported maximum storm surge of 1.5 meters above the astronomical tide. The death toll from the cyclone was about 10000.
- a severe earthquake (on January 26, 2001) that measured 7.9 on richter scale. The epicenter being Bhachau (kutch), Gandhidham & Adipur and the entire kutch region faced tremendous loss of human lives & infrastructure. The death toll was about 60000.

These cyclone & earthquake caused extensive devastation in all the affected districts, uprooting vast number of trees, damaging roads, public buildings, livelihoods and disrupting telecommunications and power infrastructure.

The Need is to move forward towards a resilient infrastructure that can serve as a foundation for growth and economic development of Gandhidham-Adipur cities and help build disaster resilient-communities thus, ensuring development benefits over the longer term. The robustness of UG electrical network to the effects of high speed cyclonic wind gust when compared to the overhead electrical system makes it a more viable choice when providing a safe environment in all aspects.

This sub-project is part of a package to support Government of Gujarat (GOG) for reconstruction and recovery efforts and to strengthen its capacity to manage future disasters. Hence, the conversion of existing overhead HT & LT electrical lines into underground electrical cabling network has been proposed in Gandhidham and Adipur cities of Kutch district to provide a resilient infrastructure that can withstand natural disaters like cyclones. The underground electrical cabling works will be implemented by the Paschim Gujarat Vij Company Ltd (PGVCL).

Significant features of an Underground Electrical Cabling network are:

- **Resilient infrastructure-** It is safer to public lives and property particularly of vulnerable sections of society, during calamities/disasters/thunders/lightening instances, reduces risk of vehicular accidents, electrocutions etc.
- **Reliable-** Effective and reliable alternative to overhead lines due to real-time monitoring, low wear and tear risk, reduced outages (about half of their equivalent overhead networks), etc.
- **Low carbon footprint & energy *s*avings-** Approx. 30% lower power losses in comparison to overhead lines at high circuit loads. Improved system efficiency in UG cables, lowering greenhouse gas emissions and energy savings.
- **Safe and aesthetic-** UG cable network enhances the visuals of the area which improves aesthetics, higher public acceptance and convey environmental benefits. Also, it reduces the vehicular accident risks due to removal of HT and LT poles along the road side.

Key Benefits of Undergrounding the existing overhead electrical network are:

- All areas covered under this project will ensure to practically remain unaffected in future from power disruptions and associated implications during or after cyclone/high winds or natural calamities/extreme weather conditions, hence, resilient to natural disasters, the main project development objective of UG cabling project component under NCRMP II.
- UG cables have lower transmission losses and can absorb emergency power loads. UG cables have lower maintenance costs and emit no electric field and can be engineered to emit a lower magnetic field than an overhead line.
- While the upfront investment required for an underground cable distribution system is higher, the recurring expenses are lower and therefore a fair financial comparison with overhead lines should consider the NPV of both types of costs over a long planning period e.g. 25 to 30 years. In most cases, underground cabling turns out to be cost effective in a financial sense.
- It is an established fact that UG Cable network will lower the transmission losses, which will result in energy saving and subsequently reduction in green house gases (GHG) for generation of saved energy/electricity for UG Cable network.
- UG cables are not affected by momentary interruptions as occurring from lightning and falling of tree branches on overhead lines, which de-energize and then re-energize the circuit moment later, a most common feature in over head lines.

- It will substantially conserve state's resources required during re-construction of damaged electrical network after the devastation caused by a cyclone and other natural disasters.

3.0 Objectives of the Assignment

As mandated under Environmental and Social Management Framework (ESMF) of NCRMP II, the Environment Impact Assessment (EIA) and Social Impact Assessment (SIA) study is required for underground electrical cabling works. In compliance with the ESMF, the GSDMA engaged M/S HaskoningDHV Consulting Private Limited for conducting EIA, SIA and preparation of EMP & RAP for the sub-project.

In line with the World Bank Safeguards and GOI's policies on Environmental Assessment, the overall objective of this sub-project is to carry out Environment Impact Assessment (EIA) of the proposed project, identify environment impacts, EHS issues and provide corresponding mitigation measures in the Environmental management plan (EMP), thus, ensuring sustainable implementation of the project. The intent of this study is to identify, predict and assess likely environmental effects of the proposed project and to provide a level of environmental information to assist decision-makers in making an informed decision. Essentially, it emphasizes on reducing/avoiding the likely effects on people and on environmentally sensitive entities, if any & where possible. Further, minor refinements to the route alignment may be made in consultation with landowners, stakeholders and local communities if appropriate or/and necessary.

The specific objectives of the sub-project are:

- To establish environmental baseline in the study area
- To identify environmental impacts and significant issues and facilitate an informed decision making for the proposed works, including analysis of the various alternatives
- To assess potential impacts and provide for the requisite avoidance, minimization, and mitigation measures to address those impacts
- To identify appropriate mitigation strategies targeted towards avoidance/minimization of impacts and occupational health & safety issues and develop environmental management plan addressing implementation, monitoring and reporting requirements during project implementation
- To review and verify the adequacy of existing system/practices for application of relevant safeguard procedures and practices, and adherence to various applicable regulations/rules and guidelines detailed out in the ESMF
- Preparation of relevant/comprehensive sub-project specific EIA and EMP including cost estimates for their integration into the DPRs and Bidding documents.

4.0 Approach & EIA Methodology

Approach: Based on the detailed review and perusal of the TOR objectives provided by the Client (GSDMA), and in compliance with appropriate national/state legislations, guidelines and the World Bank safeguard policies, the environmental and social assessment analyzes and documents potential impacts/risks and corresponding mitigation measures for each stage of the project cycle, including design and planning, construction, operation, and decommissioning/closure.

Environmental Screening of the project has been undertaken to evaluate the need of conducting an EIA study and level of detail which the EIA will require. It determines the existing environmental status of the study area by identifying environmentally sensitive areas such as presence of national parks, sanctuaries, wildlife corridors, reserved/protected forests, wetlands, mangroves etc. within the

surrounding environment of the project area. This results in categorization of the project, regulatory permissions/clearances required and helps in informed decision making regarding sustainable implementation of the project.

Methodology: The EIA study addresses all the areas/aspects affected by the implementation of the proposed UG cabling project. The assessment of likely significant environmental impacts was based on current knowledge of the site and the surrounding environment. Both positive and negative impacts were assessed that may arise during the construction and operational phase of the development. Following the findings of various studies contributing to the EIA, methods of avoiding, reducing or off-setting any potentially significant adverse impacts (collectively known as 'mitigation measures') were identified with corresponding monitoring; and outlined in the Environmental Management Plan.

Following the initial start-up meeting, GSDMA, PGVCL (Rajkot & Gandhidham), Gandhidham Nagarpalika, GPCB, GUIDE, Forest Department (Bhuj), BISAG, KPT and other concerned departments within these establishments were contacted to obtain data/documents for desk-study review and understanding of the proposed sub-project subsequently developing a credible baseline for the project environment. Field reconnaissance survey of the project area was done by the consultant's team along with the PGVCL officials. This included visit to sub-station locations, selected HTL routes, LTL routes including critical areas (congested areas). Presence of terrestrial flora and fauna in the project area and the presence of any ecologically sensitive or endangered or threatened species were given high importance while carrying out impact assessment. Further, environmental monitoring was conducted during May 2017 for 4 environmental attributes (air, noise, soil and water) to study the ambient environment within the proposed project. Transect walks by the survey team was carried out feeder-wise throughout the proposed UG electrical network alignment. Spot consultations were held with residents to understand the ownership status of land and structure and also elicit their opinion and reaction regarding the proposed project implementation. In addition, videography was carried out block-wise covering the entire proposed UG electrical transmission route. Focus group discussions/public consultations were carried out to have an insight of the on-ground issues and take into account concerns/disputes/problems that may arise during the course of the project operations.

5.0 Project Description

The sub-project is spread across an area of 36.6 sq.km covering a population of approximately 0.3 million as per Census 2011. ***The Existing OH Electrical Network*** in Gandhidham-Adipur has two sub-stations:

- **Sub-station 1:** 66 kV Gandhidham-2 substation, covering Sadhu Vasvani, Gopalpuri, Bharat Nagar and Sunderpuri 11 kV Feeders which is distributed over an length of 362.54 Kms in Gandhidham & Adipur Cities
- **Sub-station 2:** 66 kV KFTZ substation covering Gandhidham, New Gandhidham-2, Lilashah, New Lilashah-2, Jhulelal, KERF, Jagjivan, Ganeshnagar, Aerodram, Gurukul, Adipur, DC 5, New GJ 11 kV Feeders

PGVCL is the Implementation agency for the proposed UG electrical cabling network within Gandhidham & Adipur Cities. The total project cost is estimated to be 161.71 crores, implementation period being 18 months after the award of work.

Salient features of the proposed UG electrical network as per DPR prepared by PGVCL are:

- Underground electrical cabling network (high tension & low tension) covers a length of 430.74 Kms in Gandhidham and Adipur cities. Length of HT Cable laying is approximately 164.74 Kms and of LT Cable laying is approximately 266 Kms

- Gandhidham and Adipur will be fed from seventeen 11 kV feeders emanating from two 66 KV sub-stations.
- Provision of three new additional 11kV feeders namely, New Gandhidham, New Lilashah, New GJ for balanced load sharing among the 11kV feeders of Gandhidham sub-station.
- Provision of diversion of load of one feeder to another feeder through the proposed Ring Main Units (RMUs) network for achieving a resilient & flexible electrical network.
- Installation of 559 nos. of 11kV RMUs (Ring Main Units).
- Installation of 642 nos. LT Feeder Pillar and 4950 nos. LT Service Pillar for power to individual LT consumers.
- Provision of duct for telecommunication cables, etc.
- Installation of 642 nos. new distribution transformers along with 27 nos. (63 KVA –18 Nos. and 25 KVA 9 Nos.) existing distribution transformers based on regrouping by considering the future load growth.
- SCADA (Supervisory Control and Data Acquisition System) compatible RMU's (Ring main unit) will be employed with a view of developing Gandhidham city into the Smart City regime in the near future.
- Separate trench for OFC cable routing will be provided, hence, avoiding re-excavation & probable damage to roads/footpaths, other utilities etc.

The proposed project has considered different types of cable trench configuration (owing to different locations and suitability) and methods for laying of UG cables. The trench configurations will vary as per the site conditions i.e. soil type, width of the lane & space available to carry out construction works. The trench will be excavated upto a maximum of 1200 mm depth and 500 mm width in the city with wide roads. However, in conjusted areas, where cable laying operations will be difficult, LT cable will be erected from FSP of Transformer to MSP so that more width is not required (250-300 mm). Here, small MSP's (mini section piller) among 4 to 5 consumers will be erected in front of the consumer premises and from the MSP, cables will be provided via DWC pipe to the meter of the consumers (pipe will be clamped to the compound wall of the consumer or as desired by the consumer). For congested areas with narrow lanes and by-lanes Aerial Bunch (AB) method will be employed as it is considered to be the best choice for power distribution in congested urban areas. This method is already being implemented in many areas in Gandhidham- Adipur.

The Commissioning of the UG System will be carried out after performing and achieving tolerable results of the tests after laying in compliance with specifications & standards. The existing overhead infrastructure will be **Decommissioned** and dismantled after six months of the commissioning of the UG electrical cable project. It will involve dismantling of all the existing overhead infrastructure (including overhead conductors, insulators, straight and Vcross arms, guywires, poles, distribution transformers etc.). It is estimated that 1278 number of distribution transformers (DT's) will be dismantled. The dismantled transformers during decommissioning phase will be reused entirely by PGVCL locally or in there other projects.

Further, as per the discussions with PGVCL officials, it is estimated that 80% of the dismantled electric poles which are in good condition will be reused in other projects and the rest by local people in rural areas (to make boundary wall etc.). Approx. 20% of the dismantled electric poles will be scrapped (end-of-life) and auctioned online by PGVCL which is an existing method too for rejected electrical items generated from the exsiting electrical network. Debris generated will be disposed with the consent of Gandhidham NagarPalika in the existing waste disposal site or any other site designated for Construction & Demolition waste or reused in other construction works (filling potholes etc.)

6.0 Regulatory framework

Gujarat Pollution Control Board (GPCB) is the legislative authority for prevention and control of environmental pollution under Air, Water acts and Environmental (Protection) Act, 1986 that may occur during the project implementation period. ESMF has been prepared as per the country regulations and World Bank's Operation Policies for Social and Environmental Safeguards. The Paschim Guajarat Vij Company Ltd (PGVCL – project implementing agency) will ensure compliance of legal and regulatory framework during the implementation of the project. Environmental Assessment (OP/BP 4.01), Forests (OP/BP 4.36) and Physical Cultural Resources (OP/BP 4.11) are the Environmental Safeguard policies of the World Bank that are triggered. Applicable environmental regulations at the National/State level requiring clearances mainly pertain to:

- Coastal Regulation Zone (CRZ) Notification, 2011 and subsequent amendments
- The Air (Prevention and Control of Pollution) Act, 1981 (amended 1987)
- The Water (Prevention and Control of Pollution) Act, 1974 (amended 1988)
- The Hazardous and Other Wastes (Management, and Trans-boundary Movement) Rules, 2016
- The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010
- Public Liability and Insurance Act 1991

The other regulations comprises employment and labour laws thus, providing necessary safeguards to the employees rights at work and refer to the set of standards/acts for working conditions and wages that will be binding to the employer (contractor) during the project implementation period viz, Payment of Wages Act 1936, Minimum Wages Act 1948, Inter-State Migrant Workmen's, (Regulation of Employment & Conditions of Service) Act 1979, Employees Compensation Act 1923, The Personal Injuries (Compensation Insurance) Act 1963, Employer's Liability Act 1938, Labour (Regulation and Abolition) Act 1970, Equal Remuneration Act 1979, Maternity Benefit Act 1951, Child Labour (Prohibition and Regulation) Act 1986, Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act 2013.

7.0 Description of the Environment

In order to assess the impact of the proposed development, it is necessary to determine the baseline environmental conditions that exist, in the project area.

Project State: Gujarat has the largest share of the total Indian coastline (1600 km). This coastal stretch has a high diversity of terrain, shelf depths and hydrology, with some extremely flat and low lying sections. The state boasts of its great historical, religious and tourism significance and is strategically located between 20˚1'& 24˚7'N latitudes and 68˚4' & 74˚ 4'E longitudes. It's bounded by the Arabian Sea, Pakistan and Rajasthan on its west, north and northeast respectively and Madhya Pradesh and Maharashtra on its southeast and south. The physiology and culture of Gujarat divides it into several regions like Kutch, Saurashtra, Kathiawad, and Northeast Gujarat.

Overview of Gujarat (Census 2011)	
Total Population	6,04,39,692
Area (Km2)	1,96,244
Population Growth	19.28%
Urban Population	42.6%
Rural Population	57.4%
SC Population	6.74%
ST Population	14.75%
Sex Ratio	919
Child Sex Ratio	890
Density/km2	308
Overall Literacy	78.03%
Male Literacy	85.75%
Female Literacy	69.68%
Contribution to Gross State Domestic Product (2011-2012)	12.2%
Primary	14.2%
Secondary	38.6%
Tertiary	47.2%

Sub-Project Area: The sub-project area comprises the cities of Gandhidham-Adipur in Gadhidham Taluka of Kutch district, Gujarat. Gandhidham is located 59 kms from the District Headquarter - Bhuj. Owing to its strategic location in the district as well as its proximity to Kandla port, Gandhidham-Adipur

is well connected to the rest of India by rail and road network. Both towns are governed by Gandhidham NagarPalika comprising 14 wards. The municipal area (36.6 sq.km) accounts for population of 2,47,992 and 54,565 households (Census 2011).

Environmental Screening: The screening exercise was accompolished in two parts and particularly emphasized on:

a). the significance of the location of the project i.e. environmental features and sensitive areas within 10 km periphery of the project area. The observations/findings of this exercise are:

- The sub-project area falls partly in CRZ II as per the information (Maps/Emails/Discussions) available from BISAG and ISRO. The sub-project area is under municipal limits, is developed and has been provided with drainage and approach roads. Laying of UG cables will be limited to existing roads, hence, no impact on the coastal areas have been anticipated.
- There are no biosphere reserves, national parks, Wildlife/Bird Sanctuary, Tiger reserve/elephant reserves, important bird areas, coastal area with corals and/or any other environmentally sensitive areas.
- Coastal wetlands i.e. mangroves, mud-flats/swamps, salt-pans and natural lakes are present within the sub-project area.
- There are no ancient monument(s) and/or archaeological site(s) that are under protected category at the State or National level.
- No Historic Places of regional or local importance is located in or within 10 km from the periphery of the proposed sub-project area.
- No forest land is involved in the project. Although, around 1 ha of the protected trees are located along the proposed UG electrical cable route alignment from Kandla Port Trust Office to Adipur. Prior tree felling permission will be required from the Forest Department/District Authority.

b). the impact of the proposed project activities (trenching, laying of cables etc.) on the existing surrounding environment. For this, the operational area/corridor of impact (COI) and the project influence area (PIA) has been defined after assessment of various construction methodologies that will be adopted during implementation phase of the project. The observations/findings of this exercise were:

- There are 139 sensitive receptors within COI/PIA. Notably, all these sensitive receptors are well within their boundaries and away from the proposed electrical cable alignment. Only few might get exposed to inconvenience due to traffic movements, dust and noise levels, if these issues that may arise are not addressed properly before the start of the construction operations.
- 85 no. of trees have been enumerated within the operational corridor. As per discussions with PGVCL, no felling of trees will be required during laying of UG electrical cabling as the alignment will either be deviated or completely avoided, as far as possible. However, prior tree felling permission, if any, will be required from the forest department/district authority.
- 294 structures (kiosks, ramps, floors, ottah etc.) will be impacted. The impact of the proposed sub-project activities largely include floors/ramps as constructed by residents by encroaching/occupying government land beyond the carriageway being used for parking and other purposes. These structures will be restored to its previous state, after completion of the cable laying and prior to road restoration works.
- 10 common property resources (CPRs) along the proposed underground electrical cabling route have been identified that may be impacted, although will be avoided completely by realigning the route at the time of implementation.

- Underground infrastructure like under ground drainage network (obtained from Gandhidham NagarPalika) and other utilities are to be given due consideration during excavation and UG electrical cable laying works. These underground utilities will be avoided or other alternatives may be considered by the contractors in consultation with the implementation authority and the other concerned agencies viz, Gandhidham Nagar Palika, water supply & sewerage departments as well as building owners, as per the need and requirement.

Disaster Risk Profile:

Cyclones-Gandhidham taluka is one of the most vulnerable to high intensity cyclonic and storm impact in Kutch district. According to the hazard risk and vulnerability atlas prepared by GSDMA that shows the cyclone hazard zonation at the district level, Gandhidham & Adipur falls under very high damage risk zone with wind speed of 50m/s.

Floods-Kutch district does not face any major hazard from river flooding. The rocky and black cotton soil type in the district makes the catchment in the region impervious. Gandhidham & Adipur face flood issues primarily due to heavy rain and drainage and increased run-off loads in hard surfaces.

Earthquakes- The sub-project area lies within the Kutch region/district that falls under Zone V, a "severe intensity zone" where earthquakes of magnitude 8.0 can be expected. The most recent earthquake which occurred in the region on 26th January 2001 was of magnitude 6.9 on Richter scale and had caused extensive damage to life and property.

Climate & Rainfall: The sub-project area experiences a hot semi-arid type of climate and is characterized by hot and dry summers. Winter and summer temperature ranges from 3°C - 48°C with a average humidity of 60% which increases to 80% during southwest monsoon and decreases to 50% during November–December. As per IMD, the relative humidity of Kutch varies between 43.5% during March and 77% during August. The average annual rainfall is 319.8 mm and the maximum rainfall is received in the month of July.

Topography: The topography of the project area is generally flat with an average elevation of 27 metres. The topography of the town is gradually downward from west direction to east direction and from north direction to south direction of the town.

Soil type & Quality: The soils of Kutch district are mostly sandy to sandy-loam, silty clay-loam and are salt affected and that of the northern portion is composed of Rann sediments. The soil type is predominantly sandy and saline in the sub-project area of Gandhidham-Adipur. Soil quality testing carried out by NABL accredited Consultants during May 2017 indicate that the soil texture of the sub-project area is loamy sand in nature with pH ranging from 6.64 to 7.74.

Water levels and Quality: As per CGWB, the water level during pre-monsoon lies within a range of 2-5m below ground level, whereas, the water level varies between 5-10m post monsoons in Gandhidham area. Water quality in Gandhidham taluka is saline. The ground-water quality monitoring carried out by NABL accredited Consultants during May 2017 indicate high levels of TDS. The other parameters tested is well within the permissible limits.

Ambient Air Quality Monitoring: was done for 24 hour duration with sample change for all parameters at eight hour interval at four sampling locations. The monitoring was conducted by NABL accredited Consultants in the study area during May 2017 and indicate that the overall mean of 24-hourly average values of the parameters monitored is below the permissible limits as stipulated for residential and industrial areas under National Ambient Air Quality Standards.

Ambient Noise Level Monitoring: was done for 24 hour duration at four sampling locations. The monitoring was conducted by NABL accredited Consultants in the study area during May 2017 and indicate that day time noise levels within the residential area just meets the specified standard, but night time noise levels as monitored is quite high. This necessitates for an appropriate noise management plan to be in place during works carried out in the day time and ensuring that no works are carried out during the night time.

Environmental features: of the sub-project area within its 10 km periphery comprises salt pans, creek water and sparse halophytic and scrubby vegetation of A. marina, Suaeda, Salicornia and Salvadora, essentially mangroves. Gandhidham taluka of Kutch district is estimated to have 61.97 sq.km of mangroves (GEC & BISAG, 2009). The mangroves are mostly scrubby formations with ~1m height and an overall density of 4596 plants/ha. In general, mangroves in the sub-project area are predominantly single species, consisting only A. marina, a hardy species capable of tolerating high physiological stresses.

8.0 Environmental Impacts

The purpose of impact assessment is to estimate and review the nature and magnitude of the environmental change that the proposed project may entail. Broadly, the impact analysis has been carried out in three overlapping phases- *Identification, Prediction & its Evaluation.* The methodology adopted for assessing impacts comprises:

- Development of Project Activities Checklist: identifies the activities or actions likely to produce environmental impacts, based on a detailed analysis of the project engineering
- Development of Checklist of Environmental attributes or valued environmental components (VEC's): identifies different environmental components and elements that could be affected by the project activities. Potential environmental effects of the sub-project were assessed primarily using 17 environmental indices/attributes under 5 broad VEC's.
- Impact assessment checklist was used to examine the interaction of the project activities with the Valued Environmental Components (VEC's).
- Based on the findings of the impact assessment checklist, a suitable approach is adopted for valuation of the 'Overall Significance of an Impact', without mitigation. Impacts are described in terms of 'significance'. Significance is a function of the magnitude of the impact and the likelihood of the impact occurring. Impact magnitude (sometimes termed severity) is a function of the extent, duration and intensity of the impact. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process.

The Impact Assessment Checklist & Matrix were prepared to identify & assess the impacts arising due to the project activities and subsequently evaluate the magnitude and severity of those impacts on the VEC's without mitigative measures. The components considered for impact assessment and its significance are:

- Physical Resources: Topography, Weather & Climate
- Environmental Resources: Air Environment, Noise levels, Surface & Ground Water, Soil
- Ecological Resources: Terrestrial Fauna & Flora
- Socio-Economic Environment: Health & Safety, Land Use, Ancient Monuments/Archaeological Sites, Employment, Traffic & Transport, Construction Waste, Solid Waste, Liquid Waste

The outcome i.e. significance of the impacts have been further assessed and appropriate mitigation measures are suggested phase-wise as:

1) Design/Pre-Construction phase
2) Construction Phase
   a) Impact Assessment & Mitigation Measures – Environmental Components
   b) Impact Assessment & Mitigation Measures/Work Guidelines – Activity-Wise
3) Operation Phase
4) Decommissioning phase (Dismantling of OH electrical infrastructure)

9.0 Analysis of Alternatives

With or Without project scenario: The **'with'** scenario of the proposed sub-project is expected to provide a resilient electrical infrastructure for Gandhidham & Adipur in the event of cyclones or other natural disaster. This sub-project will foremost save lives of people and will minimize the damage to public and private property thus, reducing the economic impact on the state.

In case of the '**Without'** project scenario, the existing OH electrical network will stand as it is and will be exposed to the havoc and destruction caused by the cyclones/natural disasters in the cities of Gandhidham & Adipur. Moreover, to meet the increasing demand of the future power supply in the city, the existing OH electrical network will need investment for its upgradation. Considering the extent of risk the OH electrical network poses to the society and the city due to cyclones/natural disasters, similar upgradation will only mean an aggravation of the existing problems and will reflect as an added cost to the quantum of destruction/devastation, economically in the long run.

Alternatives for operational area: The trench configurations and the technology/methods that will be applied during cable laying operations will vary as per the site conditions i.e. soil type/surface, width of the lane & space available to carry out construction works.

- **In city and other areas with wide roads** the trench will be excavated upto a maximum of 1.2 m depth and 0.5 m width. A strip of 0.75 m width on both sides of the excavated trench will be earmarked in order to avoid fouling/disturbance of cable trenches with other pre-existing utilities/infrastructure and roadside trees.
- In very **narrow roads,** the width of the trench will reduce to 250-300mm or even less, whichever is feasible.
- In **congested areas** with narrow lanes and by-lanes, Aerial Bunch (AB) method will be employed as it is considered the best choice for power distribution in congested urban areas. This method is already being implemented in many areas of the sub-project area.
- **Double-wall corrugated (DWC) method:** According to PGVCL, if there are objections from the people when carrying out trenching in their lanes and which requires dismantling of their costly tiles or other components, the cable will be laid through DWC pipe by clamping the pipe on the compound wall of the house.

Alternatives for UG cable laying method:

Considering the site conditions of the sub-project area and other factors such as location of structures, trees, sensitive receptors etc., on-site decisions will be undertaken to carry out **manual or mechanical excavation.** Discussions with PGVCL indicate the deployment of both the methods considering the nature of work involved in the implementation of the project and prioritizing the minimization of

impacts along the COI/PIA. Essentially, manual trenching will be carried out in narrow lanes, by-lanes where machines can not be used and the project area.

The excavation will be carried out mainly by the conventional open **trenching** method. However, where open trenching is not feasible, owing to site conditions, UG cables will be laid using the **trenchless** method of Horizontal Directional Drilling (HDD). In general, HDD process is highly suitable in urban areas or places where aboveground obstructions exist that are expensive, inconvenient or impossible to disturb for laying of UG cables.

10.0 Consultations with Key Stakeholders

The public consultations in the project area were held at two levels: Local and City level. The key informants mainly included head of households and members of households likely to be affected by the project, ward councilors, local voluntary organizations & CBOS, Government agencies and others with focus on vulnerable sections of the society. In addition, discussions were also held with various Government organizations like Forest Department, Nagarpalika, Pollution Control Board, KPT, GSDMA, BISAG, GUIDE, Chamber of Commerce, Water Supply Department and Individuals etc. for gaining understanding of the project area. The consultation programme during project preparation was designed with the view to disseminate project information and to incorporate community opinion in the environment and social reports.

The consultant team held FGDs in various parts of the city. The selection of areas were done in such a way so as to have maximum representation of people from various strata of the society as well to cover different type of localities in the city. Individuals in economically poor area, largely appreciated the proposed sub-project activities. However, some of them expressed concern about the likely impacts on the structure. In contrast, citizens in economically rich areas were largely not found concerned and refused to spare time to provide information. A number of joint site visits and discussions were held with the PGVCL officers at Gandhidham and Rajkot for exploring viable options for reducing the negative environment and social impacts and integrating the same within the overall project design .

Further, during the World Bank Mission, it was discussed and agreed with PGVCL that minimal social and environment impact is anticipated under this project. The replication of the success stories of UG electrical cabling works in other cities by PGCVL, will be implemented in Gandhidham and Adipur cities as well. Community concerns were mainly regarding demolition of structures/assets due to existence of electrical poles within the premises (residential/commercial units) or in close proximity to the structures and the inconvenience that will occur during trenching works and laying of UG cables. In addition, there were suggestions such as advance notification (atleast 7 days) to the community before the start of works, removal of electrical poles after the UG cables are fully operational, depth of cable laying to be 2m instead of 1.2m and laying of cables to be carried out on the road-side having less number of structures.

The City Level Consultation workshop was organized on May 17th, 2017 in Conference Hall of Chambers of Commerce and Industries in Gandhidham. There were 62 participants comprising representative from various government departments, Gandhidham Nagarpalika, Chamber of Commerce and Industries, public representative, voluntary organizations/CBOs, eminent citizens, local community, etc. Concerns/suggestions raised by the participants are:

- It was suggested that details of lay out plan of HT & LT cable laying routes should be provided to key community persons. This might help in reducing hindrances during implementation works.

- One of the concerns raised by the participant was related to high content in salt in the land and its likely effect on the UG cables. In response to this, PGVCL informed that the cable to be laid is of high quality and corrosive resistant.
- Few participants opined that the proposed UG electrical works is designed for a very short period of time. The population growth upto the year 2022 is not adequately addressed. It was suggested that the system should be designed for 30 years.
- Some participants informed that the gas pipeline is also planned in the near future in the city. Hence, the proposed electrical cable system should take this into consideration and modify the design accordingly, if required.
- Participants from Chambers of Commerce and Industries, Gandhidham informed that they have been advocating for UG electrical cable system in the cities for quite some time. They appreciated the initiative for the proposed electrical works and requested PGVCL to organize a separate session after the final approval of the project.

11.0 Environmental Management Plan and Budgetary Provisions

The EMP comprises measures for avoiding or mitigating environmental impacts anticipated during construction, operation and maintenance activities of the UG electrical cabling project. The EMP will be made binding on all contractors operating on the site and will be included mandatorily in the contractual clauses. Thus, the contractor is expected to be fully aware of the Environmental, Health and Safety requirements of UG cable project and accordingly make necessary provisions for implementing the EMP at the bidding stage itself.

Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, however, the contractor shall allocate a budget for compliance with the EMP measures, requirements and actions. The total estimated budget (including restoration costs of structures impacted) for EMP implementation is around 9.45 crores.

12.0 Institutional Arrangements and Grievance Redressal Mechanism

National Disaster Management Authority (NDMA) is the Nodal Agency at the National Level for the implementation of the NCRMP II. The over-all project delivery of the NCRMP is overseen by a National Steering Committee. The Project Management Unit (PMU) within the NDMA works as the executing agency and oversee different components across the states. The PMU team comprises various specialists including Environment & Social specialists who are responsible for the application and implementation of the safeguards compliances.

The SSC will be responsible for reviewing the investment budget; approve the investments, co-ordinate the activities of various departments including obtaining requisite clearances, review the progress of works being executed by the line departments/agencies against the set milestones, review findings of the monitoring and evaluation and issue instructions as suitable.

GSDMA will engage Project Management and Supervision Consultant (PMSC) as PIU for carrying out day to day project activities, headed by Environmental and Social specialists. The Environmental specialist of PMSC will be responsible for the implementation of the safeguards compliances associated with the sub-project activities as well as other environmental provisions specified in the state's regulatory framework. In addition, the Environment Specialist shall provide feedback based on the field visits, regular supervision and monitoring activities, including those undertaken as part of Third Party audits to the Environmental Experts at the

national level in NDMA. The Environment Specialists at the national level will in turn provide technical assistance in planning and design of the activities, including reviews and trainings. Paschim Gujarat Vij Company Limited (PGVCL) is the Line Department/implementation agency and will be responsible for the execution of the sub-project activities/work through the contractors and internally by the department staff.

PIU (GSDMA/PMSC) will ensure the establishment of an effective grievance redressal mechanism to handle all types of grievances within a reasonable time frame. All concerns received/raised through the GRM are to be addressed earnestly, transparently and in a time bound manner, to avoid any inconvenience to the grieved/affected person(s).

The PIU and the contractor will inform the general public along the cable route alignment, which have been opened up for cable laying, about the available grievance redressal procedure, whom to contact and when, where and how to file a grievance, time likely to be taken to redress minor and major grievances, etc.

Further, the GRM has been designed at the national and state levels to address complaints and grievances and engagement of a third party auditor. Third party will be appointed by the GSDMA to provide independent assurance on compliance with the ESMF.