Mr. Waseem Anwar Bhinder,
Registrar – Registrar Office,
NEPRA Tower, Attaturk Aven
Sector G-5/1, NEPRA,
Islamabad

Ref # KE/RA&GR/NEPRA/2024/932
October 2, 2024

SUBJECT: MODIFICATION OF TRANSMISSION LICENCE

Dear Sir,

KE ("the Company") was granted a generation license having no. TL/02/2010 on June 11, 2010 ("**Transmission Licence**") under Section 16 and 25 of the NEPRA Act, 1997 (as amended).

Through the subject application, KE hereby seeks approval of the Honorable NEPRA Authority allowing KE to add 500/220 KANNUP-Karachi Interconnection (KKI) Grid and associated 220kV Transmission Lines ("**the Project**") in the Transmission License of KE. The 500/220kV KKI Grid station, will serve as an interconnection point for transfer of power between National grid and KE network at voltage level of 500kV, located in the west of Karachi. The associated 500kV Transmission lines will serve as Tie – lines to transfer power between National grid and KE, which will be evacuated through 220kV LILO at 220kV Baldia and 220kV Mauripur Grid Stations. The Project will increase the Interconnection capacity of KE with National grid, thus enabling KE to off-take additional power from the National Grid.

With respect to aforementioned, it is humbly submitted that Cabinet Committee on Energy (CCoE) in its meeting dated June 19, 2020, and August 27, 2020, decided to abandon KE's 700 MW Coal Project and considering the excess capacity in the National Grid, directed KE to draw additional power from the National Grid. As per directives of the CCoE, to enable off-take of additional supply from National Grid through base load power plants in south including power plants at 500kV voltage level, KE conceived the Project.

Subsequently, KE entered into a Power Purchase Agency Agreement (PPAA) and Interconnection Agreement (ICA) with CPPA-G and NTDC respectively for import of additional power from the National Grid. As per these agreements, KE shall be supplied with 1,000 MW of firm supply from National Grid, whereas supply over and above the firm 1,000 MW and up to the interconnection capacity will be on pro-rata basis with other DISCOs. This would not only benefit KE consumers in terms of addition of cheaper power in KE system, but also benefit the entire country by reduction in existing burden of idle capacity payments and ensure better utilization of installed generation capacity.

In the light of above, this application is being submitted under sub-regulation (2) of the Regulation 10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure

Regulations, 2021 ("Regulations") for addition of the Project in the Transmission License of KE. In relation, hereto, this is to certify that the following documents enclosed in support with this modification application are prepared and submitted in conformity with the provisions of the Regulations, and that the Company undertakes to abide by the terms and provisions of the Regulations.

a) Text of Proposed Modification (Annexure A)
b) Statement of Reasons and Specifications in support of Modification (Annexure A)
c) Statement showing the impact of tariff, quality of service (Annexure A)
d) Support Documents (Annexure A1, A2, A3, A4, B)
e) Certified True Copy of Board Resolution (Annexure C)
f) Authority Letter in favor of signatory (Annexure D)
g) Affidavit (Annexure E)

Additionally, please find enclosed cross cheque of Rs. 1,643,563.7 (**copy of workings enclosed herewith**) having # 07747719 dated October 2, 2024, of Habib Bank Limited (HBL) bank being the license modification fee after deduction of withholding tax, calculated in accordance with Schedule II of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021

KE humbly requests the Honorable NEPRA Authority to allow and approve the requested addition of the Project in the Transmission License in line with Regulation 10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021.

Sincerely,

Muhammad Imran Qureshi
Chief Regulatory Affairs &
Government Relations Officer

Enclosures: documents mentioned in serial (a) to (g) and cheque # 07747719

NEW 500/220 kV KKI GRID STATION AND ASSOCIATED 500kV AND 220kV TRANSMISSION LINES PROJECT

A. Text of Proposed Modification

Considering the projected growth in power demand in KE's service area, among other generation additions, KE's planned initiatives included a 700 MW Coal Project. However, the Cabinet Committee on Energy (CCoE) in its meeting dated June 19, 2020, and August 27, 2020, decided to abandon KE's 700 MW Coal Project and considering the excess capacity in the National Grid, directed KE to draw additional power from the National Grid.

In view of the directives of the CCoE, KE is in the process of setting up new grids and interconnections at 220kV and 500kV level, which shall enhance the capacity to off-take power from the National Grid. This would not only benefit KE consumers in terms of addition of cheaper power in KE system but will also benefit the entire country by reduction in existing burden of idle capacity payments and ensure better utilization of installed generation capacity.

System Statistics

Description	As of June 30, 2024			*Proposed Addition*	
	66 kV	132 kV	220 kV	*220 kV*	*500 kV*
Grid Stations	3	60	11	*1*	*1*
Transmission Line (km)	152.6	805.3	435.7	*9*	*3.67*
Transformation Capacity (MVA)	79	7,116	5,500	*1,800*	

In view of foregoing, KE humbly seeks approval from the Honorable NEPRA Authority for addition of 500/220 KANNUP-Karachi Interconnection (KKI) Grid and associated 220kV Transmission Lines **("the Project")** in the Transmission License of KE dated June 10, 2010.

B. Statement of Reasons for Modification

As per directives of the CCoE meeting dated June 19, 2020 and August 27, 2020, to enable off-take of additional supply from National Grid through base load power plants in south including power plants at 500kV voltage level, KE conceived the Project and the Project cost has already been approved by the Honorable NEPRA Authority as part of KE's Investment Plan, as more fully explained in Section C below.

Subsequently, KE entered into a Power Purchase Agency Agreement (PPAA) and Interconnection Agreement (ICA) with CPPA-G and NTDC respectively for import of additional power from the National Grid. As per these agreements, KE shall be supplied with 1,000 MW of firm supply from National Grid, whereas supply over and above the firm 1,000 MW and up to the interconnection capacity will be on pro-rata basis with other DISCOs. This would not only benefit KE consumers in terms of addition of cheaper power in KE system, but also benefit the entire country by reduction in existing burden of idle capacity payments and ensure better utilization of installed generation capacity.

The 500/220kV KKI Grid station, will serve as an interconnection point for transfer of power between National grid and KE network at voltage level of 500kV, located in the west of Karachi. The associated 500kV Transmission lines will serve as Tie – lines to transfer power between National grid and KE, which will be evacuated through 220kV LILO at 220kV Baldia and 220kV Mauripur Grid Stations.

Scope of the Project

The proposed project has the following components.

- Construction of KKI Grid has the following subcomponents:
  a) 500 kV KKI GIS Grid Station (one and half breaker scheme)
  b) 220 kV KKI GIS Grid Station (double bus bar scheme)

- Interconnectivity via Loop-In-Loop-Out (LILO) arrangement of NTDC of 500 kV –KANUPP II/III-Port Qasim Transmission Line which has been approved by NEPRA under KE's Investment plan for construction purposes only *(in the interim stage till the completion of NTDC's 500 kV KANUPP II/III-Port Qasim Transmission Line, KE will be interconnecting through LILO arrangement with NTDC's 500 kV KANUPP Jamshoro line)*.

- Interconnectivity of 220 kV Double Circuit Baldia-Mauripur Transmission Line and the proposed 220 kV KKI GIS grid.

It may please be noted that as of July 2024, around 90% of the Project stands completed with full completion and commissioning expected by September 2024.

C. Impact on Tariff

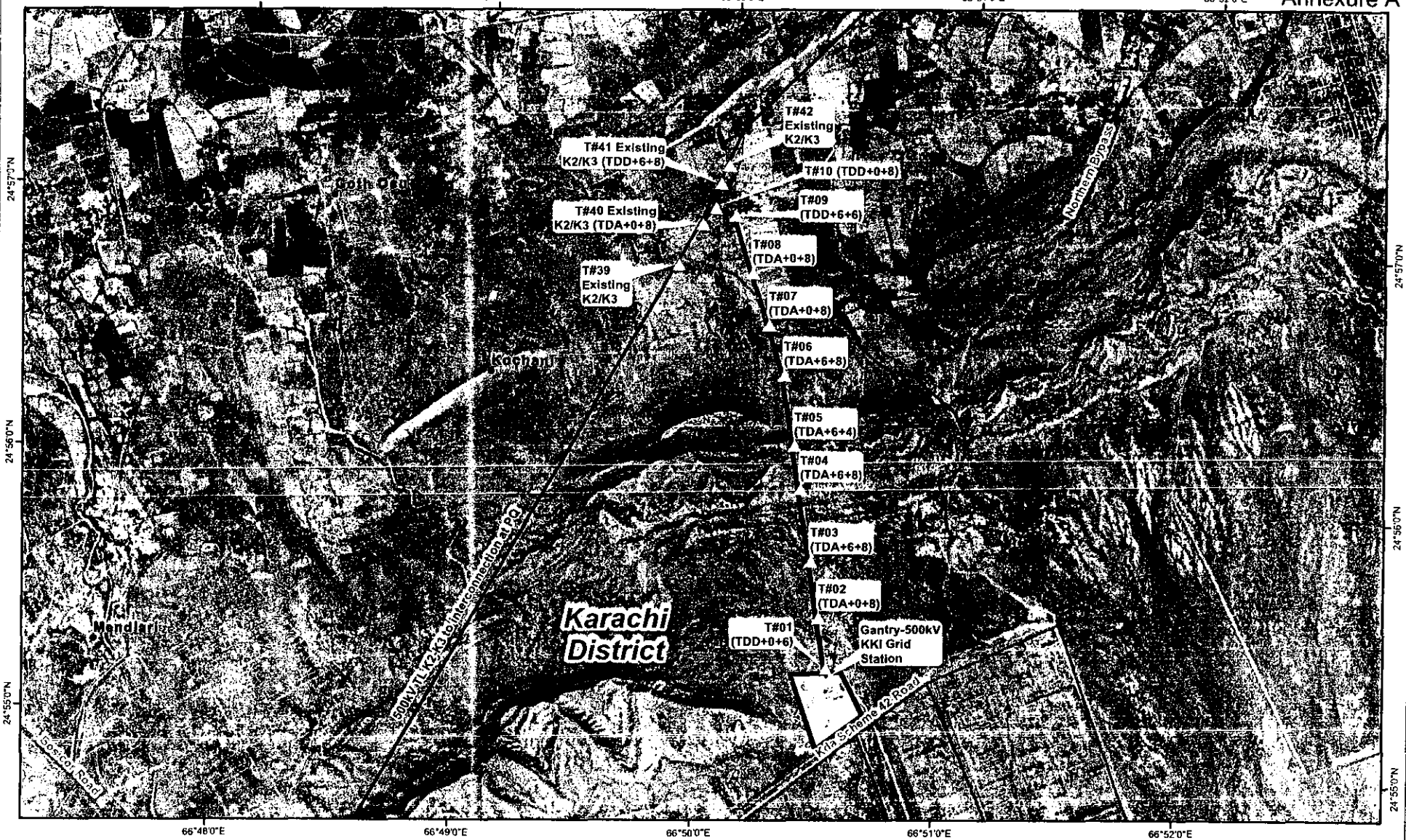
The Project cost has already been allowed by the Honorable NEPRA Authority in the Mid Term Review decision dated March 01, 2022 and through its decision in the matter of KE's Investment Plan FY 2024-2030 for Transmission & Distribution business issued vide NEPRA Determination No. NEPRA/Director(Tech.)/LAD-01/5450-56 dated April 24, 2024.

In view of the foregoing, it is humbly submitted that impact on tariff due to addition of KKI Grid is already inbuilt in the tariff, hence there will be no additional impact on tariff due to the proposed addition. Further, it is important to highlight that the addition of KKI Grid to KE's Transmission network will enable KE to off-take additional power from the National Grid, which would result in lowering the overall cost of power and shall be passed through in tariff.

D. Impact on Quality of Service

The Project will increase the Interconnection capacity of KE with National grid, thus enabling KE to off-take additional power from the National Grid. Further, it will also enhance the system stability and reliability whilst improving the quality of service through better planning to meet any untoward contingency requirements.

Annexure A1



Legend

- Settlement
- Tower
- 500kV TL K2-K3 to interconnection at PQ
- 500kV TL Int. with KKI G/S
- Roads
- District Boundary

Original Paper Size: A3
(H 69 x W 54 in - 297 x 420 mm)
Orientation: Landscape

Projection: GCS
Datum: WGS84
Units / Dimensions: Meters / Kilometers

Scale 1:25,000

0 0.5 1 km

CLIENT:
KARACHI ELECTRIC SUPPLY COMPANY

K-ELECTRIC

CONSULTANT:
NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LIMITED

NESPAK

PROJECT:

500kV T/LINE SINGLE CIRCUIT LOOP IN/LOOP OUT OF EXISTING 500KV K2/K3 - PORT QASIM TRANSMISSION LINE AT NEW 500KV KKI GRID STATION

K-ELECTRIC
Energy That Moves Life

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

PROPOSED "NEW 500/220/132 KV KKI GRID STATION AND ASSOCIATED 500KV AND 220KV TRANSMISSION LINES PROJECT"

Draft Report
July 2020

EMC Pakistan
Private Limited

K-ELECTRIC
Energy That Moves Life

Environmental and Social Impact Assessment

Proposed "New 500/220/132 kV KKI Grid Station and associated 500kV and 220kV Transmission Lines Project"

Final Report
July 2020
Ref: EIA/01/07/20

EMC PAKISTAN PVT. LTD.
503, Anum Estate, Opp. Duty Free Shop, Main Shahrah-e-Faisal, Karachi.
Phones: 9221-34311466, 34324680, Fax: 9221-34311467.
E-mail: mail@emc.com.pk, info@emc.com.pk
Website: www.emc.com.pk

EXECUTIVE SUMMARY

Environmental Impact Assessment is a tool for environmental conservation and has been identified as a key component in implementation of any new project. The relevant rules which support this statement are: Section 17 of Sindh Environmental Protection Act 2014 and other regulatory documents such as Sindh Environmental Protection Agency (Review of IEE/EIA) Regulations 2014. These regulations require that every new development project has to be preceded by an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending upon the magnitude of the severity of impacts anticipated at the time of commissioning and operations of the project.

In compliance of above laws, this report has been prepared; which presents the findings of the Environmental Impact Assessment (EIA) study carried out by EMC Pakistan Pvt. Limited for the proposed "New 500/220/132kV KKI Grid Station and Associated 500kV and 220kV Transmission Lines Project". The project has been studied and analyzed in detail.

The proposed power supply project aims to construct new 500/220/132 kV KKI GIS Grid Station and associated 500kV and 220kV transmission lines in Mauripur sub-division, District West, Karachi. The project has following components.

1. Construction of a 500/220/132 kV KKI (KANUPP-Karachi Interconnection) GIS Grid Station on KDA Scheme 42 Road, Hawkes Bay Town. The proponent has proposed 02 sites for the construction of this Grid Station (the site selection will be based on ease of acquisition and price of the plot). The KKI grid station has further sub components;
   i. 500 kV KKI GIS Grid Station (one and half breaker scheme)
   ii. 220 kV KKI GIS Grid Station (double bus bar scheme)
   iii. 132/11 kV KKI GIS Grid Station (double bus bar scheme)
2. Interconnectivity via LILO arrangement of NTDC 500 kV –KANUPP II/III-Port Qasim TL
   - 500kV Overhead double circuit approximately 05 km route length, subject to availability of ROW, to new 500 KV KKI GIS grid via NTDC 500kV –KANUPP II/III-Port Qasim TL including OPGW.
3. Interconnectivity via LILO arrangement of 220 kV Double Circuit Baldia-Mauripur.
   - Two 220kV Overhead double circuit approximately 9 km route length, subject to availability of ROW, to new 220 KV KKI GIS grid via LILO arrangement of 220kV Double Circuit Baldia-Mauripur including OPGW.

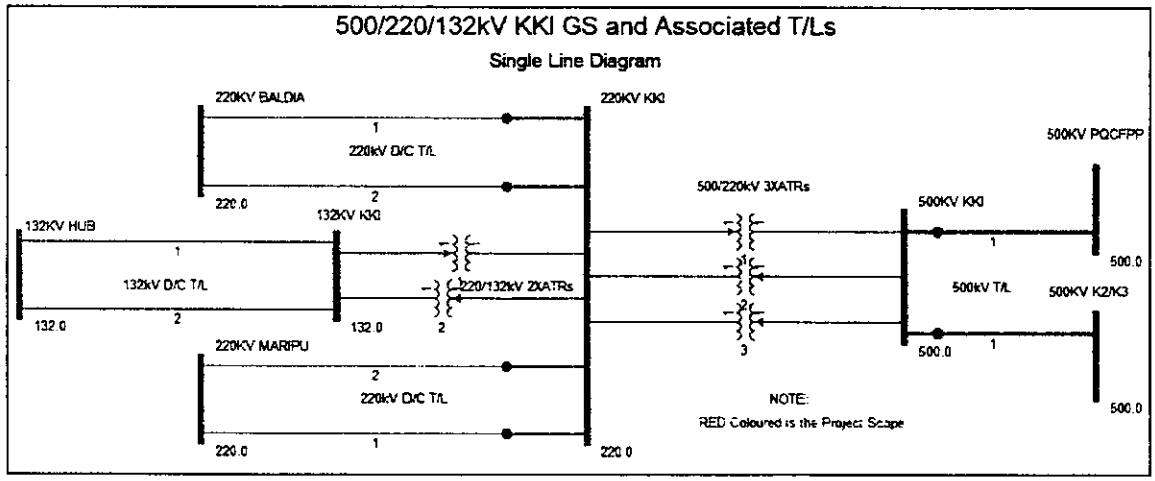


Fig Ex-1.1: Single Line Diagram of Project

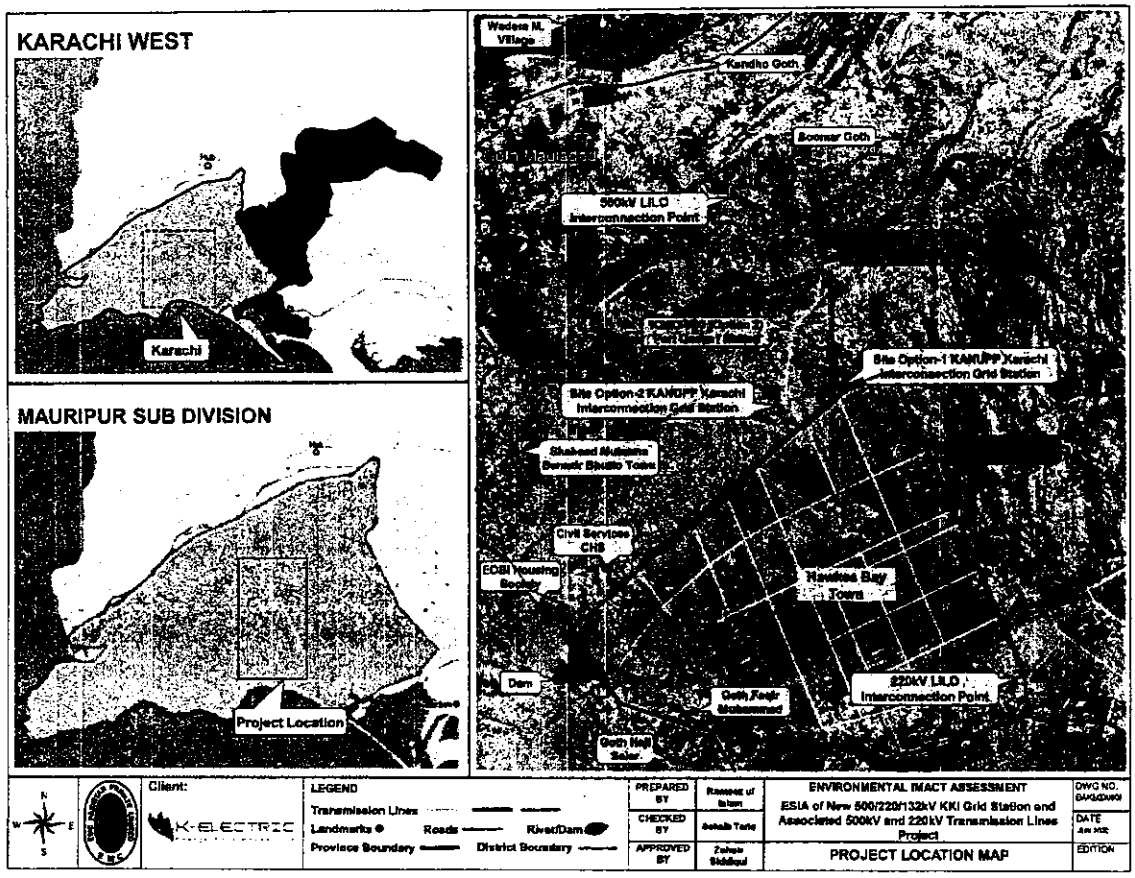


Fig Ex-1.2: Location of proposed project

Objectives of the Project

The proposed power supply project aims to construct new 500/220/132 kV Grid Station and associated 500kV & 220kV Transmission Lines.

The project is being developed and will be implemented, keeping in view the ongoing industrial development, and to meet the increasing commercial, residential and agricultural loads demand (forecasted) across Karachi (the Metropolis), Dhabeji and Gharo in Sindh, and Uthal, Vinder and Bela in Balochistan.

The proposed 500/220/132kV Grid station when constructed will serve as an importing point of power from National grid to K Electric network at 500kV level located in the west of Karachi. The associated 500kV Transmission line will serve as an incoming source of power and the 220kV transmission lines as power evacuation or power transfer links to the 220kV Baldia and Mauripur Grid Stations and then to the rest of the KE network.

Other Approvals

NOCs from utilities and authorities will be taken after approval of SEPA, and after hiring of EPC Contractor, who will also facilitate ensure ROW.

Categorization of the Project

The Sindh Environmental Protection Agency (Review of IEE/EIA) Regulations, 2014 categorizes the project on the basis of nature and scope of the project. The project "New 500/220/132kV KKI Grid Station and Associated 500kV and 220kV

Transmission Lines Project" falls in Schedule II requiring an EIA to be submitted to relevant Environmental Protection Agency, which in this case is Sindh Environmental Protection Agency (SEPA) and is given as:

- ✓ A. Energy
- ✓ 4. Transmission Lines (11 kV and above) and Distribution projects.

Collection of Data

To further study the project features, primary and secondary data is collected. Primary data is obtained through field data collection which includes observational surveys, monitoring and analysis of various environmental parameters, consultations and meetings for data collection from the neighboring communities etc. And, secondary data is collected from various sources such as internet, studies previously conducted in the project area and its neighborhood, in-house sources, Government Departments and NGO's etc. Furthermore, applicable international guidelines, conventions and environmental assessment procedures prepared by the SEPA have been consulted frequently while preparing this document.

Baseline

The physical, ecological and socio-economic environmental conditions of the microenvironment and macro environment of the project area have been studied in detail. Previous published and unpublished literature and other information were collected in order to gain a complete understanding of existing environmental and socioeconomic conditions in the area including the topography, geology, soils, water resources, ambient air, climate, flora and fauna, habitats within the proposed site and its surroundings, socio-economic conditions, infrastructure and land use; and any heritage aspects such as sites of cultural, archaeological or historical significance.

Physical Environment

The Ambient air quality was conducted at five locations in the macro environment by EMC Pakistan Pvt. Limited. Based on the result of the survey, the average values of pollutants monitored in 5 locations are within the SEQS standards for Ambient Air Quality. It is mainly due to the fact that the area largely unhabituated and less frequented by light and heavy traffic. There are no established industrial units within the project area.

The noise level at the proposed project alignment at different locations on the average is 59.4 dB (A), shows that the average noise measurements of the survey is slightly exceeding the limits of SEQS for residential areas, mainly due to the heavy wind blowing in largely open and abandoned area.

Ecological Environment

Ecological surveys were conducted in and around the project alignment to check the current ecological status of the project site and its immediate surroundings. Floral species found in the project area include *Prosopis Juliflora, Euphorbia caducifolia, Calotropis procera, Capparis decidua, Salvadora oleides, Prosopis cineraria, and Acacia nilotica.*

Socio Economic Environment

The socio economic situations prevailing in the microenvironment of the project area, based on primary and secondary information were studied. The primary data was gathered through extensive field surveys, while various relevant sources were used for secondary data. The proposed grid station and transmission lines is located in Mauripur sub-division, District West, Karachi.

Impacts and Mitigation Measures

Potential environmental impacts that would result due to various activities performed in project area for the grid station and transmission lines during different phases such as design, construction, operation and maintenance are identified and mitigation measures have been suggested to reduce those impacts. The potential impacts expected to arise during construction phase are temporary and localized and last during construction phase. Some of the significant impacts of construction activities are i) Intrusion to sensitive receptors and Existing Infrastructure, ii) obstruction to movement of people/traffic, iii) deterioration of air & water quality due to temporary construction camps in area, vii) construction waste handling and disposal, viii) deterioration of local air quality due to dust and vehicular emissions, ix) noise and vibration near the construction activity site, x) occupational health and safety, , and xiv) community health & safety. The potential impacts in operation phase will be minor in nature and will arise only during maintenance of the proposed transmission line project e.g. EMF, wind, fire and earthquake hazards, SF_6 release, transformer oil spill and impact on migratory bird flyway. The mitigation measures for these impacts are summarized in the Environmental Management Plan.

Conclusions and Recommendations

On the basis of the findings of the EIA Study, it is possible to conclude that:

- Construction and Operation of Grid Station and Transmission lines will, on adoption of the mitigation measures, have no significant impact on the physical as well as socio-economic composition of the microenvironment and macro-environment of the project area;
- The likely impact of construction and operation of the Transmission line will be appropriately mitigated through proven technologies, careful planning and landscaping;
- The project is not likely to cause displacement of population, loss of business and annoyance to the living environment, or disturb the peace and tranquility of its surroundings;
- The project will meet the forecasted demand for energy Karachi and neighboring areas;
- The proposed project after commissioning will become an integral part of the microenvironment and a friendly component of its macro environment.

Mitigation will be assured by a program of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the EPA Sindh.

The study recommends and confirms that the proponent shall adopt all environmental management processes in full, as prescribed by the national and international laws and guidelines and given in the EIA document.

The study therefore recommends that the EIA report should be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management Plan will be followed in letter and spirit.

Environmental Management Plan (EMP)

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
Designing Phase			
Migratory bird flyways / Birds	Chance of Collision of Birds with the conductor string	• All suspension poles shall have detachable bird protection devices, over each suspension insulator string. • Bird flappers and deflectors will be installed on conductors to avoid collision of birds on strings.	CC
Temporary Construction Camps	Deterioration of air & water quality, and social impacts	• Camps are to be located away from residents/commercial activities to minimize nuisance; • Sanitation facilities in the camps, if provided, should be mobile & collect its wastewater or connected to the local sewerage system; • Bathing of construction crew should be prohibited at the camp as it will require large quantity of water and generate large volume of wastage.	CC
Contract clauses	Contractor may not perform the work in environmental friendly manner	• Construction Contractor / Waste Contractor shall be made responsible through contract documents for proper disposal of the spoil / excavated earth and not to dump these spoils/ earth near open plots / open spaces / open storm water drains / in front of residents or leave unattended along the construction site. It should be disposed in KMC designated landfill site. • A proper site rehabilitation plan shall be made by the contractor which includes the spoil / excavated earth disposal arrangements • Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and applicable standards during all the construction operations and ensure compliance of the same through periodic environmental monitoring reports. • Contractors shall be made responsible through contract documents to follow Standard Practices and Standard Operating Procedures (SOPs) to ensure health & safety of workers at the site and public during all construction operations. • As the work is usually completed by contractors and sub-contractors, K-Electric should monitor their works to ensure proper task completion.	KE
Construction Phase			
Excavation, storage of soil and waste, generation of waste	Soil Erosion	• Construction activities should be scheduled to avoid runoff due to rain; • The dredged soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation; • Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions;	CC

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
		• Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites; • Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.	
Water Resources	Impact on Surface and ground water sources	• All excavated soil left after backfilling should be completely removed; • Debris and vegetation clogging culverts and drains should be regularly cleared; and • Soil runoff from the site leading to off-site contamination (particularly during rainy season) should not be allowed. • Spillage of oil and grease from the vehicles should be avoided.	CC
Fuel, Oil & Chemical handling, storage and disposal	Soil contamination	• Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course; • Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be avoided at construction site; • Oil contaminated materials should be disposed at designated waste disposal facilities.	CC
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase should be developed and implemented; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of waste should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	CC
Dust Emissions	Deterioration of local Air Quality	• Dust emissions from soil piles and aggregate storage stockpiles should be reduced by keeping the material wet by sprinkling water at appropriate frequency and erecting windshield walls on three sides of the piles; • It should be mandated by KE to Contractor to backfill the excavations after laying of the tower foundations and rehabilitate the excavated area to its original position. If it is a road, the backfilling will be followed by levelling and carpeting of road with bitumen;	CC

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Vehicular movement should be restricted to a specific time for dumping of supplies and construction materials; and • Workers should wear dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.	
Exhaust Emissions	Deterioration of local Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS; • Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) will be banned from sites; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	CC
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents	• Machinery operation and high noise activities should be carefully planned and scheduled; • To the extent practical batching plants and construction areas should not be located within 500 meters of a settlement; • Where that is not possible, high noise activities should cease between 20:00 hrs. to 06:00 hrs. at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents. • Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • The stationary sources of noise such as concrete mixers, batching plant, power generators and pumps will be selected and segregated from work areas and residents; and • Occupational health, safety and environmental procedures and Environmental management plan for proposed project would be followed.	CC
ROW Clearance	Impacts on Ecology (Flora and Fauna), cutting of trees	• Compensatory plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs; and • By using the best practice for vegetation clearing and disposal practices; will minimize the environmental risk associated with clearing and disturbance of vegetation.	CC

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
Safety Precautions for the Workers	The construction and civil works pose an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities during construction phase	• Preventive and protective measures including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital will be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work; • To maintain safe conditions for the general public, construction camps will be fenced and gated, that must be locked at all times; and To protect workers from heat stress • Move to a cool place e.g. cool shady area; • Provide plenty of drinking water; • Break the working in shifts	CC
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic flow along the right of way of transmission lines. This increase in traffic may congest the flow of traffic and may cause some accidental injuries and deteriorate the air quality of ambient air.	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines; • The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily; • Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	CC
Social Impacts	Community health & safety issues	• Emergency response plan should be prepared and implemented during entire phase of construction;	CC

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Procedures for interaction with local and regional emergency and health authorities should be made; • In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 4:30-6:30 pm; • Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the residential areas and communities; • It should be mandated by KE to Contractor to backfill and rehabilitate the excavated area to its original position. • Proper lighting at night near trenches will be ensured; and • Diversions, danger points and works at culverts, bridges and construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. For of construction of foundation for Tower, vegetation removal is minimal therefore, impact on ecology are negligible.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities.	CC
Operational and Maintenance Phase			
Wind, fire and earthquakes	Electricity arcing, poles and towers dislodgment	• Transmission towers have been design as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions. • Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads • System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. • Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards: o The fire hazards risk will be minimized through the use of tall towers and wide ROW. o System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. o Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.	KE/CC

Table Ex.1: Environmental Management Plan for construction and operation of overhead transmission line

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
Electromagnetic interference	The corona of overhead TL conductors and high frequency currents of overhead Transmission Line can create radio noise which interferes with broadcast signals or electronic equipment.	• Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.	KE
Electrocution hazard	High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).	• Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground. • Reduction in the Resistance to Ground of the grounding system • Proper placement of ground conductors	KE
Gaseous Emissions	Air pollution	• All vehicles, power generators and other equipment used during the maintenance work will be properly tuned and maintained in good working conditions in order to minimize emission of pollutants; and • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance with SEQS.	KE
Solid Waste	The maintenance activities may generate some hazardous and non-hazardous waste such as wires and wild vegetation etc.	• Ensure that all solid waste generated during operational or maintenance work is collected and disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	KE

Notes KE = K-Electric; CC = Construction Contractor; SEQS = Sindh Environmental Quality Standards; PM = Particulate Matter, TL = Transmission Line

Table Ex.1: Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
Designing Phase			
Social Impacts	Land acquisition & resettlement, Institute near to right of way, traffic jams	• Traffic management plan will be prepared to manage the traffic jam; especially in peak hours; • Land acquisition shall be achieved as per the national rules and KE standards	KE
Waste disposal	Inadequate disposal of all wastes including transformer oil, residual contaminated soils, empty paint bucket and scrap metal.	• Create waste management policy and plan to identify sufficient locations for and storage of waste generated from construction camps and disposal of residual contaminated soils and scrap metal; and • Designate disposal sites in the contract and cost unit disposal rates accordingly.	KE
Contract clauses	Contractor may disown to work in environmental friendly manner	• Include provisions of this EMP in tender documentation and make contractors liable to implement mitigation measures by reference to EIA in contract; • Include Waste Management plan, Emergency Management Plan in contract as a payment milestone(s); and • Require environmental accident checklist and a list of controlled chemicals / substances to be included in the contractor's work method statement and tender documentation.	KE
Natural Hazards	Project Area lies in Zone 2A where minor to moderate damage can occur due to earth quakes.	• An earthquake proof design will be developed so that little or no intensification of the basic accelerations associated with the frequency spectrum of the seismic disturbance is encountered.	KE
Construction Phase			
Social Impacts	Community health & safety issues	• In order to minimize traffic congestion (if applicable), deliveries of materials and equipment will avoid peak traffic hours; • Dust emission from soil piles and aggregate storage stockpiles shall be reduced by keeping the material wet by sprinkling of water at appropriate frequency; • Vehicular movement shall be restricted to a specific time for dumping of supplies and construction material.	Contractor
Water Resources	Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for	• Regular monitoring of water consumption and quality; • Use of leak proof water storage tanks; and	Contractor/ KE

Table Ex.1: Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
	such activities is being met from external sources such as water tankers supplying water to the construction site		
Air quality	Deterioration of Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to SEQS; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	Contractor
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to workers and local fauna	• As far as possible, those machinery and equipment would be selected that create less noise and vibration; • Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • Occupational health, safety and environmental procedures and Environmental management plan for proposed project will be followed.	KE / Contractor
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase will be developed and implemented; • Construction sites will be equipped with temporary refuse bins, and construction wastes will be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas will not be within 50 m of water ways; • Any hazardous waste will be separated and stored in areas clearly designated and labeled, and disposed in environmental friendly manner;	Contractor / KE

Table Ex.1: Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Wastes will be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and • Upon completion of activities at a construction site all solid wastes will be completely removed and the site will be re-contoured or prepared for natural revegetation.	
Safety Precautions for the Workers	The construction and civil works poses an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities of construction phase	• Preventive and protective measures including elimination, substitution, or modification of hazardous conditions, with particular attention to live power lines, working at height, EMFs, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital shall be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work; • To maintain safe conditions for the general public, all substations will be fenced and gated that must be locked at all times; and • Appropriate signage will be posted that shows the owner of the grid station, the hazardous nature of the substation and contact information.	KE / Contractor
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic in the vicinity of grid station. This increase in traffic	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines;	CC

Table Ex.1: Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
	may congest the flow of traffic and may cause some accidental injuries and deteriorate the air quality of ambient air.	• The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily; • Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. Onsite vegetation clearance will be required only within the boundaries of proposed grid station. Therefore, the impact on ecology of area from construction activities is minimal.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities. • Compensatory tree plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs;	KE/CC
Operational and Maintenance Phase			
Transformer Oils & Fuel Spills	Pollution of soil	• Chemicals and oils will be stored in secure designated areas with permanent impermeable layer; • Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas; • A reservoir may be constructed below transformer for oil containment and spill control in case of leakage or outflow of oil due to severe internal fault. Bunds may also be constructed in transformer area for further protection. • Contaminated residues and waste oily residues will be disposed at an appropriate site approved by the relevant local environmental authority.	KE
Human Exposure to Electromagnetic Fields (EMF)	Adverse health effects	• Principles of careful avoidance will be adopted to ensure exposure levels are well below the generally accepted standards; • Regular health monitoring of workers to assess the possible adverse impacts due to EMF,	KE

Table Ex.1: Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
SF6	Asphyxiation and Global Warming	• The SF6 Gas insulated switchgears design should comply with relevant IEC standards for the prevention of gas leakage. • The manufacturer is bound to design the switchgear with leakage rate of SF6 per annum for the whole substation within 0.5-1%. • Temperature compensated Pressure gauges will be installed for each compartment for monitoring of switchgear gas density and pressure. • The GIS switchgear will be equipped with SF6 Alarm, tripping and monitoring system with efficient and quick leakage/loss detection system. • Signals, usually wired up to the control room for operator attention in case of any minor or major loss of SF6 e.g. loss of SF6, SF6 pressure rising, SF6 minimum density, SF6 1st stage, SF6 2nd stage etc., so any loss of SF6 will be noticed. • During maintenance of switchgear or during SF6 gas filling/recovery, a calibrated and purposely designed machine named DILO is used for proper transfer of Gas to and from Gas compartments or specially designed cylinders, also proper pressure is maintained as per manufacturer recommendations. • Only the trained, designated or certified personnel are authorized to use the DILO machine for process of SF6 Gas filling or recovery. • Proper Safety measures and precautions should be taken prior to the start of work.	KE
Electrocution	Direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices.	• The addition of resistive surface layer • Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season. • Keep extra safety margin from live part during wet season. • There should be strict safety requirements for personnel assigned to work in substation. • To maintain safe conditions for the plant workers, substation should be fenced. • A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be calculated to protect passers-	KE

Table Ex.1: Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
		by during short-circuit. Where the substation has a metallic fence, it should be properly grounded to protect the workers from this hazard.	
Fire and Earthquake	Risk of Fire and Earthquake	• Maintenance and monitoring of electrical equipment will be done to prevent faults; • Arrangement will be done to prevent the flying Bats and birds to come into contact with the Grid Station; • Fire extinguishing arrangements will be ensured; • Designing of structures will be made earthquake resistant; and • Emergency response plans will be developed.	KE
Noise	Noise Pollution	• Vehicles and other maintenance equipment will comply with SEQS and other international standards for noise and are maintained to meet standards; • If possible, all noise generating equipment will be locked up by acoustic barrier to minimize the extent of impact area; • All operational or maintenance staff will wear mufflers/earplugs while operating or working near high noise sources; and • Back-up power generators will be maintained regularly.	KE
Solid Waste	The operation and maintenance activities of proposed project may generate some hazardous and non- hazardous waste such as wires, metal scrap etc. which if not disposed of properly could have adverse impacts on the environment.	• All solid waste collected during operational or maintenance work will be disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and	KE

Table Ex.1: Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation. (To be added in the finalized chapter)	
Notes K.E = K. Electric; SEQS = Sindh Environmental Quality Standards			

Abbreviations and Acronyms

AC	Alternating Current
ACD	Anti-Climbing Device
ASCE	American Society of Civil Engineers
CC	Construction Contractor
CCoE	Cabinet Committee on Energy
CNG	Compressed natural gas
CO	Carbon monoxide
CO2	Carbon dioxide
CSR	Corporate Social Responsibility
dB	Decibel (Unit of Sound level)
DC	Direct Current
DIN Regulation	German Institute for Standardization (Deutsches Institut fuer Normung)
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
GIS	Gas Insulated Switchgear
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GS	Grid station
HSE	Health Safety and Environment
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEC	International Electro-technical Commission
IMC	Independent Monitoring Consultant
ISO	International Organization for Standardization
KANUPP	Karachi Nuclear Power Project
KDA	Karachi Development Authority
KE	K Electric
KKI	KANUPP-Karachi Interconnection
kV	Kilo Volt
kW	Kilo watt
kW&SB	Karachi Water and Sewerage Board
LILO	Looping in/Looping out
MVA	Mega Volt Amp
MGD	Million gallons per day
NO2	Nitrogen dioxide
NO	Nitric oxide
NOC	No Objection Certificate
NTDC	National Transmission & Dispatch Company

OLTC	On-load tap changer
OPGW	Optical Ground Wire
O3	Ozone
PCB	Polychlorinated Biphenyl
PID	Project Implementation Department
PLDP	Power Line Drop Point
PM	Particulate Matter
PPE	Personal Protective Equipment
ROW	Right Of Way
RTU	Remote Terminal Unit
RTV	(Room Temperature Vulcanized Silicone
SAS	Substation Automation System
SCADA	Supervisory control and data acquisition
SEPA	Sindh Environmental Protection Agency
SEQS	Sindh Environmental Quality Standards
SF6	Sulfur Hexafluoride
SO2	Sulfur Dioxide
SOx	Sulfur Oxides
SPM	Suspended Particulate Matter
TL	Transmission Line
UNFCCC	United Nations Framework Convention on Climate Change
UTC	Coordinated Universal Time
VT	Voltage Transformer

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Chapter 1 INTRODUCTION

K-Electric Limited plans to construct and operate New 500/220/132 kV KKI Grid Station and associated 500kV and 220kV Transmission Lines in Mauripur sub-division, District West, Karachi. The project is being developed and will be implemented, keeping in view the ongoing industrial development and to meet the forecasted increase in commercial, residential and agricultural loads across Karachi, Dhabeji and Gharo in Sindh, and Uthal, Vinder and Bela in Balochistan. EMC Pakistan Pvt. Limited has been engaged by K-Electric to conduct the Environmental and Social Impact Assessment of the proposed project to comply with the provisions of Sindh Environmental Protection Act, 2014 and the Sindh EPA Review of IEE and EIA Regulations, 2014.

1.1 Project Developer Introduction

Through a network spanning across 6,500 square kilometers, KE supplies power to all residential, commercial, industrial and agricultural areas, serving over 2.5 million customers across Karachi, Dhabeji and Gharo in Sindh, and Uthal, Vinder and Bela in Balochistan. KE is the only vertically-integrated power utility in Pakistan, which means the organisation manages all three key areas – Generation, Transmission and Distribution – of producing and delivering energy to consumers.

Since 2009, KE has invested over 2.1 billion USD in Generation and Transmission & Distribution network, which has resulted in increase in generation capacity by approximately 29% and transmission & distribution capacity by 60%, while reducing the transmission and distribution losses by 15.5% points[1].

1.1.1 Vision

To restore and maintain pride in KE, Karachi and Pakistan.

1.1.2 Mission

Brightening lives by building the capacity to deliver uninterrupted, safe and affordable power to Karachiites.

1.1.3 Corporate Health, Safety, Environment and Quality

The company aims to maintain a high international standard to ensure quality, safety and reliability in its operations. Training courses are conducted on a regular basis and staff is also provided training and networking opportunities within its power plants in Karachi. The Company's commitment to Environmental Sustainability is indicated by the Environmental Health & Safety Awards it has received over the years[2].

1.2 Project Overview

The proposed project involves construction and operation of 500/220/132 kV Grid station and 500kV and 220kV transmission lines. The clearance shall be in the range of 9-12 m from road walkway, kaccha track and from structures e.g. houses, trees; the clearance will be adjusted in accordance with the structure height determine by the topographic survey of the project area. Lattice type transmission towers will be utilized on 500kV level while for 220kV TL, lattice/tubular type towers will be utilized as per the land availability as well as transmission line design.

[1] Retrieved from https://www.ke.com.pk/our-company/who-we-are/
[2] Retrieved from https://www.ke.com.pk/

1.3 Project Location

Project is located in Mauripur sub-division, District West, Karachi as shown in Figure 1.1. Coordinates of various project components are given in table below;

Table 1.1: Location coordinates of project components

S. No	Project Component	Coordinates
1	500/220/132 kV KKI Grid Station – Location Option#1	24°55'22.20"N & 66°50'59.69"E
2	500/220/132 kV KKI Grid Station – Location Option#1	24°55'11.36"N & 66°50'28.80"E
3	LILO Interconnection Point at 500kV NTDC KANUPP-II/III-Port Qasim TL	24°57'5.14"N & 66°49'54.95"E
4	LILO Interconnection Point at 220kV Baldia-Mauripur TL	24°53'2.47"N & 66°52'44.11"E

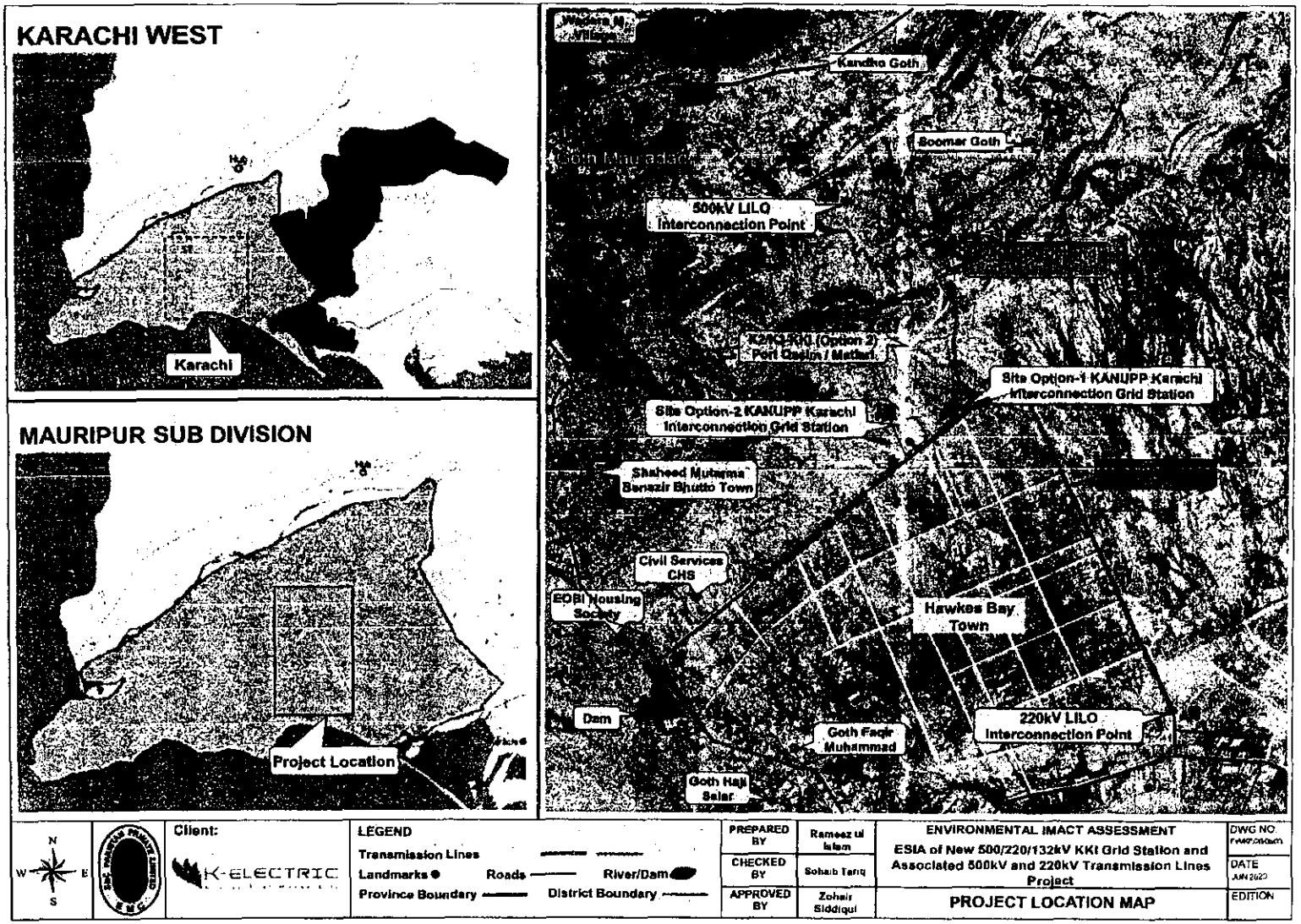


Fig 1.1: Location map of the project

1.4 Categorization of the Project

Sindh Environmental Protection Agency (Review of EIA/IEE) Regulations, 2014 notified under section 37 of SEPA, 2014 categorizes projects in two separate schedules which requires either an IEE (Schedule-I) or an EIA (Schedule-II) and according to this, the proposed project falls in **Schedule II: A(4)** requiring an EIA.

✓ Transmission Lines (11 kV and above) and Distribution projects.

1.5 Project Rationale

Cabinet Committee on Energy (CCoE) has approved to supply the additional electricity to KE. The additional electricity will be supplied from upcoming KANUPP-II & III Nuclear Power Plants and Coal-fired Power Plants in Port Qasim. To supply additional electricity to KE network, transmission infrastructure has to be enhanced[3][4][5]. The proposed project has been conceived to tap the additional electricity supply to KE.

The proposed 500/220/132kV KKI (KANUPP-Karachi Interconnection) Grid station, when constructed will serve as an importing point of power from National grid to K-Electric network at 500kV level, located in the west of Karachi. The associated 500kV Transmission lines will serve as an incoming source of power and the 220kV transmission line will serve as power evacuation or power transfer link to the 220kV Baldia and Mauripur Grid Stations and then to the rest of the KE network.

1.6 Objectives of EIA

As stated by the United Nations Environment Programme's Division of Technology, Industry and Economics, an EIA is a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, finding ways and means to reduce the adverse impacts, shape projects to suit the local environment, and presenting options to decision-makers.

An EIA can bring about both environmental and economic benefits, such as the reduction in costs and time taken for implementation and design of a project and lesser intervention of legalities and regulations. A properly conducted EIA lessens conflicts by promoting community participation, informs decision-makers, and helps lay the base for environmentally sound projects.

The main purpose of this EIA Study is to provide and analyze information on the nature and severity of environmental aspects and propose mitigation measures in case of negative impacts arising from the construction and operation of the project and related activities that would take place concurrently or subsequently. The EIA study will, in fact, respond to the provision of Sindh Environmental Protection Act 2014 and Guidelines for the Preparation and Review of Environmental Reports. The Study will:

- Identify all major and minor impacts, negative as well as positive, on the environment (physical and ecological) during its different stages viz. pre-construction, construction and operation of Project;
- Identify Socioeconomic aspects, and
- Devise Environmental Management& Monitoring Plan (EMMP) for sustainable operation of the Project.

[3] Retrieved from https://nation.com.pk/20-Jun-2020/ccoe-endorses-are-policy-2019-supply-of-additional-power-to-k-electric

[4] Retrieved from https://tribune.com.pk/story/2246349/2-ccoe-okays-additional-350mw-k-electric/

[5] Retrieved from iea-coal.org/pakistan-karachi-to-receive-additional-1400-mw-electricity-by-2023-asad-umar/

1.7 Methodology Adopted for EIA

This environmental impact assessment was conducted in the following manner:

1.7.1 Scoping

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping exercise included the following tasks:

- **Data Compilation**: A generic description of the proposed activities relevant to this environmental assessment was compiled with the help of the Project proponent.
- **Review of Published literature**: All available published and unpublished information pertaining to the micro and macro environment of the study area was obtained and reviewed. It included the earlier studies conducted in the study area, environmental and social baselines and impact assessment studies conducted by different consultants in past. Secondary data was very helpful in understanding the issues that were identified by other consultants.
- **Review of applicable Legislation**: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.
- **Identification of potential impacts**: The information collected in the above procedures was reviewed and potential environmental impacts were identified.
- **Initial site visit**: An initial site visit was conducted to get an overview of site conditions and the surrounding areas.
- **Stakeholder consultation**: A stakeholder consultation was undertaken to document the concerns of the local community and other stakeholders, and to identify issues that may require additional assessment in order to address these concerns.

1.7.2 Review of Legislation and Guidelines

National legislation, international agreements and environmental guidelines were reviewed to set environmental standards that The KE will be required to follow during construction & operation phase of the project. Sindh Environmental Protection Act 2014, SEPA (Review of IEE/EIA) regulations 2014, Guidelines for the Preparation and Review of Environmental Reports and IFC EHS Guidelines for Electric Power Transmission & Distribution were the basic guiding documents used during the study.

1.7.3 Baseline Data Collection

Baseline Data was collected from different sources including electronic and print media, studies previously conducted by EMC Pakistan Pvt. Limited and archives of the experts, consultations with institutions, Non-government Organizations (NGOs) and field surveys conducted for this study by the team of EMC Pakistan Pvt. Limited etc.

Primary Data Collection

The team comprising of environment specialists, ecologist and sociologist collected area-specific primary data during site visits of the proposed project. A description of baseline data (physical, biological and socioeconomic conditions) of the proposed project is provided in this report.

Secondary Data Collection

Previous published and unpublished literature and other information were collected in order to gain a complete understanding of existing environmental conditions in the area including the following:

- **Physical environment**: Topography, geology, soil, water resources, ambient air, noise and climate;
- **Biological environment**: Flora and fauna within the proposed site and its surroundings;
- **Socio-economic environment**: Settlements, socio-economic conditions, infrastructure and land use; and
- **Heritage aspects**: Sites of cultural, archaeological or historical significance.

1.7.4 Identification of Aspects

Identification of environmental aspects and their significance is fundamentally important for the determination of severity of incidence of impacts at different stages of the project. This step is aimed at obtaining an inventory of the aspects. The aspects identified during this step cover all activities like construction, installation and operation, in order to determine those which have or can have a significant impact on the environment.

1.7.5 Impact Assessment & EMMP

Environmental experts at EMC Pakistan Pvt. Limited analyzed and assessed the anticipated impacts that are likely to arise due to the identified aspects. Potential impacts were evaluated using the environmental, ecological, socioeconomic, and project information collected. The impact assessment covers the following aspects:

- Potential change in environmental parameters likely to be affected by Project-related activities;
- Prediction of potential impacts;
- Evaluation of the likelihood and significance of potential impacts;
- Defining of mitigation measures to reduce impacts to as low as reasonably practicable;
- Prediction of any residual impacts, including all long-term and short-term, direct and indirect, and beneficial and adverse impacts; and
- Monitoring of residual impacts.

An environmental management & monitoring plan (EMMP) was developed to oversee the environmental performance of the project, adoption of proposed mitigation measures, to monitor impacts of all activities and performance of mitigation measures and to identify the residual impact, and also the positive/negative changes in the physical, ecological, and socioeconomic environment.

1.7.6 Documentation & Review

This is the final step of the EIA study. The data generated during and for the study was compiled and examined by experts. Sections of this report were prepared as the study progressed, by consultation with experts. The report was finally reviewed by Team Leader, who analyzed the information, assessed the potential environmental impacts in the light of national and international guidelines, and examined the alternatives in the light of observations on the field as well as meetings with the stakeholders.

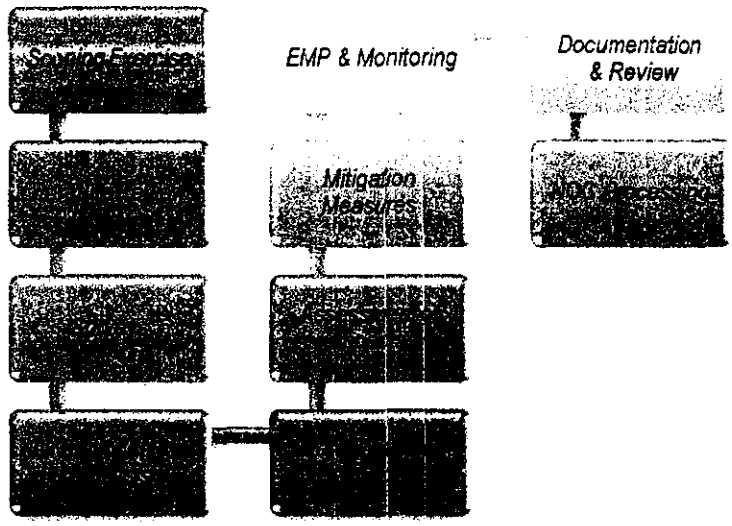


Fig 1.2: EIA Methodology

1.8 Structure of the Report

This document is structured as follows:

- **Chapter 1:** Presents the background, objectives, scope and methodology adopted for the study;
- **Chapter 2:** Provides an overall description of the project;
- **Chapter 3:** Describes the legislative and policy framework governing the project;
- **Chapter 4:** Provides environmental (Physical & Biological) and Social baseline conditions of the macro and microenvironment of the project area;
- **Chapter 5:** Summarizes the main concerns raised by stakeholders during consultations;
- **Chapter 6:** Provides analysis of different alternatives;
- **Chapter 7:** Screening of environmental impacts of the project and appropriate mitigation measures;
- **Chapter 8:** Provides environmental management and monitoring plan (EMMP); and
- **Chapter 9:** Provides conclusions and recommendations.

The main text of the report is supported by a series of Annexure which provides supplementary information including respective sections of prominent provincial and national laws and guidelines.

1.9 EIA Study Team

EMC Pakistan Pvt. Limited formed the following team for conducting the Environmental & Social Impact Assessment (ESIA) of the proposed 500/220/132 kV KKI Grid Station and associated 500kV, 200kV transmission lines.

Table 1.2: List of EIA Study Team

S. No.	Name of Experts	Position in EIA Team
1.	Mr. Syed Nadeem Arif	Director/Team Lead
2.	Mr. Ahmed Zohair Siddiqui	Deputy Team Lead
3.	Dr. Badar Ghauri	Air and Noise Quality Expert
4.	Mr. S.M. Zaman	Soil Scientist
5.	Mr. Abdul Rauf Siddiqui	Environmentalist
6.	Mr. Sohaib Tariq	Environmental Engineer
7.	Mr. Khurram Shams Khan	Senior Sociologist
8.	Ms. Samita Nadeem	Senior Environmental Engineer
9.	Mr. Vijay Kumar	Sociologist
10.	Mr. Syed M. Omer Arif	Environmental Engineer
11.	Mr. Imran Khan	Environmentalist
12.	Mr. Ather Adil	Field Sampling Officer

Chapter 2 PROJECT DESCRIPTION

2.1 Introduction

This chapter of EIA presents a brief overview of the project including objectives, location, scope, need, schedule and cost of the project. This chapter gives a clear picture of the project, its context and operations.

2.2 Overview of the project

The proposed power supply project aims to construct new 500/220/132 kV KKI GIS Grid Station and associated 500kV, 220kV Transmission Lines. The project has following components.

1. Construction of a 500/220/132 kV KKI (KANUPP-Karachi Interconnection) GIS Grid Station on KDA Scheme 42 Road, Hawkes Bay Town. The proponent has proposed 02 sites for the construction of this Grid Station (the site selection will be based on ease of acquisition and price of the plot). The KKI grid station has further sub components;
   i. 500 kV KKI GIS Grid Station (one and half breaker scheme)
   ii. 220 kV KKI GIS Grid Station (double bus bar scheme)
   iii. 132/11 kV KKI GIS Grid Station (double bus bar scheme)
2. Interconnectivity between the NTDC 500 kV KANUPP II/III - Port Qasim TL and the proposed 500 KV KKI GIS grid. This Interconnectivity will be made by laying a 500kV Overhead double circuit (approximately 05 km route length, subject to availability of ROW), including OPGW (Optical Ground Wire).
3. Interconnectivity of 220 kV Double Circuit Baldia-Mauripur TL and the proposed 220 KV KKI GIS grid. This Interconnectivity will be made by laying two 220kV Overhead double circuit (approximately 9 km route length, subject to availability of ROW), including OPGW.

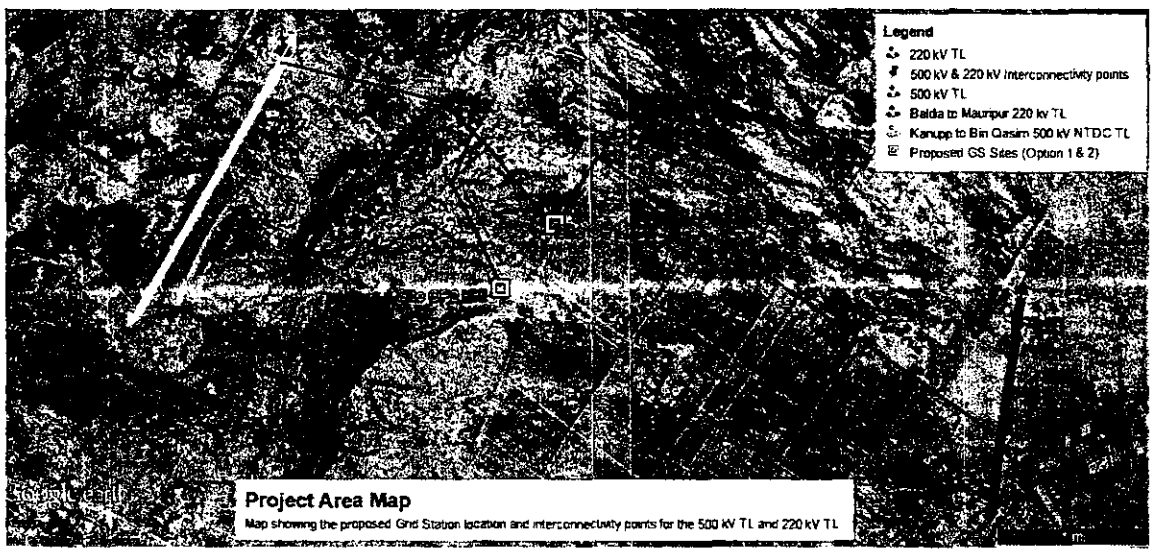


Fig 2.1: Location map of Grid Station and Transmission Line (Blue and Brown)

2.3 Objectives of the project

The project is being developed to cater the increasing demands of commercial, residential and agricultural sectors across Karachi (the Metropolis), Dhabeji and Gharo in Sindh, and Uthal, Vinder and Bela in Balochistan.

The proposed 500/220/132kV KKI (KANUPP-Karachi Interconnection) Grid station will serve as an importing point of power from 500 kV National grid to K Electric network located in the west of Karachi. The associated 500kV Transmission

lines will serve as an incoming source of power and the 220kV Transmission lines as power transfer links to the 220kV Baldia, Mauripur Grid Stations and then to the rest of the KE network.

2.4 Scope and need of the project

The scope of the project is construction of 500/220/132 kV KKI Grid Station, and laying, testing and commissioning of associated 500 kV import transmission line from the NTDC 500 kV KANUPP – Port Qasim TL, 220 kV transmission line from the KKI grid station to Baldia-Mauripur 220 KV TL Grid station.

Karachi has a wide network of power transmission but the standards and conditions of the power transmission system are inadequate to meet rapidly growing demand of electrical power. This situation limits the national development and economic growth. To cope with the constraints, the proposed project has been planned to expand the network. This program will enhance the customer service and improve power supply reliability to Karachi.

Nowadays power systems are complicated networks. They have several generating stations and load centers that are interconnected through power transmission lines. Generation facilities should have the capacity to produce required power to meet the customer demand. Bulk power generated must be transported through best transmission systems over a long distance without overheating or jeopardizing system stability.

2.5 Project Location

The proposed KKI Grid Station and associated transmission lines are situated in Hawks Bay Town, Mauripur Sub Division, District Karachi West. The proposed route plan of the 220kV Supply line is as shown in **Fig. 2.2**.

2.6 Technical Details of Project

On broader perspective, the project can be divided into 02 components, construction of grid station and secondly laying of overhead transmission line. This section sheds light on the technical aspects of these activities which includes design, equipment, accessories, standards followed, methodology etc. Figure 2.3 below shows the single Line diagram of the proposed project.

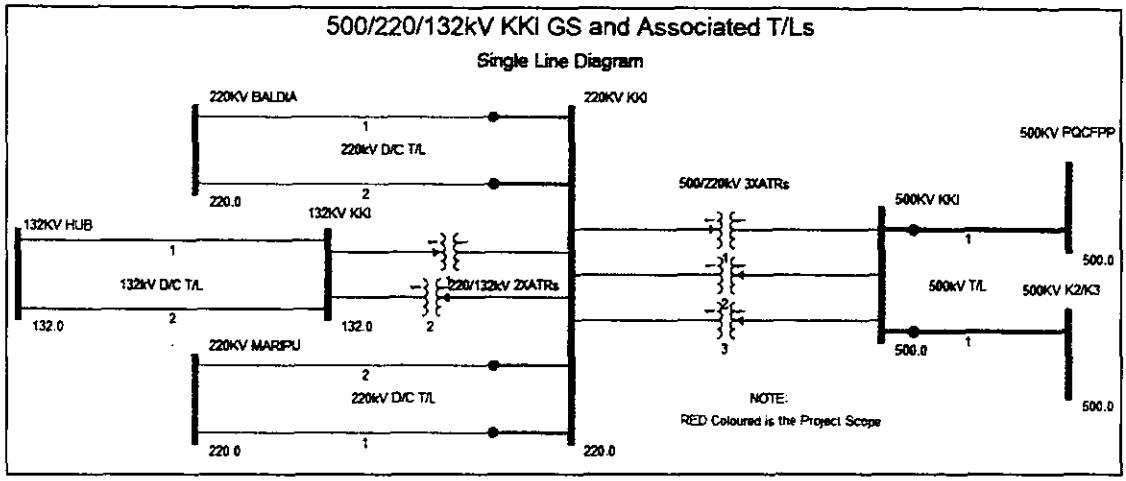


Fig 2.3: Single Line diagram of the project

2.6.1 Grid Station

Grid Station Equipment

A. Transformers:

- 500/220kV 600MVA Auto Transformers with OLTC
- 220/132kV 250MVA Auto Transformer with OLTC

B. Switchgear:

Substation layout

- 500kV Gas insulated Switchgear with One and Half breaker bus bar scheme
- 220kV Gas insulated Switchgear with double bus bar single breaker scheme
- 132kV Gas insulated Switchgear with double bus bar single breaker scheme

Switchgear Equipment

- SF6 Circuit breakers
- Disconnector Switches
- Current and Voltage Transformers
- Surge Arresters
- Earthing Switches

C. SCADA/RTU/SAS/Telecom System Equipment

D. AC supply system

E. DC auxiliary supply system with Battery banks and Battery chargers.

F. Control/Metering/Protection system with Protection Relays

G. Station Earthing and Lightening protection system equipment

H. Gantry crane

Details of interconnection

A. 500kV Interconnection:

For the import of power 500/220/132 kV KKI Grid Station will be interconnected with existing/future NTDC 500kV Transmission Line (s) traversing the area using Line-In/Line-Out scheme.

B. 220 kV/132 kV Interconnection:

For power evacuation the 500/220/132 kV Grid Station will be interconnected at 220kV level with existing KE 220kV Baldia-Mauripur Transmission Line using D/C LILO scheme.

Grid Station Construction and Post Construction Activities

The construction phase for the grid station construction and associated Transmission lines will take up to three-year period. The grid station construction activities will include following major activities.

i. Removal of all vegetation within the proposed site
ii. Preparation of land
iii. Construction of foundations for infrastructure such as transformers, control building etc.
iv. Construction of oil holding area (for holding transformer oil in an emergency scenario) and safety fire walls
v. Construction of drainage and stormwater channel as control measure (the proposed site has hills a km away in the North, which can create water torrents during heavy rain)
vi. Delivery and installation of transformer, bus bars, switchgears etc.
vii. Construction of control rooms and administrative infrastructure
viii. Construction of perimeter fence
ix. Post construction clean–up, restoration and landscaping of site

Chemicals used in GIS Grid Station

Sulfur Hexafluoride gas (SF6) and Transformer Oil are prominent chemicals commonly used in Grid Stations. However, these have serious environmental and safety hazards if not handled and stored with care. Their characteristics, usage and K Electrics' procedures of handling, storage, leakage detection and protection and spill control have been described below.

1. Sulfur Hexafluoride gas (SF6)

SF6 gas is extremely chemically stable, non-flammable and highly electronegative, with an excellent dielectric property of approximately 2.5 times more than air. Therefore, it is commonly used in electrical switchgear, transformers and substations as an electrical insulation, arc quenching and cooling medium.

Toxicity

Pure SF6 is physiologically completely harmless for humans and animals. It's even used in medical diagnostic. Due to its weight it might displace the oxygen in the air, if large quantities are concentrating in deeper and non-ventilated places. It has no eco-toxic potential; it does not deplete ozone. Due to its high global warming potential of 22.200 (According to the 3rd Assessment Report of UNFCCC) it may contribute to the man-made greenhouse-effect, if it is released into the

atmosphere. However, in electrical switchgear the SF6 gas is always used in gas-tight compartments, greatly minimising leakage. This make the real impact on greenhouse effect negligible.[1]

KE's procedure for SF6 Gas use and Leakage detection/Protection:

i. The SF6 Gas insulated switchgears design comply with relevant IEC standards for the prevention of gas leakage.
ii. The manufacturer is bound to design the switchgear with leakage rate for SF6 for the whole substation within 0.5-1% per annum.
iii. Temperature compensated Pressure gauges are installed for each compartment for monitoring of switchgear gas density and pressure.
iv. The GIS switchgear are equipped with SF6 Alarm, tripping and monitoring system with efficient and quick leakage/loss detection system.
v. Signals usually wired up to the control room for operator attention in case of any minor or major loss of SF6 e.g. loss of SF6, SF6 pressure rising, SF6 minimum density, SF6 1st stage, SF6 2nd stage etc., so any loss of SF6 will be noticed.
vi. During maintenance of switchgear or during SF6 gas filling/recovery a calibrated and purposely designed machine named DILO is used for proper transfer of Gas to and from Gas compartments or specially designed cylinders, also proper pressure is maintained as per manufacturer recommendations.
vii. Only the trained, designated or certified personnel are authorized to use the DILO machine for process of SF6 Gas filling or recovery.
viii. Proper Safety measures and precautions should be taken prior to the start of work.

2. Transformer Oil

Transformer oil or insulating oil is an oil that is stable at high temperatures and has excellent electrical insulating properties. It is used in oil-filled transformers, some types of high-voltage capacitors, fluorescent lamp ballasts, and some types of high-voltage switches and circuit breakers.

Toxicity

The main constituent of transformer oil is polychlorinated biphenyl (PCB) which is responsible for producing toxicity in humans. Chronic exposure with PCB may cause some toxicity such as hepatotoxicity and neurotoxicity.

KE's procedure for Transformer Oil use and spill control:

i. Power Transformer installed in the grid station will have oil as cooling and insulating medium. Oil leakage takes place during operation or when changing the oil in the transformer. This oil spillage which can catch fire is dangerous to the switchyard operation. So stones are provided to protect from fire when oil spillage takes place.
ii. Construction of a reservoir below transformer for oil containment and spill control in case of leakage or outflow of oil due to severe internal fault.

2.6.2 Overhead Transmission Lines

An overhead transmission line is a traditional method of supplying electricity from one end to another, in which line is suspended by means of towers and poles. Since large portion of transmission line is overhead so this type of transmitting method is low-cost method for transmission sector as compared to underground transmission, therefore large quantities of electric energy is being supplied using this method where air plays an important role in providing most of the insulation.

[1] https://electrical-engineering-portal.com/

Mostly two types of towers (lattice structure or tubular poles) are used to support the line. Commonly Aluminum made (either plain or reinforced with steel or sometimes composite materials) bare wire conductors are used in the overhead line, but sometimes copper material is also used in the overhead line depending upon the voltage distribution, voltage connections and customer premises.

Electric power will be brought from the existing NTDC 500 kV transmission line via proposed 500 kV TL to the proposed 500/220/132 kV KKI Grid Station and then transmitted via 220 kV overhead transmission line of about 7 Km to Baldia-Mauripur TL (Existing). The line route is planned keeping in mind the less possible right-of-way section for the line. All construction, commissioning and installation will be done according to K.E. Technical Procedure (TP). Technical Provision can be seen in in the following sections.

The Transmission Line Process Diagram is as follows;

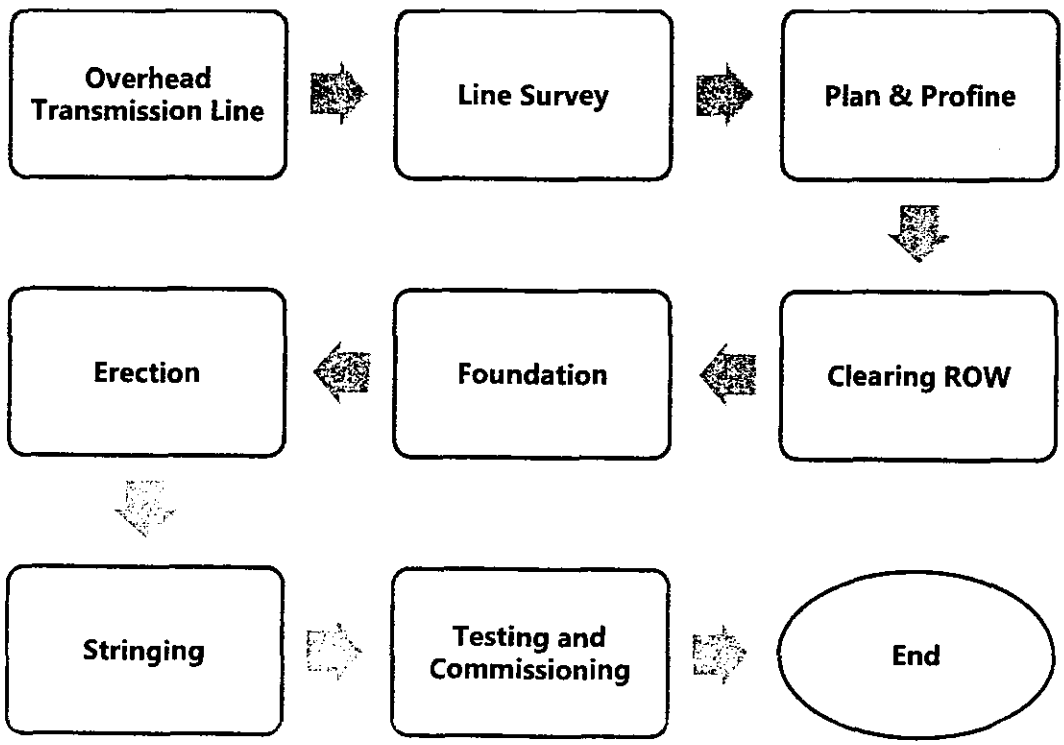


Fig 2.4: Overhead Transmission Line Laying steps

i. Line Survey

Initially a line survey is carried out to have a clear picture about the road map of the transmission line. Preliminary survey is done to understand the terrain and direction of the line from start point to end point.

As the survey is carried out at preliminary stage no quality standards are required. Follow up of safety precautions are necessary to avoid any incident. While carrying out the line survey it is to be clearly taken in mind that the route is to be selected requiring minimum right of way.

ii. Plan & Profile

It is the second stage of the survey of the proposed line. This survey carries out all the detail information about the line; including terrain of the land, tower types, number of towers, tower height, distance between two consecutive towers, wind speed etc.

The important thing to remember while doing survey for plan and profile is that minor changes in the initial line are acceptable. But if the matter cannot be resolved, preemptive measures are to be taken and client has to be taken in to full confidence before taking any decisions.

All the quality standards are to be followed and safety of the equipment and personnel is to be given prime importance. Personal Protective Equipment (PPE) should be used necessary for the desired locations. Due to suburb area away from the main facilities basic necessities are to be carried in order to face the hazards in case of emergency situation. The basic facilities include; drinking water, first aid box.

iii. General Technical Specification for Overhead Transmission line

Design

This section of the Specification shall cover the design and design parameters for the construction of the overhead lines.

1. Design Spans

The design of all towers shall provide for the basic, wind and weight spans.

i. The term basic span shall mean the horizontal distance between centers of adjacent supports on level ground from which the height of standard supports is derived with the specified conductor clearances to ground in still air at maximum temperature.
ii. The term wind span shall mean half the sum of adjacent horizontal span length supported on any one tower.
iii. The term weight span shall mean the length of conductor, the weight of which is supported at any tower at minimum temperature in still air. At suspension position, the minimum weight of conductor support shall not be less than 25% of the total weight of conductor in the two adjacent spans.
iv. The terms maximum span shall mean the maximum single span for which the distances between the conductors are designed.

For all 220kV Tubular towers & all alternative lattice towers in place of tubular towers, weight span, wind span & basic span should be 300m.

2. Design Loads

The design shall be based on the following considerations:

i. Normal Conditions

a) Vertical loads (V): consisting of:

- Weight produced by the effective portion of the adjacent conductors and earth wire spans.
- Weight of insulator strings and lineman with tackles

b) Transverse loads (T) consisting of:

- Wind loads produced by the effective portion of the adjacent conductor and earth wire spans
- Wind loads pulls corresponding to type of towers

c) Longitudinal loads (L)

Longitudinal loads are the resultant forces produced by the maximum tension of conductors or earth wire in the direction perpendicular to cross arms.

ii. Broken wire conditions (Abnormal conditions)

a) Suspension tower

- A1 - Any two phases of one circuit broken (No wind)
- A2 - Any one phase and earth wire broken (No wind)

b) Angle Tension tower

- B1 - Three phases of one circuit broken (No wind)

c) Terminal tower (Dead end) tower

- C1 - Three phases of one circuit and earth wire strung (No wind) (No load will be assumed on the slack span side)

d) Vertical loads (V) consisting of;

- 50% of weight produced by the effective portion of the adjacent conductor and earth wire spans
- Weight of the insulator strings and line man with tackles

e) Transverse loads (T)

- To be calculated with following formula (80 m + 60% of wind Span) x wind load per m. of conductor + wind load on insulators.
- 50% of normal condition for maximum angle pulls.

f) Longitudinal Loads (L)

- 50% of the maximum working tension of all conductors comprising one phase or 100% maximum tension of earth wire for suspension towers.
- 100% of maximum working tension of conductors or earth wire for angle, tension and terminal towers.

The decrease of the vertical and transverse loads above refers only to phases where conductors are broken.

Towers shall be designed so that all members will withstand normal and broken wire conditions with safety factors. The total loading for the tower shall include the dead weight of the tower plus transverse wind load on tower plus the simultaneous application of loading as specified above for each tower type. Wind loads on tower leg extension shall be taken into consideration. Terminal towers shall be designed to face the direction of the incoming line, and shall withstand the load of all conductors and earth wire(s).

Design of all RCC structures along with complete drawings shall be submitted by the contractor after vetting through a renowned and approved structural consultant, for approval from KE.

3. Standards

The work to be performed by the Contractor shall strictly comply with the clauses, and Schedules of these Specifications. If standards/particular requirements are not specified, the work shall comply with International or National Standards acceptable to K-Electric.

A. General

Self-supporting lattice type towers shall be used throughout the entire route of the 500 kV transmission line and for the 220 kV transmission line both lattice tower and tubular tower will be utilized.

Steel lattice towers shall be square-base type. The members of lattice steel structure shall be hot rolled steel angle sections, and plates. All tower material shall be factory made and entirely galvanized by the hot dip process.

All material shall be tested at the steel mill in accordance with the applicable specification and standards under which they are manufactured. The Contractor shall supply the Owner with all certified mill tests. Tests shall be conducted in accordance with DIN Regulations or their equivalent. The tests to be conducted shall include, but are not limited to, uniformity of galvanizing coating, mechanical and chemical properties of all steel and additional embrittlement tests on high strength steel.

B. Types of Towers

The towers shall be designed that their heights may be extended or reduced at suitable intervals (preferably in accordance with already in practice in Owner's system). An extended or reduced tower shall be denoted by the addition of the height of extension or reduction to its basic designation. For the use of steeply sloped ground basic and extended towers shall be designed with different leg extensions, without reducing the specified factors of safety in any manner, to compensate for variations in topography. The Contractor shall determine the definitive requirements during tower site survey and supply all leg extensions required.

For the installation of joint Box for OPGW, the contractor shall provide two bolt holes near the top of each tower. The exact size and locations of these holes shall be agreed between the contractor and KE during approval of tower drawings.

C. Design

The towers shall be designed with an overload capacity (factor of safety) for normal design loads and for unbalanced design loads (broken wire conditions) as specified. No damage or permanent distortion of any members, bolts, and connections of fittings or elongations of bolts holes shall be permitted for these design conditions.

D. Conductor Attachments

Conductor attachments shall be provided as required by their respective towers and all brackets shall be considered as part of their respective basic towers and shall be supplied as integral parts of them. Suspension towers shall have brackets (hangers) suitable for the attachment of insulator strings associated with suspension conductor support assemblies and shall be flexible on the direction of the line and rigid transverse to the line. The angle tension and terminal towers shall have brackets suitable for the attachment of insulator strings associated of an overhead earth wire clamp to the tower, holes shall be provided on the earth wire peak.

E. Anti-climbing device

Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground.

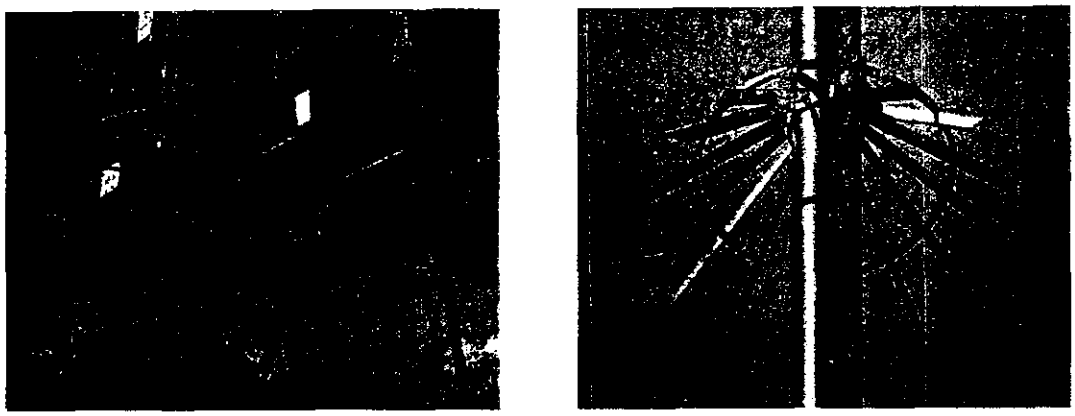


Fig 2.5: Examples of anti-climbing devices

F. Anti-Bird Devices

All suspension towers and tension towers having jumper insulator strings shall be provided with anti- bird devices on each cross arm over insulator strings. The anti-bird devices shall be spike type galvanized and fitted with bolts and nuts.

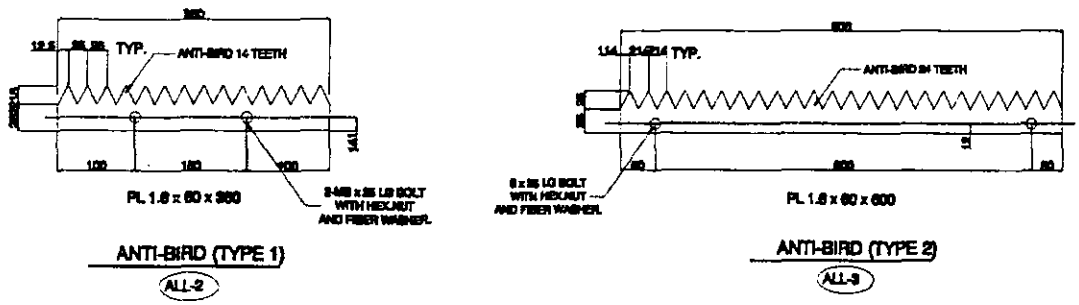


Fig 2.6: Examples of Anti-bird devices

Insulators and Fittings

1. Insulator Units

An Insulator is a material that resists the flow of electric current. It is an object intended to support or separate electrical conductors without passing current through itself. High-voltage insulators used for high-voltage power transmission are made from glass, porcelain, or composite polymer materials. Porcelain insulators possesses all the major characteristics of technical ceramics, e.g. insulating capabilities, dimensional stability, hardness, thermal resistance and resistance to corrosion.

RTV (Room Temperature Vulcanized Silicone) coated Anti-fog, Porcelain Disc type insulators will be used in the project transmission lines.

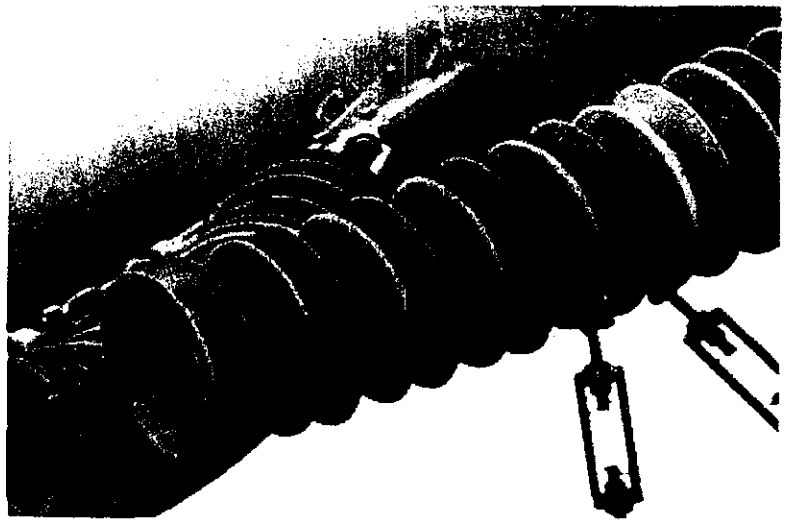


Fig 2.7: RTV coated Porcelain Disc type insulator

2. Metal Components

All ferrous metal components except those of stainless steel shall be hot dipped galvanized to give an average coating of 150 micro meter with surface decarbonizing method.

End caps shall be made of malleable cast iron and shall be of the clevis type. The pins shall be made of stainless steel or other suitable material of such quality that the unit shall comply with these Specifications. Pins and caps shall be of such design that they do not yield or distort under the specific mechanical loadings in such a manner as to add undue stresses to the porcelain.

3. Insulator Fittings

All tower and conductor attachment hardware such as ball eyes, clevises, yokes plates, D-shackles, extension links, dead end bodies, jumper terminals etc. and arcing rings shall be supplied as required as part of the insulator strings. All ferrous parts shall be hot-dip galvanized. The zinc coating shall average 150-micron thickness by utilizing surface de-carbonizing method. The utilizable height of tower - height of the tower from ground level to the attachment of lowest conductor is nominal as it does not take into account all forms of line fittings that could possibly reduce this height.

When selecting insulator string fittings, hot line maintenance shall be considered. The design of all conductor fittings and accessories shall avoid sharp corners or projections, which would produce high electrical stress in normal working. The design of the adjacent metal parts and mating surfaces shall be such as to avoid corrosion of the contact surfaces and to maintain good electrical contact under service conditions.

Arcing devices at line side and intermediate shall be designed to withstand a force of 1000 N, applied to the tip. Arcing accessories used in insulator strings shall, in principle, meet two requirements:

i. Protection of the insulant against intensive thermal radiation of the arc plasma.
ii. Improvement respectively homogenizing of the electric field around the live end of the insulator string.

Both requirements are met by the following design characteristics of accessories and strings:

i. The arcing accessory shall ring the metallic cap at the insulator end (transfer of the arc root subsequent to flash-overdue to dirt accumulation).

ii. The arc root shall be subject to unilateral short-circuit current supply at any point of the accessory (arc root shall safely and quickly be driven to the final burning point).
iii. The final burning point shall be so designed that the reflection to the insulant is kept to a low level (shielding effect). The inevitable consumption at the final burning point must not impair appreciably the performance of accessory (final burning point designed as a ball).
iv. The arcing accessory shall be made from solid material of small diameter. It shall be avoided that the arc root be supplied over a larger area (high moving speed of arc root).
v. Electrodes shall be made from steel (low consumption, poor thermal conductivity). Aluminum or aluminum alloys are not admissible high consumption related with considerable pollution of insulant).
vi. The dimensions of arcing accessories shall be adapted to the used insulator types, the thermal and dynamical stresses and to the maximum service voltage.
vii. On long rod insulator strings, in principle, each string end must be provided with an arcing accessory; the use of intermediate arcing accessories is imperative on multiple insulator strings.
viii. Audible discharges on the arcing accessory at the live end of insulator string must not occur at maximum service voltage.
ix. Arcing accessories must be hot dip galvanized to protect accessory against corrosion.
x. The manufacturer shall be bound to prove the thermal and electrical performance of arcing accessories.

4. Insulator Strings

The complete suspension and tension strings with all clamps, fittings, and arcing rings shall have the mechanical and electrical characteristics as per the standard.

The insulator strings shall also be capable of withstanding the mechanical loads applied by the required conductor working tensions, wind spans and weight spans and in addition the wind on the insulator string and the weight of the insulator string itself and the weight of the line-man with tackles when multiplied by the factors of safety specified in the Schedule. All insulator strings shall be attached to cross arms by means of shackles. Hooks shall not be used.

All insulator strings shall be equipped with appropriate protective devices, such as arcing rings. The design of these protective devices shall be such as to support loadings during the installation of insulator strings and stringing of conductors and to reduce as far as possible damage to the conductors, clamps, insulator strings and arcing horns or rings themselves under all flashover conditions.

Conductors and Accessories

1. Conductors

Aluminum Quad/twin/single bundle conductor will be utilized for phase conductors of 500kV/220kV level respectively.

2. Optical Ground Wire (OPGW)

OPGW is primarily used by the electric utility industry, placed in the secure topmost position of the transmission line where it "shields" the all-important conductors from lightning while providing a telecommunications path for internal as well as third party communications. Optical Ground Wire is a dual functioning cable, meaning it serves two purposes. It is designed to replace traditional static / shield / earth wires on overhead transmission lines with the added benefit of containing optical fibers which can be used for telecommunications purposes.

For the proposed project transmission lines, Optical Fiber Ground Wire (OPGW) with sufficient no. of Fibers and accessories including Joint Boxes will be installed.

3. Accessories

a) General

Conductor accessories made of non-stainless steel shall be reliably protected against rusting. Materials and construction of conductor accessories shall be chosen to eliminate any possibility of electrolytic corrosion and radio interference.

The design of all conductor fittings, vibration and spacer dampers etc. shall be smooth and free from waves, ridges, sharp corners, projections and other irregularities to avoid corona.

b) Vibration Dampers

The vibration dampers shall preferably be of the Stockbridge type. The clamps of the dampers shall be designed to permit installation and removal by the use of hot-line tools. The dampers shall be attached to the conductor in a manner which will prevent damage thereto. Each damper weight shall be provided with one drain hole, positioned to be at the bottom of the weight when the damper is installed in a vertical place. The design of the damper is to be such as to ensure freedom from subsequent drops of the damper weights in service. The design shall avoid sharp corners or projections which would produce high electrical stress under normal working conditions.

c) Conductor Accessories

i. Suspension Clamps

Suspension clamps for attachment of conductors to insulator strings at suspension towers shall be the trunnion type or equivalent and shall consist of a clamping piece of metal alloy with bolts and other details made of hot dip galvanized forged steel. Suspension clamps must be designed for the loadings to be applied and must also reliably hold the conductor in the case of unbalanced conductor tensions to be expected in operation, however, the clamp shall permit the complete conductor to slip in a range of 10% to 30% of the ultimate tensile strength of the conductor. The clamp shall be free to pivot in the vertical plane and the rotation axis of the clamp shall intersect the conductor axis. The clamping area should be grooved to increase resistance to conductor slippage. The suspension clamping detail shall be in such a manner that no magnetic loop is formed around the conductor.

ii. Tension Clamp Assembly

Conductor tension assemblies shall be the type and size for the conductor which will be used on this work and shall be of the tubular compression type complete with compression, dead-end bodies, jumper terminals and steel eye end. Each dead-end assembly shall be capable of developing not less than 95 per cent of the ultimate strength of the conductor and shall have conductivity not less than that of the conductor.

iii. Compression Joints

Compression joints for splicing conductors shall be of the tubular type suitable for the type and size of conductor used. Each connector shall be complete, consisting of one joint which shall be capable of developing strength not less than 95% of the rated ultimate strength of the conductor. The conductivity of the completed splices shall be not less than that of the conductor.

iv. Repair Sleeves

Repair sleeves shall be the type and size for the conductor which will be used on this work and shall be composed of two pieces fitted into each other can be applied to reinforce a conductor having some of the strands damaged.

v. Spacer Dampers

Spacer dampers shall be designed to keep the individual conductors forming a bundle at the required distance, whatever service conditions may be prevailing, to prevent the conductors from clashing due to different wind - inducing lateral vibrations. Apart from that, the spacer dampers shall provide a measure of energy absorption which lessens the negative effects of line vibration. Contractor shall specify the positioning of the spacer dampers throughout the span.

The outer contours of the parts must be designed in such a way that at operating voltage no visible or audible corona discharges may occur on the spacer damper.

The rubber used between the spacer bar and clamp shells must be of a semi-conductive rubber that potential equalization between the bar and clamp shells is maintained. The rubber part must be completely protected from harmful ultraviolet light.

The clamp shells and spacer bar shall be made of corrosion-resistant, high strength aluminum alloy. All ferrous metal and iron parts shall be hot dip galvanized. The spacer damper shall be permanently fixed on the conductors of the tensioned bundle by means of a clamping device. It should be possible to secure all clamping screws in a form locking manner as to avoid their getting loose during service.

Foundations

i. General

a. The foundations for towers shall normally be of mass concrete or reinforced concrete. Where these are not applicable, the other forms of foundations (including pile foundations) shall also be used as required. Each tower foundation has to be proposed and justified by the Contractor but shall be approved by the Owner.
b. The Contractor shall stake out the tower locations and submit to the Owner the foundation conditions including permissible bearing pressure expected by him at each tower together with the type of foundation considered applicable by him. The Contractor has to perform soil investigations at tower sites to verify the foundation conditions and submit the soil investigation report.
c. The Contractor shall submit the actual maximum uplift and bearing load without any safety factor for each footing and for each type of tower. The stability of the foundations with respect to uplift shall be determined at a safety factor as indicated in the document The bearing pressure on the soil shall not exceed the limits laid down for each type of foundation and soil condition.
d. Unless otherwise directed, all tower footings shall be designed by the Contractor as individual leg footings, four footings per steel lattice tower and one pile cap per tubular pole tower. Dimensions of all leg footings shall be determined for tower reaction for the maximum down thrust, uplift and horizontal shear. All tower base reactions shall be computed from design structure loadings including their specified safety factors.
e. All concrete foundations shall be made from Sulphate Resisting Cement, in Karachi Area.
f. If pile foundations are required after examining the soil investigations, the Owner shall be informed about the location and the design shall be made under strict control.
g. Ultimate foundation loadings per leg shall be calculated as follows:

ii. Safety Factors of Foundations

Safety factor in normal loading condition = 1.8
Safety factor in unbalanced loading Condition = 1.5

iii. Foundation Design for Tubular Poles

The design for foundations of poles shall be made in accordance with "Design of Steel Transmission Pole Structures" prepared by ASCE.

iv. Types of Foundations

The following types of foundations for towers may be employed:

a) Concrete Block Foundation

This type of concrete block foundation is suitable for soft soil, sand or loose gravel occurring generally for the full depth.

b) Soft Rock Foundation

This type of concrete block foundation is suitable in the case where soft rock should occur from more than the bottom 50% of the soft soil foundation setting depth. The soft rock encountered may be of a homogeneous limestone or coral nature or of a harder limestone or other rock, but being fissured and stratified.

c) Hard Rock Foundation

This type of foundation is suitable for homogeneous hard rock.

d) Special Foundation

In addition, where special ground conditions exist, which do not allow any of the above designs in an original or modified form, special types of foundation as concrete piers, rafts or piling may be used.

v. Soil Characteristics

The Contractor shall ascertain the soil conditions and characteristics performing sub-surface soil explorations at each tower location by one standard penetration test. The test shall be made to a depth equal to the distance from the ground surface to the bottom of the footing, plus two meters. The tools and equipment to be used for the test shall be of the approved standard type. The results of the tests shall be compiled in an approved form and submitted to the Owner for verification.

The Contractor shall then finalize the design of each type of the foundations in accordance with the results of soil penetration test obtained.

2.7 *Proposed Methodology for laying of Overhead Transmission Line*

1. Erection works of towers:

i. Site mobilization of erection team with equipment and machinery under supervision of site engineer.
ii. The tower/pole material requires to be shifted at specific site location after proper checking and identification of correct type of tower/pole, also arrangement of tower braces as per erection plan.

iii. Assembling of tower braces on ground
iv. Erection of tower in parts
v. Bolts and nut tightening up to specified torque of Erected part of tower
vi. After erection of complete tower, cross arms will be installed/erected
vii. Nut and bolts of cross arms will be tightened up to the value provided by manufacture
viii. In case of pole the poles are directly erected using crane, as the parts of pole are already present
ix. Installation of X-arms of poles

Details:

Lattice type Transmission towers will be utilized on 500kV level, and both lattice/tubular type towers will be utilized for 220kV level as per the land availability as well as transmission line design.

Specifications:

The Lattice tower will be of D/C suspension/tension/dead end type with braces of multiple sizes, four legs, stubs, body part, cross arms for phase conductors, and peaks with grounding wire support.

The tubular type towers will be of D/C suspension/tension/dead end type with cross arms for phase conductors, and peak with grounding wire support.

The total no. of towers will be determined at the design stage of project.

2. String work:

i. Site mobilization of stringing team with proper equipment and machinery under supervision of site engineer.
ii. Installation of rollers/Travelers on ground and on all three cross arms
iii. A rope will be crossed on three travelers
iv. Insulators strings will be assembled on ground and pull up on cross arms with the help of rope and travelers which attached with puller, then attach with cross arms.
v. After installation of insulators, a pilot wire will be crossed from three sheave Ariel roller on tower arms. The pilot wire will have conductor stocking with head board at one end.
vi. Installation of pullers, cable and pilot wire drums, tensioners
vii. Conductor pulling activity is carried out until the conductor reach puller machine
viii. The conductor will be adjusted for proper sag and continuous checking of sag with the help of total station.
ix. Fittings and travelers will be dismantled once the string activity is done.

Vertical and Horizontal Clearance: The following minimum clearances shall be maintained for the Over Head TL.

Horizontal Clearance: Shall be in the range of 9-12m from road, walkway, katcha track and from structures e.g. houses, trees,

Vertical clearance will be adjusted in accordance with the structure height determine by topographic survey of project area.

Grounding Wire: Optical Fiber Ground Wire (OPGW) with sufficient no. of Fibers and accessories including Joint Boxes will be used.

Insulators: RTV coated Anti-fog, Porcelain Disc type insulators will be used.

Power Line Drop Point (PLDP): PLDP (if used) will be of tubular type with platform for equipment.

3. Testing & Commissioning of TL:

i. Test should be carried out before connecting line to system on both sides.
ii. Warning taps shall be fixed before start of tests at both ends of line
iii. Men present at both sides of line shall guard the line against entry of unauthorized person.
iv. Before starting tests, conductor shall be hanged from each phase of the line at both ends within man approachable height. Proper tightening of these conductors to the line shall be ensured for minimum contact resistance. These conductors will be used for connecting test sets to the line and phases will be short at the other end of line.

2.8 Electrocution prevention measures, particularly during wet season

- Reduction in the Resistance to Ground of the grounding system
- Proper placement of ground conductors
- The addition of resistive surface layer
- Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season.
- Keep extra safety margin from live part during wet season.

2.9 Waste Management

Miscellaneous types of waste will be generated from the project activities includes excavated soil, construction material, iron scrape and broken wires and electronics items which shall be stored at designated place and dispose of according to EPA certified waste contractor.

1. Construction Phase

The final product after construction phase is a modern substation and its associated structures.

a. By-products

Construction phase of the project is likely to generate the following by-products:

- Metal cuttings
- Excess construction materials
- Excavated material

b. Waste

At this phase the proposed project is anticipated to generate different waste such as;

Domestic Waste

The workers will not be supplied with any forms of foodstuffs. They are expected to buy or carry their own food. Plastic bags and containers which the workers will use to carry their food are expected to increase within the site and in the immediate vicinity. Other forms of waste include sanitary waste and therefore the provision of sanitary facilities is mandatory for the site construction workers.

Site Construction Waste

The project will generate waste from the site construction activities which includes:

- Dust and fumes;
- Scrap metals;
- Excavated soils and vegetation;
- Maintenance wastes;
- Packaging materials, etc.

Dust

Site excavation process will generate dust and other particulates particularly during dry weather conditions that will be released into the atmosphere.

Smoke Emissions

The site machinery, equipment and trucks used are expected to generate smoke emissions when in operation. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks by the Contractor.

2. Operation Phase

a. By-products

The only byproduct anticipated during operational phase is conductor wires and scrap metals (recyclables) during replacement which takes several years before being replaced.

b. Waste

The wastes that will be generated are;

Domestic Waste

Some of the domestic waste to be generated at the facility includes waste paper and empty cans.

Process waste

No waste is anticipated from the process since the project entails substation and its associated infrastructures and transmission lines only.

3. Decommissioning Phase

a. By-products

The By-products will include:

- Metal generated from the decommissioning of substation and associated infrastructure; and
- Foundation materials which can be donated to individuals for reuse

b. Waste

During the Decommissioning phase of the proposed project, several waste are expected to be generated. These shall include:

- Dusts and fumes
- Scrap metals
- Remains of concrete from demolition of substation foundation

Dust

The activities that will occur particularly during the demolition process will generate a considerable amount of dust and other particulates that will be released into the atmosphere.

Smoke Emissions

The demolition machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.

2.10 Tentative Schedule of Site preparation and Construction of Grid Station and Transmission Line

Timeline for the completion of proposed project activities is 36 months.

2.11 Work force and camps required for construction phase of Grid Station and Transmission Line

Workforce of 150-200 person will be utilized during the construction of grid station and laying of overhead transmission line. 05 camps will be constructed to provide shelter to the workforce.

2.12 Resource required and their source during construction and Operation phases of Grid Station and Transmission Line

Water and electricity would be required during the construction and operation phases of the proposed project.

Table 2.1: Resource requirement & sources (Construction & Operation Phase)

Construction phase:		
Resource	**Consumption**	**Source**
Electricity	100-150 kW (approx.)	Diesel Generators & temporary metered connection from KE local IBC/Distribution (depends on availability)
Water	500-1000 gallons/day	Bore and Tanker service both.
Operational phase:		
Electricity	500-1000 kW (approx.)	K Electric will supply Electricity through station transformers or Power VTs.
Water	100-150 gallons/day	Tanker service or Connection from water supply authority

2.13 Storage area for material and equipment during construction and operation phase of Grid Station and Transmission Line

A temporary storage area (s) develop by contractor for materials/equipment storage required for construction. A permanent storage area is a part of Grid station for material storage during operational phase.

2.14 Land Acquisition, ROW requirements, NOCs from authorities & Utility agencies of Grid Station and Transmission Line

Right of way approvals, including temporary and special rights of way, from private owners, Government and other civic agencies that may be required for the execution of the work will be acquired before the work is commenced. The NOCs/leases/approvals are not available at this early stage of project and will be taken in due course as and when required.

Chapter 3 Legislation & Administrative Framework

3.1 Introduction

Before initiation of any project, the mandatory legislations enacted by government and other regulatory agencies need to be studied. Governments from time to time have enacted many environmental rules, regulations, laws and guidelines specifying different requirements for diverse kind of projects. Therefore, it would be necessary to study those environmental laws pertaining to the project before its execution so that protection of environment can be ensured.

In this section, same methodology would be followed by studying those rules, regulations and laws that are relevant to the environmental and social aspects of the project "500/220 kV KKI Grid Station and associated 500kV and 220kV Transmission Lines". The assessment has been carried out to comply with both local and international laws and guidelines. The main among these are:

- National Environmental Laws & Legislations;
- Provincial Environmental Laws & Legislations;
- National & International Environmental and Social Guidelines; and
- Institutional Setup for Environmental Management.

This project will comprehensively practice the applicable requirements of policy documents, legislative framework and recommendations described in national and international guidelines of the project and will follow the institutions existing in the country that may influence the environmental management of the proposed project. These laws and guidelines have been incorporated in the mitigation measures and Environmental Management & Monitoring Plan (EMMP), which have been formulated for better environmental, ecological and social management.

3.2 National Environmental Laws & Legislations

In Pakistan, the awareness about necessity of having environmental protection laws and regulations developed since late 1970s. First step in this direction was the promulgation of the Pakistan Environmental Protection Ordinance, 1983. The organization entrusted with enforcement of environmental laws was then established viz. Pakistan Environmental Protection Agency in 1984. These efforts were continued and plan for protection of environment was developed called the Pakistan National Conservation Strategy.

Similarly, provincial governments also created Provincial Environmental Protection Agencies to look after the environmental issues in their regions. Then, in 1993, the National Environmental Quality Standards (NEQS) were made.

The powers of Environmental Protection Agencies were considerably enhanced by enacting the Pakistan Environmental Protection Act, 1997. And, the Pakistan Environmental Protection Agency Review of IEE and EIA Regulations (IEE-EIA Regulations), 2000 explained the details about the preparation, submission, and review of Initial Environmental Examinations (IEEs) and Environmental Impact Assessments (EIAs). Moreover, there are numerous other national laws that contain the provisions for protection of environment.

Previously, the issue of 'environmental pollution and ecology' was placed in Concurrent list in the Constitution which allowed both Federal and Provincial Governments to enact laws on it. But, Eighteenth Amendment to the Constitution of Pakistan, 2010, transferred this issue to the Provincial governments. Due to this, the functions related to the national environmental management were transferred to the provinces. The Federal Government has established two Environmental Tribunals one each in Karachi and Lahore. The Karachi Tribunal has control over the provinces of Sindh and Baluchistan while the Lahore Tribunal covers the provinces of the Punjab and the Khyber Pukhtunkhwa. The High Courts have designated senior civil judges as Environmental Magistrates to take all contraventions punishable in respect of handling of hazardous substances and pollution caused by motor vehicles etc. The international obligations in the context of environment will be management by the Ministry of Climate Change, Government of Pakistan.

Significant national environmental laws and legislations that have relevance to the project are as discussed under:

3.2.1 The Pakistan Environmental Policy, 2005[1]

The Pakistan Environmental Policy provides an overarching framework for addressing the environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of biodiversity, desertification, natural disasters and climate change. It also gives direction for addressing the cross sectoral issues as well as the underlying causes of environmental degradation and meeting international obligations.

The National Environmental Policy, while recognizing the goals and objectives of the National Conservation Strategy, National Environmental Action Plan and other existing environment related national policies, strategies and action plans, provide broad guidelines to the Federal Government, Provincial Governments, Federally Administrated, Territories and Local Governments for addressing environmental concerns and ensuring effective management for their environmental resources.

The National Environmental Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life for the citizens through sustainable development and the same is agreed by the proposed project.

3.2.2 Pakistan Penal Code, 1860[2]

Section XIV of PPC deals with the offences affecting the public health, safety, convenience, decency and morals. Person may be guilty of public nuisance if his act or omission causes common injury, danger or annoyance to the public or results in spread of infection of diseases dangerous to life. The section also deals with environmental pollution.

Provisions under this Act relating to environment are no longer being enforced after promulgation of the Pakistan Environmental Protection Act, 1997 and then by Sindh Environmental Protection Act, 2014. However, pollution offences can still be tried under the Pakistan Penal Code, 1860.

3.2.3 Land Acquisition Act, 1894[3]

This Act provides law for the acquisition of land needed for public purposes and for companies; and for determining the amount of compensation to be made on account of such acquisitions. The law provides details of various peculiarities involved in acquisition of land such as preliminary investigation, objection to acquisition, declaration of intended acquisition, enquiry into measurements, value & claims, taking possession, reference to court and procedure thereon, apportionment of compensation, payment, temporary occupation of land, acquisition of land for companies, disputes resolutions, penalties and exemptions etc. This Act has 55 sections addressing different areas. Such as section 4(2) mentions that it shall be lawful for any official authorized by the Collector to enter upon and survey, to dig or to do all other Acts necessary to ascertain that whether the land is adapted for such purpose..

3.2.4 The Telegraph Act, 1885

The Telegraph Act (TA) was conceived in the British era for telegraphic poles and then was passed to post-independence Pakistan with a broader application covering also electric poles and towers. The original provision of this law was that the land occupied by telegraph poles was not to be compensated (only crops destroyed during the erection of the pole were compensated). This was based on the logic that a pole, covering only a negligible land area, does not cause substantial impacts to land users.

In case of impacts caused by the poles and towers for public facilities and transmission lines, land acquisition is not regulated by the LAA but instead by the Telegraph Act, 1885 (amended in 1975).

The Act (section 11) confers powers to the NTDC to enter private lands and (section 10) construct/maintain electricity towers and transmission lines without the need to acquire the land affected and paying compensation for it. However sub-section 10 (d), provides that the NTDC is required to avoid causing unnecessary damages to the affected land and associated assets. Finally Sub Section 10 (d) and Section 16 provides that if any such damage occurs (i.e. damages to

[1] *The Pakistan Environmental Policy, 2005,Govt. of Pakistan, Ministry of Environment*
[2] *Pakistan Penal Code(XLV of1860)6th October 1860*
[3] *The Land Acquisition Act 1894 (Act of 1894) http://punjabelaws.gov.pk/laws/12.html*

crops, irrigation facilities, and land quality or land income) the project proponent has to provide just compensation for the damages caused.

The Telegraph Act also requires the proponents to: (i) properly inform the affected people through written notices and onsite public meetings; (ii) compensate at market rates all the lands occupied by towers in urban areas, or replace the broad-based conventional towers by narrow-based tubular poles to minimize impact on land; (iii) avoid land impacts in rural areas through the use of towers with sufficient vertical clearance to allow the continuation of unrestricted farming and animal grazing; and, (iv) if the construction of such towers is impossible, compensate the land occupied by tower bases also in rural areas. In addition, the proponent will compensate by default all the crops, trees and other assets expected to be affected by the Transmission Line construction phases including (i) construction of tower bases; (ii) tower erection; and (iii) stringing of power cables.

This Act makes provision of installing towers without acquiring any land. However, provision is there for temporary acquisition of land during the construction period. During the proposed Transmission Line project, it will be ensured that land under the transmission lines is accessible and can be used productively. In the absence of such situation, the land will be acquired and compensation paid either under LAA (1894), or under the willing buyer-willing seller at market prices with consensus on price.

3.2.5 Antiquities Act, 1975[4]

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments; etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain such articles of archaeological significance.

No archeological and cultural site as protected under Antiquities Act 1975 is present near the proposed route alignment.

3.2.6 The Forest Act, 1927[5]

The Forest Act deals with the matters related with protection and conservation of natural vegetation/habitats. The Act contains procedures for constituting and managing various types of forests, such as reserved forests, village forests and protected forests. The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It also defines the duties of forest related public servants, prohibits cutting of trees and prescribes penalties for violation of any provision of the Act.

The Project site does not encompass any reserve/protected forest area.

3.2.7 The Electricity Act, 1910[6] & the Electricity (Amendment) Ordinance, 1979[7]

The electricity Act, 1910 relates to the supply and use of electrical energy. Supply of energy licenses and its revocation under various conditions is given in part II of the Act. This Act obligates licensee to pay compensation for any damages caused during the constructions and maintenance of any power distribution facilities. Part III of the Act discusses the supply, transmission and use of energy by non licensees. This law prohibits the generation, transmission, supply or use of energy, in any way that may injure any railway, tramway, canal or waterway or any dock, wharf or pier vested in or controlled by a local authority.

The electricity Act, 1910 is amended through the electricity (Amendment) Ordinance, 1979. Penalty of three years imprisonment or five thousand fines or with both is prescribed for dishonest abstraction or consumption of energy.

[4] *Act VII of 1976(Gazette of Pakistan, Extraordinary, Part 1, 14th January, 1976*
[5] *The Forest Act,1927(XVI of 1927) http://punjab laws.gov.com/laws/40.html*
[6] *The Electricity Act, 1910, (IX of 1910)*
[7] *The Electricity (Amendment) Ordinance, 1979, (LXII 0F 1979)*

3.2.8 Electricity Rules, 1937[8]

These rules regulate the generation, transmission, supply and use of energy in Pakistan. The Act prescribes the conditions and procedures of issuance of licenses. General precautions for the safety of the public are mentioned. Construction, insulation and earthing of apparatus are prescribed to be done to prevent danger. Additional rules for electric tractions are also given.

3.2.9 The Electricity Control Ordinance, 1965[9]

This ordinance provides powers to control the production, distribution, use and consumption of electrical energy during an emergency throughout Pakistan. When the National Assembly is not in session and the President is satisfied that circumstances exist which render immediate legislation necessary, the president can promulgate the ordinance. The ordinance prescribes a penalty of six month or with fine, or with both, in case of non-compliance of the ordinance.

3.3 Provincial and Local Environmental Laws and Legislations

3.3.1 Sindh Environmental Protection Act, 2014[10]

This Act has been enacted to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development. It equally lays emphasis for the preservation of the natural resources of Sindh and to adopt ways and means for restoring the balance in its eco-system by avoiding all types of environmental hazards.

Environmental Protection Council (EPC)

It has been formed consisting of Chief Minister as Chairman with Minister in charge of Environment Protection Department, Addl. Chief Secretary, Planning & Development Department, Government of Sindh and Secretaries of Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Livestock & Fisheries Forest & Wildlife, Energy, Education Departments Government of Sindh and Divisional Commissioners of Sindh. Non-official members are also included (i.e. representatives of Chamber of Commerce & Industry and from medical or legal professions etc.) along with DG EPA & two Members of Provincial Assembly also form part of EPC.

The functions and powers of EPC include coordination & supervision of provisions of Act, approving provincial environmental & sustainable development policies & SEQS, provide guidance for protection & conservation, consider annual Sindh Environmental Report, deal with interprovincial and federal provincial issues, provide guidance for bio safety and assist Federal Government in implementation of various provisions of UN Convention on laws on Seas (UNCLOS).

Sindh Environmental Protection Agency (SEPA)

SEPA would be headed by Director General (DG) with the aim to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made there under. The Agency shall have technical and legal staff and may form advisory committees.

The Agency shall administer and implement the provisions of this Act and rules and regulations. It shall also prepare environmental policies, take measures for implementation of environmental policies, prepare Sindh Environment Report and prepare or revise Sindh Environmental Quality Standards. SEPA shall also establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution and to estimate the costs of cleaning up pollution and rehabilitating the environment and sustainable development. SEPA would also take measures for protection of environment such as to promote research;

[8] *Electricity Rules, 1937*
[9] *The Electricity Control Ordinance, 1965, Ordinance No. XXVIII of 1965*
[10] Sindh Environmental Protection Act, 2014, Sindh Act No. VIII of 2014 dated 20th March, 2014

issues licenses for dealing with hazardous substances, certify laboratories, identify need for or initiate legislation, specify safeguards etc. SEPA would also encourage public awareness and education regarding environmental issues.

SEPA would have powers to enter or inspect under a search warrant issued by Environmental Protection Tribunal or a Court search at any time, any land or building etc. where there are reasonable grounds to believe that an offence under this Act has been or is being or likely to be committed. SEPA may also take samples, arrange for testing or confiscate any article in discharge of their duties.

This act has also provided for Sindh Sustainable Fund derived from various sources such as voluntary contributions or fees generated etc. This fund is utilized for protection, conservation or improvement of environment.

Salient Features

Section-11: No person shall discharge or emit or allow the discharge or emission of any effluent waste, pollutant, noise or adverse environmental effects in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards.

Section-12 & 13: No person shall import hazardous waste into Sindh province and handle hazardous substances except under licenses etc.

Section 14: No person shall undertake any action which adversely affects environment or which lead to pollute or impairment of or damage to biodiversity, ecosystem, aesthetics or any damage to environment etc.

Section 15: This section deals with regulation of motor vehicles banning emission of air or noise pollutants being emitted from them in excess of allowable standards.

Section 17: This section states that no proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment and has obtained from Agency approval in respect thereof. SEPA shall review the IEE & EIA and accord approval subject to such terms and conditions as it may prescribe or require. The agency shall communicate within four (04) months its approval or otherwise from the date EIA is filed failing which the EIA shall deemed to have been approved.

Section 21: Where agency is satisfied that the discharge or emission has occurred in violation of any provision of this act or rules etc. then it may, after giving an opportunity to person responsible, by order direct such person to take such measures within specified period. The agency under this section has been empowered to immediately stop, prevent or minimize emission, disposal etc. for remedying adverse environmental effects.

Section 22: The person who fails to comply with section 11, 17, 18 and 21 shall be punishable with a fine which may extend to five million rupees, to the damage caused to environment and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues. And, where a person convicted under sub-sections 1 & 2 had been previously convicted for any contravention of this Act, the Environmental Protection Tribunal (EPT) may, in addition to punishment, award imprisonment for a term that may extend up to three years, or order confiscation or closure of facility etc.

Section 23: Where any violation of this Act has been committed by any of employee of any corporate body, then, that employee shall be considered to be guilty of environmental pollution.

Section 25: This section allows for establishment of Environmental Protection Tribunals.

The Act is attached as **Annexure-I**.

3.3.2 Sindh EPA Review of IEE and EIA Regulations, 2014

The Sindh Environmental Protection Agency (Review of IEE/EIA) Regulations 2014 divides projects in Schedules I& II depending upon the severity of environmental impact of the project as follows:

Schedule I: A project falls in Schedule I if it is likely to have adverse environmental impacts, but of lesser degree or significance and all the mitigation measures to handle the impact is manageable. Such types of projects need IEE report including EMP.

Schedule II: Projects are categorized in Schedule II if they generate significant adverse environmental impacts that require a comprehensive management plan, or if the project is located within or passes through: a) Areas declared by the Government of Pakistan as environmentally sensitive (National Parks/Sanctuaries/Game Reserve), b) Areas of international significance (e.g. protected wetland as designated by the RAMSAR Convention), or c) Areas designated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as cultural heritage sites.

According to Sindh Environmental Protection Agency Regulation 2014, a proponent of a project shall file an EIA with the Sindh Environmental Protection Agency, if the project falls in any category listed in Schedule II; since the projects listed in Schedule II are generally major projects and have the potential to affect a large number of people.

The project "500/220 kV KKI Grid Station and associated 500kV LILO, 220kV LILO Transmission Lines" falls in Schedule II requiring an EIA as the project is categorized as:

- ✓ A. Energy
- ✓ Transmission Lines(11 kV and above) and Distribution projects

These regulations are attached as **Annexure –II.**

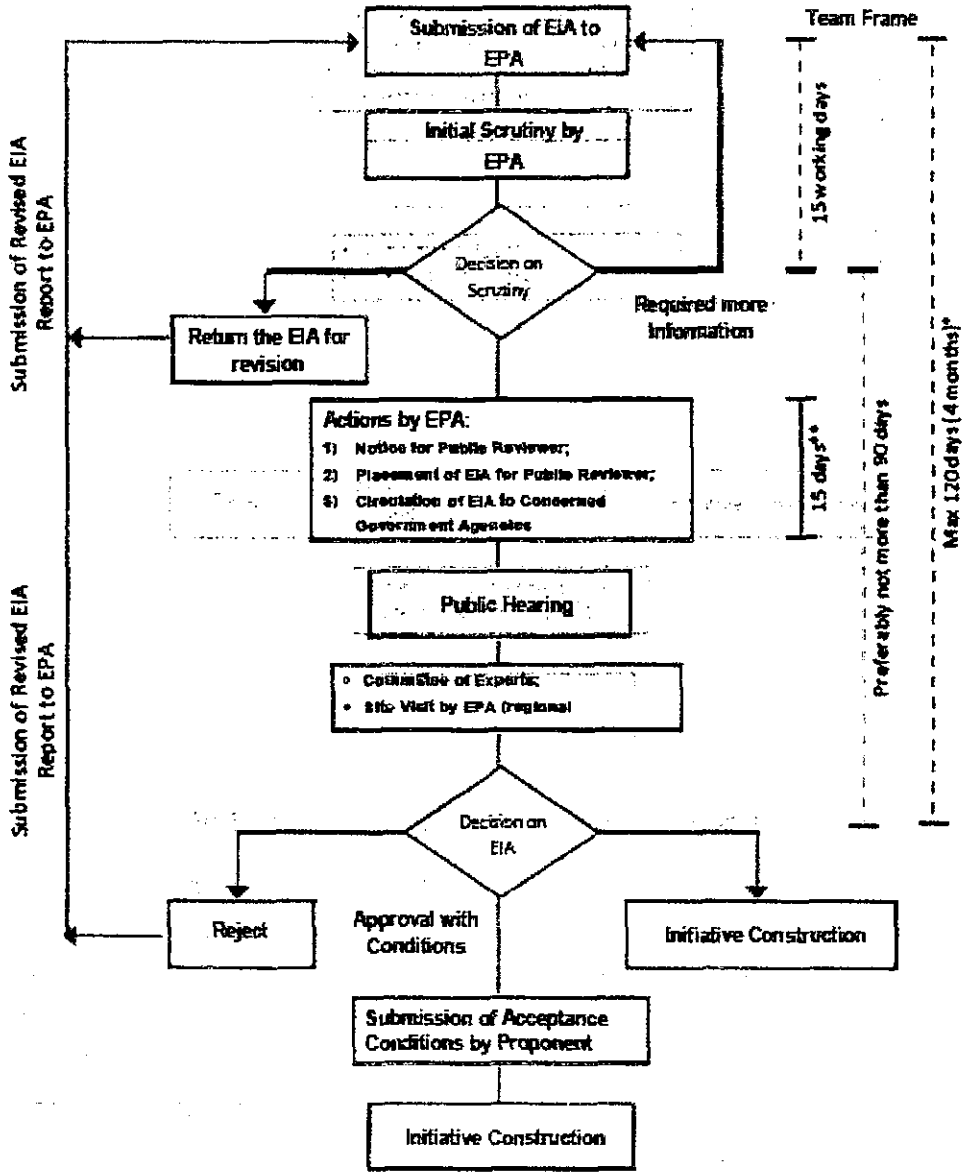


Fig 3.1: Procedure for EIA Review and Approval process

3.3.3 Sindh Environmental Quality Standards

On June 28, 2016, the Sindh Environmental Industrial Waste Water, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Air, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015 have been notified by Sindh EPA. The KE shall follow the SEQS in letter and spirit during project execution. The SEQS are attached as **Annexure –III.**

3.3.4 Hazardous Substances Rules, 2014[11]

These Rules were notified to stream line procedures for issuance of licenses to industries/ businesses that generate hazardous waste, safety precautions for workers; and devices them methods for the removal of hazardous wastes in an environmentally friendly manner. The rules also specify procedures to be adopted for import, transport and disposal of hazardous waste; and identify two hundred and forty-three hazardous substances and synthetic chemicals.

[11] *Hazardous Substances Rules, 2014*

3.3.5 Sindh Wildlife Protection Ordinance, 1972 (SWPO)[12]

This ordinance provides for the preservation, conservation and management of wildlife in Sindh. This Ordinance lays down rules for formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The ordinance also specifies three broad classifications of the protected areas: national parks, wildlife sanctuaries and game reserves. Wildlife sanctuaries are areas that have been set aside as undisturbed breeding grounds and cultivation and grazing is prohibited in the demarcated areas. Nobody is allowed to reside in a wildlife sanctuary and entrance for the general public is by special dispensation. However, these restrictions may be relaxed for scientific purpose or betterment of the respective area on the discretion of the governing authority in exceptional circumstances. Game reserves are designated as areas where hunting or shooting is not allowed except under special permits.

The project is located in Karachi West and is not neighboring any Wildlife Sanctuary or Game Reserve.

3.3.6 The Sindh Cultural Heritage (Preservation) Act, 1994

The Sindh Cultural Heritage (Preservation) Act, 1994 is the provincial law for the protection of cultural heritage. Its objectives are similar to those of the Antiquity Act, 1975. No antiquity protected under these two laws is identified in the vicinity of the proposed project area.

3.3.7 The Sindh Occupational Safety and Health Act, 1994

The Sindh Occupational Safety and Health Bill 2017 has been approved by the Provincial Assembly of Sindh (Ref. Sindh Bill No. 27 of 2017) and enacted as the Sindh Occupational Safety and health Act, 2017. The Act makes provision for Occupational Safety and Health conditions at all workplaces for the protection of persons at work places against risk of injury arising out of the activities at work places and the promotion of safe, healthy and decent working environment adapted to the physical, physiological and psychological needs of all persons at work. The Sindh Occupational Safety and Health Rules, 2019 have also been framed under the act.

3.4 Environmental and Social Guidelines

The environmental as well as social guidelines related to the proposed project are as discussed under:

3.4.1 Environmental Protection Agency's (EPA's) Guidelines on Environmental & Social Aspects

The Federal EPA has prepared a set of guidelines for conducting environmental and social assessments as discussed under:

- **Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2014[13]**

The Policy & Procedures for the Filing, Review and Approval of Environmental Assessments 2014, prepared by the SEPA under the powers conferred upon it by the Sindh Environmental Protection Act 2014, provide the necessary details on the preparation, submission, and review of the Initial Environmental Examination (IEE) and the Environmental Impact Assessment (EIA).

This EIA Study has followed the procedures defined in the Sindh Environmental Protection Act 2014 and Review guidelines 2014, and the EIA will be submitted to the SEPA in whose jurisdiction the project will be implemented. The PEPA has, however, been given the right to review any environmental report at any time and the power to revoke the decision of the provincial EPA, if it deems this to be necessary.

- **Guidelines for the Preparation and Review of Environmental Reports, 1997**

The guidelines on the preparation and review of environmental reports target project proponents and specify:

- The nature of the information to be included in environmental reports;
- The minimum qualifications of the EIA conductors appointed;

[12] *The Sindh Wildlife Protection Ordinance, 1972. 1 Sindh Ordinance No. V of 197 2. AN 13th April, 1972*

[13] *Policy and Procedure for the Filing, Review and Approval of Environmental Assessments, Government of Pakistan, November 1997*

- The need to incorporate suitable mitigation measures at every stage of project implementation; and
- The need to specify monitoring procedures.

The terms of reference for the reports are to be prepared by the project proponents themselves. The report must contain baseline data on the study area, detailed assessment thereof, and mitigation measures.

- **Guidelines for Public Consultation**

These guidelines provide assistance throughout the environmental assessment of the project by involving the public which can lead to better and more acceptable decision-making. Timely, well planned and appropriately implemented public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the proposal, will lead to better outcomes, and lay the basis for ongoing positive relationships between the stakeholders. Specifically public involvement is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives.

3.4.2 World Bank Guidelines on Environmental & Social Aspects[14]

The principal World Bank publications that contain environmental guidelines are listed below:

- Environmental Assessment Operational Policy 4.01. Washington, DC, USA. World Bank 1999;
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991,;
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991; and
- Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.

The first two publications listed here provide general guidelines for the conduct of an IEE/EIA, and address the IEE/EIA practitioners themselves as well as project designers. While the Source book in particular has been designed for the Bank projects, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains a wealth of information which is useful to environmentalists and project proponents.

The Source book identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment, and emphasizes the need to incorporate socio-economic issues in EIA exercises.

3.4.3 IFC Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP)[15]. These industry sector EHS guidelines are designed to be used together with the General or multiple industry-sector guidelines as may be necessary. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project such as host country context, assimilative capacity of the environment etc. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

[14] *World Bank Guidelines On Environmental & Social Aspects*
[15] www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

Industry-Specific Impacts and Management

This include construction site waste generation, soil erosion and sediment, control from materials sourcing areas and site preparation activities, fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles), noise from heavy equipment and truck traffic, potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities.

Performance Indicators and Monitoring

Where dust or potentially contaminated water runoff exists, site operations should comply with guidelines described. Monitoring should be conducted by trained individuals and monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Occupational health and safety performance should be evaluated against internationally published exposure guidelines. Projects should try to reduce the number of accidents among project workers.

Chapter 4 ENVIRONMENTAL & SOCIAL BASELINE OF THE PROJECT AREA

4.1 General

4.1.1 The Aim of Baseline Study

The baseline study relates to the physical, biological and socio-economic environment of the project area prior to the beginning of construction and operational activities. This categorization would aid in understanding the prevalent macro and micro environment conditions of this project and would enable assessment of possible environmental impacts that may arise as a result of the activities associated with the project. It would also assist the design team in defining the mitigation measures that would be required to minimize if not eliminate the negative impacts which are pointed out in this study.

4.1.2 Methodology

Information for this section was collected from different sources including electronic and print media, studies previously conducted in proposed project area by EMC and archives of the experts, consultations with institutions, Non-government Organizations (NGOs) and field surveys conducted for this study by the team of EMC, etc.

4.1.3 Study Area

The macro environment of the project area comprises the Mauripur sub-division of District West, Karachi. Two location options for the grid station will be along KDA Scheme 42 Road with option 1 at 24°55'22.20"N & 66°50'59.69"E and option 2 at 24 55 11.36N & 66 50 28.80E. The route of the 500kV transmission line originates at the LILO interconnection point at 24°57'5.14"N & 66°49'54.95"E of the existing 500kV KANUPP II-III/Port Qasim transmission line of NTDC and terminates southwards at the grid station. The 220kV transmission lines originate at the grid station and move east along KDA Scheme 42 Road before turning southeast along primary access road of Hawks Bay Town and terminate at LILO interconnection point at 24°53'2.47"N & 66°52'44.11"E of the existing 220kV Baldia-Mauripur transmission line. The interconnection point lies close to Block-13, Hawks Bay Town. The macro environment and the route of the Transmission Lines is shown in the Figure 4.1.

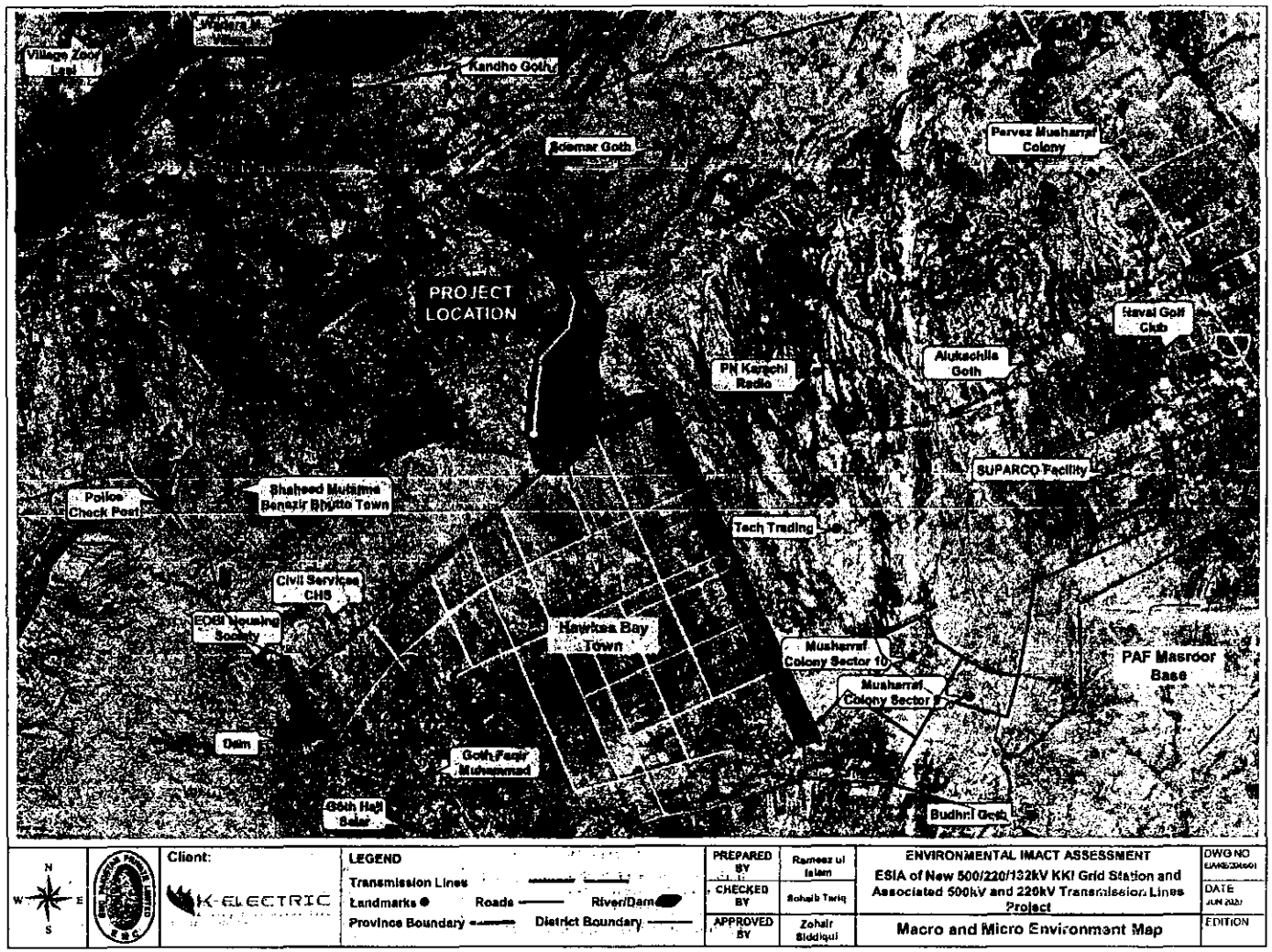
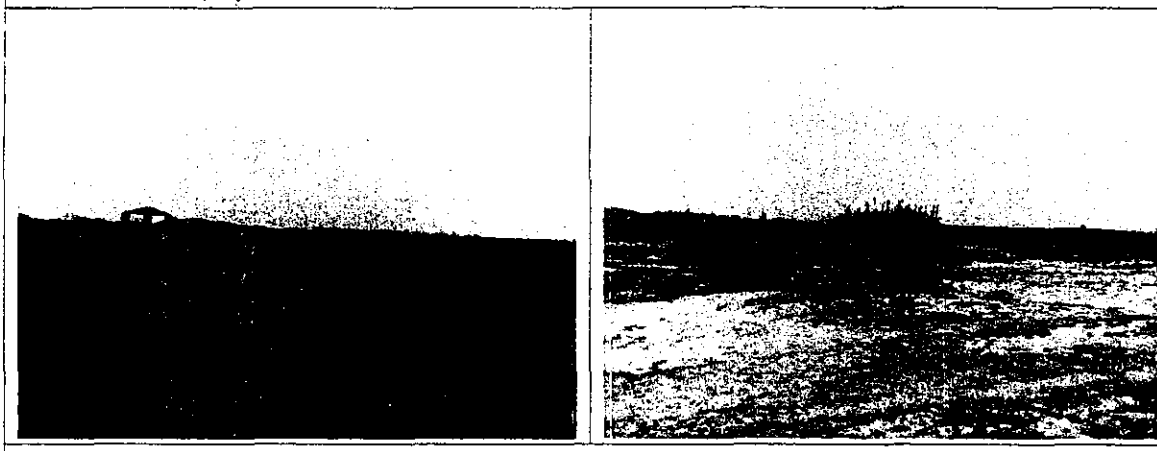
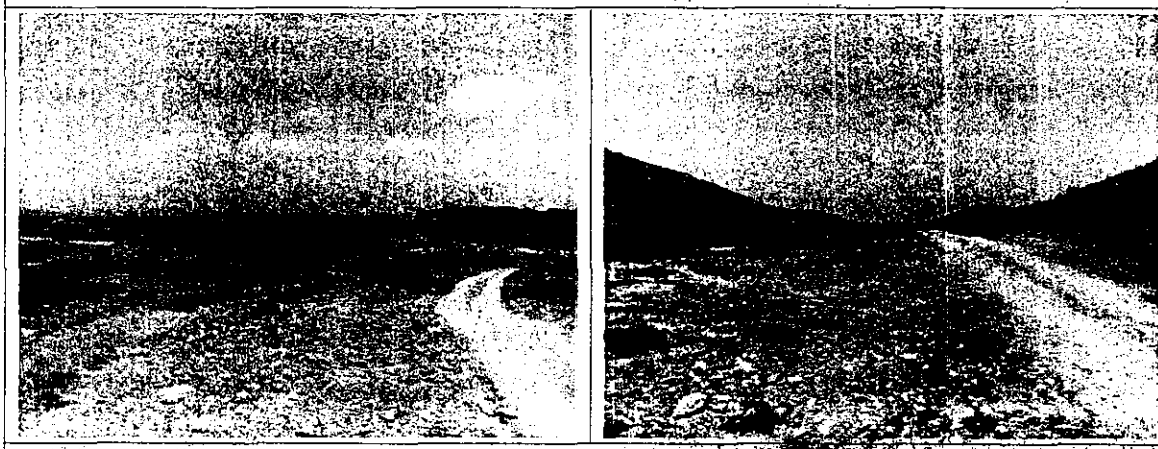


Fig 4.1: Micro and macro environment of proposed project

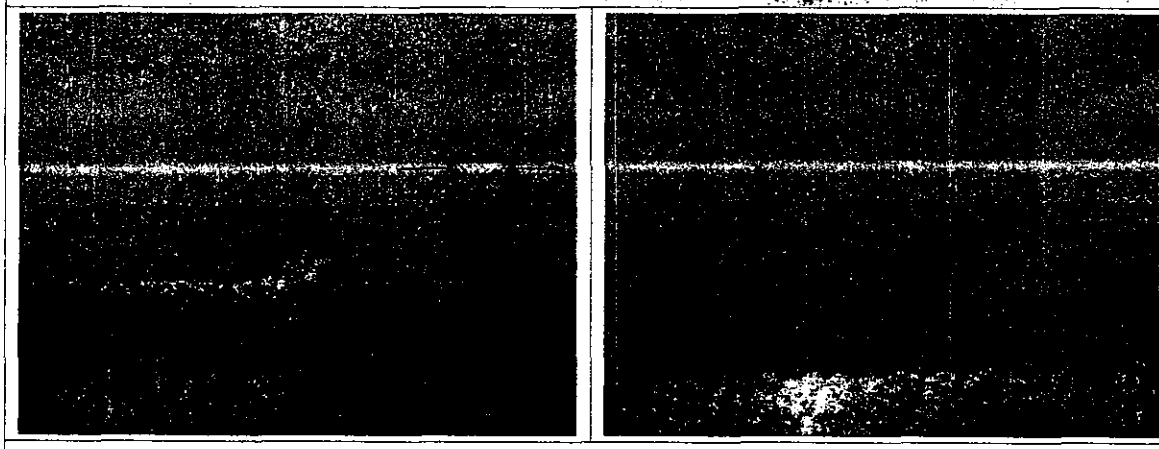
Pictorial views of project area



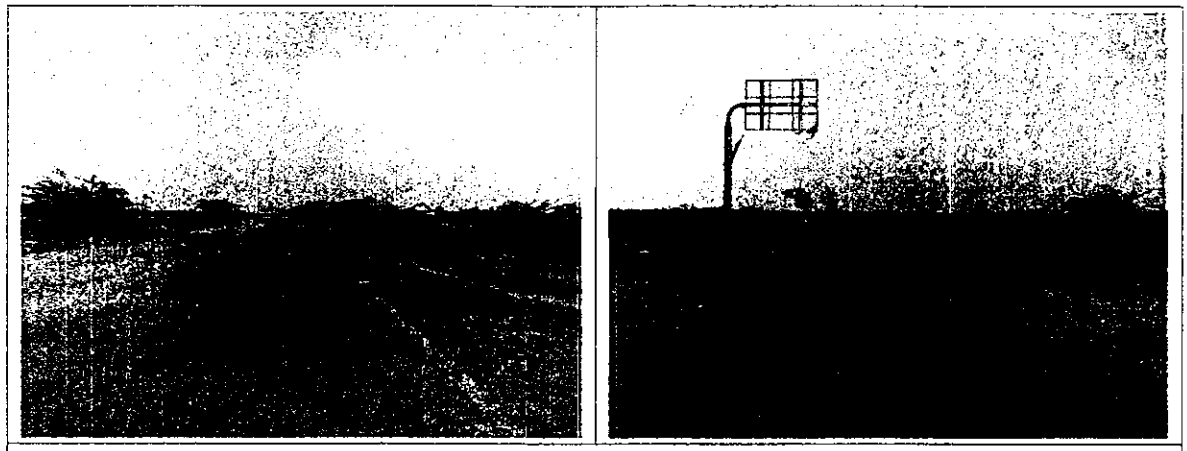
Substation location(s)



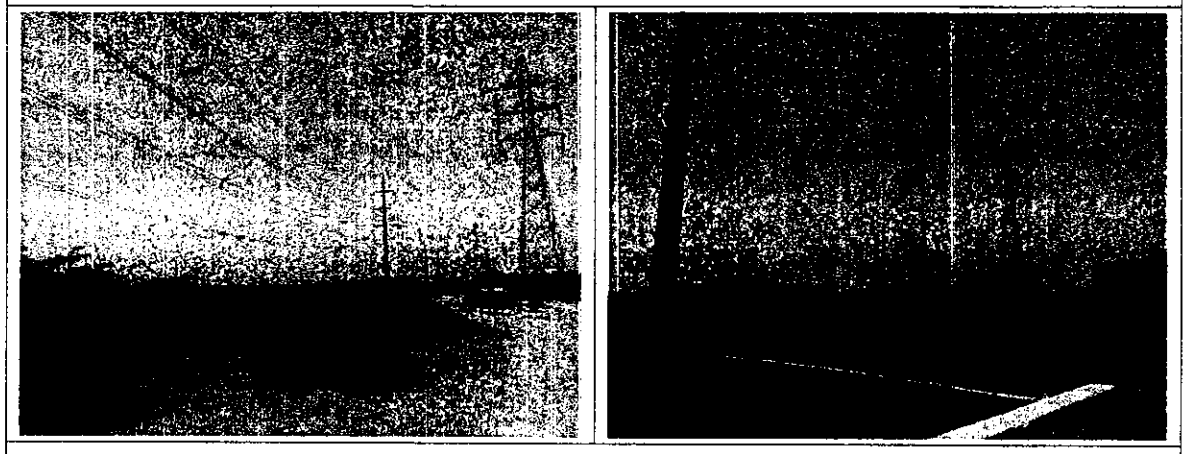
Moach pass



500kV KANUPP-II/III/Port Qasim TL near LILO interconnection point



KDA Scheme 42 road



220kV Baldia-Mauripur TL near LILO interconnection point

4.2 Physical Environment

4.2.1 Meteorology and Climate

Karachi has an arid climate (Köppen Climate Classification: *BWh*) dominated by long summer season but moderated by marine influence from the Arabian Sea[1]. There is a minor seasonal intervention of a mild winter from mid-December to mid-February followed by a long hot and humid summer extending from April to September, with monsoon rains from July to mid- September. The characteristic climatic feature of the four seasons of Karachi is presented in Table 4.1.

Table 4.1: Seasonal Characteristics of the Climate of Karachi

Season	Temperature	Rainfall	Wind
Summer (Mid-March to Mid-June)	The summer is hot with temperature increasing from 26.2 °C in March, rising up to 40 °C in June.	There are less frequent rain showers in summer with no more than 1 or 2 rainy days in summer. Average total amount of rain in summer is around 10 mm	The wind speed in summer is variable. It is around 2.5 m/s in March and rises up to 18 m/s in April and drops to 4 m/s for the rest of the season. The direction mostly remains blowing from West
Monsoon (Mid-June to mid-September)	The temperature in monsoon remains high but relatively lower than summer and oscillates around 32°C.	Almost 80 % of the yearly rain occurs in the monsoon with July and August being the wettest month.	The wind direction in the monsoon is mostly blowing from East.

[1] https://en.climate-data.org/asia/pakistan/sindh/karachi-992367/

Table 4.1: Seasonal Characteristics of the Climate of Karachi			
Season	**Temperature**	**Rainfall**	**Wind**
Post-Monsoon Summer (Mid-September to November)	The average temperature post monsoon drops and average min temperature may reach 12 °C in November.	The post-monsoon period remains mostly dry and rainfall in November is around 1.8 mm.	The wind speed in September is around 3.7 m/s and drops to 1.4 m/s in November.
Winter (December to mid-March)	The winter is mild with January being the coolest month where average minimum temperature falls to 6 °C.	Like the other seasons, except monsoon, there is little occasional rainfall. The rainfall in winter is less than 50 mm.	The wind speed in the winter season increases from 1.4 m/s in December to 2.6 m/s in March. The wind direction for most part winter season is blowing from NE and changes its course to blowing from West in early March

Temperature

The air temperature in Karachi Division and its coastal areas are generally moderate throughout the year due to presence of sea. Climate data generated by the meteorological station at Karachi Air Port represents climatic conditions for the region. The mean monthly maximum and minimum temperatures, recorded during the last 16 years in Karachi to describe the weather conditions are shown in Table 4.2 and 4.3 respectively. The Tables indicate that the mean monthly maximum temperature in Karachi ranged between 26.8°C and 26.8°C during the 2001-2017 periods, while the mean monthly minimum temperature ranged between 13.6°C and 15.72°C. The annual mean maximum and mean minimum temperature during 2001-17 periods were 32.8°C and 23.0°C, which indicates that there has been a significant rise in the mean minimum temperature during this period.

Table 4.2: Mean Monthly Maximum Temperature °C													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2001	27.2	29.6	33.1	34.6	35.1	34.9	32.2	32.3	33.1	36.0	33.5	30.4	32.7
2002	27.0	28.2	33.3	35.4	35.6	35.1	32.2	31.6	31.4	36.5	32.7	28.1	32.3
2003	27.6	28.5	32.4	36.6	35.7	34.9	34.1	32.6	32.5	37.0	32.2	28.3	32.7
2004	26.6	29.9	36.2	35.4	36.8	35.6	33.8	32.7	32.8	33.7	33.1	29.4	33.0
2005	24.9	26.3	31.5	35.3	35.4	36.0	33.2	32.2	34.2	35.2	33.1	28.4	32.1
2006	26.0	31.3	31.8	34.0	34.6	35.3	33.8	31.0	34.2	35.0	33.4	26.3	32.2
2007	26.9	29.4	31.4	37.7	36.0	36.4	N/A	N/A	N/A	N/A	N/A	N/A	33.0
2008	24.4	26.9	34.3	34.4	33.9	35.1	33.5	31.9	34.7	35.5	32.5	27.2	32.0
2009	26.2	29.8	33.0	36.0	36.8	35.7	34.5	33.0	32.8	35.9	33.0	28.6	32.9
2010	27.5	29.2	34	35.7	36.5	34.7	34.6	33.2	34.5	35.9	32.7	28	33.0
2011	26.9	28.5	33.2	35.8	35.3	35.3	34.2	32.8	32.9	N/A	N/A	N/A	N/A
2012	25.7	26.9	31.7	35.1	35.5	34.6	33.2	32.7	33.2	35.0	32.7	28.2	32.0
2013	26.7	28.0	33.3	34.0	35.1	36.5	33.8	32.1	33.0	35.7	32.3	28.3	32.4
2014	25.5	28.0	31.7	35.1	35.9	36.5	34.0	33.7	33.8	36.3	32.9	28.7	32.7
2015	26.3	28.9	31.5	35.9	36.0	37.7	34.1	32.3	34.6	35.8	33.0	28.6	32.9
2016	27.8	30.3	33.3	34.7	35.7	36.1	33.6	33.0	32.9	34.0	33.3	31.0	33.0
2017	25.4	30.2	32.8	35.5	36.2	36.3	33.1	33.8	33.4	36.6	32.3	28.2	32.8
Source: Pakistan Meteorological Department													

Table 4.3: Mean Monthly Minimum Temperature °C													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2001	11.5	14.9	19.6	23.8	28.1	29.0	27.1	26.5	25.9	24.4	18.6	15.8	22.1
2002	12.8	13.8	19.5	23.9	27.0	28.2	29.6	25.6	24.8	22.5	17.7	14.9	21.7
2003	12.7	16.9	19.8	24.2	26.5	28.2	23.6	27.0	25.3	20.9	15.2	12.0	21.0
2004	12.9	14.5	19.1	24.8	27.3	28.8	27.5	26.3	25.3	22.4	18.0	15.4	21.9
2005	12.3	11.3	20.3	23.0	26.4	28.3	27.2	26.6	26.6	22.9	18.9	13.0	21.4
2006	11.7	18.1	19.6	24.5	27.5	28.5	28.3	26.3	26.8	25.7	19.4	14.0	22.5
2007	13.0	17.3	19.7	24.7	27.6	28.6	N/A	N/A	N/A	N/A	N/A	N/A	21.8

Table 4.3: Mean Monthly Minimum Temperature °C													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2008	10.1	11.1	19.6	24.0	27.3	29.1	27.9	26.8	26.6	23.8	17.6	14.9	21.6
2009	14.7	16.5	20.8	23.8	27.6	28.7	28.1	27.5	26.5	22.6	17.0	13.9	22.3
2010	12.2	14.7	21.3	25.1	28	28.2	28.3	27.2	25.8	23.9	17.4	11.1	21.9
2011	11	14.5	19.7	23.1	27.1	28.8	27.8	28.6	26.5	N/A	N/A	N/A	N/A
2012	11.2	11.9	19.1	24.5	27.2	28.0	27.9	26.9	26.4	22.7	18.6	14.2	21.5
2013	11.6	15.1	19.2	24.2	27.1	29.3	28.0	26.6	25.5	25.4	18.1	13.0	21.9
2014	9.9	13.1	18.9	24.4	27.0	29.2	28.3	27.1	26.8	23.3	19.5	13.1	21.7
2015	12.6	16.4	19.2	25.7	27.7	29.8	28.4	26.9	26.3	24.9	18.6	12.6	22.4
2016	14.8	14.9	21.7	24.6	27.9	27.9	28.1	27.1	26.4	24.0	17.1	15.5	22.5
2017	12.5	18.2	20.3	24.4	27.8	29.2	27.7	27.0	26.2	23.5	16.8	13.0	22.2
Source: Pakistan Meteorological Department													

Precipitation

The main source of precipitation is rainfall which is received mostly in the months of July to September during SW Monsoon winds. It is very erratic as some years are very dry and there is no rain. The average rainfall is 217 mm and most of it is received in the month of July. Occasional winter rains are also received in the months of December – February as result of NE winds which count 15-25% of total rainfall.

The record for rainfall of PMD at Karachi Airport (2001-2017) suggests that July and August are the wettest months and that the maximum rainfall recorded in Karachi during 2001-2017 period was 270.4 mm during the month of July 2003. The maximum annual rainfall was 324.9 mm during the year 2003, followed by 301.1 mm in 2006 and 279.9 mm in 2009.

Table 4.4: Monthly Amount of Precipitation (mm) at Karachi Airport													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	0.0	0.0	0.0	0.0	0.0	10.6	73.6	16.2	N/A	0.0	0.0	0.0	33.46
2002	0.0	2.4	0.0	0.0	0.0	N/A	N/A	52.2	N/A	0.0	0.5	0.4	13.87
2003	6.4	21.8	0.0	0.0	0.0	16.3	270.4	9.8	N/A	0.0	0.2	0.0	54.15
2004	13.7	0.0	0.0	0.0	0.0	N/A	3.0	5.6	N/A	39.3	0.0	4.3	13.18
2005	6.6	12.8	N/A	0.0	0.0	N/A	N/A	0.3	54.9	0.0	0.0	17.1	18.34
2006	N/A	0.0	N/A	0.0	0.0	0.0	66.2	148.6	21.9	0.0	3.1	61.3	60.22
2007	0.0	13.2	33.4	0.0	0.0	110.2	N/A	N/A	N/A	N/A	N/A	N/A	52.26
2008	8.0	Trace	1.1	0.0	0.0	0.0	54.0	37.5	Trace	0.0	0.0	21.0	24.32
2009	3.0	Trace	0.0	Trace	0.0	2.6	159.9	44.0	68.9	0.0	0.0	1.5	55.68
2012	0.2	0.0	0.0	0.0	0.0	Trace	Trace	8.1	121.0	0.0	0.0	22.8	152.1
2013	Trace	20.0	2.8	30.0	0.0	Trace	5.5	105.4	4.0	1.2	0.0	0.0	168.9
2014	Trace	0.0	12.4	0.0	1.3	Trace	1.1	9.9	1.4	0.0	4.6	0.0	30.7
2015	0.3	2.1	2.8	0.0	0.0	Trace	46.6	1.4	Trace	0.0	0.0	0.0	53.2
2016	3.1	0.0	Trace	0.0	0.0	65.8	1.9	96.9	Trace	0.0	0.0	0.0	167.7
2017	41.5	Trace	0.0	0.0	0.0	58.8	33.3	65.6	26.4	0.0	0.0	6.6	232.2
Source: Pakistan Meteorological Department													

Inundation due to Heavy Rainfall Events: Karachi has a history of urban flooding which dates back in the Colonial era. At present, most of the storm water drains and natural water ways have been clogged with solid waste or encroached, giving water no channel to flow and recede. Several areas in Karachi have been identified which are potentially vulnerable to Urban Flooding in the event of moderate to heavy rain. They include Shah Faisal Town, Malir Cantonment areas, Gulshan-e-Iqbal, Gulberg Town, Gadap Town, PECHS and Keamari Town.

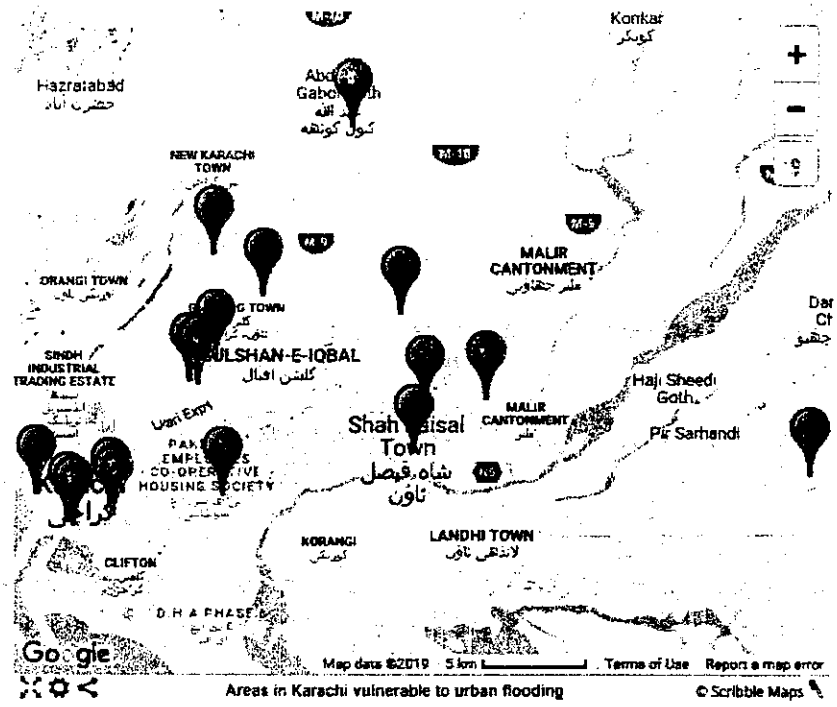


Fig 4.2: Areas in Karachi vulnerable to urban flooding[2]

During the monsoon season of 2019, moderate to severe rains have hit the city in spells from end of July till end of September, causing severe to moderate flooding in many parts of the city, causing loss of life and property in related incidents of electrocution and drowning.

The presence of hills and gullies in the proximity of project area, particular the grid station location(s) and the route of 500kV transmission line, may make it prone to seasonal flooding, mainly due to hill torrents during heavy precipitation.

Humidity

The relative humidity typically ranges from 25% (dry) to 70% (humid) over the course of a year, rarely dropping below 20% (very dry) and reaching as high as 90% (very humid).

Table 4.5: Mean Monthly Relative Humidity (Mean) at 1200 UTC (%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2014	25.0	27.0	35.0	47.0	57.0	61.0	64.0	61.0	60.0	36.0	36.0	31.0	45.0
2015	38.0	41.0	37.0	45.0	60.0	56.0	69.0	67.0	56.0	47.0	28.0	31.0	47.9
2016	46.0	25.0	41.0	47.0	60.0	60.0	68.0	70.0	63.0	57.0	34.0	38.0	50.8
2017	38.0	25.0	36.0	44.0	59.0	62.0	70.0	67.0	63.0	44.0	29.0	20.0	46.4

Source: Pakistan Meteorological Department

Wind Speed and Direction

The wind direction and speed between the summer and winter monsoon seasons are rather unsettled and large variations are noted both with respect to speed and direction.

[2] Exploring why Karachi's rainwater has nowhere to go by Amar Guriro – Published in Dawn – Sep 07, 2017. Retrieved from https://www.dawn.com/news/1355990/exploring-why-karachis-rainwater-has-nowhere-to-go

The eleven years' wind velocity record (2001-2017) indicates that the velocity varies and ranges between 1.0 m/s to 13.4 m/s. The Tables 4.5 and 4.6 show the wind speed and direction respectively.

Table 4.6: Wind Speed (m/s) at 12:00UTC

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	2.6	3.4	4.3	5.6	7.5	8.1	6.8	7.3	5.5	3.7	2.0	2.4	4.9
2002	3.6	3.9	4.0	6.5	8.5	8.2	9.8	7.3	7.7	3.3	2.9	3.2	5.7
2003	4.0	5.0	5.4	5.2	7.7	8.8	6.7	7.1	6.0	3.2	3.1	3.0	5.4
2004	3.4	3.7	4.0	6.0	8.0	9.0	10.0	9.5	7.3	3.8	1.0	2.5	5.7
2005	3.6	4.2	4.8	5.1	7.1	7.5	9.0	6.9	6.4	3.9	2.0	1.5	5.2
2006	2.0	3.0	3.0	6.2	8.0	7.7	8.3	6.2	4.7	4.2	2.2	3.0	4.9
2007	2.0	3.7	4.0	4.0	6.0	6.3	N/A	N/A	N/A	N/A	N/A	N/A	4.3
2008	4.3	7.6	8.2	10.5	12.6	7.6	11.0	9.3	8.7	6.6	5.1	3.9	7.9
2009	7.0	7.2	7.9	9.3	9.8	9.7	9.5	9.3	9.1	6.1	5.0	3.9	7.8
2012	5.8	6.6	9.3	9.8	12.3	12.8	13.1	11.2	8.4	7.1	5.7	5.8	9.0
2013	5.2	6.9	9.0	10.3	11.5	10.8	12.0	11.2	10.3	7.7	5.1	4.5	8.7
2014	5.9	8.9	8.6	11.5	12.4	13.4	12.8	11.6	11.7	8.3	6.0	4.5	9.6
2015	6.9	10.3	10.1	11.5	12.8	12.3	13.7	12.3	10.5	8.7	5.6	5.8	10.0
2016	7.5	8.7	4.8	1.1	13.0	11.7	11.8	10.5	12.1	9.2	5.5	5.2	8.4
2017	7.0	8.0	10.8	12.1	12.8	11.5	12.1	10.3	8.7	8.5	5.4	7.4	6.9

Source: Pakistan Meteorological Department

Table 4.7: Wind Direction at 12:00UTC

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	S54W	S43W	S42W	S45W	S46W	S45W	N52W	S59W	S44W	N56W	S45W	S06W
2002	S67W	S52W	S51W	S55W	S51W	S42W	S54W	S45W	S48W	S56W	N54W	S41W
2003	S60W	N50W	S45W	S48W	S45W	S68W	S60W	S47W	S43W	S54W	S50W	S27W
2004	N27E	S46W	S53W	S49W	S52W	S54W	S54W	S62W	S56W	S47W	S45W	N86E
2005	N63E	S51W	S50W	S52W	S63W	S48W	S54W	S49W	S87W	S54W	S52W	N23W
2006	S48W	S62W	S50W	S57W	S64W	S60W	S67W	S78W	S51W	S53W	S49W	N79E
2007	S30W	S62W	S47W	S55W	S58W	S47W	S41W	S55W	S60W	S48W	S48W	N45E
2008	N45E	S47W	S54W	S51W	S52W	S39W	S50W	S52W	S46W	S39W	S38W	N
2009	N45E	S45W	S41W	S58W	S46W	S46W	S56W	S49W	S56W	S42W	S39W	S45E
2012	S3E	N56E	S62W	S46W	S61W	S51W	S66W	S51W	S53W	S41W	S41W	N9W
2013	N39W	S54W	S56W	S54W	S61W	S40W	S53W	S52W	S55W	S47W	S17W	N50W
2014	S72E	S54W	S43W	S46W	S46W	S45W	S54W	S48W	S85W	S45W	S49W	S45E
2015	S72E	S54W	S43W	S48W	S50W	S40W	S54W	S55W	S50W	S41W	S	S58W
2016	S43W	S36W	S48W	S54W	S54W	S45W	S48W	S36W	S51W	S45W	S43W	S36W
2017	S83E	S56W	S51W	S45W	S45W	S44W	S66W	S57W	S48W	S51W	S59W	N45E

Source: Pakistan Meteorological Department

Dew Point

Dew point is often a better measure of how comfortable a person will find the weather than relative humidity because it more directly relates to whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Figure 4.8 shows the dew point variation with percentile bands.

Over the course of a year, the dew point typically varies from 2°C (dry) to 26°C (oppressive) and is rarely below -8°C (dry) or above 27°C (very oppressive). There are two periods in the year that are most comfortable: The first is between January 1 and March 17 and the second is between November 10 and December 31. The air feels neither too dry nor too muggy during these periods.

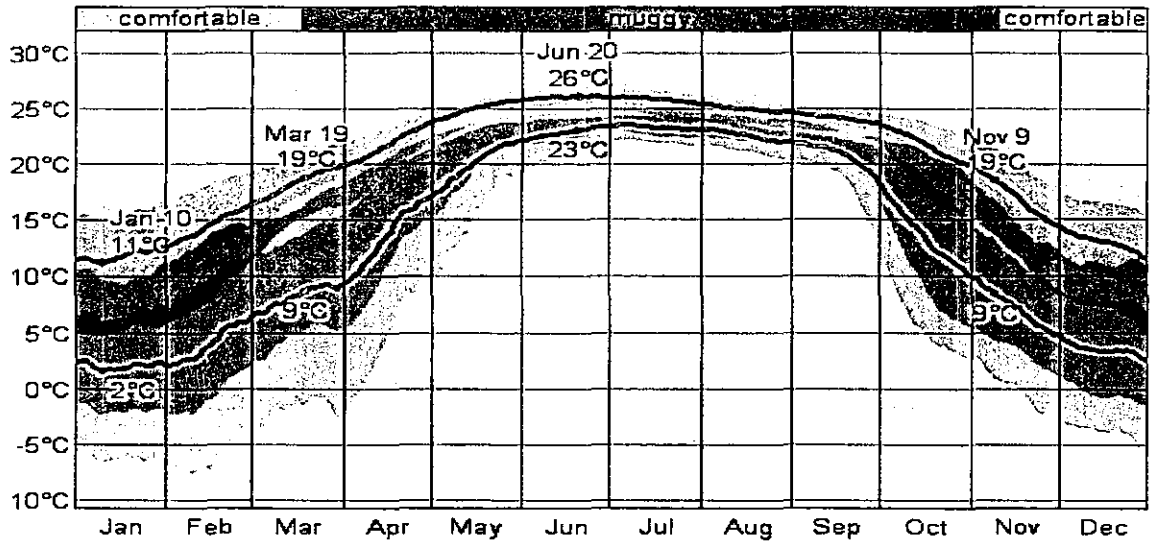


Fig 4.3: Dew point variation with percentile bands

Cloud Cover

The median cloud cover ranges from 4% (clear) to 85% (mostly cloudy). The sky is cloudiest on July 24 and clearest on November 14. The clearer part of the year begins around September 19. The cloudier part of the year begins around May 30. Figure 4.9 shows the median daily cloud cover with percentile bands.

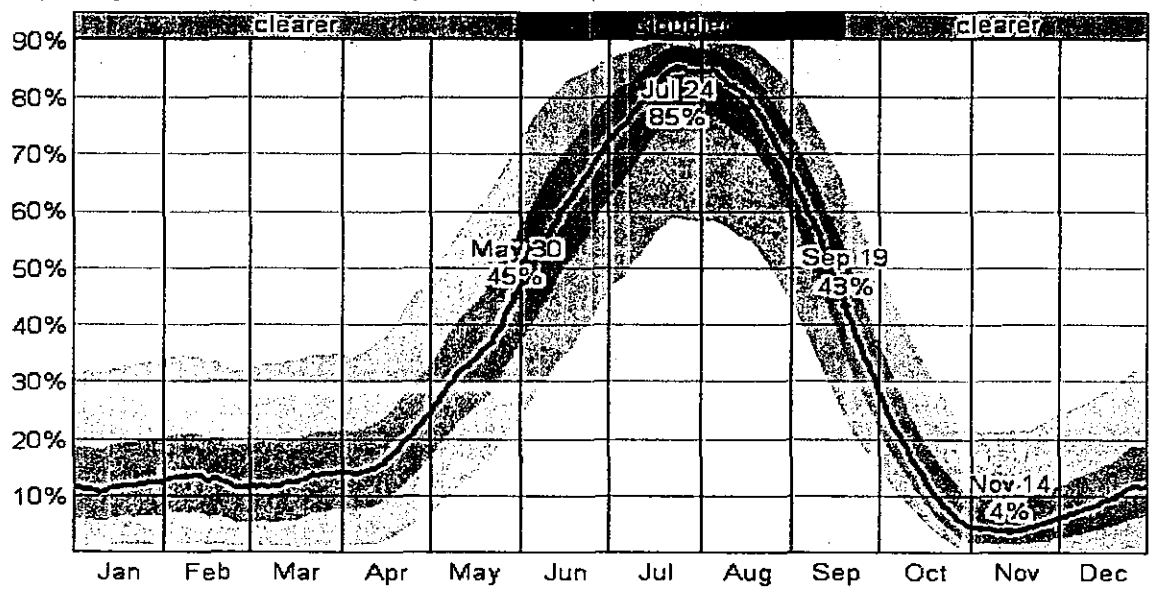


Fig 4.4: The median daily cloud cover (black line) with percentile bands (inner band from 40th to 60th percentile, outer band from 25th to 75th percentile

4.2.2 Ambient Air Quality & Noise

Inefficient transportation system and indiscriminate burning of garbage are the dominant sources of air pollution in Karachi. Operation of defective vehicles, use of low-quality fuel, and increase in the number of vehicles beyond the capacity of roads leading to frequent traffic jams are the main reasons for deterioration of ambient air quality. Emissions from stationary sources e.g. residential & business districts associated with fuel combustion for domestic use and power generation are also significant.

The environmental impact from vehicular exhaust emission is often neglected in Pakistan due to the lack of awareness in our society, which is the major factor contributing to vehicle emission that includes NO2 (Nitrogen dioxide), Carbon dioxide (CO2), Carbon monoxide (CO) and other pollutants. The implementation of CNG vehicles in Karachi may be counted as a significant achievement by any standards. It is perhaps the first instance, after Brazil and India, of alternative transport fuels being implemented on such a large scale in a low-income country. However due to adhoc attitude and lack of long-term policies, demand of natural gas including CNG outstripped supply, leading to curtailment of CNG supply in urban centers.

Project area in general represent the mixture of sparsely and moderately populated areas, commercial areas, highway and less-frequented internal and access roads. Air monitoring setup has been installed at the monitoring locations to collect ambient air quality data. Pollutants being monitored included NOx, SO2, CO, CO2, O3, SPM, PM2.5 and PM10.

Air quality monitoring was conducted at five locations in the macroenvironment. The criteria of site selection for air quality monitoring in the macroenvironment was based on representativeness of the location i.e. locations selected for monitoring are representative of the various type of activities (Industrial operations, traffic congestion etc.) in the macroenvironment.

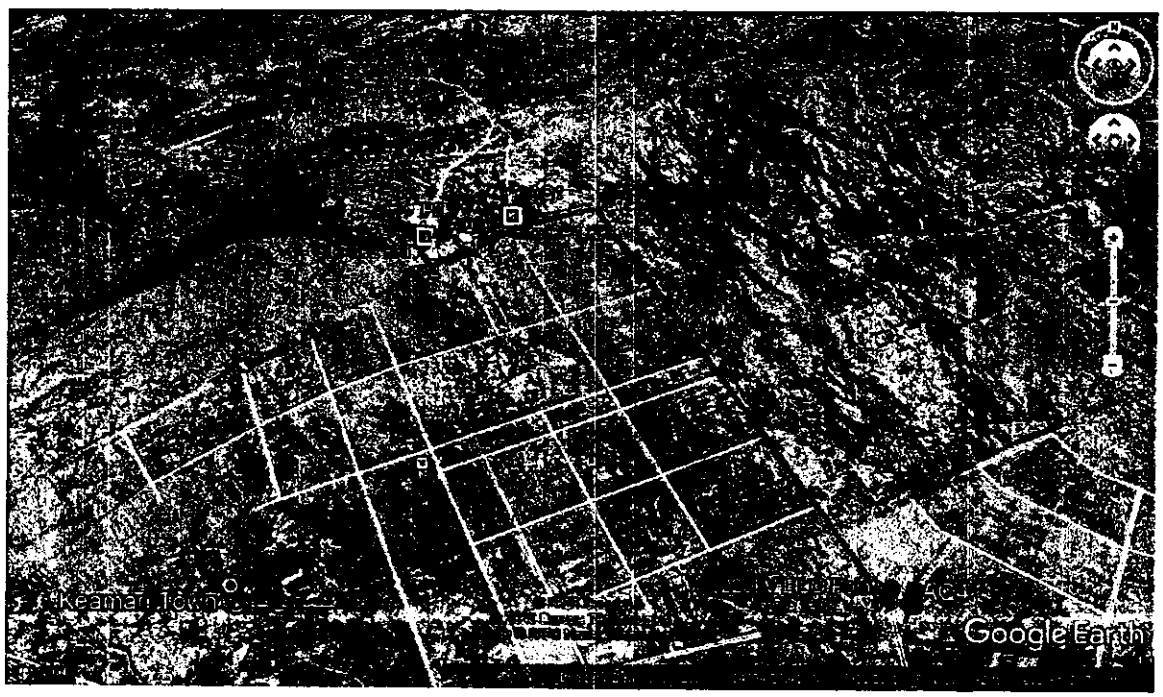


Fig 4.5: Air quality monitoring locations

The results of monitoring of the water quality are shown in Table 4.8.

Table 4.8: Results of Air Quality monitoring at selected locations

Parameter / Location	CO (mg/m³)	NO2 (µg/m³)	NO (µg/m³)	O3 (µg/m³)	PM10 (µg/m³)	PM2.5 (µg/m³)	SPM (µg/m3)	SO2 (µg/m³)
Grid Station – Location option#01	0.52	13.8	8.9	9.3	64.5	33.8	187.2	11.6
Grid Station – Location option#02	0.63	16.4	10.2	11.1	78.6	41.6	213	9.3
Near KDA Scheme 42 Road	0.71	19.2	13.3	12.7	83.4	47.8	238	10.1
Near 220kV LILO Interconnection point	0.83	20.7	15.2	13.8	91.6	49.7	243	12.3
Near 500kV LILO Interconnection point	0.47	8.8	11.6	10.3	73.3	37.7	188.9	5.8
Average	0.63	15.78	11.84	11.44	78.28	42.12	214.02	9.82
SEQS	5	80	40	130	150	75	500	120

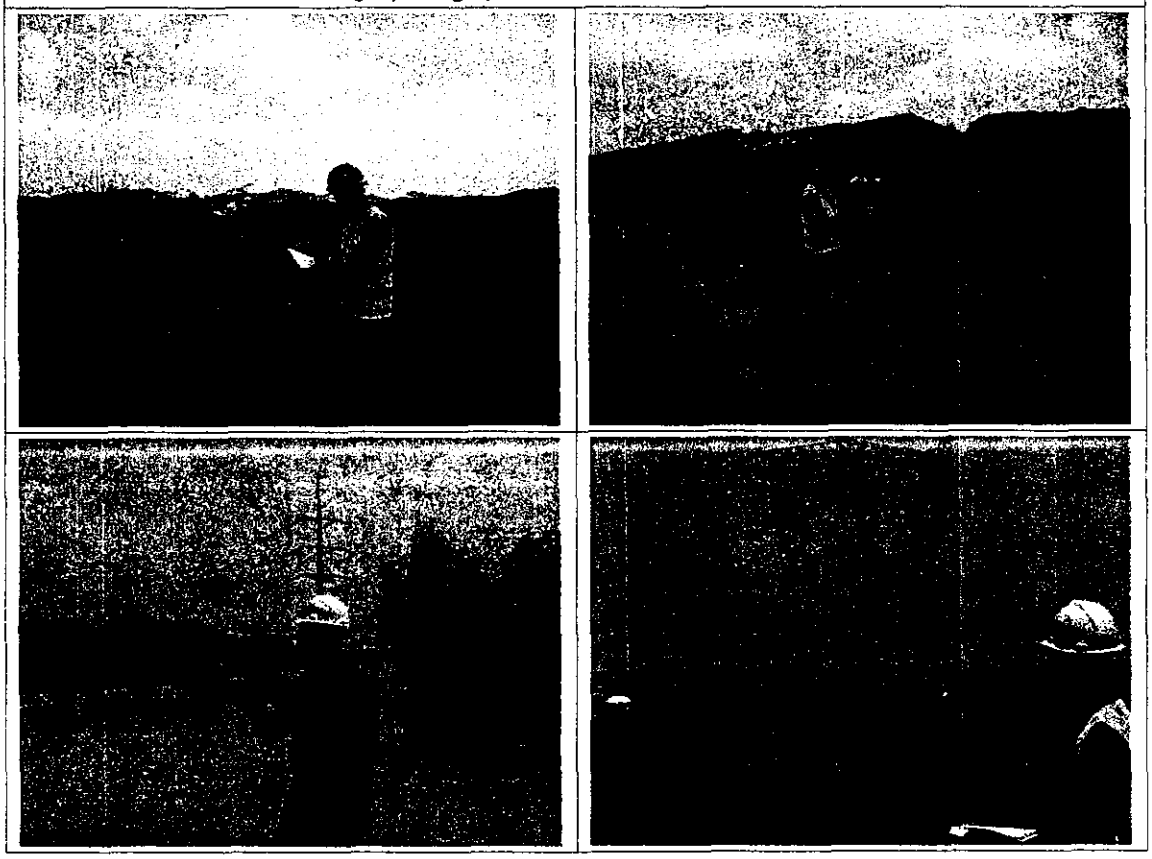
Based on the result of the survey, the average values of NO2, NO, CO, SPM, PM_{10}, $PM_{2.5}$ and SO_2 monitored in 5 locations are within the SEQS standards. It is due to remoteness of the area and sporadic spread and rural feature of the population.

The noise level data generated from the survey suggest that the noise levels in the project area slightly exceeds the SEQS standards for residential area with average value of about 59.4dBA. Predominant source of noise in the project area are light & heavy traffic with sound of strong wind blowing in the background due to flat open terrain and close proximity of sea coast.

Noise Levels – Project Area

S.NO.	LOCATION/SOURCE	SEQS Limits: 55dB(A) *Leq Noise Level Readings			
		1	2	3	Mean
1	Near Proposed Grid Station Site#1	57.7	55.4	56.2	56.4
2	Near Road Grid Station Site#1	61.2	63.3	60.1	61.5
3	Near Proposed Grid Station Site#2	57.4	58.4	59.6	58.4
4	Near Road Grid Station Site#2	63.3	61.1	64.3	62.9
5	Near KDA Scheme 42Rd Corner	60.2	61.8	59.8	60.6
6	Near 500 KvA LILO Site	54.2	55.1	56.3	55.2
7	Near Community area 500 KvA LILo Site	56.6	55.9	57.2	56.5

Ambient air and Noise Monitoring – photographs



4.2.3 Hydrogeological features of Karachi Region

1. Hydrogeology of Karachi

Hydrogeologically, the city of Karachi lies in the Hub River Basin and the Malir River Basin. The Malir River Basin is drained by the Malir River and the Lyari River. The aquifer of Karachi is, therefore, mainly recharged by seepage from Hub River, Hub Dam as well as the Malir and the Lyari Rivers. The Hub River lies on the western frontier of Sindh and for some distance the boundary between Sindh and the Baluchistan provinces. It located about 30 km to the west of Karachi, along the Karachi- Lasbela boundary. It falls into the Arabian Sea near Cape Monze, with a total drainage course length of 336 km.

During the past several years, a number of pumping wells have been installed to meet requirements for the irrigation-water supply (to raise vegetables, fruits, dairy and poultry) and drinking-water supply for Karachi. Excessive pumping of groundwater and continuous lowering of water-table is likely to result in intrusion of seawater into the Malir Basin under natural seepage conditions and under artificially induced conditions of recharge of saline seawater in the coastal aquifer(s) of Karachi.

2. Surface water resources

There are no major surface water resources in close proximity to the project. An embankment dam lies approx.5km southwest of project site. Arabian sea coast lies approx. 16km west of grid station site. Hub River lies about 7km north of the grid station site. Lyari river lies approx.14km southeast of the site, where it drains into Arabian sea through Manora channel.

3. Groundwater sources

The aquifers close to the coastal belt are mostly saline and unusable for domestic purposes. The aquifers near the Hub River bed are well developed and are source of water for agriculture and other domestic purposes. The aquifers are estimated to lie at depths of 50-100 m.

In the upper Malir basin, the main areas of ground water extraction are the Thaddo valley upstream of Goth Rabu; Mol valley near Thano Shah Beg and upper stream; Turi Nala valley upstream of Goth Hasan Ali; Jarandi valley upstream of Goth Sufan; the Mol valley particularly in the Thano Shah Beg and Kathore areas, and Khadeji valley mainly in the Sari Sing area. Practically all the wells are located along stream banks and obtain water from the unconsolidated stream bed deposits. The depth of water varies from place to place ranging from 1.5m to about 30.5m. However, it ranges from 7.6 to 2.3m in most of the wells. Water extraction from 100 to 500 GPD, whereas some of the irrigation wells worked by diesel pumps yield up to 1200 GPD.

4. Groundwater Recharge Characteristics/Sea water Intrusion

Presently, coastal Karachi is known to have five sources of recharge to its groundwater reserves.

i. Rainfall,
ii. Indus River water supply
iii. Hub-River & Hub Lake water supply
iv. Polluted Lyari and Malir rivers/ contributory channels draining mixtures of domestic industrial and agricultural wastewater, composed of pre-said three sources
v. Seawater

The possibilities of major contribution to groundwater recharge of shallow/phreatic aquifer directly by local rainfall seems very small, due to very poor frequency of rainfall events and rainfall intensities in the Karachi and high evaporation rates. The long-term (15 years annual record) mean monthly average precipitation for Karachi is between 0-15 mm during the months of January to June, 23 - 91 mm during the months of July to September, and 0-7 mm during the months of October to December.

4.2.4 Topography

Topographic map of the project area and surroundings is provided in the figure below;

Fig 4.6: Elevation map of the Project area and surroundings

Elevation ranges from being lowest, approx. 13 ft at Arabian sea coastline to the highest of about 659ft at Lal Bakhar Hill. Project area in general, has the elevation in the range of 85ft to 276ft.

4.2.5 Geology and Geomorphology

Geology: Karachi is the part of major synclinorium stretching from Ranpathani River in the east to Cape Monze in the west, Mehar and Mole Jabal (Mountains) in the north. Within the synclinorium a number of structures such as Pipri, Gulistan-e-Jauhar, Pir Mango and Cape Monze are exposed. The presence of concealed structures under the Malir River valley, Gadap and Maripur plains can fairly be deduced.

Rock aggregates, sand, limestone and clay are some of the potentials for gainful utilization. Gulistan-e-Jauhar member of the Gaj formation offers groundwater potential for limited use. The area is underlain by rocks of sedimentary origin ranging in age from Eocene to Recent. Major structural trends and the basin axis strike generally south but with a "bulge" to the east also called Karachi Arc (Bender and Raza 1995).

Geomorphology of Karachi: Karachi is located in the south of Sindh, on the coast of the Arabian Sea. It covers an area of approximately 3,600 km2, comprised largely of flat or rolling plains, with hills on the western and northern boundaries of the urban sprawl. The city represents quite a variety of habitats such as the sea coast, islands, sand dunes, swamps, semi-arid regions, cultivated fields, dry stream beds, sandy plains, hillocks. Classified according to physiographic features, Karachi City District can be divided into three broad categories: Hilly Region (Mountain Highland), Alluvial Plain (Piedmont Plain) and Coastal Areas (Valley Floor). The metropolitan area is divided by two non-perennial river streams namely Lyari and Malir Rivers. The Malir River flows from the east towards the south and centre, and the Lyari River flows from north to the south west. Gujjar and Orangi are the two main tributaries of the Lyari River while Thaddo and Chakalo are the main tributaries of the Malir River. The dry weather flow of both rivers carries urban sewage that is

ultimately drained in the Arabian Sea. Among the various physiographic features, low flat-topped parallel hills devoid of vegetation, interspersed with widespread plains and dry riverbeds are the main topographic characteristics of the city.

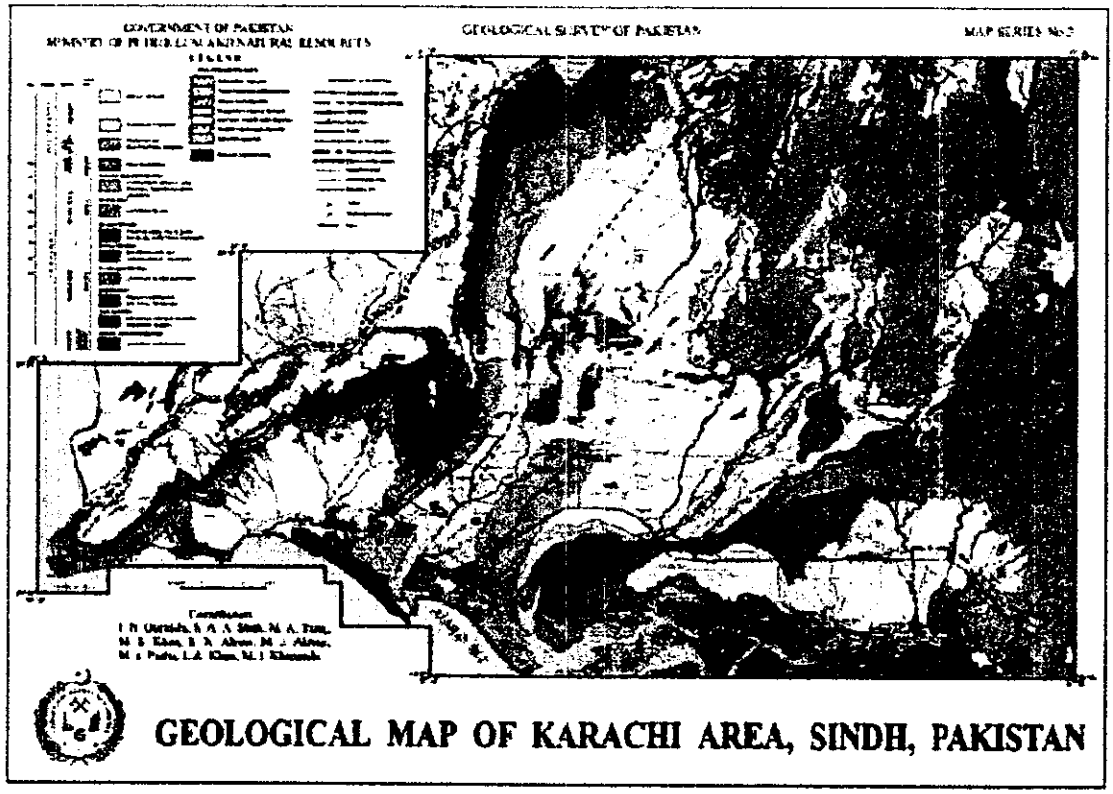


Fig 4.7: Geological map of Karachi

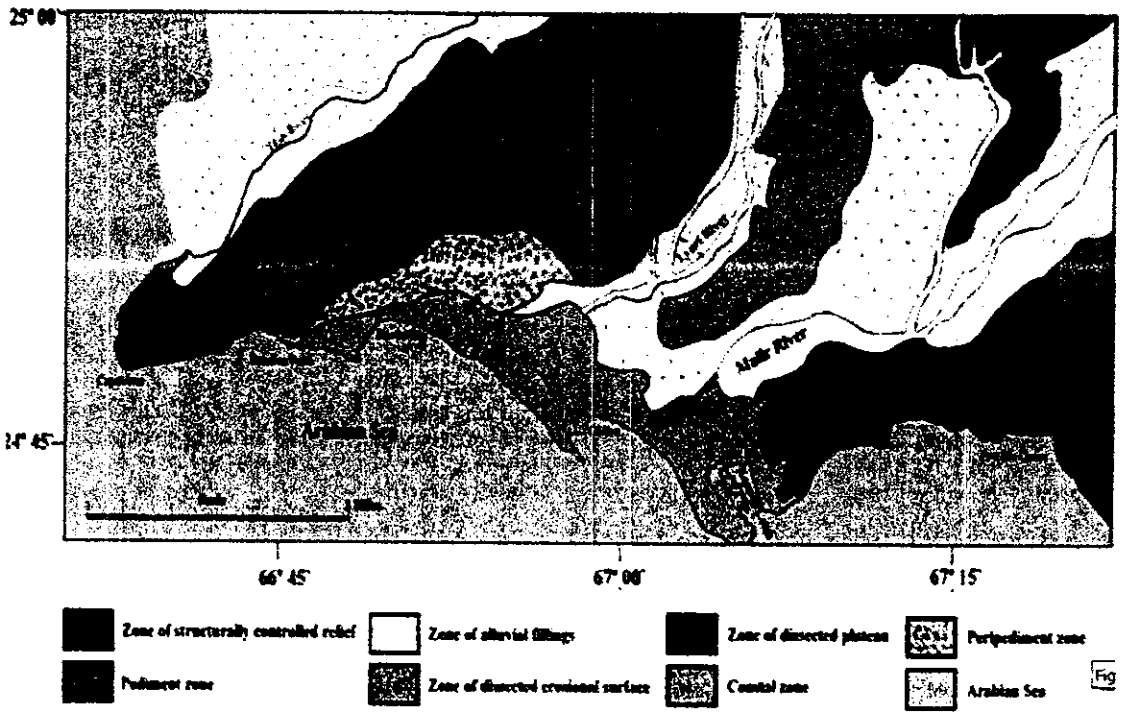


Fig 4.8: Geomorphology of Karachi[3]

[3] Soil Classification as a Tool for Evaluating Soil Behavior as Foundation Materials by Hamid. G, Hassan. K, et al. (2014)

Project area falls in Pediment zone and Zone of structurally controlled relief, as per the above map.

4.2.6 Seismicity

Seismicity in the Karachi region is related to the pressure potential being built at the convergence of the three lithospheric plates: Indian, Arabian, and Eurasian at the Triple Junction (figure below) formed by the intersection of Owen fracture zone, the Makran subduction zone and the Ornach-Nal fault. The Murray Ridge extends northward into Pakistan, to unite the Ornach-Nal-Chaman Fault system onshore, displaying a strike-slip boundary between the major tectonic plates of India and Eurasia[4].

Karachi and its environs fall in the synclinorium, described earlier as being part of Indus deltaic region. Recession of the delta and its retreat towards the southeast dried up its numerous channels, estuaries and creeks that characterize the synclines and are part of the active faults. Tectonic instability of this region can be attributed to this large number of reverse and tear faults and the recently described wrench faults.[5]

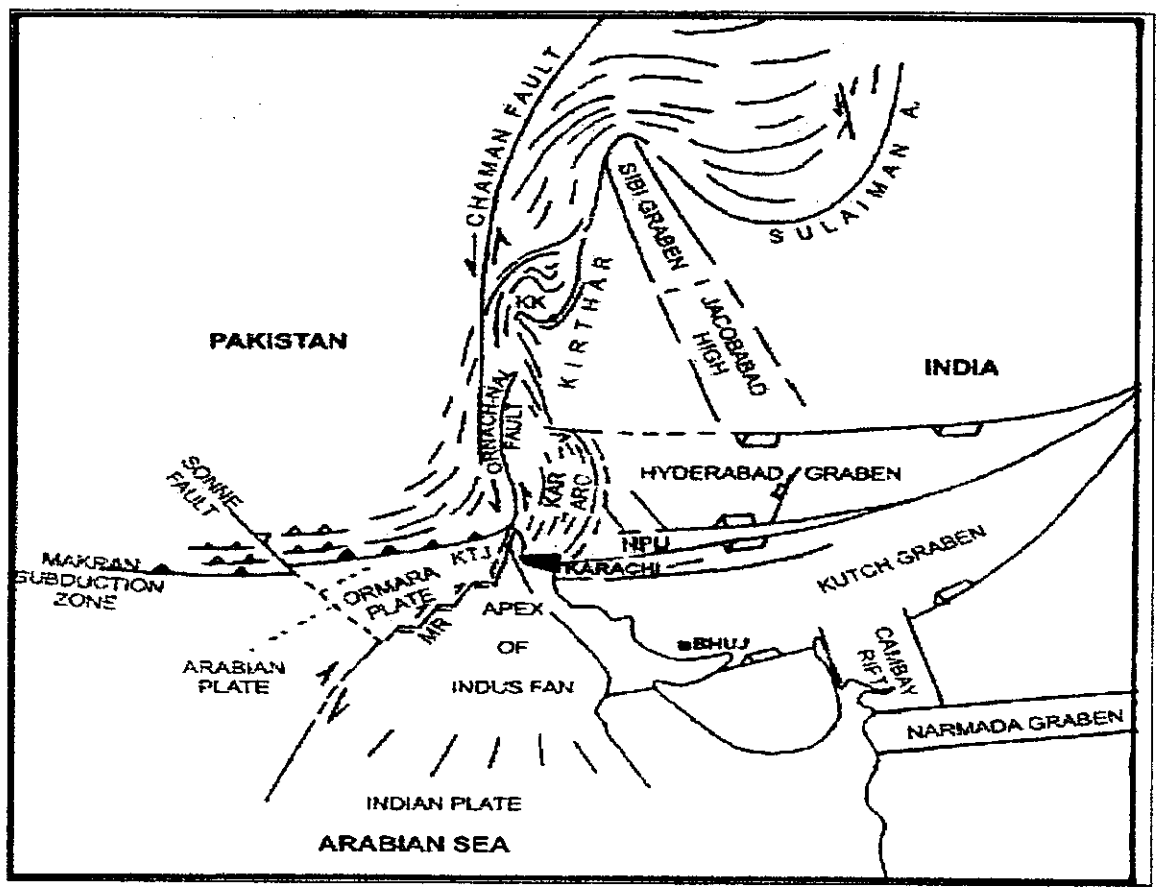


Fig 4.9: Schematic plate tectonic sketch map showing the Karachi Arc and its regional tectonic framework

Seismic activity in the region is the result of the triple junction as well as the Karachi Arc, located in southeastern Pakistan, as a large fold and thrust belt that shows Neogene thin-skinned eastward movement (Sarwar and DeJong, 1979; Schelling, 1999). Seismic activity in and around the region shows that the Karachi Arc has been active since long in prompting the eastward movement of the delta. It is possible that the movement is related to the rebound that takes

[4] (Baloch, S.M. & Quirk, D.G., Mesozoic to Neogene Tectonism and Evolution of Murray Ridge, Pak. Jour. of Hydrocarbon Research, Islamabad, 13).

[5] (Riding the mobile Karachi arc, Pakistan: Understanding tectonic threats Ghulam Sarwar and Anwar Alizai, Journal of Himalayan Earth Sciences 46(2) (2013) 9-24).

place after mass shift. Sarwar has suggested that the eastward creep of Karachi Arc is directly related to active subsidence of the Hyderabad graben that underlies it and also defines the northern and southern limits of the Karachi Arc.[6] It may be added that subsidence such as that on Southern coast of Sindh, occurs naturally as a result of plate tectonic activity above active faults, and in places where fluid is expelled from underlying sediments and is common at river deltas that may have receded. Earthquakes arise and result from the release of the force along the growth fault plane. As a result, many different growth faults are created as sediment loads shift basinward and landward.

According to a map created by the Pakistan Meteorological Department, the country is divided into 4 zones based on expected ground acceleration. The areas surrounding Quetta, those along the Makran coast and parts of the NWFP, and also along the Afghan border fall in Zone 4. The rest of the NWFP lies in Zone 3, with the exception of southern parts of this province, which lie in Zone 2. The remaining parts of the Pakistani coastline also lie in Zone 3. The remaining parts of the country lie in Zone 2. According to this classification, the Project site would be placed in Zone 2B.

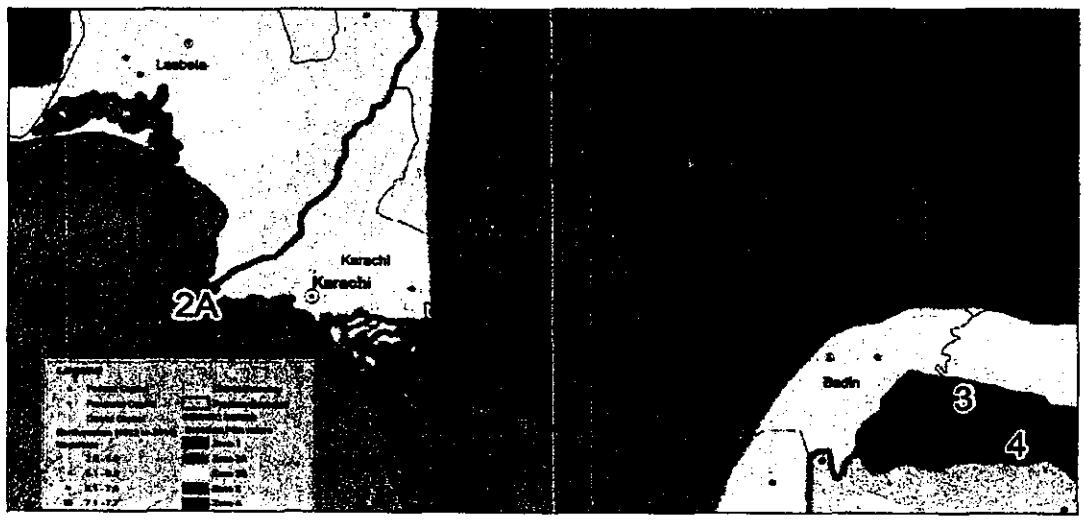


Fig 4.10: Seismic Zones between Karachi[7]

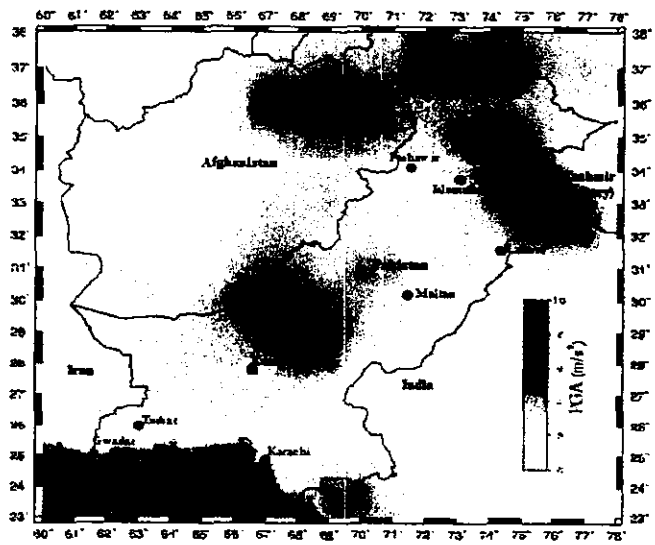


Fig 4.11: Seismic Hazard for Pakistan in terms of Peak Ground Acceleration (PGA)[8].

[6] (Sarwar, G., 2004. Earthquakes and the Neo-Tectonic Framework of the Kutch-Hyderabad-Karachi Triple Junction Area, Indo-Pakistan. Pakistan Journal of Hydrocarbon Research, 14, 35-40).

[7] Map data source(s): PMD, GSP, Pakistan Engineering Council – Prepared by Al hasan Systems Private Limited

[8] PMD Seismic Monitoring and Early Tsunami Warning Centre - http://seismic.pmd.gov.pk/seismicnew/map2.html

4.2.7 Water Supply and Sewerage System

The water supply and sewerage system are managed by Karachi Water Supply & Sewerage Board (KW&SB). Present water supply system of Karachi City has a supply capacity of about 650 MGD. Karachi receives about 580 MGD, well below the demand of over 1,100 MGD.

Table 4.9: Description of Water Supply Schemes for Karachi Bulk Water Supply

S. No	Description of Water Supply Schemes	Rated Supply (MGD)	Actual Supply (MGD)
1	Haleji Scheme	30	-
2	Greater Karachi (GK) Bulk Water Supply Scheme Stages I to IV	280	280
3	K-II Scheme	100	100
4	Additional Water Supply from GK BWS System	40	40
5	(To) Pakistan Steel	26	26
6	(To) Port Qasim Authority	7.5	7.5
7	K-III Scheme	100	100
8	Hub Dam	100[9]	70[10]
Total		683	623[11]

Source: KW&SB, Express Tribune, Wapda

Karachi had been allotted 650 MGD from River Indus through Keenjhar-Gujjo Water Supply System. However, they actual supply is below 580 MGD. KW&SB had planned to revive Haleji Lake to supply 65 MGD to Karachi or to tap this capacity from Keenjhar-Gujjo canal system for supply to Karachi. So far no substantial work on either of the projects have been reported. To meet the Karachi water demand, K-IV project was conceived in 2007 to supply 650 MGD additional water to Karachi. The project has been delayed several times, and the Phase-I of the project which was to supply about 260 MGD water to Karachi is yet to be completed.

As mentioned in the table above, the given water supply of 653 MGD may further be curtailed to about 406 MGD due to considerable losses in the water supply system[12][13].

The existing sewerage catchment area which covers 18 towns in Karachi city is divided into three districts, namely: respective catchment area of T.P-1, T.P-2 and T.P-3. KW&SB formulated the Master Plan of the water supply and sewerage system in cooperation with JICA in 2008. However, most of the projects for rehabilitation and augmentation proposed in the Master Plan study, etc. have not been carried out due to financial constraint of KW&SB. Due its negligence to maintain and operationalize the treatment plants, not only municipal effluent but industrial effluent also is directly going into sea destroying marine life. It is estimated that the city's sewage (about 470MGD) and industrial waste (about 90MGD) are being dumped into the sea largely without treatment[14].

In January 2018, the Supreme Court appointed Honorable Justice Amir Hani Muslim, a retired Supreme Court judge, the new head of the water commission with a mandate to 'implement" the recommendations of the previous commission

[9] http://www.wapda.gov.pk/index.php/projects/water-sector/o-m/hub-dam
[10] Perpetual issue: Leaks in the system create water crisis in Karachi By Syed Ashraf AliPublished: September 15, 2019 in Express Tribune. https://tribune.com.pk/story/2056804/1-perpetual-issue-leaks-system-create-water-crisis/
[11] Losses unaccounted for.
[12] Water woes: Karachi goes thirsty as its water goes to waste By Syed Ashraf AliPublished: July 29, 2019 Express Tribune. https://tribune.com.pk/story/2023808/1-water-woes-karachi-goes-thirsty-water-goes-waste/
[13] Perpetual issue: Leaks in the system create water crisis in Karachi By Syed Ashraf AliPublished: September 15, 2019 in Express Tribune. https://tribune.com.pk/story/2056804/1-perpetual-issue-leaks-system-create-water-crisis/
[14] Panacea for Karachi's water woes? By Kazim Alam. Published in Dawn on Sep 09, 2019. https://www.dawn.com/news/1504238/panacea-for-karachis-water-woes

that the apex court had formed in December 2016 and which delivered its final report in February 2017 and was head by Justice Mohammad Iqbal Kalhoro. Treatment of sewage, a much-neglected issue, saw a revival under the commission. As of February 2017, all the three sewerage treatment plants of Karachi were dysfunctional, each had a capacity of about 50MGD. A fourth treatment plant has been planned to be set up in Korangi. Commission under Justice Amir Hani Muslim lasted till January 2019. In terms of sewage disposal and treatment, following achievements can be credited to the efforts of commission;[15][16][17]

- Rehabilitation work on TP-1 (SITE) is likely to end in the first half of 2020 as the government is increasing its capacity to 150MGD.
- TP2 (Mehmoodabad) is permanently closed because of a land-related dispute, so the government is setting up a 180MGD plant in Korangi instead (TP4) which should be operational by late 2020.
- TP3 (Mauripur) became functional last year. The provincial government first increased its capacity to 73MGD and is now taking it to 180MGD. These three plants will do primary and secondary treatment of wastewater, which will let the KWSB discharge it into the sea in line with the National Environmental Quality Standards (NEQS)/SEQS.
- Five industrial effluent treatment plants are scheduled to be built in the SITE, Trans-Lyari, F.B, Landhi and Superhighway areas.

Private sector has also sprung into action, for instance, HUBCO has submitted an unsolicited proposal to the Sindh Public-Private Partnership Unit (PPPU) to set up a wastewater recycling plant at TP-1 (SITE) of 50MGD capacity[18].

4.2.8 Water Quality

Because of unsafe and insufficient water supply and low sanitation coverage, as well as people's poor hygiene habits, around 60 percent of children suffer from diarrhea that is fatal if not treated in time. Concerns have been raised by various quarters about contamination in drinking water supply in the distribution network and possible linkages with water borne diseases in the city.

Report of commission of inquiry of February 2017 indicated that all the 7 filter plants of KW&SB are malfunctioning. The clarifiers at all the Filter Plants, which were acting as circular sedimentation tanks are non-functional. The water which was full of all contamination that includes turbidity, color, odor & taste, TDS, Hardness, Calcium, Sodium, Potassium, Chloride, Sulfate, Fluoride, Nitrate and Iron etc. in high volume was being supplied to the people of Karachi.

The analytical data compared with WHO and NEQS water quality standards demonstrated that out of 84 drinking water samples, 08 (10%) water samples were found unsafe for drinking due to presence of turbidity values beyond the safe limits (5 NTU). The maximum value for turbidity was measured as 24.4 NTU. One sample (1.2%) was found unfit for drinking due to presence of color, 09(11%) water samples were found unsafe due to presence of Total Dissolved Solids (TDS) contents beyond permissible limit (1000mg/l). Maximum concentration for TDS was recorded 3846 mg/l. 07 water samples (8%) were found unsafe for drinking purpose due to presence of hardness values beyond WHO permissible limit (500mg/l). The highest value for hardness was measured as 1100mg/l whereas 30mg/l as lowest. Eleven water samples (13%) were found unfit for human consumption due to presence of sodium content beyond the maximum permissible limit (200mg/l) recommended by WHO for human consumption. The highest value for sodium was measured

[15] Ibid
[16] Judicial commission submits its fifth report in SC by Mohammad Hussain Khan. Published in Dawn 12, 2018. https://www.dawn.com/news/1450835
[17] Water commission records improvement, wants stakeholders to tap into its success. Express Tribune Dec 13, 2018. https://tribune.com.pk/story/1865552/1-water-commission-records-improvement-wants-stakeholders-tap-success/
[18] Panacea for Karachi's water woes? By Kazim Alam. Published in Dawn on Sep 09, 2019. https://www.dawn.com/news/1504238/panacea-for-karachis-water-woes

as 835mg/l. Seven samples (8%) were found unfit for human consumption due to presence of sulfate content beyond the safe limit recommended by WHO (250mg/l). The highest value for sulfate was measured 440mg/l. Eight water samples (10%) were found unfit for human consumption due to presence of chloride ion concentration beyond maximum permissible limit (250mg/l) recommended by WHO for human consumption. The highest value for chloride was measured as 1483mg/l.

Fluoride content was found exceeding WHO limit (1.5mg/l) in 03 (2%) water samples. The highest concentration for fluoride was measured as 2.23mg/l. Two water samples (2%) were found contaminated with nitrate–nitrogen content beyond the safe limit (10mg/l) recommended by WHO for safe drinking water. The highest concentration for nitrate nitrogen was recorded 20.45mg/l. One sample (1.2%) was found polluted with iron content beyond the safe limit recommended by WHO (0.3mg/l).

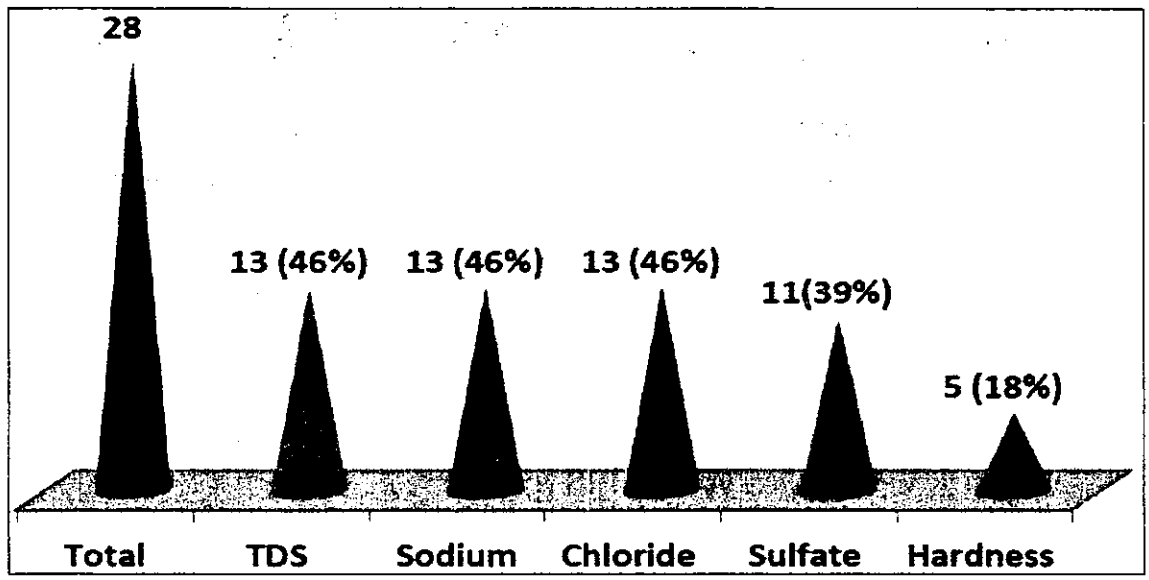


Figure 4.12: Percentage samples beyond permissible limit for different parameters in Karachi

Sixty Seven out of 84(80%) drinking water samples collected from surface and subsurface (ground water sources) used for drinking purpose were found unsafe for human consumption due to presence of Total coliforms (bacteriological contamination) beyond the WHO recommended values (0/100ml). 30(36%) water samples were found fecal contaminated i.e. presence of E. coli. The E. coli concentration lies in the range of 01 too numerous to count cfu / ml exceeding WHO limit recommended for drinking water (0/100ml). While, only seventeen water samples (20%) were found bacteriological safe for drinking purpose.

Overall data shows that out of 84 samples 67(80%) were found unsafe for drinking purpose, while only 17(20%) samples were found fit for human consumption for analyzed parameters under prescribed standards.

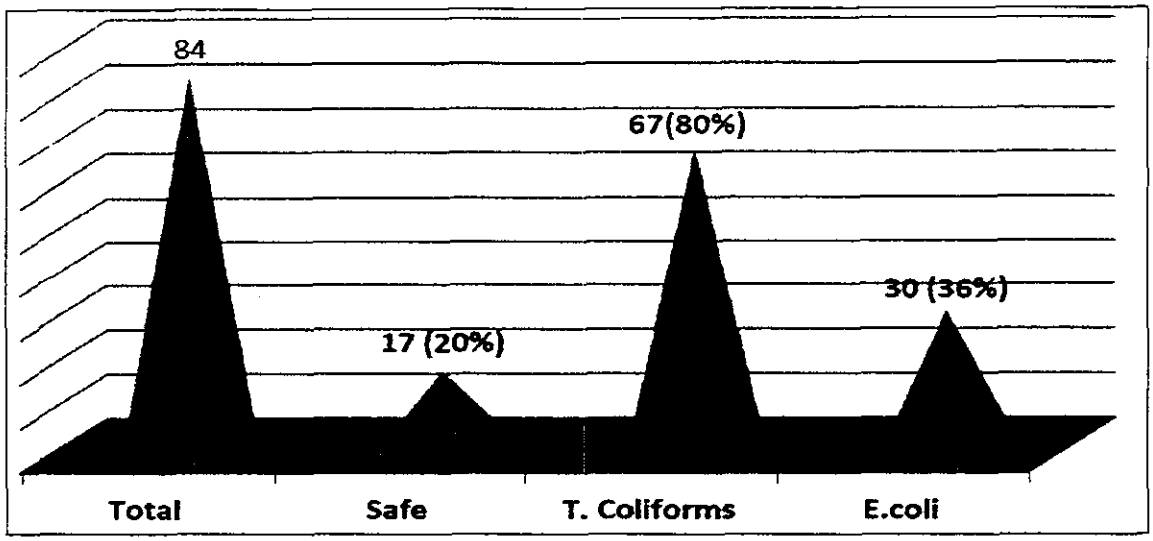


Fig 4.13: Percentage samples beyond permissible limits for bacteriological contamination in Karachi

As per the fifth interim report of implementation commission, rehabilitation of filter plants was at an advance stage of procurement and work orders were expected to be issued[19].

4.2.9 Storm Water Drainage

Following Table outlines stormwater drainages and nallahs under each township administration. Drainages are artificial water channels for stormwater drainage; on the contrary, nallahs are natural water channels. Many drainages are connected to nallahs and some drainages connected to river directly; Nallahs discharge into rivers such as Lyari River and Malir River receiving stormwater. As sewage collection system in Karachi City is not enough and its maintenance is not satisfactory, stormwater drainage and nallahs have to receive sewage all year long in addition to stormwater in rainy season.

Table 4.10: Town-wise Stormwater Drainage/Nallah Length

Town	Depth (m)	Width (m)	Length (km)
1. Keamari Town	1.21	0.91~3.04	7.62
2. SITE Town	2.13	3.65	16.08
3. Baldia Town	1.22	2.43	11.77
4. Orangi Town	1.52	2.43~3.65	34.1
5. Lyari Town	1.37	0.6~13.7	19.4
6. Saddar Town	1.37	3.05	11.14
7. Jamshed Town	1.5	2.43	33.8
8. Iqbal Town	3.64	2.4~15.2	28.0
9. Faisal Town	1.22~4.57	1.52~24.0	20.1
10. Landhi Town	1.22	2.43	35.36
11. Korangi Town	1.52	2.74	36.4
12. North Nazimabad Town	1.22	2.4	30.7
13. North Karachi Town	1.22	2.4	45.1
14. Gulberg Town	1.37	2.4	22.1
15. Liaquatabad Town	1.52	3.65	19.5
16. Malir Town	1.22	3.04	6.15
17. Bin Qasim Town	1.22	3.64	14.63
18. Gadap Town	1.22	3.65	24.43
Total			**416.38**

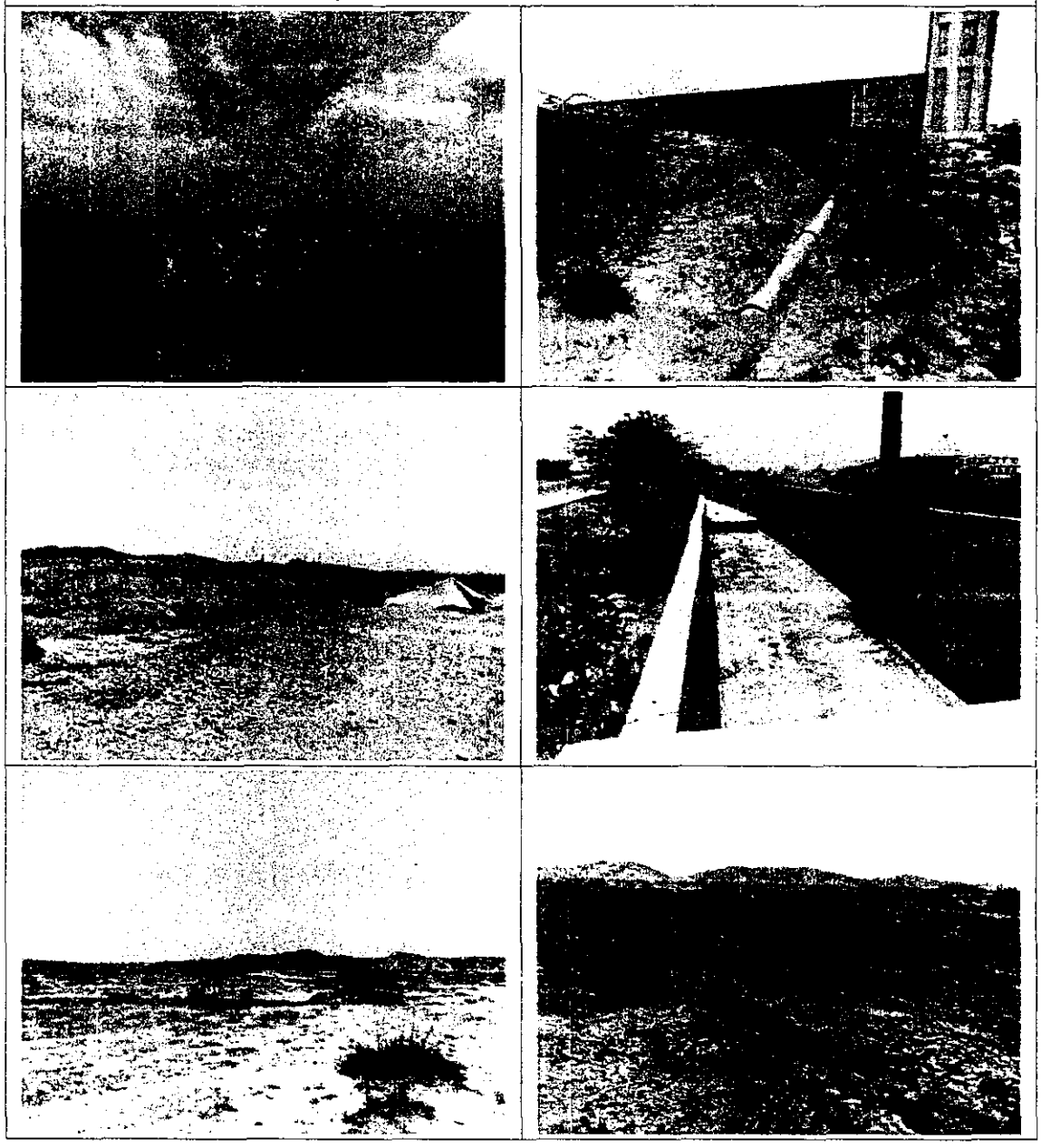
Source: KWSB

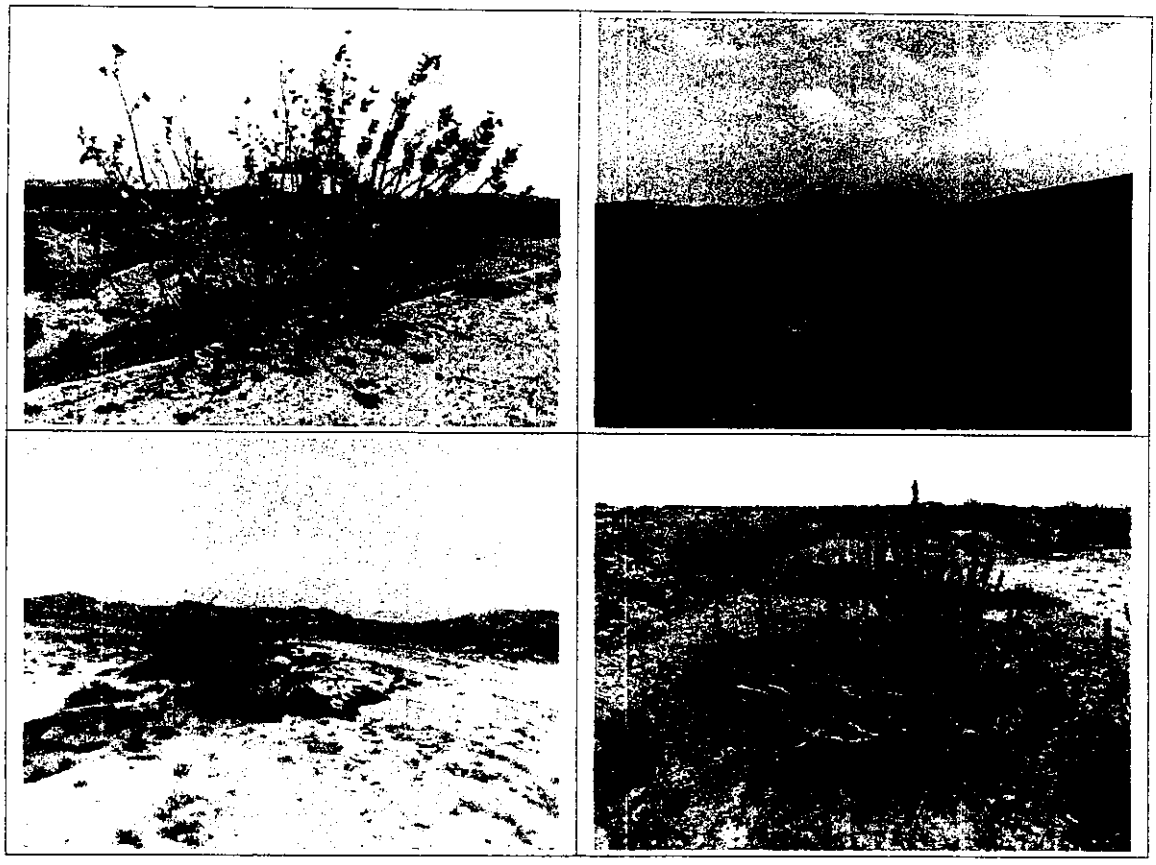
[19] Judicial commission submits its fifth report in SC by Mohammad Hussain Khan. Published in Dawn 12, 2018. https://www.dawn.com/news/1450835

There are no exclusive pumping facilities for stormwater drainage in Karachi City. However, many pumping stations called "ejector", which were constructed for sewage discharge to natural nallahs or rivers have worked as stormwater pumping facilities in rainy season.

Roadside drains are usually cleaned by KW&SB one to two months before monsoon season every year. Removed and collected silt/garbage is conveyed to solid waste disposal sites. However, roads are to be cleaned afterwards by town administration and silt/garbage is transferred to drains again. This is said to be how inundation is caused. In addition to above mentioned administrative issues, many drains and nallhas have been already encroached on by illegal houses and buildings. Strong enforcement of building code and other relevant laws is required. Another major issue with malfunctioned drains/nallahs is that garbage is easily and routinely dumped to these facilities, which leads to their reduced sections. Comprehensive solid waste management system has to be introduced in the city to overcome this problem.

Drainage patterns in the area (natural and man-made)





4.3.2 Fauna

The project site land is mostly barren and sparsely inhabited with little vegetation comprising mostly bushes, with the exception of areas along N-25. Due to human disturbance and shrinking habitat, only nominal fauna could be recorded on the site. However, the habitat of common wild animals, who could be found if there had been no disturbance in this area, comprises: Jackal, Porcupine, Fox and Wild Hare. Birds of the eco-zone likely include Grey Partridge, Common Quail, Spotted Owlet, Indian Nightjar, Woodpecker, Passerines, etc. Reptiles of the area could include Monitor Lizard, Spiny-tailed Lizard, Krait, Vipers and Rat Snake.

Threats

At present, there are no serious threats to the animal species, most of which have already moved to the distant surrounding area due to disturbance. Only the species adapted to the presence of humans occur in the area. These include Rodents, Squirrels, and Birds usually associated with human habitations in the vicinity of water points or garbage areas where food is available. Lizards may be surviving well in the rocky or wasteland area even with sparse vegetation.

4.4 Description of Socio-Economic Environment

The social baseline chapter provides a comprehensive review of the socio-economic conditions of the project area. This socio-economic profile is based on a literature review and several primary data gathering activities including site visits, sample socio-economic survey of stakeholders in the area and consultations with primary and secondary stakeholders. This social baseline provides an overview of the socio-economic conditions of the people who reside and work in the project vicinity. It also includes an assessment of the resettlement impacts during the construction and operation phase of the project. An assessment of public utilities and social services (education and health facilities) in the area was also carried out.

International best practice for EIA studies demands an assessment of the proposed project components with the Sustainable Development Goals (SDGs) defined by the UN. In 2017, the global indicator framework was developed and agreed upon by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs). Goal 7 of the SDGs aims to correct this enormous imbalance by ensuring everyone has access to affordable, reliable, and modern energy services by the year 2030. To expand energy access, it is crucial to enhance energy efficiency and to invest in renewable energy. It is time for a new global partnership on sustainable energy for all, guided by Sustainable Development Goal 7 on universally accessible, efficient, clean, and reliable energy sources and services. Moreover, in line with Social Safeguards Guidelines of the World Bank (ESMF, 2018) and Asian Development Bank (SPS, 2009), all development projects must be screened to assess the resettlement impacts and categorize the project (A, B, or C) according to the severity of the resettlement impacts.

The social baseline chapter helps in understanding the existing socioeconomic conditions of the project area as well as the larger macro-environment under which the project is falling. The social baseline is divided into macro and micro environment of the project area. Macro environment encompasses District West of Karachi Division under which the project area is falling. The discussion on macro environment covers the administrative setup, demography, education and health profile of the area. The immediate neighborhood of the project area is considered to be the micro-environment of the project and covers land use, education, health and utilities profile of the area.

4.4.1 Macro Environment

Administrative Context

The Karachi Division was abolished in 2000 and five districts of Karachi were merged in City District Karachi. The City District Karachi was divided in 18 Towns and 178 union councils. On 11 July 2011, Sindh Government restored again 5 districts of Karachi division and abolished City District Government Karachi. In November 2013, a new district (6th), Korangi was formed by splitting District Karachi East. Now Karachi Division has District Central, District East, District Malir, District South, District Korangi and District West. These districts form the Karachi Division now. There are also six military cantonments, which are administered by the Pakistan Army.

The Proposed project "500/220/132 kV KKI Grid Station and associated 500 kV and 220 kV LILO Overhead Transmission Lines" is located near Hawkesbay, Hub chowki which fall under the jurisdiction Maripur sub-division of District West, Karachi. District West is located in the western part of Karachi. The district covers a total area of 85 Sq.km while Maripur sub-division covers an area of 43.4 Sq.km, covering almost half the area of the entire district. A total of 7 sub divisions and 1 cantonments fall under District West Karachi which include Baldia sub-division, Harbour sub-division, Mango Pir sub-division, Maripur sub-division, Mominabad sub-division, Orangi sub-division, Sindh Industrial Trading Estate (Site) sub-division and Manora Cantonment.

Table 4.11: Covered Area of District & Cantonment

District West	Maripur Sub-Division
630 Sq. km	364 Sq. km

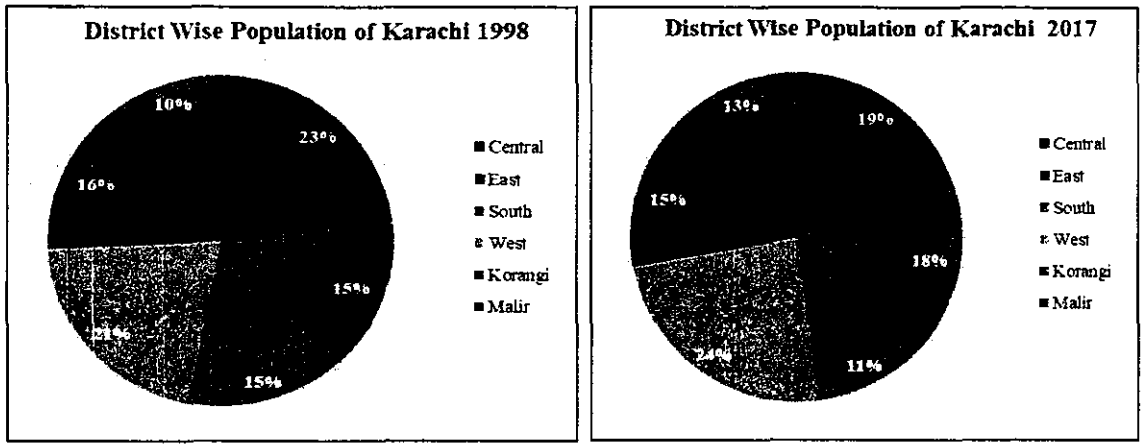
Demography

Karachi West is an industrial and commercial district having multi occupations. The main occupation of the people is business and trade. The other major portion of the population consists of labor class including skilled and unskilled labor. There are large numbers of people involved in Fishery industry. The remaining small portion of the population having different occupations including government and private services. The women also assist their men in the economic activity in different fields of business, service, education and other institutions. Mostly the women are serving in schools, colleges, hospitals and industrial unites.

Table 4.12: Demographic Change in District West and Maripur Sub-Division		
1998 Census Population	2017 Census Population	%Change (1998-2017)
DISTRICT WEST		
2,089,509	3,914,757	87%
MARIPUR SUB-DIVISION		
85,980	192,794	124%

Source: Pakistan Bureau of Stats

The total population of District West was 2,089,509 in 1998 census which increased to 3914,757 in 2017 census showing an increase of 87%. The total population of Mauripur sub-division was 85,980 according to the 1998 census which increased to 192,794 in the 2017 census showing an increase of 124%. Baldia has largest population 832,768 and Manora Cantonment has lowest population 5,874 populations in the district west.



District wise Population according to the 1998 and 2017 Census

According to the 1998 census, District West was the second densely populated District of Karachi comprising 21% of the entire population. According to the latest census District West is the most populated District of Karachi comprising 24% of the population.

Transportation

The traffic volume is one of the most serious problems of the Karachi city due to progressive increase in population and lack of mass transit transport network.

Expressway from Mauripur Road to Y-Junction

The project aims to boost the economic activity / tourism and improve the traffic management in Mauripur area and surrounding areas. The construction of this corridor will resolve the traffic pressure in the city as the proposed expressway will also have its connectivity with Lyari Expressway. Once the proposed expressway is constructed and merged with the Mauripur road and Lyari Expressway, the overall traffic will be overall beneficiary. Also, the proposed project will support Pakistan Navy for movement of their very important logistics timely at their destination load of the Mauripur area will be drastically improved and people of Karachi and business community will also get benefit from it.

The section of Mauripur Road between Gulbai Intersection near the end point of Lyari Expressway and the Y-Junction with Kakapir Road / Hawksbay beach access road, remains congested almost round the day. The existing road infrastructure serves the localized traffic of the densely populated areas along both sides, traffic of local industries, the recreational traffic to the beaches, the heavy traffic between the port/ SITE area and the Hawksbay truck stand, and the

defence / logistic needs of Pakistan Airforce and Naval establishments at Mauripur and Manora. The situation becomes even worse during the rainy season or on holidays and it takes a long time to cross this section.

Interchange at ICI Bridge

This project is primarily conceived (i) To facilitate Karachi port heavy traffic going / coming from all over country through the junction without stopping, also to facilitate city traffic using Lyari Expressway and Mauripur road for their ultimate destination; and (ii) To resolve traffic congestion during evening peak hours on Jinnah Bridge, where currently more than one kilometer queue length of vehicles can be observed due to this signalized junction.
The intersection of Mauripur Road with Ghulam Ali Allana Road, commonly known as ICI Bridge Intersection due to its location at the approach to ICI Bridge over Karachi Circular Railway, is among the most congested road junctions in the southern part of the city. It serves the heavy traffic moving between Karachi Port, SITE area and other parts of the country through the Motorway, M10 / Northern Bypass and Site Avenue in addition to the city traffic moving along Mauripur Road from Mai Kolachi Bypass and M.T.Khan Road via Jinnah Bridge and from other areas of the city through Lyari Expressway. Besides it serves the localized traffic the densely populated adjoining areas of Lyari and other old city areas and the recreational traffic towards the Hawkesbay, Sandspit and Manora beaches.

Economy

Moreover, Karachi is a cosmopolitan city. The people have a culturally enriched background and a sense of social commitment. According to the 2017 Census Report, Karachi bears 62% of the total urban population of Sindh province, 30% of the provincial population, and 22% of Pakistan's urban population. Additionally, Karachi has the country's major seaport. The city offers enormous job opportunities based on a large-scale industrial sector that is about 71.6% of the total industrial labor of Sindh province. It is the only city of Sindh province, which contributes almost 74.8% of total industrial output to the province and also generates 78% of jobs in the private sector. Therefore, Karachi city plays a vital role in the economic development of Pakistan.

The city has a very large and diverse economy. It is home for some of the largest and most dynamic industrial complexes in the country such as Sindh Industrial & Trading Estate (SITE), Korangi Industrial & Trade Estate, FB Area, North Karachi Industrial & Trade Estate, Dhabeji and Port Qasim etc. SITE Manghopir is the largest industrial park of the country comprising about 4000 factories. The areas like I.I. Chundrigar Road, Sharah-e-Faisal, Clifton and Defense are the main business hub of Karachi. The Port of Karachi is also an important industrial and commercial center in Pakistan.

Fishery plays an important role in the national economy. It provides employment to about 300,000 fishermen directly. In addition, another 400,000 people are employed in ancillary industries. It is also a major source of export earnings. The major fish harbor of Pakistan is Karachi Fisheries Harbor which is being operated by Provincial Government of Sindh. Karachi Fish Harbor handles about 90% of fish and seafood catch in Pakistan and 95% of fish and seafood exports from Pakistan.

Education Facilities

The education facilities available in the District West are not commensurate with the number of people. A large number of schools, colleges, technical colleges have been opened up in the district by the government as well as by private organization.

Table 4.13: Education Facilities in District West, Karachi

Education Facility Type/Levels	Count
Primary Schools	428
Secondary Schools	71
Higher Secondary Schools	05

Table 4.13: Education Facilities in District West, Karachi	
Education Facility Type/Levels	**Count**
Lower Secondary/ Middle	34
Elementary	31
Technical Institutes/ Colleges	01
Degree Colleges	15

Hamdard University (Madinatul Hikmat) founded by late Hakeem Muhammad Saeed is promoting knowledge in the field of Medicine, Computer Science and Business Administration.

Karachi District wise Education Statistics 2016-17

Table 4.14: District Summary: Schools, Enrollment, Teachers										
District Name	*No. of Schools*				*Enrollment*			*Teacher*		
	Boys	*Girls*	*Mixed*	*Total*	*Boys*	*Girls*	*Total*	*Male*	*Female*	*Total*
Central Karachi	*117*	*141*	*348*	*606*	*44,822*	*58,510*	*103,332*	*1,803*	*4,996*	*6,799*
East Karachi	*51*	*64*	*163*	*278*	*23,022*	*29,106*	*52,128*	*870*	*2,271*	*3,141*
South Karachi	*70*	*87*	*173*	*330*	*26,122*	*35,824*	*61,946*	*1,079*	*2,496*	*3,575*
West Karachi	*128*	*101*	*340*	*569*	*38,562*	*45,454*	*84,016*	*1,443*	*1,909*	*3,352*
Malir Karachi	*136*	*113*	*414*	*663*	*34,548*	*32,333*	*66,881*	*1,540*	*1,148*	*2,688*
Korangi Karachi	*97*	*94*	*220*	*411*	*35,192*	*46,918*	*82,110*	*1,025*	*3,082*	*4,107*
Source: SEMIS Census 2016 – 2017										
Sindh Education Management Information System (SEMIS)										

Above statistics shows that District West has second higher numbers of schools, the enrollment of the students and sufficient numbers of teachers than other districts.

The number of schools, enrollment and teachers shows here active involvement of the residents of the District West in the education sector. Facilities available in the schools are presented in the table below.

Table 4.15: District wise Basic and Advance Facilities in school									
District	**Schools**	**Electricity**	**Washroom**	**Drinking Water**	**Boundary Wall**	**Lab/Science Lab**	**Library**	**Play Ground**	**SMC**
Central Karachi	*607*	*447*	*484*	*507*	*529*	*121*	*56*	*370*	*591*
East Karachi	*264*	*223*	*241*	*219*	*238*	*59*	*25*	*84*	*259*
South Karachi	*482*	*383*	*426*	*356*	*432*	*49*	*49*	*180*	*465*
West Karachi	*363*	*232*	*301*	*256*	*340*	*82*	*27*	*173*	*359*
Korangi Karachi	*550*	*397*	*431*	*391*	*509*	*46*	*37*	*288*	*533*
Malir Karachi	*591*	*240*	*398*	*302*	*479*	*56*	*21*	*106*	*573*
Source: SEMIS Census 2016 – 2017									
Sindh Education Management Information System (SEMIS)									

The above table illustrates that advance facilities in schools of District West has improved its standard in educating its residents on certain level. Apart from the Government run education institutions, dozens of private Schools are also functioning in the district.

Public Health Facilities

In terms of healthcare, Karachi has relatively better-equipped hospitals, some of which are also categorized as the top rated medical facilities in Pakistan, both in the private and public sector. These hospitals have on panel some of the country's top doctors, surgeons, and health specialists. As such, the residents of this city theoretically have access to

comparatively improved healthcare and depending on the nature of cases, a choice of health care providers to choose from, given the proliferation of health care facilities in the city.

The following table shows the number of health practitioners and paramedical personnel in Karachi.

Table 4.16: District wise Government Medical and Paramedical personnel in Karachi 2017

District	Doctors	Nurses	L.H.V	Dispensers/Dressers	X-Ray Technicians	Lab Technicians	O.T Technicians	X-Ray Assistants	Lab. Assistants	O.T. Assistants	Midwives
Karachi Central	579	207	15	82	12	17	25	0	3	12	26
Karachi South	324	115	4	51	14	23	33	0	8	8	2
Karachi East	245	18	22	26	4	0	3	0	4	1	6
Karachi Malir	234	25	14	53	9	4	6	0	10	5	18
Karachi Korangi	252	90	38	-	-	-	-	0	8	8	25
Source: - Directorate General of Health Services, Hyderabad.											
Source: - BOS, Government of Sindh (Development Statistics of Sindh-2018).											

The following table below shows the number of health facilities in Karachi.

Table 4.17: District wise Government Health Facilities with Bed Capacity in Karachi 2017

District	Hospital		Hospital Beds		Dispensaries		R.H Centers		T.B. Centre		B.H. Units		M.C.H.C.	
	Teaching	Civil, Specialized &	Teaching	Civil, Specialized &	No.	Beds	No.	Beds	No.	Beds	No.	Beds	No.	Beds
Karachi Central	-	-	3,150	-	5	-	-	-	8	-	2	-	3	6
Karachi South	2	4	-	960	5	-	-	-	10	5	-	-	-	-
Karachi East	-	-	361	-	5	-	-	-	5	97	4	-	4	-
Karachi Malir	-	1	-	48	7	-	2	8	4	-	14	22	6	-
Karachi Korangi	-	7	-	724	8	-	-	-	7	-	8	16	4	41
Source: - Directorate General of Health Services, Hyderabad.														
Source: - BOS, Government of Sindh (Development Statistics of Sindh-2018).														

The public health facilities in Karachi are highly centralized in a few locations and cannot cater to a large part of the population. The above-mentioned public health facilities data is not updated in the government records thus subject to some shortcomings. Though health facilities available in District West Karachi include public, private and welfare hospitals need to be increased.

However, there are number of dispensaries, maternity homes and child welfare centers and hospitals in the district which cater to the medical emergencies of the people of different localities. Namely Valika Hospital on Manghopir Road. Qatar

Hospital in Orangi, Murshid Hospital and Naval Hospital in Mauripur, Ziauddin Hospital, KPT Hospital, Korean Hospital, Al-Khidmat Hospital, Arain General Hospital, Patni General Hospital, Metro Lion's Hospital, Hazrat Hassan Hospital, Rasheeda Memorial Hospital, Al-Mujeeb Welfare Hospital etc.

4.4.2 Micro Environment

The micro environment of the project is located in Maripur sub-division of District West, Karachi. The micro environment of the project area comprises of following Housing Schemes: EOBI Housing Scheme, Hawkesbay Town, Shaheed Mohtarma Benazir Bhutto Town and Civil Service Housing Society. However, these housing schemes are uninhabited. There are few villages in the micro environment namely Jorak Goth, Gul Hassan Brohi, Arib Kalmati, Soomar Khaskheli and Dad Mohammad Kalmati. Majority of the villages are relatively small (100-200 persons). The project area is served by KDA Scheme 42 road.

During the site visit, a total of five major villages were identified in the project area. Based on the project design and defined RoW for the construction and operations phase, the survey team concluded that there will be no resettlement impacts from the proposed project design. For the resettlement impacts, the project may thus be categorized in 'Category C', requiring no further action. Major socio-economic findings regarding the five villages was obtained from village elders and 'gate-keepers' of the villages. These villages are located within 5-kilometer radius of the project site.

Livelihood

The people of the project area largely earn their income by working as unskilled or semi-skilled employees in factories, industries or other labor work. The majority of people are engaged with various industries within the immediate locality, but also travel to other cities for better wages. Majority of people are daily-wage earners and thus vulnerable to external and internal disturbances, that may be triggered due to changing economic conditions.

Agricultural land of the area is mostly barren due to scarcity of water; rain-fed agriculture is the only option. The second source of livelihood is livestock rearing. Livestock are an important asset for the families here that provide various dairy products. Goats and cows are most common in the villages, while sheep is also kept by villagers in limited numbers quantity.

Poverty is prevalent in the villages due to scarcity of water and diseases. People are unable to cultivate the land and they have no other livelihood sources which sustain them. COVID-19 has created adverse impacts on livelihoods of area people. There is no labor work in the area because factories and industries have been temporarily shut down.

Educational Institutes

Education opportunities are mostly available only up to the primary level in the area with only few villages having primacy schools on for boys no separate for girls. The quality of education is very poor in the project area. There is no separate girl's school in the villages so girl's literacy ratio is very less in the villages. The school building conditions are also unsatisfactory in the project area. There is no middle and higher secondary school in the area so majority of students have stopped their education after completing primary education.

Healthcare Facilities

There are no major health facilities at any of the villages, except in one village, which has a dispensary. This dispensary was opened for 4 hours in day and it does not deal the patient in emergency. This dispensary now remained closed due to COVID-19 because dispenser is not come to dispensary/ the medical facilities are extremely limited with no

ambulance services and absence of quality medicines. The villagers go to nearby civil hospital for the treatment and also prefer to go to private clinics. The major diseases reported in this area are Hepatitis, Diarrhea and Malaria.

Utilities

Electricity is available few villages but there is load-shedding of 14-16 hours daily. Affordable people use solar panel as an alternate energy. There is no gas connection in the villages so people use wood for cooking purpose.

Water & Sanitation

The main sources of drinking water are hand pump (boring water). These hand pumps are installed at household level and communal level. The quality of the water is satisfactory. It does not change throughout the year. The villages do not have proper sewerage system for the disposal of domestic toilet waste. The toilets systems in these villages are pit-hole latrine type.

There is no proper waste disposal service in an area. People of the community dispose waste in an open area and burn it.

Transportations & Roads Network

There is no facility of proper public transportation but few rickshaws are available which are used for public transportation. Majority of the houses over here have at least one bike, whereas few houses have cars. The project area is served by KDA Scheme 42 road while villages are connected by dirt roads. The villagers face problems due to unpaved roads.

Chapter 5 STAKEHOLDER CONSULTATION

5.1 Background and Overview

5.1.1 Context for Stakeholder Engagement

The objective of involving the public in general and project affected persons in the decision-making process is to identify and assess potential positive and negative impacts of the project and identify win-win solutions for the adverse impacts. Stakeholder engagement is an essential tool for establishing and promoting productive dialogue between the project proponent (s), stakeholders, and project affected persons / groups. Both the success and sustainability of a development project is dependent on the active involvement and participation of stakeholders during the entire project cycle from planning to implementation.

The perceptions, knowledge and attitudes of the stakeholders play a critical role in the project design, construction and operations phase. Therefore, an effective stakeholder engagement process ensures an enabling environment that encourages the articulation of various socioeconomic aspects particularly those related to residential and commercial interests in the project area. Stakeholder engagement is an iterative process that provides opportunity for companies to strengthen their relationship with those residing and/or working in the project area and develop a mechanism for continuous quality improvement. A five-step approach to Stakeholder Engagement for a typical project is illustrated in the figure below.

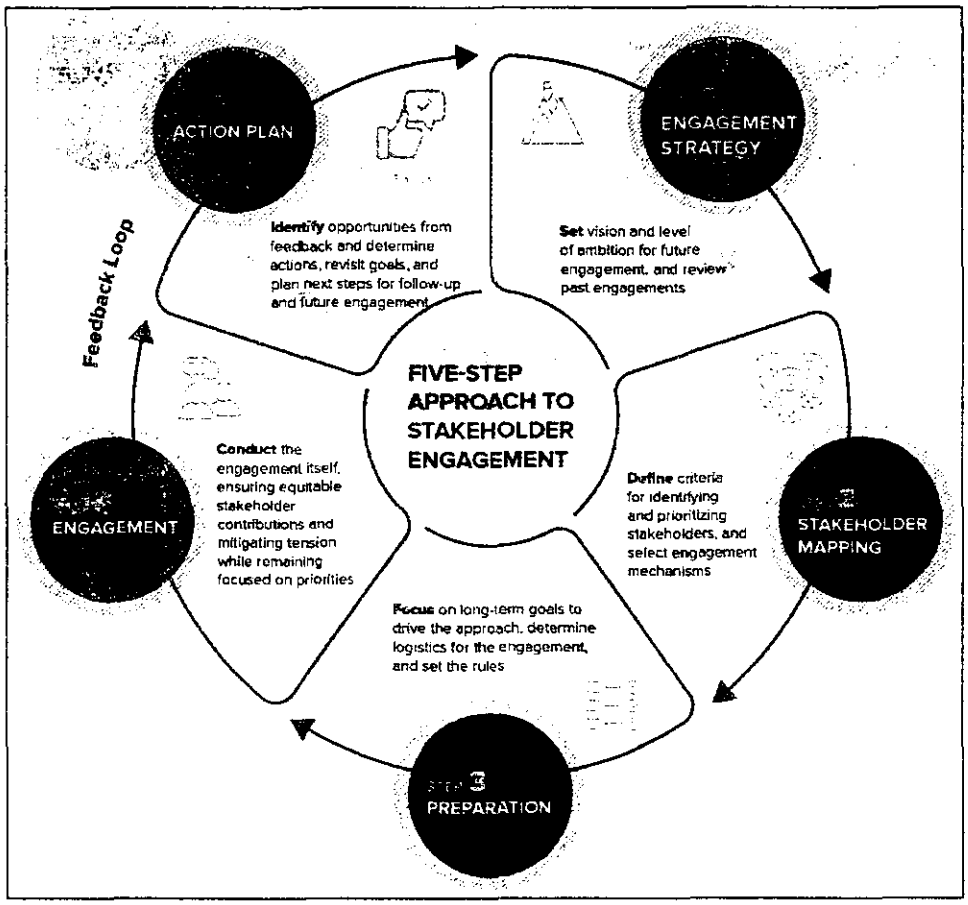


Fig 5.1: Steps for Stakeholder Engagement

5.1.2 Stakeholder Consultation in EIA Study

The participation of stakeholders is now universally recognized as an integral part of the Environmental and Social Impact Assessment. Local communities, government level stakeholders, national and international NGOs and the civil society representatives may be able to contribute to, and benefit from, the dialogue directed at identifying and resolving key project-related issues. Stakeholder consultation presents an opportunity for mutual information-sharing and dialogue between the project proponent and stakeholders. An effective public consultation process provides concrete suggestions that can help improve project design, resolve conflicts at an early stage, identify management solutions to mitigate potentially adverse consequences and enhance positive impacts.

Providing the public with adequate reliable information of the planned project is of significant importance in creating public trust and acceptance. Moreover, experience reveals that unexpected project impacts on the local community generally give rise to significant issues and concerns. Such problems can be avoided if people are properly informed and consulted about the project and given the opportunity to raise their concerns.

This chapter provides an overview of the public consultation process adopted for the 500/220/132 kV KKI Grid Station and associated 500 kV and 220kv LILO Transmission Lines Project and presents the findings of the stakeholder consultations. The key aspects, including consultation objectives, consultation approach, stakeholders and their concerns are detailed outlined in the following sections.

5.2 Consultation Approach

5.2.1 Objectives and Aims of Stakeholder Engagement

The engagement aims and objectives for this project are in line with the Guidelines for Public Consultation under the Federal and Provincial Environmental legislation. Moreover, the consultation process and procedures applied are in sync with the basic requirements of stakeholder engagement in guidance documents of the World Bank (*Environmental and Social Management Framework, 2017*) and the Asian Development Bank (*Safeguards Policy Statement, 2009*). The objectives are articulated here:

1. Provide project-related information to stakeholders (including project context, background, objectives, beneficiaries, implementation mechanism, time-frame, potential benefits and risks of project etc).
2. Engage major stakeholder groups (residents, commercial/industrial units, Government Departments, academia and subject specialists) and solicit feedback through adequate consultation tools, depending on the particular socio-economic context of stakeholder groups.
3. Enable opportunity for stakeholders to discuss and debate the probable positive and negative impacts of the project and suggest mitigation measures that are agreeable to all stakeholders and the regulatory authorities.

5.2.2 Identification of Primary and Secondary Stakeholders

Stakeholders are individuals, groups, or institutions that may be affected by and can significantly influence the project activities, and are thus, integral to the achievement of the objectives of a project. Stakeholders can be divided into two broad categories; primary and secondary (Table 5.1).

Primary stakeholders are those who have a direct interest in the project due their proximity to the project site, more often this category includes residents, commercial entities and institutions falling in the project area. Secondary stakeholders include the relevant government agencies and public interest groups which may indirectly influence or be

influenced by the project. The concerns and input from both primary and secondary stakeholders are important to identify the issues arising from the construction and/or operation phase of the project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

Table 5.1 (a): Primary & Secondary Stakeholders for 500/220/132 kV KKI Grid Station and associated 500 kV and 220 kV LILO Overhead Transmission Lines

Table 5.1: Major Primary & Secondary Stakeholders	
Nearby Villages	• Village Jorak Goth • Gul Hassan Brohi • Arib Kalmati, Soomar Khaskheli • Daad Mohammad Kalmat
Government Agencies & Other Service Providers	• Sindh Environmental Protection Agency (SEPA) • Social Welfare Department Govt. of Sindh • Sindh irrigation & Drainage Authority (SIDA) • Sindh Forest & Wildlife Department • Culture, Tourism, & Antiquities Department • K. Electric • Sui Southern Gas Company (SSGC)
NGOs/Interest groups	• Shehri-CBE • National Forum for Environment & Health (NFEH) • Citizens for Environment (NGO)

5.3 Consultation Methodology and Tools

5.3.1 Primary Stakeholder Consultation

The consultation exercise with primary stakeholders was carried out in two stages. In the first stage, several site visits were carried out to identify all stakeholders that either reside or work in the project vicinity and conduct an initial identification of potential positive and negative impacts. Relevant public service institutions directly involved in service provision in the areas were also identified. A total of 5 villages, falling within a distance of 5 km from the project site, were selected for the consultation.

The social survey team used a pre-designed semi-structured template to engage the representatives and 'gate-keepers' of the villages and goths. The village representatives were briefed about background and scope of the New 500/220/132 kV KKI Grid Station and Associated 500 kV and 220kv LILO Transmission Lines Project. Concerns and suggestions of the respondents were noted down by the team and pictures of the session were taken with the consent of the villagers. If the villagers had any queries regarding the project, the team responded to their queries during the session. Those stakeholders, who were not available at the first attempt, were re-visited on the same day or followed-up for their comments during the next few days. During each meeting, the project team introduced the project to the stakeholders, recorded their concerns and

Moreover, the team inquired about the current situation of the area such as the status of utilities, security and law and order situation in the project area from the residents near the project site. Several open-ended questions were also included in the questionnaire to ensure that the respondents could openly share their opinions and suggestions relevant to the study. The following table shows the villages that were consulted.

Table 5.2: Consultation with Primary Stakeholders		
S. No	Stakeholder	Date of Meeting
1	Jorak Goth	10-06-2020
2	Gul Hassan Brohi	10-06-2020
3	Arib Kalmati	10-06-2020
4	Soomar Khaskheli	10-06-2020
5	Dad Mohammad Kalmati	10-06-2020

5.3.2 Secondary Stakeholder Consultations

In light of the social distancing restrictions imposed due to the outbreak of COVID-19, an online scoping session was held on June 12, 2020 through the ZOOM application. Relevant secondary stakeholders were invited to attend the meeting by sending an invitation through email and WhatsApp. Their participation was confirmed through phone calls. A total of 21 participants attended the scooping meeting. During the scoping meeting, a brief overview of the project was presented by EMC Pakistan with relevant technical background shared by the KE representatives. After the discussion, EMC Pakistan moderated an open Q/A session and recorded stakeholder concerns and feedback.

5.4 Stakeholders' Response and Feedback

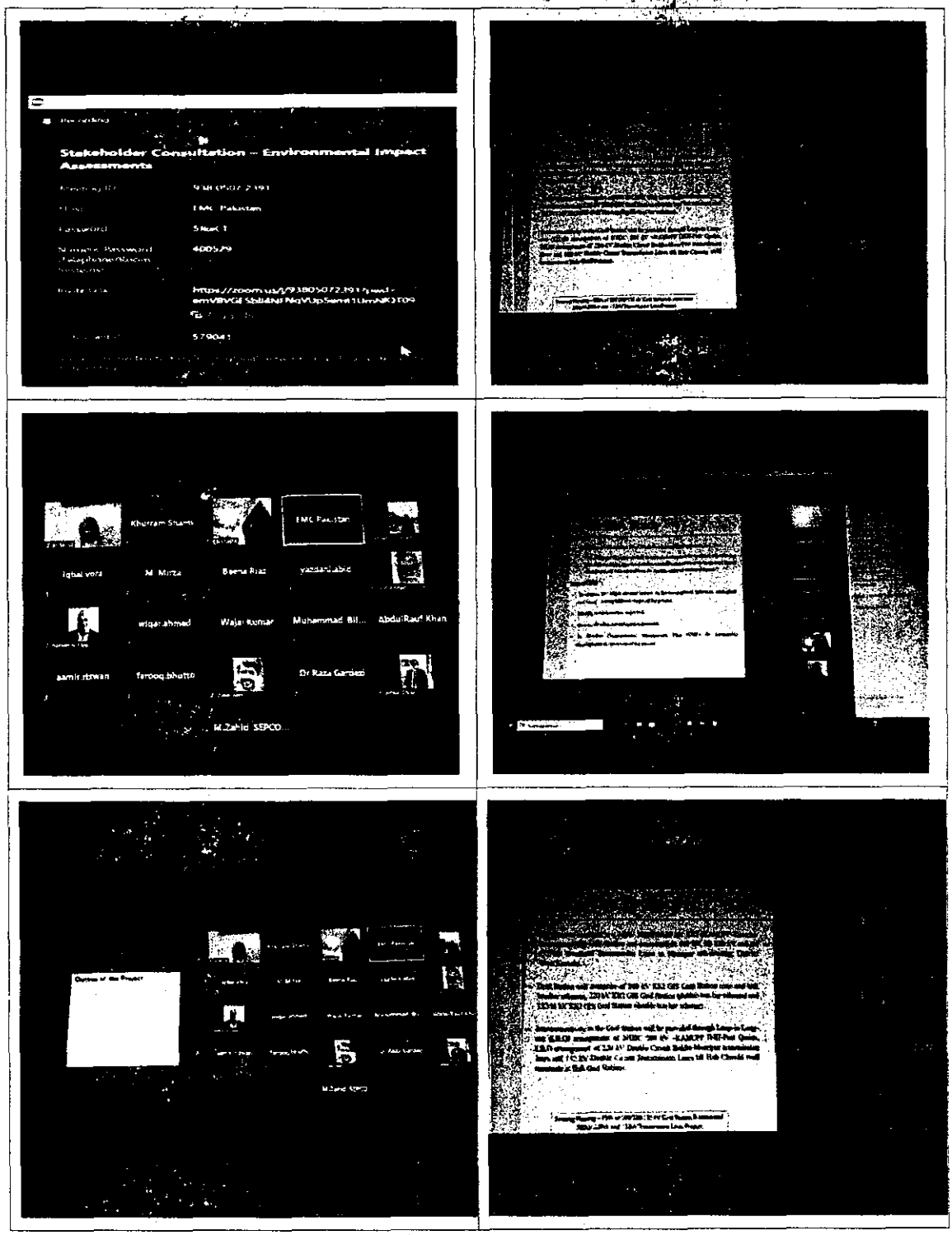
The comments, concerns and suggestions received from stakeholders during the primary consultation meetings and scoping sessions have been collated in this section. The comments have been divided into those that were received during the Scoping Meetings and those that were solicited during interaction with the villagers. The comments solicited from stakeholders were helpful in the screening of the potential environmental & social aspects of the project.

5.4.1 Concerns & Suggestions: Secondary Stakeholders

- During the Scoping Meeting, several queries were raised regarding the design elements of the project as well as the implementation. Dr. Raza Gardezi sought clarification regarding the source of the pipelines, whether these would be local or imported. Queries were also raised by him with regards due to the standards that would be followed-whether US or UK standards would be preferred? Moreover, he inquired whether KE had any plan to address issues of the local populace that may be affected by the proposed project. Dr. Gardezi also placed emphasis on documenting the impacts on vegetation in the area and the carbon loss due to removal of plants.
- In response to Dr. Gazrdezi's queries, Ms. Beeza Riaz, DGM explained that K-Electric was established over 100 years ago and has well-established systems and procedures for all aspects pertaining to project-related impacts on the local communities and has successfully implemented main activities under its Environmental Sustainability initiatives. Moreover, K-Electric has a large CSR portfolio that is actively being implemented covering various sectors including Education, Health, Community Development etc. With regards to plantation, Ms. Beena asserted that K-Electric maintain Carbon Footprint data and continues to actively implement plantation activities beyond the recommended replantation requirements.
- In response to the other queries, another senior KE Representative confirmed that pipes would be locally procured for this assignment and ASMI standards would be used. Moreover, he explained that KE is conscious of the importance of supporting local industry and makes an effort to ensure the maximum engagement of local industry/services for KE projects.

- An Environmental Lawyer, Mr. Abro appreciated the online mode of consultation sessions for the Scoping Meeting, but inquired regarding the possibility of online Public Hearings and the possibility of including the feedback of local communities both during the EIA study process and during the hearing? Poor communities do not have access to the technological needs and are challenged by the COVID-19 SOPs.

Online Scoping Meeting -12th June, 2020



5.4.2 Stakeholder Concerns and Suggestions: Primary Stakeholders

The discussion with village representatives during the consultation sessions have been summarized in the following paragraphs along with brief village profiles providing the relevant socio-economic context.

1. Village Jorak, Deh Bakhr, Hawkesbay, Kemari Zone

The village is dominated by the Brohi caste, an indigenous Baloch group that have been settled here for at least a hundred years. Presently, the village only has 50 households and a total estimated population of 400, indicating an average family size of 8, which is slightly higher than the provincial average for rural communities in Sindh. More than half the village population are female, indicating a low male-female ratio.

The villagers shared that their main source of income is labor work include factories and stone crash while secondary sources include livestock rearing. There is no irrigation water so people agriculture depends upon rainfall. Poverty has risen in recently due to COVID-19 because opportunities for laborers earning from daily wages has reduced significantly. As a result, many locals are moving closer to Karachi in search of better job and labor opportunities.

The villagers had no reservations regarding the proposed project activities in their area. However, they want employment opportunities both for skilled and unskilled labor to be provided to the local people. They further shared that there is need for development work in the project area. There is need to develop schools, hospitals, filter plant and roads in the area.

2. Village (Hamlet) Gul Hassan Brohi, Deh Bakhr, Hawkes bay, Kemari Zone

This village also belongs to inhabitants of the Brohi caste and is home only to 15 households having population of around 120. This hamlet enjoys a balanced male-female ratio. There is no primary school in the village so very few children go to nearby school to acquire the education. The villagers said there is need for development work in the project area especially schools, hospitals, drinking water and roads. They did not have any major reservation against the project and said they welcomed it as long as it benefits the area in terms of development and creation of job opportunities.

3. Village Arib Kalmati, Deh Bakhr, Hawkes bay, Kemari Zone

Only the Kalmati Baloch people are settled in this village, named after Arib Kalmati, who has since passed away. They are indigenous and they have been settled here since last 80 years. The village has consisted approximately 80 households having population of around 600.

The villagers informed that their main source of income is labor work at factories, drivers for heavy transport and daily-wage earners at stone crushing plants. However, livestock rearing and agriculture is an important secondary source, but that suffers significantly in periods of low and/or scantly rainfall.

The villagers had no reservations regarding the proposed project activities in their area. However, they want employment opportunities both for skilled and unskilled labor to be provided to the local people. They further shared that there is need for development work in the project area. There is need to develop schools, hospitals, filter plant and roads in the area.

4. Village Soomar Khaskheli, Hawkesbay, Kemari Zone

There is only the Khaskheli caste settled in the village, a Sindhi ethnic group. They have been settled here since last 100 years. The village has consisted approximately 25 households having population of around 200. There is primary

school where girls and boys acquiring equally education in the area but due COVID-19 education and health are disrupted in the area. This village enjoys pure drinking water. There is electricity in village but load-shedding is remained for 4 to 6 hours in a day so people use solar energy and battery as an alert energies. There is no gas available in village so people use wood for cooking purpose.

In past, few non-governmental organizations have worked in the area and they provided them capacity building training on organization development and also distributed solar plates among the poor households. With the onset of government-imposed lockdown due to COVID-19, opportunities for daily-wage earners is now significantly less, and some days, laborers are not able to find any work at all. As a result, many locals have moved to the nearest localities of Karachi in search of better labor opportunities. The villagers had no reservations regarding the proposed project activities in their area. However, they want employment opportunities both for skilled and unskilled labor to be provided to the local people.

5. Village Daad Mohammad Kalmati, Deh Bakhr, Hawkesbay, Kemari Zone

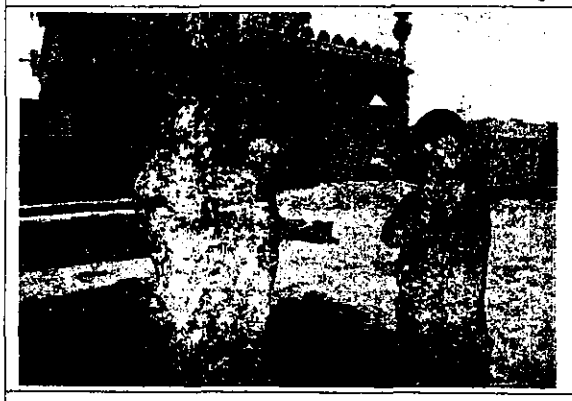
Of all the nearby villages near the project site, Daad Muhammad Kalmati Village is the smallest with only 12 households and a total population of less than a hundred. The female population is slightly higher than the number of males. The basic social services such as health facilities and schools are not available at this village. The infrastructure is ruined because there is no proper road so people feel difficulty in emergency. There is no proper public transport so often people use own bike and donkey cart as a public transport. The villagers are positive about the upcoming development, but hope the KE works will provide electricity to their villages as well and support their younger generation by giving them preference for menial jobs and labour work.

Consultation with Village Representatives in Project Environs

Consultation with Village Elders, Jorak Village

Consultation with Village Elders, Village Gul Hassan Brohi


Consultation with Village Elders, Village Arib Kalmati




Consultation with Village Elders, Village Soomar Khaskheli


Consultation with Village Elders, Village Dad Mohammad Kalmati

Chapter 6 SCREENING OF ALTERNATIVES

6.1 Introduction

The screening of alternatives is a part of the EIA process to select the best among all possible project options. The alternatives of a project are defined as the options that can help to meet the objectives of a project by different means including an alternative project site, technology or material, design or inputs. The key criteria when identifying alternatives is that they should be economically feasible and practically reasonable.

Alternatives to the proposed project components include:

1. The "no project" option
2. Grid Station Alternatives
    a) Alternative sites for the proposed substation
    b) Alternative designs for proposed substation and associated infrastructure
3. Transmission Line Alternatives

1. The "no project" option

K Electric is responsible to supply electricity to Karachi and few parts of district Lasbela, Balochistan. However, due to growing population, expanding towns and increasing demands have put tremendous pressure on the K Electric's generation and distribution infrastructure. To cope with this situation, K Electric has proposed this project to tap in the electricity from KANUPP II/III and add it to its distribution network. This project will not only help reduce the load shedding, it will also generate job opportunities, both during construction and operation phases, and provide energy to the industries and thus augment the economic growth of the country.

By opting the No Project alternative, all the afore mentioned benefits cannot be achieved. Therefore, No Project alternative is not a suitable option.

2. Grid Station Alternatives

a) Alternative sites for the proposed substation

At this stage of project there are two number of sites (alternatives) are proposed and under discussion with the land owners as potential sites for subject Grid Station. The finalization of land will be primarily based on ease in acquisition, economical aspects, and minimum negative environmental & social impacts.

b) Alternative designs for proposed substation and associated infrastructure

3. Gas Insulated Substation (GIS)

Disadvantages of GIS Substation

1. Cost is higher compared to Ordinary Conventional Substations
2. Care should be taken that no dust particles enter into the live compartments which result in flashovers
3. When fault occurs internally, diagnosis of the fault and rectifying this takes very long time (outage time is high)

4. SF6 gas pressure must be monitored in each compartment, reduction in the pressure of the SF6 gas in any module results in flashovers and faults.

Gas Insulted Substation have following advantages which advocates its selection

1. It occupies very less space (1/10th) compared to ordinary substations. Hence these Gas Insulated Substations (GIS) are most preferred where area for substation is small (e.g.: Cities)
2. Most reliable compared to Air Insulated Substations, number of outages due to the fault is less
3. Almost maintenance free
4. Can be assembled at the manufacturer's facilities, and modules can be placed and commissioned at the plant quite easily.

Locations where Gas Insulated Substation is preferred

Gas Insulated Substations are preferred in the places where the land requirement for the substation is difficult such as in populated areas and highly polluted areas where outdoor switchyard is not preferred. In Gas Insulated Substations all the switching electrical equipment such as circuit breakers, isolators, earth switches, and bus bars are completely enclosed inside modules which are filled with SF6 gas. These modules are factory made and site assembled. Hence takes very little time for commissioning compared to air-insulated substations.

The main advantage of this Gas Insulated Substation is because of its compact size due to a high dielectric strength of the SF6 gas. And the availability and reliability of the GIS substations are more compared to air-insulated substations (Faults occurring chances of Air insulated substation or conventional substations are more. Hence GIS substations are provided where the high reliability of electric power is required such as nuclear plants and other important facilities where un-interruption of power is more required.

Some of the places where Gas insulated substations are preferred are:

1. Large towns where space available is limited
2. Industrial complexes where un-interruption of power is necessarily
3. Mountain regions and valleys
4. Underground substations
5. Off-shore (On sea or lake) substations
6. HVDC transmission system terminal substations

4. Transmission technologies alternative

Overhead versus Underground Transmission line

The decision between overhead versus underground transmission lines was also considered. Certainly, electric power can be transmitted by underground power cables which assist the transmission of power crosswise over thickly populated urban zones, territories where area is occupied or arranging assent is troublesome, waterways and other natural obstacles, land with extraordinary natural or environmental heritage, regions of significant or prestigious infrastructural advancement and area whose worth must be kept up for future urban development and rural improvement.

a) Underground Transmission

- Less subject to harm from extreme climate conditions (mostly lightning, wind and heavy showering);
- Remarkably decreases the intensity of electromagnetic fields (EMF) in the surrounding area. All electric currents produce EMF, yet the protecting shield provided by the earth encompassing underground cables limits their extent and power;
- Underground cable requires a narrower encompassing strip to introduce; though an overhead line require a surrounding strip of around 20–200 meters wide to be kept for all time clear for safety, support and repair;
- Site restoration for underground construction is a much larger effort than it is for overhead construction because soil is disturbed along the entire route;
- High-voltage underground transmission lines require small substations called transition substations wherever the underground cables connect to overhead transmission;
- Underground high-voltage transmission lines generally need to be replaced after approximately 40 years;
- Underground cables pose no risk to low flying airplane or to natural life, and are essentially more secure as they pose no shock hazard (except the digging and excavation);
- There maintenance and repair is very arduous and time consuming;
- Underground lines are silent except in the immediate area near the transition substations, which are lighted throughout the night for security purposes;
- They are less likely to cause death or injury due to accidental contact with the lines/cables;
- The transmission through underground is more expensive than overhead electrical cables, and the life cycle expense of an underground power cable is two to four times more than an overhead electrical cable.

b) Overhead Transmission

- Installation of overhead lines may prevent from removal of small trees and bushes along the transmission ROW;
- Overhead lines are at great risk against lightning strikes which can cause interruption and serious accident;
- Overhead lines use bare conductors and can be damaged;
- Aesthetically unattractive as they distract the scene of the landscape;
- It doesn't require high cost in construction, repair & maintenance;
- Overhead high voltage lines can emit hiss or hum noises;
- When people come into accidental contact with overhead lines, the implications are extremely severe;
- Overhead lines have a life expectancy of more than 80 years;
- Its cost is lesser than Underground Transmission line.

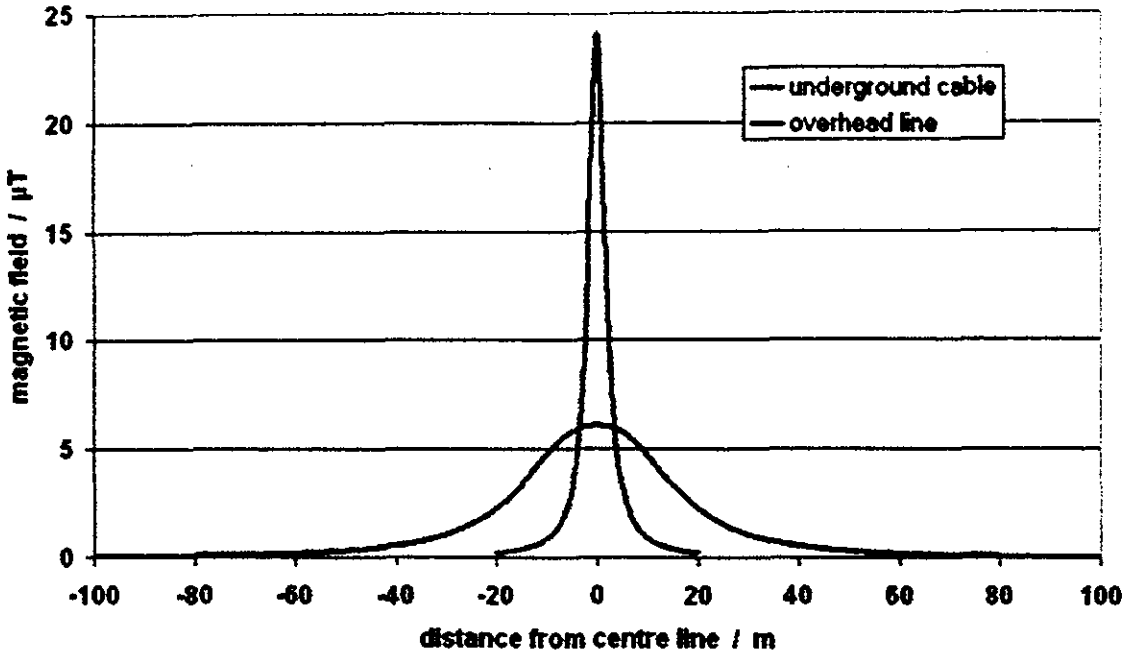


Fig 6.1: EMF effect comparisons between Underground and over headline
Source: http://www.emfs.info/sources/underground

In underground cable EMF concentration increases in the center line because of the buried in the earth but in the contemporary overhead transmission line EMF affect disperses with low concentration to 60 m from the center.

Chapter 7 Potential Environmental Impacts & Proposed Mitigation Measures

7.1 Introduction

This chapter documents the findings of assessment of potential environmental and socio-economic impacts and proposes their mitigation measures. It includes identification, analysis, prediction, significance and characteristics of the impacts and mitigation measures to prevent unacceptable adverse effects through the implementation of appropriate project modifications.

This chapter plays a vital role in environmental impact assessment and identifies all significant impacts during the designing, construction and operation phases of the project. Environmental and social aspects identified during the stakeholder consultations and by the screening process are assessed for their severity and mitigation measures have been proposed on the basis of assessment. Additionally residual impacts are identified using professional judgment that may persist after adoption of mitigation measures. The proponent will adopt these mitigation measures to reduce, minimize and compensate for the negative impacts as far as possible.

7.2 Screening Methodology

Potential Project impacts have been identified in this section related to the project pre-construction (siting), construction and operation phases. Impact predictions are based on the consultants' previous experiences on similar projects; professional judgment; data collected in the field; discussions with local communities, relevant government officials and relevant technical specialists. Predicted impacts relate to all aspects of the proposed grid station and transmission lines project. Many of the mitigation measures are related to grid station siting, route alignment, others with good construction practices.

7.3 Designing Phase: Impacts and their Mitigation Measures

Designing phase impacts are primarily related to i) land acquisition, resettlement and approvals; ii) sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways); and iii) physical cultural resources. Mitigations are mainly related to careful selection of the right of way for underground transmission line so as to avoid or minimize impacts.

7.3.1 Land Acquisition and Approvals

The land for grid station and ROW for the TL and tower base placement will be obtained from relevant authorities during the design phase. NOCs from relevant institutions will be taken before the construction of grid station and of TL. No resettlement is envisaged from project activities. Way leave consent will be obtained as required.

7.3.2 Physical Cultural Resources by affecting any archaeological site

There are no protected cultural and heritage sites located near the proposed grid station site and TLs routes.

7.3.3 Sensitive Receptors and Existing Infrastructure

The construction of grid station and TLs are unlikely to adversely impact sensitive receptors and existing infrastructure in project area as most of the project area is sparsely populated, with grid station location options have been defined and overhead transmission lines will require minimal area for tower placement at specific locations.

Mitigation Measures

- Prior notices shall be given to the legal shop owners and residents before the starting tower placement activities near these settings;
- GRM as discussed in Chapter 8 shall be followed in letter and spirit;
- Impacts on public utilities should be minimized by incorporating environment friendly construction methods in the engineering design; and
- Works around public utilities should be carried out in consultation with relevant authorities.

7.3.4 Movement of People/Traffic

Grid station location(s) has been defined and does not apparently block any established passage for movement of people. Overhead TLs will understandably provide passageways for people and traffic.

Mitigation Measures

- Transmission towers should not be placed on or block any established pathway for human and animal movement.
- Tower erection activities should be scheduled (skipping peak hours) to minimize the impact to the movement of people and traffic.

7.3.5 Temporary Construction Camps

There may be a requirement to establish small construction camp. If not undertaken carefully these activities can result in deterioration of air & water quality, and social impacts including social unrest and disease transmission.

Mitigation Measures

- Camps are to be located away from residential areas to minimize nuisance;
- Sanitation facilities in the camps if provided should be mobile and collect its wastewater or connected to the local sewerage system;

7.3.6 Establishing responsibility on construction contractor regarding disposal of spoil/ excavated earth

Construction Contractor/Waste Contractor shall be made responsible through contract documents for proper disposal of the spoil / excavated earth and not to dump these spoils/ earth near open plots / open spaces / open storm water drains / in front of residents or left unattended along the construction site. It should be disposed in designated landfill site.

A proper site rehabilitation plan shall be made by the contractor include the spoil / excavated earth disposal arrangements

7.3.7 Establishing responsibility on construction contractor to abide SEQS

Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and applicable standards during all the construction activities and ensure compliance of the same through periodic environmental monitoring reports.

7.3.8 Health and Safety of Workers and Public

Contractors shall be made responsible through contract documents to follow Standard Practices and Standard Operating Procedures (SOPs) to ensure health & safety of workers at the site and public during all construction operations.

7.3.9 Living and Livelihood of the Neighbouring Community

The proposed grid station location(s) and transmission lines route avoids the community areas and settlements. Settlements in the area mostly belong the Baloch people, with Brohi and Khaskheli as dominated casts. Dominant source of livelihood is labor in factories and in stone crushing plants. Secondary sources of livelihood include livestock rearing. The proposed grid station and transmission lines are unlikely to cause any loss of livelihoods to the area populace.

7.4 Construction Phase: Impacts and Mitigation Measures

Construction phase impacts include erosion of soil; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal; aesthetic impacts; and occupational and community health risks. Mitigation measures include good construction and housekeeping practices, and compensatory planting for any loss of trees in the ROW.

7.4.1 Erosion of soil

Project activities may cause erosion of soil. Such activities may be identified as grid station construction, transportation of materials and equipment, preparation of tower base for overhead TL, landscaping and removal of natural vegetation etc. Usually, the exposed soil after excavation for foundations is vulnerable to erosions and runoff by heavy rains.

But, the impact of all these activities would be less significant and temporary lasting only for construction period. However, the aspects of soil erosion such as blockage of surface drainage network, impact on quality of natural water and biological system may cause potential environmental impacts that may also affect their users.

Mitigation Measures

- The most suitable strategy to avoid adverse environmental impact of soil erosion is to limit area from where the removal of vegetation is being done to construction sites only. The other areas should be disturbed least.
- Construction activities should be so scheduled to avoid runoff due to rain;
- The dredged soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation;
- Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions;
- Site workers should wear dust masks especially during the dry and windy weather conditions;
- Debris should be collected during construction and disposed of in low lying areas near the site;
- Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area where required or be disposed at designated spoil disposal sites;
- Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.

7.4.2 Impacts on Surface and ground water sources

Generally the type and significance of the impact is dependent on the characteristics of the water resource, the design of the structures and their method of construction.

Mitigation Measures

- All excavated soil should be completely removed;
- Debris and vegetation clogging culverts should be regularly cleared;
- Soil runoff from the site leading to off-site contamination (particularly during rainy season) should not be allowed; and
- Spillage of oil and grease from the vehicles should be avoided.

7.4.3 Fuel, Oil & Chemical handling, storage and disposal

Inappropriate handling, storage and disposal of fuels, oils and chemicals at construction sites may lead to contamination of soil.

Mitigation Measures

- Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course;
- Refueling, oil changing and maintenance of machinery, equipment and vehicles should only be carried out at designated areas within the construction site;
- Oil contaminated materials should be disposed at designated waste disposal facilities.

7.4.4 Water Consumption and Conservation

Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is likely to be met from external sources such as water tankers supplying water to the construction site.

Mitigation Measure

- Regular monitoring of water consumption, conservation and quality;
- Use of leak proof water storage tanks;

7.4.5 Solid Waste Management

Typical solid waste generated during construction include waste concrete, steel scrap, wooden scaffolding, empty cement bags, excavated soil, wood remains etc. Solid waste generated during land clearance and Earth-fill material could be in significant quantities. This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. It may block nearby natural drainage channels that can ultimately cause localized flooding during monsoon season. Random storage of this waste may be hazardous to the workers at the site as well. Windblown debris is a nuisance to the nearby settlements and dwellings. Poor waste management practices would result in short term and long term negative impacts on the aesthetics of the surrounding.

Mitigation Measures

- A Comprehensive Waste management Plan for Construction phase should be developed;
- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site;
- Designated waste storage areas should not be within 50 m of water ways;
- Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner.
- All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and
- Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.

7.4.6 Dust Emissions

Construction activities that may lead to dust generation include excavation; transportation and tipping of cut materials; handling and storage of aggregates in concrete plants; concrete batching; site leveling and clearing of trees; and associated activities. The quantity of dust that may generate on a particular day of construction phase will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on that day.

Mitigation Measures

- Dust emissions from soil piles and aggregate storage stockpiles should be reduced by keeping the material wet by sprinkling water at appropriate frequency and erecting windshield walls on three sides of the piles;
- Vehicular movement should be restricted to a specific time for dumping of supplies and construction materials; and
- Workers should wear dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.

7.4.7 Exhaust Emissions

Major sources of exhaust emissions are standby diesel generators, material transport vehicles and emissions from construction machinery/earth moving equipment. Major exhaust emissions of concern are CO, CO_2, SOx, NOx and PM10. These emissions are injurious to human health in high concentration and also can cause vegetation damage by clogging the photosynthesis process in plants.

Mitigation Measures

- All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants;
- Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS;
- Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e. visible smoke/soot) will be banned from sites;
- Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and

7.4.8 Noise and Vibration

During the construction phase noise will be generated from the operation of heavy machinery and haulage of construction materials to and around construction sites and construction activities including concrete mixing, excavation, backup power generators for supply of electricity; use of pressure horn etc. These construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents and fauna.

Vibration and noise could become a major consideration (within 100m of schools, religious premises, hospitals or residences etc.).

Mitigation Measures

- Machinery operation and high noise activities should be carefully planned and scheduled;
- To the extent practical, batching plants and construction areas should not be located within 500 meters of a settlement;
- Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs[1] at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents.
- Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery;
- Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs;
- Occupational health, safety and environmental procedures and Environmental management plan for proposed project would be followed.

7.4.9 Impacts on Ecology (Flora and Fauna)

Also the overhead TL will require the least footprint and only site clearance is required at tower bases. Onsite vegetation clearance will be required only within the boundaries of proposed grid station. Therefore, the impact on ecology of area from construction activities is minimal.

Mitigation Measures

- Compensatory tree plantation shall be provided at a ratio of 1:3;
- Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs; and
- By using the best practice for vegetation clearing and disposal practices; will minimize the environmental risk associated with clearing and disturbance of vegetation communities.

7.4.10 Occupational Health and Safety

The construction of civil works poses an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities of construction phase.

[1] Night time hours given in SEQS for Noise.

Mitigation Measures

- Preventive and protective measures including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, EMFs, high noise levels, and exposure to chemicals will be made;
- Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents;
- Appropriate fire extinguishers and fire response plans will be available at the site;
- Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital will be available;
- Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided;
- Procedures for documenting and reporting occupational accidents, diseases, and incidents;
- Emergency prevention, preparedness, and response arrangements will be in place;
- There will be strict safety requirements for personnel assigned to construction work;
- To maintain safe conditions for the general public, grid station will be fenced and gated, that must be locked at all times; and
- Appropriate signage will be posted that shows the owner of the grid station, its hazardous and contact information.

7.4.11 Heat Stress to Construction Workers

There will be a likely impact of sunlight causing heat stress to construction workers during summer season. Also the project corridor has no significant vegetative cover.

Mitigation Measures

- Move to a cool place e.g. cool shady area;
- Provide plenty of drinking water;
- Break the working in shifts

7.4.12 Impacts on Traffic

Traffic flow in the locality of project slightly increases during construction activities. The transportation of trucks for raw materials and mobilization and demobilization of the earth works equipment are required during construction phase of proposed project. This activity has potential to directly impact the traffic flow along the right of way of proposed transmission line. However, as most of the project area is not frequented by heavy and light traffic, adverse impact of general traffic conditions in area would be minimal.

Mitigation Measures

- Traffic management plan will be developed and implemented during the construction phase;
- Construction activities will be scheduled to reduce the chances of traffic congestion;
- Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines;

- Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway;
- Vehicles will be maintained regularly to reduce the exhaust emissions; and
- Any complain launched by community member will be responded and appropriate action will be taken to avoid it in future.

7.4.13 Socio-economic Impacts

During construction phase, an average of approximately 150-200 persons will be employed on contract basis which will put the positive impact on the socio-economic status of project area and surroundings.

7.4.14 Community Health & Safety

The construction of grid station and transmission lines may pose a modest risk to local communities from emergency events such as entry of local people in dangerous working environments i.e. close to grid station and transmission lines infrastructure.

Mitigation Measures

- Emergency response plan should be prepared and implemented during entire phase of construction;
- Procedures for interaction with local and regional emergency and health authorities should be made;
- In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should usual avoid peak traffic hours between 6:30-8:30 am and 4:30-6:30 pm;
- Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the community areas;
- Diversions, danger points and works at construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents.

7.5 Operational and Maintenance Phase: Impacts and Mitigation Measures

The most focusable area in the impact assessment process of proposed project is operational and maintenance activities of New Grid station & Transmission lines as impacts generated during these phases may have long term and continuous affects. Potential operational issues include impact on migratory birds, spills or release of oils or hazardous materials, SF_6, EMF effects, occupational and community health and safety risks, risks from fires, earthquakes. Mitigation measures have been incorporated into the design to minimize them to acceptable levels.

7.5.1 Impact on migratory bird flyways

The birds during migration fly at elevations between 800 and 2000 m, whereas maximum height of the towers of the transmission lines is less than 40 m. As such, the transmission line routes will not cause any obstruction for the flight of migratory birds. Similarly the transmission line will not intercept Indus Flyway (Central Asian-Indian Flyway) causing any disruption to flight of migratory birds.

Figure 7.1 shows the Indus Flyway or Central Asian-Indian Flyway (green). This famous route from Siberia to various destinations in Pakistan over Karakorum, Hindu Kush, and Suleiman Ranges along Indus River down to the delta is known as International Migratory Bird Route Number 4. It is also called as the Green Route or more commonly Indus

Flyway, one of the important migratory routes in the Central Asian - Indian Flyway. The birds start on this route in November. February is the peak time and by March they start flying back home. These periods may vary depending upon weather conditions in Siberia and/or Pakistan. As per an estimate based on regular counts at different Pakistani wetlands, between 700,000 and 1,200,000 birds arrive in Pakistan through Indus Flyway every year. Figure 7.2 shows the Migratory route, breeding range and wintering range of Ferruginous Duck *Aythya nyroca* in Pakistan. This study suggests that the project site is not on the corridor of migratory birds.

Therefore no adverse impact on migratory birds is expected.

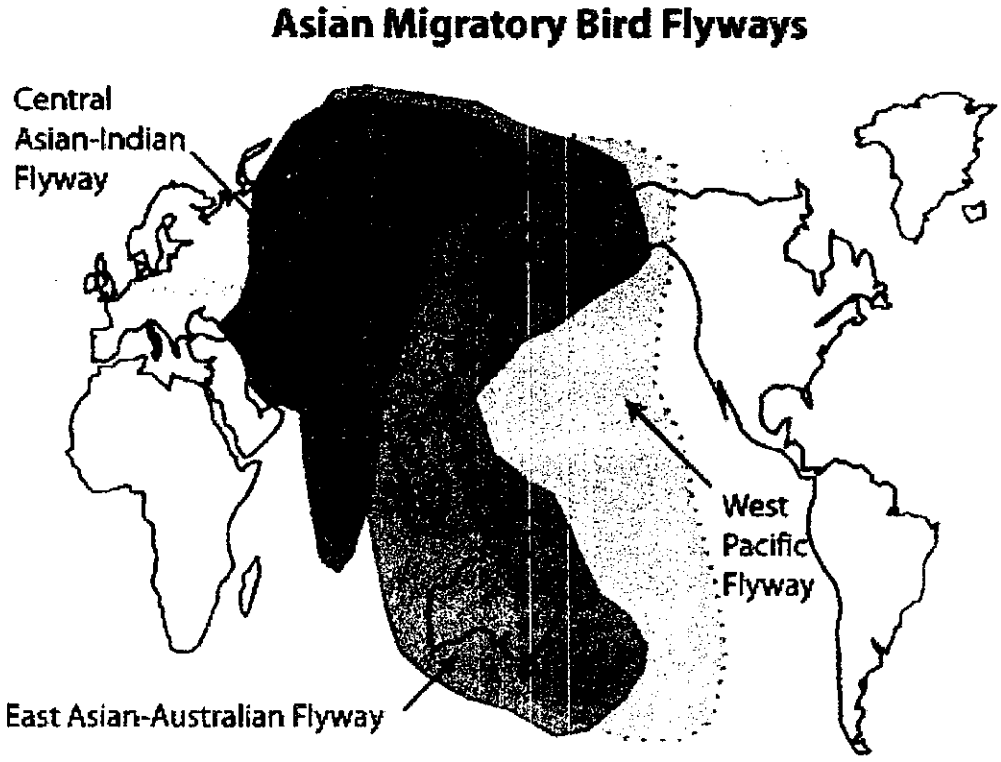


Fig 7.1: Various flyways of birds from Siberia to south[2]

[2] By U.S. Fish and Wildlife Service - U.S. Fish and Wildlife Service/Alaska, Public Domain, https://commons.wikimedia.org/w/index.php?curid=36889825

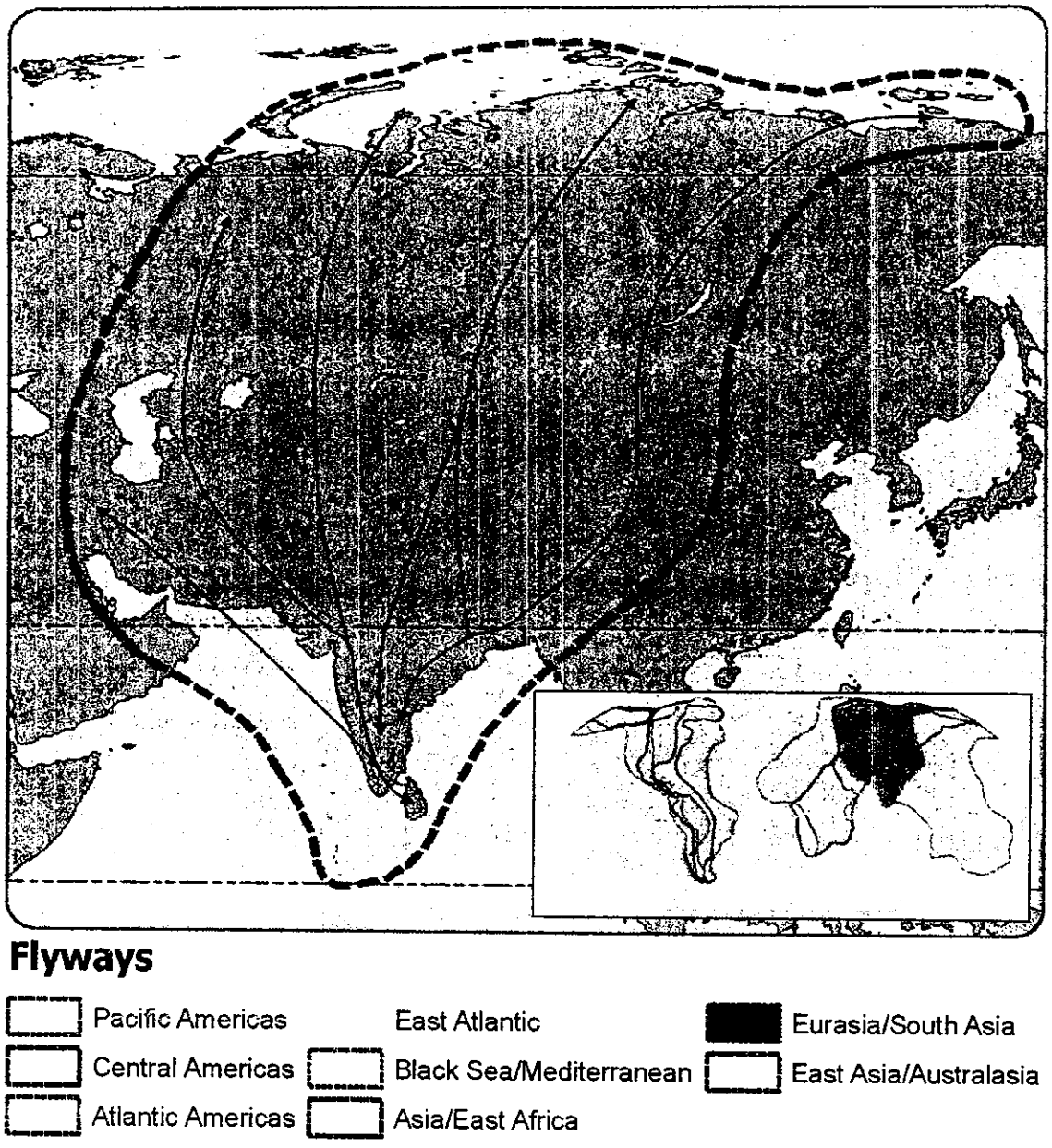


Fig 7.2: Eurasian/South Asia Migratory bird flyway (Source: Birdlife International)

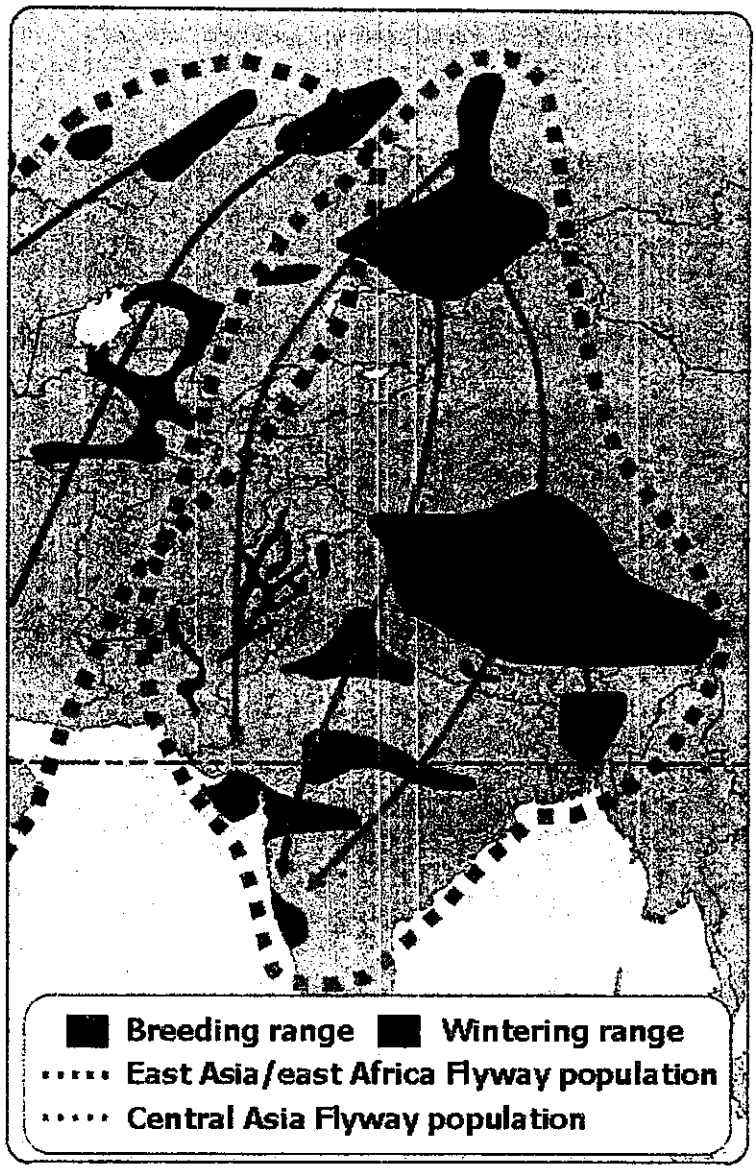


Fig 7.3: Migratory route, breeding range and wintering range of Ferruginous Duck Aythya nyroca in Pakistan
(Source: Birdlife International)

Mitigation Measures

- All suspension poles shall have detachable bird protection devices, over each suspension insulator string.
    - All suspension towers and tension towers having jumper insulator strings shall be provided with anti-bird devices on each cross arm over insulator strings. The anti-bird devices shall be spike type galvanized and fitted with bolts and nuts.
- Bird flappers and deflectors will be installed on conductors to avoid collision of birds on strings.

7.5.2 Health Impacts

a. Human Exposure to Electromagnetic Fields (EMF)

During the operation phase the Transmission Line will be energized and there may be an increase in the level of electromagnetic fields (EMFs) in the ROW vicinity.

In epidemiological studies, researchers try to establish whether there is a statistical association between selected groups of people with certain types of exposures of EMF and diseases. Some epidemiological studies have suggested a possible link between exposure to magnetic fields and childhood leukemia. It is unclear however, whether exposure to magnetic fields actually caused the disease. Some studies do not include magnetic field measurements when trying to determine an association and no epidemiological study has drawn direct conclusions about a link between cancer and EMF.

Experimental studies involve exposing cells, tissues and/or animals to magnetic fields under controlled conditions. These studies allow researchers to closely control magnetic field exposure and provide information about any small scale biological changes that magnetic fields may cause. Experimental studies have not found that magnetic fields are the cause of any disease.

Many reputable health authorities such as the World Health Organization (WHO) and Health Canada have conducted thorough reviews of all the different types of studies and research on EMF and health. These health authorities have examined the scientific weight-of-evidence and have determined that when all of the epidemiological and experimental studies are considered together, the consensus is that there is no cause-effect relationship between exposure to magnetic fields and human health. The WHO concludes:

From the current scientific literature there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer (WHO, 2006).

Similarly, the World Bank Electric Power Transmission and Distribution EHS Guidelines state: Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and grid stations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern (World Bank, 2007).

The World Bank Electric Power Transmission and Distribution EHS Guidelines recommend evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation (ICNIRP); average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure. The WHO reviews also conclude that exposures below the limits recommended by the ICNIRP international guidelines do not appear to have any known consequence on health.

Mitigation Measures

To minimize potential EMF impacts from the Project the following mitigation measures have been adopted:

- Design the transmission line to ensure that electric and magnetic fields are minimized, given the voltage and load requirements;
- Design line accordingly as not to increase background EMF at sensitive receptors;

- Operation phase EMF monitoring will be undertaken. Average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure; and
- EMF monitoring will be conducted as per pre-defined procedures of KE. Further, maintain the complaints register.

Both Ac and Dc technologies produce magnetic fields and both decrease with distance as you move away from the line or cable. See graphs below:

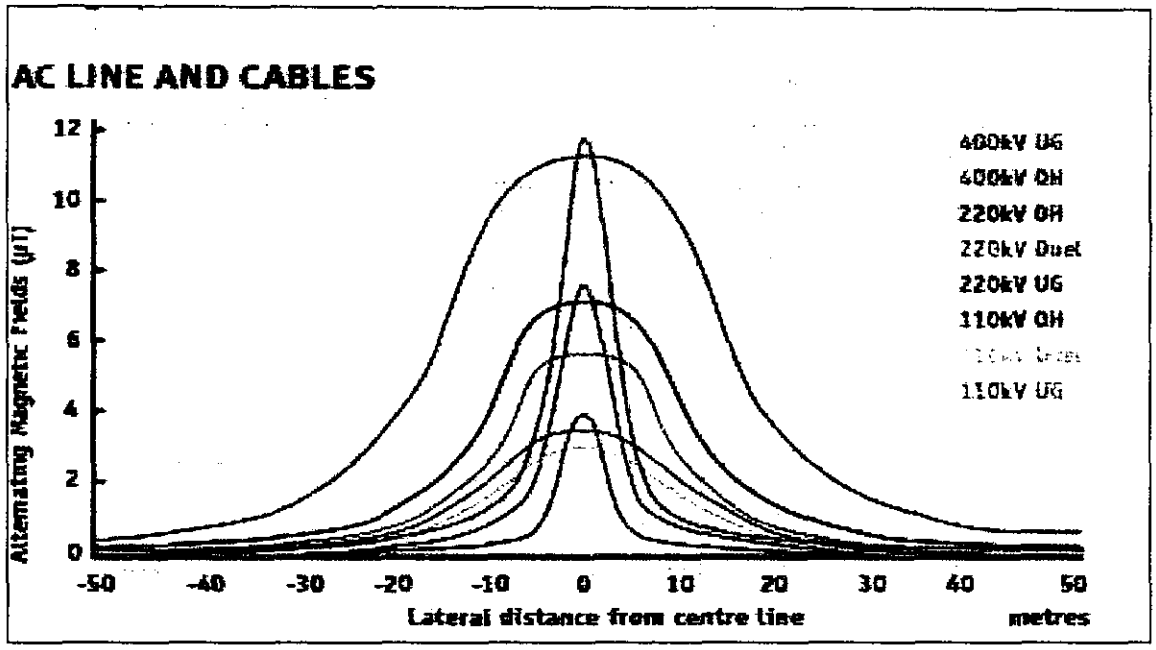


Fig 7.4: Overhead Transmission line: Maximum magnetic field

Source: EMF-You-Booklet_2014

The maximum EMF given in the graph is approximately 12 microtelsa (μT), which is well below the ICNIRP guideline of 100 μT. Overall no significant adverse EMF impacts are predicted during Project operation.

Electrocution and Induced Currents

Electrocution can occur as a result of direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity. Power line fields can also induce voltages and currents on conductive objects such as metal roofs or building, fences, and vehicles. When a person or animal comes in contact with a conductive object a perceptible current or small secondary shock may occur.

Mitigation Measures

- Warning signs will be posted at towers along the ROW.
- Conducting objects (e.g. fences or other metallic structures) installed near power lines will be grounded to prevent shock.

7.5.3 Wind, Fire and Earthquake Hazards

Wind, fire and earthquakes pose risks to the project operation and the likelihood of occurrence consider medium with significance of impact is major.

Mitigation Measures

- Transmission towers have been design as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions.
- Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.
- Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards:
  - The fire hazards risk will be minimized through the use of tall towers and wide ROW.
  - System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards.
  - Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.

7.5.4 Electromagnetic Interference

The corona of overhead Transmission Line conductors and high frequency currents of overhead Transmission Line can create radio noise which interferes with broadcast signals or electronic equipment.

Mitigation Measures

- Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.

7.5.5 Impact of Waste

The operation and maintenance activities of proposed project may generate some hazardous and non-hazardous waste such as wires and wild vegetation etc.

Mitigation Measures

- Ensure that all solid waste collected during operational or maintenance work is disposed of in an appropriate disposal site in the locality, or if possible, be recycled.

7.5.6 Sulfur Hexafluoride Gas (SF6)

Sulfur Hexafluoride (SF_6) will be used as a gas insulator for electrical switching equipment. Commercially available SF6 is not dangerous, and is not specifically subjected to the local environmental regulations. The use of SF6, a heavy gas in a confined area presents the risk of asphyxia, since it reduces oxygen content. SF_6 is a stable gas, heavier than air, not harmful to humans, non-toxic and non–corrosive. It is also non-explosive and non-inflammable.

According to United Nations Framework Convention on Climate Change (UNFCCC) SF6 released into the atmosphere is considered a greenhouse gas with a significantly higher global warming potential (GWP) of 23900 than that of CO2 in 100 years. SF_6 is used in enclosed systems which are extremely safe and unlikely to leak under normal circumstances. SF_6 is collected and recycled if a piece of equipment or a grid station needs to be opened. Despite the fact that SF_6 gas is very stable, it will partly decompose in association with electric discharges and arcs, producing gaseous and solid decomposition products. Normally the level of gaseous decomposition products is kept low through the use of absorbers built into the switchgear. In large concentrations, the decomposition products are corrosive and poisonous.

Mitigation Measures:

The following mitigation measure are taken into consideration for SF6 related operations and maintenance:

- The SF6 Gas insulated switchgears design should comply with relevant IEC standards for the prevention of gas leakage.
- The manufacturer is bound to design the switchgear with leakage rate of SF6 per annum for the whole grid station within 0.5-1%.
- Temperature compensated Pressure gauges will be installed for each compartment for monitoring of switchgear gas density and pressure.
- The GIS switchgear will be equipped with SF6 Alarm, tripping and monitoring system with efficient and quick leakage/loss detection system.
- Signals, usually wired up to the control room for operator attention in case of any minor or major loss of SF6 e.g. loss of SF6, SF6 pressure rising, SF6 minimum density, SF6 1st stage, SF6 2nd stage etc. , so any loss of SF6 will be noticed.
- During maintenance of switchgear or during SF6 gas filling/recovery, a calibrated and purposely designed machine named DILO is used for proper transfer of Gas to and from Gas compartments or specially designed cylinders, also proper pressure is maintained as per manufacturer recommendations.
- Only the trained, designated or certified personnel are authorized to use the DILO machine for process of SF6 Gas filling or recovery.
- Proper Safety measures and precautions should be taken prior to the start of work.

7.5.7 Transformer Oil and Lubricants Spill

Power Transformer installed in the grid station will have oil as cooling and insulating medium. Oil leakage may take place during operations or when changing insulating medium. This potential oil spillage, which can catch fire, is dangerous to the switchyard operations. Control measures will be needed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Oil spills are rare and are preempted by routine maintenance. Transformer oil may be supplied in drums from external source and tap tanks may be topped up as necessary on site.

Mitigation Measures

- Stones are provided at the transformer base to protect from fire when an oil spill takes place.
- A reservoir may be constructed below transformer for oil containment and spill control in case of leakage or outflow of oil due to severe internal fault. Bunds may also be constructed in transformer area for further protection.
- Use of Polychlorinated Biphenyls (PCBs) is prohibited as they are carcinogens.
- Refueling and maintenance should take place in dedicated areas.
- Contaminated residues and waste oily residues should be sent to the manufacturer(s) or disposed in environment friendly manner in consultation with local authority.

7.5.8 Electrocution Hazard

Grid station poses electrocution hazard due to energized electrical equipment and interconnecting wires. High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).

Mitigation Measures

- Reduction in the Resistance to Ground of the grounding system
- Proper placement of ground conductors
- The addition of resistive surface layer
- Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season.
- Keep extra safety margin from live part during wet season.
- There should be strict safety requirements for personnel assigned to work in grid station.
- To maintain safe conditions for the plant workers, grid station should be fenced.
- Appropriate signage should also be posted that shows the hazardous nature of the grid station.
- A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be calculated to protect passers-by during short-circuit. Where the grid station has a metallic fence, it should be properly grounded to protect the workers from this hazard.
- Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground.

7.5.9 Positive Socioeconomic Impact

Project operation will result in some positive socio-economic impacts including:

- Generating short to medium-term employment for local people; and
- Improving the technical skills of local people.

Chapter 8 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

8.1 Introduction

8.1.1 General

This section discusses the implementation and management of mitigation measures that are required for proposed project that includes progressive report and techniques to assure that all necessary environmental protection measures are carried out in the future as planned and to reduce residual impact to acceptable levels and achieve the expected outcomes of the project. The Environmental Management and Monitoring Plan (EMMP) are based on the type, extent and duration of the identified environmental impacts. The EMMP has been prepared following the regulatory requirements and guidelines.

Environmental management and monitoring is mandatory activity to be undertaken by the administration over the entire project cycle showing its commitment towards meeting environmental regulations/standards as well as maintaining health and safety standards.

The environmental management and monitoring programs are implemented from the very early stages of planning and execution phases of the project. In fact, the authorization of the project is the point of initiation of environmental management plan. The monitoring data, observations recorded and test results / analyses are vital and formulate legal documents to be kept in safe custody and may be provided to competent authority as and when required in accordance to Sindh Environmental Protection Act 2014.

EMMP is a dynamic and a live document that is under constant review having periodic revisions and may be updated as required. Any amendments in the procedures, information are notified to the concerned personnel after the approval from the competent authority for subsequent implementation. It also highlights the responsible personnel to work for the implementation of this EMMP.

The Proponent will be responsible for implementing the EMMP and ensuring that all personnel management are informed about the EMMP and the requirement to implement the procedures it contains. The EMMP is intended as a quick reference for Project personnel and regulators to monitor compliance.

8.1.2 Objectives of EMMP

The EMMP will serve as a principal execution module of the project that would not only mitigate adverse environmental impacts during the designing, construction, operational and maintenance phase of the project but also ensures that environmental standards and good housekeeping is maintained. Continuous environmental monitoring is exercised to ensure that preventive measures are in place and are effective; to sustain environmental integrity. Some of the key objectives of the EMP are to:

- Outline mitigation measures recommended in the EIA and define the responsibility and implementation of these measures;
- To outline functions and responsibilities of personnel;
- To state and implement standards and guidelines which are required under environmental legislations particular in context to the project,
- Facilitates the implementation of the mitigation measures by providing the technical details of each project impact, and proposing implementation schedule of the proposed mitigation measures;

- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented; and
- Identify training requirements at various levels and provide a plan for the implementation of training sessions

It is important that the recommendations and mitigation measures are carried out according to the spirit of the environmental assessment process and in line with the guidelines. The EMMP are presented in Table 8.1 and Table 8.2. Screening of potential environmental and social impacts has played a vital role in reconfirming typical mitigation measures and in identifying any different approaches based on the feasibility and detailed design assumptions and any alternatives available at this stage.

8.1.3 Legislation and Guidelines

Legislation and guidelines pertaining to this project have been discussed at length in chapter 3 of this EIA study. It shall ensure that the project activities during designing, construction and operation phases of the project would follow the relevant environmental legislations and guidelines. The staff of the proponent and contractor should also be aware of these laws.

8.2 Environmental Management Plan (EMP)

The impacts and their mitigation measures have been classified into those relevant to the designing, construction, operational and maintenance phase. The matrix provides details of the mitigation measures recommended for each of the identified impacts, time span of the implementation of mitigation measures, and the responsibility of the institution. The institutional responsibility has been specified for the purpose of the implementation and the supervision. The matrix is supplemented with a monitoring plan.

The monitoring plan is designed based on the project cycle. During the designing period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time. Where detailed design is required (e.g. for power distribution lines and avoidance of other resources) the inclusion and checking of designs must be carried out. During the construction period, the monitoring activities will focus on ensuring that environmental mitigation measures are implemented, and to guide any remedial action to address unexpected impacts. Monitoring activities during project operation will focus on recording environmental performance and proposing remedial actions to address unexpected impacts.

8.3 Structure of EMP

The environmental management plan is divided into the following core components:

- Organizational Structure and Roles and responsibilities;
- Implementation of Environmental Management Plan
- Mitigation matrix for each project phase;
- Monitoring plan for the project;
- Worker's Health and Safety Plan
- Waste management plan
- Equipment Maintenance

- Emergency Response Plan
- Site Restoration
- Change Management Plan

8.4 Organizational Structure and Roles and Responsibilities

8.4.1 Organizational Structure

The proposed project includes the following organizations:

- PPL as the project proponent and owner of the EMP
- Contractor and Subcontractor
- SEPA as regulatory body

In addition to the above organizations, Independent Monitoring Consultant (IMC) will also be involved for compliance and effects monitoring. The general roles and responsibilities of PPL and the Contractors are detailed in the following sections.

8.4.2 Institutional Framework for Implementation of EMP

This Framework illustrates the roles & responsibilities required for the implementation of EMP. KE would provide technical staff for the project components. Environmental management during different phases of proposed project would also be performed by KE. The contractors, staff and supervisors would be trained to ensure environmental safety. The EMP will be prepared to cover all phases of the project including designing, construction, operation and maintenance and the Proponent will ensure that all activities during all phases are in compliance with the EMP and SEQS. The brief Organizational structure for Environmental management is given in Figure 8.1.

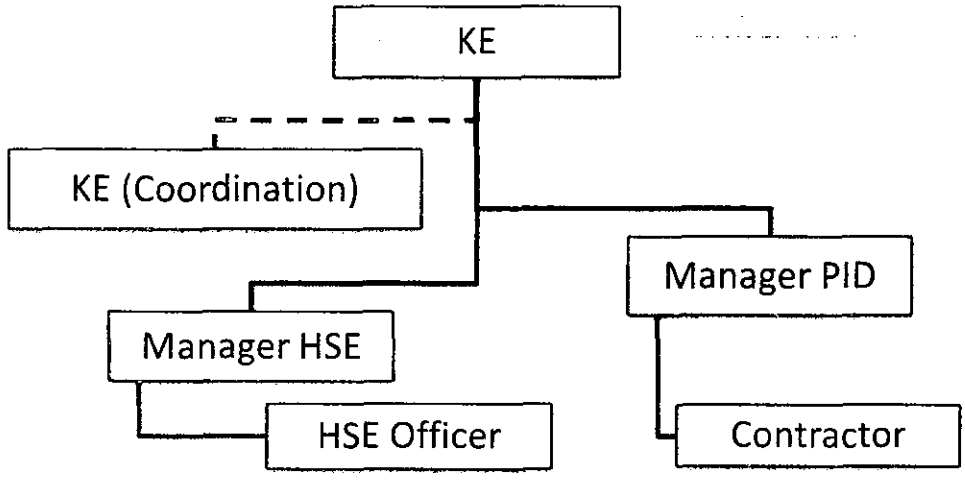


Fig 8.1: Proposed Organizational setup for environmental management

The K-Electric (KE)

KE would perform the following roles and responsibilities:

- The K-Electric (KE) top management will be responsible for the successful execution of the project;

- KE will ensure that the project complies with regulatory requirements;
- KE is responsible and accountable for HSE performance;
- Provide physical and financial resources to ensure better performance of HSE department;
- It would also be ensured that EMP is followed, staff is properly trained and with requisite expertise and execution of project in accordance with approved plan;
- To have emergency and rescue plans for safety of staff and general public.

HSE Manager

In management plan, the role of HSE Manager is always considered vital. Some roles and responsibilities of HSE Manager are as under:

- To improve the coordination and exchange of information between management, employees and contractors etc.;
- Ensure the health and safety of employees;
- Monitor the progress of development and implementation of EMP;
- To ensure that the point of views of staff and contractors are considered and placed in the EMP accordingly;
- Propose corrective and preventive measures wherever environmental deviations exceed compliance limits;
- To review EMP every year, tracking issues and change the EMP accordingly with the solutions and suggestions; and
- To contribute towards the actions to deliver the management plan and ensure its continued development.

HSE Officer

The role of HSE Officer will be authorized by HSE Manger. Some roles and responsibilities of HSE Officer are as under:

- Integrate as far as possible the aims and objectives of different users within an agreed plan;
- Maintain a balanced, holistic approach to the solution of concerned issues in accordance with the legislative requirements;
- Provide professional guidance on questions relating to the environmental management and issues raised by contractors/ relevant personnel; and
- Implement the suggestions and recommendations given in EMP.

Manager PID

- To respond to issues and solutions proposed by HSE department;
- To evaluate the progress of development and implementation of EMP; and
- To approve any change in decision making and authorities in consultation with HSE Manager, if appropriate.

Contractors

Some roles and responsibilities of Contractors are as under:

- To carry out development activities in environmentally sound manner;
- To coordinate with HSE Officer to resolve pertinent issues;

- To ensure that the project activities are undertaken in an environment friendly manner and the mitigation measures are implemented as per the recommendations of EIA;
- Evaluate compliance with SEQS, National and International Policies for Environmental Protection;
- To manage and implement environmental management practices as given in this EMP as well as HSE policies adopted/ prepared by the proponent.

Environmental Protection Agency

EPA as regulatory body has the responsibility to ensure project's compliance with local environmental laws is always ensured by the proponent. Under section 7 of Sindh Environmental Protection Act, SEPA has the powers to conduct surprise inspections or visits of the project area to observe the status of environmental compliance of the project.

8.5 Implementation of Environmental Management Plan

The implementation of EMP will be the responsibility of KE's management, supervisory staff and operations staff etc. and will be implemented during all stages of the project activity.

For large projects, carried out over extended periods, the 'Implementation' section of the EMP may be developed using a stage-based format. The stage-based format involves documenting the environmental issues and control measures for each stage of a project. This can create some repetition but is useful in large projects as each table provides a separate checklist for each stage in a project's progression.

8.5.1 Planning and Design of the Operation

a. Design of the Operation

Design and operations of the proposed project have been described in Section 2 of the report. Following the approval of the IEE, if any aspect of the operations or requirements of the IEE need to be changed, KE will categorize that change in accordance with the Change Management Plan and take appropriate measures thereon.

b. Approvals

Obtaining approval from Sindh Environment Protection Agency (SEPA) will not relieve the proponent or its appointed contractors or suppliers of any other legal obligations and hence the proponent and its contractors and suppliers will obtain all other relevant clearances and necessary approvals required by the Government of Pakistan or Government of Sindh prior to commencing the respective operations.

c. Contractual Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and suppliers and thus EMP will form part of their contracts with KE.

8.5.2 Implementation of the Operation

a. Co-ordination with Stakeholders

KE will ensure that co-ordination required with the project stakeholders on environmental and social matters as required by the EMP is maintained throughout the operation.

b. Environmental Management Systems

KE and the contractors will ensure that the mitigation measures mentioned in the EIA are adhered to and organizational HSE Management Systems are implemented during the proposed project. The contractors will abide by the relevant contractual provisions relating to the environment.

c. Monitoring

KE and its contractors will ensure that monitoring of the project activities is carried out according to the monitoring program given in the EMP.

d. Emergency Procedures

KE's Emergency Response Plan and Waste Management procedures for operation phase will be implemented. However, EPC contractors will develop their own procedures for construction phase.

e. Approvals

The project contractors will be responsible for obtaining all relevant approvals from KE such as approvals for waste contractors, water source and others as Necessary leases/approvals/NOCs from authorities including land and utility agencies specified in the environmental management and monitoring plan.

f. Training

KE and its contractors and suppliers will be responsible for the selection and training of their staff that are capable of completing the project activities in an environmentally safe manner. KE and its contractors and suppliers will be responsible for providing induction to their staff members on the EIA requirements, the EMP and their implementation provided in the EMP.

g. Operations Monitoring

KE will be responsible for effective monitoring for efficient operations of the Grid Station transmission lines. Grid station and its auxiliary systems will be monitored for their performance within the acceptable limits.

h. Restoration

KE will ensure that the restoration of the site after the end of construction activities.

8.6 Mitigation Matrix

Mitigation Management Matrix have been provided in this Environmental Management Plan (table 8.1(a) and (b)). The Mitigation Management Matrix will be used as a management and monitoring tool for implementation of the mitigation measures. The matrix lists down the following.

- The mitigation measures recommended in the EIA;
- The person/organization directly responsible for adhering to or executing the required mitigation measures;
- The parameters which will be monitored to ensure compliance with the mitigation measures; and
- The timing at which the mitigation or monitoring has to be carried out.

It is highlighted that although responsibilities for executing and monitoring mitigation measures have been delegated to different persons/organizations, KE holds the primary and overall responsibility for ensuring full implementation of the EMP.

8.7 Environmental Monitoring Plan

The EIA predicts the impacts of the proposed project on the basis of information available at the time of conducting the assessment and the natural processes that link various environmental parameters. Based on this prediction, mitigation measures are proposed such that the predicted residual effects do not exceed acceptable levels. However, there is always an element of uncertainty in such predictions due to an insufficient grasp of the processes, limitations in prediction techniques, or inadequate data on the environment/social aspects. Consequently, it is possible that even if the mitigation measures are implemented fully, the negative impacts of the project might exceed acceptable limits.

In order to address the above concerns, environmental health and safety monitoring will be undertaken during the project activities, with the overall objective of proper management of environmental and social risks and uncertainties. Broadly, monitoring will be undertaken with the following objectives:

- To verify that the impacts of the proposed project are within acceptable limits, thus establishing credibility (public assurance).
- To immediately warn the project proponents (and the regulatory agencies, if required) of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures.
- To provide information to plan and control the timing, location, and level of certain project activities so that the effects are minimized.

The following environmental parameters will be monitored at locations identified during the construction and operation phase:

- Air quality and noise level
- Oily runoff, fuel spillage from transformer or other electrical appliances
- Emissions from generators, vehicle exhaust etc.
- Waste management

A detailed environmental monitoring program/plan is provided in this section to assist the proponent in evaluating and monitoring the project performance against the EIA requirements.

To achieve the objectives of monitoring, Environmental Audits will be conducted to enable site management to assess the day-to-day environmental management of construction and operation activities at the site. The activities which will be monitored include all aspects of construction and operations that result in emissions, effluent or wastes or any other aspect of environmental concern.

8.7.1 Environmental Management Systems Audit

Environmental Management Systems Audit will be conducted to assess the implementation and operational success of the EMS at the Grid Station. This is achieved by assessing the objectives, organizational structure and responsibilities, Procedures, processes and resources available at the site. The EMS Audit is a systems assessment, rather than an audit of environmental compliance, which is assessed through the Site.

8.7.2 Independent Monitoring Consultant (IMC)

The role of Independent Monitoring Consultant (IMC) is very important to the overall performance of the facility in terms of environment, health and safety. The IMC can provide professional testing and consulting services to enhance the environment, health and safety performance of the project in the areas of water, air quality, waste management and other aspects. K.E can choose to hire an IMC for periodic monitoring of its facility to evaluate compliance to EPA's requirements.

8.7.3 Compliance Monitoring

The compliance monitoring of the project activities is principally a tool to ensure that the environmental control measures identified in the IEE are strictly adhered to during the project activities. Compliance monitoring will be the responsibility of all organizations involved in the field activities, i.e., K Electric and the contractors. It will be carried out by the following:

- HSE Supervisor
- Independent Monitoring Consultant (IMC)

The compliance monitoring will be conducted at agreed intervals:

- Systematically observe the activities undertaken by the contractors (and subcontractors) or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the EIA and EMP.
- Document and communicate the observations to the concerned person(s) of the contractors and K Electric's HSE department, so that any corrective measures, if required, can be taken in a timely manner.
- Maintain a record of all incidents of environmental and social significance, related actions and corrective measures taken.
- Maintain contact with the stakeholders, solicit their views and concerns, and discuss them during the regular meetings.
- Prepare periodic reports of the environmental, health and safety performance of project.

The monitoring plan discussed in Table 8.2(a) and (b) will be used as a monitoring tool for compliance monitoring. Inspection will be done using checklists prepared by the respective contractors, on the basis of Table 8.2(a) and (b), during the construction phase.

8.8 Environmental Training

An environmental training program will be prepared to address the need of contractor's site staff and build their capacity to effectively implement project-specific EMMP. HSE Officer will coordinate with contractors to organize training for their staff and to help them establish system /infrastructure for future sustainability. In addition to the training arranged and imparted by the HSE officer for complete project team, the contractor will also plan small training sessions for workers involved in specific jobs. Cost of trainings and mitigation measures will be deemed included in contract cost. Environmental Training Plan is provided in Table 8.3.

8.9 Emergency Response Plan

Emergency procedures will be prepared to include all events which have the tendency to create an emergency situation at the Grid Station. It is advisable that emergency procedures are prepared in conjunction with the emergency services such as fire brigade.

The procedures will be readily available to all personnel involved, regularly practiced and checked periodically that they are up to date. Employees likely to be affected will be provided with the knowledge of the actions required to minimize the adverse effects.

The emergency procedures will consider:

- the properties of the raw materials and excipients, solvents used;
- concerns associated with the exposure to the product
- the quantities involved;
- the Grid Station accessories may cause electric shock hazard

8.9.1 Contingency Planning –Incidents and Emergencies

A. Fire Contingency Plan

Because flammable / combustible materials, and electrical appliances are present at the site, fire is an ever-present hazard. All personnel and subcontractors are not trained professional fire-fighters. Therefore, if there is any doubt that a fire cannot be quickly contained and extinguished, personnel will notify the Site supervisor and vacate the area. The site supervisor will immediately notify the local Fire Department.

The following procedures will be followed to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- "No Smoking" signs will be posted at visible areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area, the area supervisor will give instruction on exit procedures and assembly points. Exit routes will be displayed through signage in work areas and exit points will be clearly marked.

The following procedures will be implemented in the event of a fire:

- Anyone who sees a fire will notify the supervisor who will then contact the Site Superintendent and the HSE Officer. The HSE Officer will activate the emergency alarm and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will comprise of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the site superintendent and the Health and Safety Officer will be notified.

i. Responsibilities of Fire Safety Officer

- The Fire Safety Officer will supervise and perform firefighting activities.
- Responsible for Head Count in the assembly area.
- Conduct Fire drills for the employees and reports the outcomes, suggestions and action plan of such drills.
- Responsible for maintenance and documentation of all fire extinguishers.
- Develop and regularly review building fire exit plans.
- Inspect and test new and existing fire protection systems, fire detection systems and fire safety equipment to ensure that they are operating optimally.
- Action by Staff Detecting the fire or smoke

If any person smells a burning odor or hear any one shouting "Fire, Fire" or sees the fire/smoke, he/she will immediately inform the telephone operator and will:

- Give his/ her name
- Location of Fire
- Type of Fire

Receptionist (Telephone Operator) will

- immediately inform Administration Manager, during and after working hours.
- call security in-charge
- call fire safety officer.
- call Police and City Government only if told by Security in-charge or fire officer.

Staff on duty will restrict fire by closing doors and windows of affected area, if possible and turn electrical mains to OFF position. If the fire is contained and small, rush towards the nearest fire extinguisher and try to extinguish the fire.

B. Evacuation Procedures

In the event of on-site evacuation of personnel is necessary, the following actions will be taken:

- The emergency signal will be activated (one single long blast on the air horn).
- No further entry of visitors or contractors will be permitted.
- Shut off all machinery if safe to do so.
- All on-site personnel, visitors, and contractors will assemble at the entrance of the site for a head count and await further instruction from the Site Superintendent.
- All persons will be accounted for by their immediate crew leaders (e.g., area supervisor). Crew leaders will determine the safest exits for employees and will choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader will try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the Site Superintendent.

C. Evacuation Responsibility

This decision will be made by the Emergency Rescue Team which includes Fire Safety Officer & Security In-charge and will be communicated to the Manager Administration.

Emergency Rescue Team will inform the Chief Operating Officer and decide if partial or full evacuation is required. Also liaise to mitigate the situation and return the area to normal as soon as possible.

The emergency response team members involved are as follows:

i. Actions by Security Officer/ Manager/ In charge

- Manager Administration and the Security officer in co-ordination with specific area in-charge will arrange for evacuation.
- If the fire goes beyond the control of management, the local Fire brigade to be summoned in consultation with Manager Administration.
- He will conduct root cause analysis and log the same on the prescribed incident report form.
- Security in charge will inform Manager Administration as soon as fire is confirmed by him personally.
- Call Fire Department immediately.
- Advise telephone operator to inform all head of departments/in-charges.

ii. Senior Management/Administration

- Should reach the place of fire as soon as the news is confirmed.
- Manager Administration will inform all areas of the Grid Station operations if needed.
- Media Handling
- A debriefing session at the end of the disaster.

iii. House Keeping

- Open all windows and doors for ventilation.
- Remove obstacles on the way to the fire exit.

8.9.2 Fire Detection & Warning

Portable Fire extinguishers will be used in buildings and as protection during "Hot Work" activities throughout the site. As construction progresses and systems are commissioned within specific buildings, personnel will be informed of the different alarm sounds.

Following types of fire extinguishers are generally used:

- ABC (Dry Chemical): Red or Orange in color. All-purpose dry chemical may be used on any type of fire
- CO_2: Red in color, Big Black horn on hose. Good for Oil, Grease & Electrical fires.
- Water: Completely red with no color band. Suitable for paper, textiles, wood, most plastics & rubber.

Large office accommodation will be protected by the use of hard-wired smoke detection devices with battery backup.

A suitable means of raising the alarm, in the event of a fire or other emergency at the facility, will be established. The alarm system will be appropriate to ensure all personnel can be notified immediately of any emergency situation and evacuation, or other actions required. The alarm system will be tested on a regular basis.

8.9.3 Fire Fighting Equipment

The following firefighting equipment will be maintained in good order in the facility:

- Fire Extinguishers of adequate size and Type
- Sand buckets
- Rescue gear
- Equipment will be maintained and tested to ensure serviceability in the event of a fire.
- Tests will be conducted monthly.
- Fire water storage tank of adequate size to meet requirements of firefighting during construction phase.

The facility fire suppression system will be prioritized and made serviceable as soon as practical during construction.

8.9.4 Fire Drills

The Fire Safety Coordinator/ Officer will ensure that monthly drills are carried out that ensure all personnel are familiar with the evacuation procedure and their respective muster points.

Simulated fire emergencies will be carried out to ensure the readiness and competency of the fire brigade to fight a major fire. During the drill, equipment will be tested. In the event any equipment should fail it will be immediately replaced.

Review of brigade competency will be determined during the drills. Brigade members will be retrained if any evidence of in-competency exists.

8.10 Waste Management Plan

The waste management plan will be prepared and implemented by the construction contractor for the proposed Grid Station and Transmission Line in order to ensure timely collection, handling and disposal of the waste generated during the construction phase. Waste management at the Grid Station would:

- reduce risk exposure to a minimum,
- protect employees,
- bring the organization into compliance with EPA's requirements

8.11 Change Management Plan

8.11.1 Change in Operations

Any change in the project design or project operation if required, will be made in relevance to the EMP and all the impacts associated with changed process will be either similar to the existing impacts and if different, will be assessed and included in the mitigation management plan. This has, on the basis of nature of process change, been distributed into three categories.

a) First-Order Change

Change leading to a significant removal of any operation from the project described in the chapter on description of project of this report and consequently requires a reassessment of the environmental impacts associated with the changes. In such an instance, updated environmental impacts of the proposed change will be sent to EPA for approval.

b) Second-Order Change

Change that entails project activities not significantly different from those described in the EIA report, and which may result in project impacts whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the environmental impacts of the activity will be reassessed. Additional mitigation measures, if required, will be identified and documented for being reported to EPA for their record.

c) Third-Order Change

Change that is of little consequence to the EIA findings. This type of change does not result in impact levels exceeding those already assessed in the EIA report; rather these may be made onsite to minimize the impact of an activity. The only action required in this regard will be to record the details of process change in the record register.

8.11.2 Change in Record Register

A record register will be maintained at project site at the start of project activities. All the changes to be made will be recorded in this register. This will assist in the step-by-step environmental monitoring and decision-making. Record register will be the responsibility of EHS department, and will be used internally.

8.11.3 Change in EMP

Changes in project design necessitate changes in the EMP. In this case, following actions will be taken:

- A meeting will be held between project management and contractor, to discuss and agree upon the proposed change to the EMP.
- Based on the discussion during the meeting, a report will be produced, which will include the additional EMP clauses and the reasons for their addition.
- Additional EMP clauses will be added to the original EMP as a second volume which will be distributed to the relevant project personnel and contractor.

8.12 Grievance Redress Mechanism (GRM)

KE and its Construction Contractor will adopt the Community GRM Procedure outlined below, which requires interaction, consultation, and timely resolution of legitimate grievances. This approach is aimed at building a reputation of responsiveness, concerned and responsibility among the community, with a view to building and sustaining acceptance and support for the construction and operation of the project.

The grievance officer recruited by Construction Contractor will place a complaint register at an accessible location (Union Council office, mosque, or at camp site) for respective community so anyone can register their complaint in this register and on weekly basis, it will be checked by the Grievance Redress Committee (GRC).

KE and its Contractor(s) shall foster a sense of working with the local community and demonstrate that the Project takes a proactive stance to grievances.

In implementing KE's Community Grievance Procedure, the Contractor(s) shall:

- Record all grievances using the template Grievance Form given at the end of this section;
- Assess and advise the resolution of the grievance in the time frame required by the assessment.

All grievances will be investigated and a response (outlining a resolution) will be provided by KE/Contractor(s) as soon as possible and not more than 30 days after receiving the grievance. If more time is required for resolution, the person raising the grievance and KE shall be kept informed.

While the Contractor(s) is not prevented from initiating the grievance resolution, any corrective action taken must be in coordination with KE.

KE and its Contractor(s) shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of this Plan. The Contractor Plan shall describe the resources allocated to and responsibility for the execution of each task and requirement contained therein, and shall describe how roles and responsibilities are communicated to relevant personnel.

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
Designing Phase			
Migratory bird flyways / Birds	Chance of Collision of Birds with the conductor string	• All suspension poles shall have detachable bird protection devices, over each suspension insulator string. • Bird flappers and deflectors will be installed on conductors to avoid collision of birds on strings.	CC
Temporary Construction Camps	Deterioration of air & water quality, and social impacts	• Camps are to be located away from residents/commercial activities to minimize nuisance; • Sanitation facilities in the camps, if provided, should be mobile & collect its wastewater or connected to the local sewerage system; • Bathing of construction crew should be prohibited at the camp as it will require large quantity of water and generate large volume of wastage.	CC
Contract clauses	Contractor may not perform the work in environmental friendly manner	• Construction Contractor / Waste Contractor shall be made responsible through contract documents for proper disposal of the spoil / excavated earth and not to dump these spoils/ earth near open plots / open spaces / open storm water drains / in front of residents or leave unattended along the construction site. It should be disposed in KMC designated landfill site. • A proper site rehabilitation plan shall be made by the contractor which includes the spoil / excavated earth disposal arrangements • Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and applicable standards during all the construction operations and ensure compliance of the same through periodic environmental monitoring reports. • Contractors shall be made responsible through contract documents to follow Standard Practices and Standard Operating Procedures (SOPs) to ensure health & safety of workers at the site and public during all construction operations. • As the work is usually completed by contractors and sub-contractors, K-Electric should monitor their works to ensure proper task completion.	KE
Construction Phase			
Excavation, storage of soil and waste, generation of waste	Soil Erosion	• Construction activities should be scheduled to avoid runoff due to rain; • The dredged soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation;	CC

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions; • Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites; • Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.	
Water Resources	Impact on Surface and ground water sources	• All excavated soil left after backfilling should be completely removed; • Debris and vegetation clogging culverts and drains should be regularly cleared; and • Soil runoff from the site leading to off-site contamination (particularly during rainy season) should not be allowed. • Spillage of oil and grease from the vehicles should be avoided.	CC
Fuel, Oil & Chemical handling, storage and disposal	Soil contamination	• Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course; • Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be avoided at construction site; • Oil contaminated materials should be disposed at designated waste disposal facilities.	CC
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase should be developed and implemented; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of waste should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and	CC

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	
Dust Emissions	Deterioration of local Air Quality	• Dust emissions from soil piles and aggregate storage stockpiles should be reduced by keeping the material wet by sprinkling water at appropriate frequency and erecting windshield walls on three sides of the piles; • It should be mandated by KE to Contractor to backfill the excavations after laying of the tower foundations and rehabilitate the excavated area to its original position. If it is a road, the backfilling will be followed by levelling and carpeting of road with bitumen; • Vehicular movement should be restricted to a specific time for dumping of supplies and construction materials; and • Workers should wear dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.	CC
Exhaust Emissions	Deterioration of local Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS; • Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) will be banned from sites; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	CC
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents	• Machinery operation and high noise activities should be carefully planned and scheduled; • To the extent practical batching plants and construction areas should not be located within 500 meters of a settlement; • Where that is not possible, high noise activities should cease between 20:00 hrs. to 06:00 hrs. at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents.	CC

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
		• Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • The stationary sources of noise such as concrete mixers, batching plant, power generators and pumps will be selected and segregated from work areas and residents; and • Occupational health, safety and environmental procedures and Environmental management plan for proposed project would be followed.	
ROW Clearance	Impacts on Ecology (Flora and Fauna), cutting of trees	• Compensatory plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs; and • By using the best practice for vegetation clearing and disposal practices; will minimize the environmental risk associated with clearing and disturbance of vegetation.	CC
Safety Precautions for the Workers	The construction and civil works pose an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities during construction phase	• Preventive and protective measures including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital will be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work;	CC

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• To maintain safe conditions for the general public, construction camps will be fenced and gated, that must be locked at all times; and To protect workers from heat stress • Move to a cool place e.g. cool shady area; • Provide plenty of drinking water; • Break the working in shifts	
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic flow along the right of way of transmission lines. This increase in traffic may congest the flow of traffic and may cause some accidental injuries and deteriorate the air quality of ambient air.	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines; • The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily; • Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	CC
Social Impacts	Community health & safety issues	• Emergency response plan should be prepared and implemented during entire phase of construction; • Procedures for interaction with local and regional emergency and health authorities should be made; • In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 4:30-6:30 pm; • Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the residential areas and communities; • It should be mandated by KE to Contractor to backfill and rehabilitate the excavated area to its original position.	CC

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Proper lighting at night near trenches will be ensured; and • Diversions, danger points and works at culverts, bridges and construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. For of construction of foundation for Tower, vegetation removal is minimal therefore, impact on ecology are negligible.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities.	CC
Operational and Maintenance Phase			
Wind, fire and earthquakes	Electricity arcing, poles and towers dislodgment	• Transmission towers have been design as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions. • Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads • System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. • Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards: o The fire hazards risk will be minimized through the use of tall towers and wide ROW. o System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. o Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.	KE/CC
Electromagnetic Interference	The corona of overhead TL conductors and high frequency currents of overhead Transmission Line can create radio noise	• Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.	KE

Table 8.1 (a): Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	which interferes with broadcast signals or electronic equipment.		
Electrocution hazard	High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).	• Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground. • Reduction in the Resistance to Ground of the grounding system • Proper placement of ground conductors	KE
Gaseous Emissions	Air pollution	• All vehicles, power generators and other equipment used during the maintenance work will be properly tuned and maintained in good working conditions in order to minimize emission of pollutants; and • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance with SEQS.	KE
Solid Waste	The maintenance activities may generate some hazardous and non-hazardous waste such as wires and wild vegetation etc.	• Ensure that all solid waste generated during operational or maintenance work is collected and disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	KE
Notes KE = K-Electric; CC = Construction Contractor; SEQS = Sindh Environmental Quality Standards; PM = Particulate Matter, TL = Transmission Line			

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
Designing Phase			
Social Impacts	Land acquisition & resettlement, Institute near to right of way, traffic jams	• Traffic management plan will be prepared to manage the traffic jam; especially in peak hours; • Land acquisition shall be achieved as per the national rules and KE standards	KE
Waste disposal	Inadequate disposal of all wastes including transformer oil, residual contaminated soils, empty paint bucket and scrap metal.	• Create waste management policy and plan to identify sufficient locations for and storage of waste generated from construction camps and disposal of residual contaminated soils and scrap metal; and • Designate disposal sites in the contract and cost unit disposal rates accordingly.	KE
Contract clauses	Contractor may disown to work in environmental friendly manner	• Include provisions of this EMP in tender documentation and make contractors liable to implement mitigation measures by reference to EIA in contract; • Include Waste Management plan, Emergency Management Plan in contract as a payment milestone(s); and • Require environmental accident checklist and a list of controlled chemicals / substances to be included in the contractor's work method statement and tender documentation.	KE
Natural Hazards	Project Area lies in Zone 2A where minor to moderate damage can occur due to earth quakes.	• An earthquake proof design will be developed so that little or no intensification of the basic accelerations associated with the frequency spectrum of the seismic disturbance is encountered.	KE
Construction Phase			
Social Impacts	Community health & safety issues	• In order to minimize traffic congestion (if applicable), deliveries of materials and equipment will avoid peak traffic hours; • Dust emission from soil piles and aggregate storage stockpiles shall be reduced by keeping the material wet by sprinkling of water at appropriate frequency; • Vehicular movement shall be restricted to a specific time for dumping of supplies and construction material.	Contractor
Water Resources	Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is being met from	• Regular monitoring of water consumption and quality; • Use of leak proof water storage tanks; and	Contractor/ KE

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	external sources such as water tankers supplying water to the construction site		
Air quality	Deterioration of Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to SEQS; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	Contractor
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to workers and local fauna	• As far as possible, those machinery and equipment would be selected that create less noise and vibration; • Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • Occupational health, safety and environmental procedures and Environmental management plan for proposed project will be followed.	KE / Contractor
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase will be developed and implemented; • Construction sites will be equipped with temporary refuse bins, and construction wastes will be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas will not be within 50 m of water ways; • Any hazardous waste will be separated and stored in areas clearly designated and labeled, and disposed in environmental friendly manner; • Wastes will be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and	Contractor / KE

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Upon completion of activities at a construction site all solid wastes will be completely removed and the site will be re-contoured or prepared for natural revegetation.	
Safety Precautions for the Workers	The construction and civil works poses an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities of construction phase	• Preventive and protective measures including elimination, substitution, or modification of hazardous conditions, with particular attention to live power lines, working at height, EMFs, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital shall be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work; • To maintain safe conditions for the general public, all substations will be fenced and gated that must be locked at all times; and • Appropriate signage will be posted that shows the owner of the grid station, the hazardous nature of the substation and contact information.	KE / Contractor
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic in the vicinity of grid station. This increase in traffic may congest the flow of traffic and may cause	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines; • The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily;	CC

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	some accidental injuries and deteriorate the air quality of ambient air.	• Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. Onsite vegetation clearance will be required only within the boundaries of proposed grid station. Therefore, the impact on ecology of area from construction activities is minimal.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities. • Compensatory tree plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs;	KE/CC
Operational and Maintenance Phase			
Transformer Oils & Fuel Spills	Pollution of soil	• Chemicals and oils will be stored in secure designated areas with permanent impermeable layer; • Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas; • A reservoir may be constructed below transformer for oil containment and spill control in case of leakage or outflow of oil due to severe internal fault. Bunds may also be constructed in transformer area for further protection. • Contaminated residues and waste oily residues will be disposed at an appropriate site approved by the relevant local environmental authority.	KE
Human Exposure to Electromagnetic Fields (EMF)	Adverse health effects	• Principles of careful avoidance will be adopted to ensure exposure levels are well below the generally accepted standards; • Regular health monitoring of workers to assess the possible adverse impacts due to EMF,	KE
SF6	Asphyxiation and Global Warming	• The SF6 Gas insulated switchgears design should comply with relevant IEC standards for the prevention of gas leakage. • The manufacturer is bound to design the switchgear with leakage rate of SF6 per annum for the whole substation within 0.5-1%.	KE

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
		• Temperature compensated Pressure gauges will be installed for each compartment for monitoring of switchgear gas density and pressure. • The GIS switchgear will be equipped with SF6 Alarm, tripping and monitoring system with efficient and quick leakage/loss detection system. • Signals, usually wired up to the control room for operator attention in case of any minor or major loss of SF6 e.g. loss of SF6, SF6 pressure rising, SF6 minimum density, SF6 1st stage, SF6 2nd stage etc., so any loss of SF6 will be noticed. • During maintenance of switchgear or during SF6 gas filling/recovery, a calibrated and purposely designed machine named DILO is used for proper transfer of Gas to and from Gas compartments or specially designed cylinders, also proper pressure is maintained as per manufacturer recommendations. • Only the trained, designated or certified personnel are authorized to use the DILO machine for process of SF6 Gas filling or recovery. • Proper Safety measures and precautions should be taken prior to the start of work.	
Electrocution	Direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices.	• The addition of resistive surface layer • Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season. • Keep extra safety margin from live part during wet season. • There should be strict safety requirements for personnel assigned to work in substation. • To maintain safe conditions for the plant workers, substation should be fenced. • A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be calculated to protect passers-by during short-circuit. Where the substation has a metallic fence, it should be properly grounded to protect the workers from this hazard.	KE
Fire and Earthquake	Risk of Fire and Earthquake	• Maintenance and monitoring of electrical equipment will be done to prevent faults; • Arrangement will be done to prevent the flying Bats and birds to come into contact with the Grid Station;	KE

Table 8.1(b): Environmental Management Plan for construction and operation of Grid station

Environmental Aspect	Impacts	Mitigation Measures	Responsibility
		• Fire extinguishing arrangements will be ensured; • Designing of structures will be made earthquake resistant; and • Emergency response plans will be developed.	
Noise	Noise Pollution	• Vehicles and other maintenance equipment will comply with SEQS and other international standards for noise and are maintained to meet standards; • If possible, all noise generating equipment will be locked up by acoustic barrier to minimize the extent of impact area; • All operational or maintenance staff will wear mufflers/earplugs while operating or working near high noise sources; and • Back-up power generators will be maintained regularly.	KE
Solid Waste	The operation and maintenance activities of proposed project may generate some hazardous and non- hazardous waste such as wires, metal scrap etc. which if not disposed of properly could have adverse impacts on the environment.	• All solid waste collected during operational or maintenance work will be disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation. (To be added in the finalized chapter)	KE

Notes

K.E = K. Electric; SEQS = Sindh Environmental Quality Standards

Table 8.2 (a): Environmental Monitoring Plan for construction and operation of overhead transmission line				
Environmental Aspect	**Monitoring Parameters**	**Monitoring Location**	**Monitoring Frequency**	**Responsibility**
Designing Phase				
Migratory bird flyways / Birds	Check the bird protection devices are installed	Entire transmission Line	Monthly / reported quarterly basis	CC/KE
Water consumption	Consumption in liters	Construction sites/camps	Measured on daily basis / reported quarterly basis	CC/KE
Construction Phase				
Excavation, storage of soil and waste, generation of waste	Check any obstruction in existing drains due to construction, check lifting of waste material, check waste management plan	At construction site	Monthly / reported quarterly basis	CC/KE
Water Resources	Check drainage infrastructure	Construction sites near drainage infrastructure	Monthly / reported quarterly basis	CC/KE
Fuel, Oil & Chemical handling, storage and disposal	Check contamination on the ground, check waste disposal	Vehicles/ machinery in working areas	Monthly / reported quarterly basis	CC/KE
Construction Waste Disposal	Domestic waste, Hazardous waste – Chemical waste, electro waste, Paper and Polythene material waste and Wood	Collection, handling, storage areas and disposal	Measured on daily basis and reported quarterly	CC/KE
Dust Emissions	SPM, PM_{10}, $PM_{2.5}$, SOx, NO, NO_2 and CO	Near Construction site (if several construction sites with a buffer distance of 5 km working consecutively or together, each site will be monitored at in a month)	Measured monthly for 12 working hours / reported quarterly basis	CC/KE
Exhaust Emissions	Smoke, CO, Noise, NOx, PM, SO_2	All construction vehicles	Measured monthly/ reported quarterly basis	CC/KE
Noise and Vibration	Noise Intensity (dB)	Near Construction site (if several construction sites with a buffer distance of 5 km working consecutively or	Monthly / reported quarterly basis	CC/KE

Table 8.2 (a): Environmental Monitoring Plan for construction and operation of overhead transmission line				
Environmental Aspect	**Monitoring Parameters**	**Monitoring Location**	**Monitoring Frequency**	**Responsibility**
		together, each site will be monitored at in a month)		
ROW Clearance	Check tree cutting, compensatory plantation, inventory of cleared trees / plants	At construction alignment	Monthly / reported quarterly basis	CC/KE
Safety Precautions for the Workers	Accidents, PPEs, Annoyance, Fire Hazards, Safety Protocols, Spill on Land and Spill on Water	All construction areas	Continuous / reported quarterly basis	CC/KE
Traffic Movement near construction site	Traffic flow, timing of activities, near misses and injuries records and reporting	At crossroads and along transmission line Right of Way	Continuous / reported quarterly basis	CC/KE
Social Impacts	Review of complaint register Local Consultations	Near Construction site	Monthly / reported quarterly basis	CC/KE
	Surface topography, Proper backfilling and carpeting	All excavated areas	Continuous / reported quarterly basis	CC/KE
Operational and Maintenance Phase				
Wind, fire and earthquakes	Regular maintenance of the protection system including conductors and circuit breakers will be undertaken	Transmission line Corridor	Monthly / reported quarterly basis	KE
Human Exposure to Electromagnetic Fields (EMF)	Electromagnetic Field (EMF)	Transmission line Corridor	Conducted and reported annually	KE
Gaseous Emissions	Smoke, CO, Noise, NOx, PM, SO_2	All maintenance vehicles	During maintenance activities	KE
Solid Waste	Waste collection and disposal records	Maintenance areas	During maintenance activities	KE

Table 8.2(b): Environmental Monitoring Plan for Grid Station				
Monitoring Areas	**Monitoring Parameter**	**Monitoring Locations**	**Monitoring Frequency**	**Responsibility**
Construction Phase				
Air Quality	Particulate Matter, SOx, NOX and CO	Construction sites/camps	Quarterly	IMC
Wastewater	Temperature, pH, COD, TSS, TDS, BOD5, Copper and Chromium	Outlet of the wastewater discharge	Monthly	IMC
Soil	Soil contamination (Oil & Grease)	All construction areas	Continuous	IMC
Water Consumption	Liters	Construction sites/camps	Measured on daily basis and reported quarterly	HSE Officer/IMC
Solid Waste	Domestic waste, Hazardous waste –Chemical waste, electro waste, Paper and Polythene material waste and Wood	Segregation & Collection, handling, storage areas and disposal	Measured on daily basis and reported quarterly	HSE Officer/IMC
Health & Safety of Workers	Accidents, PPEs, Annoyance, Fire Hazards, Safety Protocols, Spill on Land	All construction areas	Continuous	HSE Officer/IMC
Noise Quality	Noise Intensity (dB)	All construction areas	At start of Construction Phase and Quarterly	IMC
Operational and Maintenance Phase				
Spills	Spills on land	Fuel Storage, Transformers, Capacitor and Switchgear	During Fuel Transportation, Oil changing and Engine Maintenance	IMC
Noise	Noise Intensity (dB)	Grid Station	At start of Operational Phase and Quarterly	IMC
Health & Safety	Accidents, PPEs, Fire Hazards, Safety Protocols	Grid Station	Monthly	IMC
Electromagnetic Field (EMF)	Adverse health effects due to EMF	Grid Station	At defined frequency as per Occupational Health Monitoring Plan	IMC
General				
Compliance Monitoring	IEE Commitments, Mitigation Measures, Implementation of EMMP and Conditions of Environmental Approval	All areas in all phases	Monthly	IMC

Table 8.3: Environmental Training Plan

Staff	Responsibilities	Areas	Schedule
Project staff	Contractor/HSE Officer	• Findings of EIA • Mitigation Measures • EMP • Waste disposal procedures • Camp Operation • Social and Cultural values of the Project areas • Environmental sensitivity of the Project area • Flora and Fauna of the area • Emergency Response Plan • Community Issues	Prior to start of Project activities
Drivers	Contractor/HSE Officer	• Road safety • Road restrictions • Defensive driving	Before and during construction activities
Camp/Site Staff	Safety Officer	• Waste Disposal • Housekeeping	Before and during construction activities

8.13 Monitoring Forms

Environmental reviews will decide for necessary items to be monitored which are based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

Table 8.4 (a): Sample Forms for Ambient Air Quality Monitoring Record

PM_{10} (Respirable Particulate Matter)						
Location	**S.No.**	**Date**	**Time (Hrs: Min)**	**Result ($\mu g/m^3$)**	**SEQS ($\mu g/m^3$)**	**Remarks**
	1				150	
	2				150	
	3				150	
	4				150	
	5				150	
	6				150	
	7				150	
	8				150	

Table 8.4 (b): Sample Forms for Ambient Air Quality Monitoring Record

CO, SOx, NOx							
Location	**S.No.**	**Parameter**	**Date**	**Time (Hrs:Min)**	**Result ($\mu g/m3$)**	**SEQS ($\mu g/m3$)**	**Remarks**
	1	CO			..... (mg/m^3)	5 (mg/m^3)	
	2	SOx				120	
	3	NOx				40	

Table 8.5: Sample Form for Noise Quality Monitoring Record

Location	**S.No.**	**Date**	**Time (Hrs:Min)**	**Analysis**	**Result dB(A)Scale**	**SEQS**	**Remarks**
	1					55 / 45*	
	2					55 / 45	
	3					55 / 45	
	4					55 / 45	
	5					55 / 45	
	6					55 / 45	
	7					55 / 45	
	8					55 / 45	

*Limits are for Commercial Area, Day Time / Night Time

(Domestic/non-hazardous solid wastes)

Location: _____ Date: _____ Source: _____ (domestic/ non-hazardous)

Table 8.6: Sample Form for Solid Waste Monitoring Board

Total Quantity (kg)	*Components*	*Weight (as discarded)*	*% by weight (as discarded)*	*Recyclables*	*Non-recyclables*	*Organic waste*
	Food/kitchen waste					
	Plastics					
	Metals					
	Paper					
	Textile/Rugs					
	Cardboard					
	Glass					
	Rubber					
	Others					
Total						

Generation Rate:

Total waste generated = _____ kg/capita/day

No. of persons in units

Summary:

- Total Waste Generated (as collected) =_____kg
- Recyclable waste quantity =_____kg
- Non-Recyclable waste quantity =_____kg
- Organic waste quantity =_____kg
- %age of Recyclables =_____%
- %age of Non-recyclables =_____%
- %age of Organic waste =_____%
- Total waste send for recycling =_____kg
- Total waste send for landfill =_____kg

Comments:

(Hazardous solid wastes)

Location: _____ Date: _____ Source: _____(Hazardous)

Table 8.7: Sample Form for Solid Waste Monitoring Board

Total Quantity (kg) Recyclables	*Hazardous waste Components*	*Weight (as discarded)*	*% by weight (as discarded)*	*Characteristics (corrosive, toxic, explosive, etc.)*	*Non-recyclables (requiring disposal)*
Total					

Total waste generated = _____ kg/capita/day

No. of persons in units

Summary:

- Total Waste Generated (as collected) = _____ kg
- Recyclable waste quantity = _____ kg
- Non-Recyclable waste quantity = _____ kg
- %age of Recyclables = _____ %
- %age of Non-recyclables = _____ %
- Total waste send for recycling = _____ kg
- Total waste send for disposal = _____ kg

Comments:

(Health & Safety)

Monitoring Items	Monitoring Results

Note: Needed during both the construction and operational phase

(Electromagnetic Fields)

Monitoring Items	Monitoring Results

Note: Needed during the operational phase

Chapter 9 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

This Environmental and Social Impact Assessment study was carried out to identify the environmental and socioeconomic impacts of the proposed "New 500/220/132kV Grid Station and associated 500kV and 220kV Transmission Lines" project.

During study, environmental and socioeconomic baseline information was collected from variety of sources including visit of project area, previous environmental reports and studies conducted in the area, published literature and field surveys. All these information were used to compose the profile of the physical, biological and socioeconomic environment of the area which is likely to be affected by the proposed project activities. Information for the project description was provided by the project management.

On the basis of baseline and project description, potential environmental impacts were identified on the project's physical, biological and socioeconomic environments. The potential impacts during the construction phase of the proposed project included the generation of dust and gaseous emissions, noise, construction waste, health and safety and socioeconomic effects. Similarly, the key environmental and social issues during the operation phase included the Electromagnetic field and impacts of accidental releases of SF6 and Transformer oil.

The EIA process finds that the impacts of the project activities at the design, construction and operation stages have been adequately addressed and mitigation measures duly proposed wherever needed. Adoption of mitigation measures will ensure reduction of impact on the micro and macroenvironment as well as socio-economic conditions to acceptable levels. The development of this project will be compatible with the requirements of the Sindh Environmental Protection Act 2014, Sindh Environmental Protection Agency (Review of IEE/EIA) Regulations 2014, and Sindh Environmental Quality Standards (SEQS); as well as other regulatory requirements of Government of Sindh and Government of Pakistan. The issue of environment, health & safety has been duly incorporated in the design, construction & operations phases of the project.

IFC's Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution have been reviewed for the proposed project and will be utilized as standard for Good International Industries Performance (GIIP). The project also aims to adhere to IFC's Environmental and Social Performance Standards, which define IFC clients' responsibilities for managing their environmental and social risks. These Standards include:

- Risk Management
    - The proposed ESIA has taken into consideration various environmental and social risks that could arise during different stages of projects and corresponding mitigation measures have been given to minimize or eliminate them.
- Labour
    - The proposed project will result in short to medium term employment, particular for unskilled labour. Measures for labour protection against potential hazards during the course of project have been described in the report.
- Resource Efficiency
    - The proposed project aims to for efficient electricity transmission by employing proven technologies.

- Community
  - Communities in the project area have been consulted during the ESIA study. Measures to alleviate possible negative impacts of project to the communities have been described in the report.
- Land Resettlement
  - No resettlement is envisaged from the project activities.
- Biodiversity
  - The project area is predominantly barren and has Xerophytes as prevalent vegetation. No major adverse impacts are envisaged from the project activities on the biodiversity of the area.
- Indigenous people
  - No known designated indigenous people inhabit the project area.
- Cultural Heritage
  - No gazetted cultural heritage site is located in the project area.

On the basis of the findings of the EIA Study, it is possible to conclude that:

- Construction and Operation of Grid Station and Transmission lines will, on adoption of the mitigation measures, have no significant impact on the physical as well as socio-economic composition of the microenvironment and macroenvironment of the project area;
- The likely impact of construction and operation of the grid station and transmission lines will be appropriately mitigated through proven technologies, careful planning and landscaping;
- The project will meet the forecasted demand for energy;
- Employment opportunities will be generated for short to medium term;
- The proposed project; after commissioning will become an integral part of the microenvironment.

Mitigation will be assured by a plan of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and may also include interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the EPA Sindh.

9.2 Recommendations

The study recommends and confirms that the proponent shall adopt all environmental management processes in full, as prescribed by the national and international laws and guidelines and given in the EIA document. Following essentials recommendations which are also the part of EMP as mitigation measures will be followed by KE in letter and spirit:

- Prior notices shall be given to the communities in the project area before the starting commissioning activities near these sensitive locations;
- Prior notices shall be given to the legal shop owners and residents before the starting commissioning activities near these settings;
- For cutting of trees, compensatory plantation shall be provided at a ratio of 1:3;
- A Comprehensive Waste management Plan for construction and operation phases should be developed;

- Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA;
- Protective measures against high noise intensity, soil erosion, traffic problem, land pollution and water contamination will be taken care of;
- Emergency response plan should be prepared and implemented during construction and operation phases;
- Preventive and protective measures including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, EMFs, high noise levels, and exposure to chemicals will be made; and
- The Project will thus respond to all aspects of sustainability: Economic, social and environmental and will thus be a sustainably viable project.

The study therefore recommends that the EIA report should be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management Plan will be followed in letter and spirit.

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ANNEXURES

Annexure – I

Sindh Environmental Protection Act 2014

EXTRAORDINARY **Registered No. M324**

The Sindh Government Gazette

Published by Authority

KARACHI THURSDAY MARCH 20, 2014

PART-IV

PROVINCIAL ASSEMBLY OF SINDH
NOTIFICATION
KARACHI, THE 20TH MARCH, 2014.

NO.PAS/Legis-B-06/2014- The Sindh Environmental Protection Bill, 2014 having been passed by the Provincial Assembly of Sindh on 24th February, 2014 and assented to by the Governor of Sindh on 19th March, 2014 is hereby published as an Act of the Legislature of Sindh.

THE SINDH ENVIRONMENTAL PROTECTION ACT, 2014.

SINDH ACT NO. VIII OF 2014.

AN
ACT

to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

WHEREAS it is expedient to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto; **Preamble.**

PART-I

It is hereby enacted as follows:-

1. (1) This Act may be called the Sindh Environmental Protection Act, 2014 **Short title and commencement.**

(2) It extends to the whole of the Province of Sindh.
(3) It shall come into force at once.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context-

(i) "adverse environmental effect" means impairment of, or damage to, the environment and includes—

(a) impairment of, or damage to, human health and safety or to biodiversity or property;

(b) pollution; and

(c) any adverse environmental effect as may be specified in the rules or regulations made under this Act;

(ii) "Agency" means the Sindh Environmental Protection Agency established under section 5 of this Act;

(iii) "agricultural waste" means waste from farm and agricultural activities including poultry, cattle farming, animal husbandry residues from the use of fertilizers, pesticides and other farm chemicals and agricultural runoff;

(iv) "air pollutant" means any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioactive substances;

(v) "biodiversity" or "biological diversity" means the variability among living organisms from all sources, including inter-alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems;

(vi) "biosafety" means the mechanism developing through policy and procedure to ensure human health and the environmentally safe application of biotechnology;

(vii) "Council" means the Sindh Environmental Protection Council established under section 3 of this Act,

(viii) "discharge" means spilling, leaking, pumping, depositing, seeping, releasing, flowing-out, pouring, emitting, emptying or dumping into the land, water or atmosphere;

(ix) "ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit;

(x) "effluent" means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapour;

(xi) "emission standards" means the permissible standards established by the Agency for emission of air pollutants and noise and for discharge of effluent and waste;

(xii) "environment" means-
(a) air, water, land and natural resources;
(b) all layers of the atmosphere;
(c) all organic and inorganic matters and living organisms;
(d) ecosystems and ecological relationships;
(e) buildings, structures, roads, facilities and works;
(f) all social and economic conditions affecting community life; and
(g) the inter-relationship between any of the factors in sub-clause (a) to (f) made under this Act;

(xiii) "environmental aspect" means an organization's activities or services that can interact with the environment;

(xiv) "environment audit" means a systemic scrutiny of environmental performance of an organization, factory company or manufacturing and production unit regarding to its operations

(xv) "environmental impact assessment" means an environmental study comprising collection of data prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;

(xvi) "Environmental Management Plan" means a site specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with the environmental legislation;

(xvii) "Environmental Protection Order" means an order passed under Section 21 made under this Act.

(xviii) "Environmental Protection Tribunal" means the Environmental Protection Tribunal constituted under section 25 of this Act ;

(xxviii) "industrial activity" means any operation or process for manufacturing, making, formulating, synthesising, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purposes;

(xxix) "industrial waste" means waste resulting from an industrial activity;

(xxx) "initial environmental examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment;

(xxxi) "local authority" means any agency set up or designated by Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;

(xxxii) "local council" means a local council constituted or established under a law relating to local government;

(xxxiii) "motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer, but does not include a vehicle running upon fixed rails;

(xxxiv) "municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(xxxv) "noise" means the intensity, duration and character of sounds from all sources, and includes vibration;

(xxvi) "non degradable plastic products" means a plastic product which are made from the non-biodegradable substances;

(xxxvii) "nuclear waste" means waste from any nuclear reactor or nuclear plant or other nuclear energy system, whether or not such waste is radioactive;

(xxviii) "industrial activity" means any operation or process for manufacturing, making, formulating, synthesising, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purposes;

(xxix) "industrial waste" means waste resulting from an industrial activity;

(xxx) "initial environmental examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment;

(xxxi) "local authority" means any agency set up or designated by Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;

(xxxii) "local council" means a local council constituted or established under a law relating to local government;

(xxxiii) "motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer, but does not include a vehicle running upon fixed rails;

(xxxiv) "municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(xxxv) "noise" means the intensity, duration and character of sounds from all sources, and includes vibration;

(xxvi) "non degradable plastic products" means a plastic product which are made from the non-biodegradable substances

(xxxvii) "nuclear waste" means waste from any nuclear reactor or nuclear plant or other nuclear energy system, whether or not such waste is radioactive;

(xxxviii) "Oxo-biodegradable Plastic Products" means a plastic product made of a polymer by adding a pro-degrading additive containing a transition metal salt, except cobalt, which cause the plastic to degrade and bio-grade from oxidative and cell mediated phenomena either simultaneously or successfully;

(xxxix) "person" means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

(xl) "pollution" means the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiational, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity,

(xli) "prescribed" means prescribed by rules made under this Act;

(xlii) "project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes-

(a) construction or use of buildings or other works;

(b) construction or use of roads or other transport systems;

(c) construction or operation of factories or other installations;

(d) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like;

(e) any change of land use or water use; and

(f) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations;

(xliii) "proponent" means the person who proposes or intends to undertake a project;

(xliv) "regulations" means regulations made under this Act;

(xlv) "rules" means rules made under this Act;

(xlvi) "sewage" means liquid or semi-solid wastes and sludge from sanitary conveniences, kitchens, laundries, washing and similar activities and from any sewerage system or sewage disposal works;

(xlvii) "Schedule Plastic Products" means all types of flexible plastic packaging and disposable plastic products made of Polythene, Polypropylene, Polystyrene and Poly-ethylene Terephthalate (PET), used for food and non-food items, like shopping bags, garbage bags, snacks packs, water and milk packaging, shrink wraps, bubble pellet wraps, films, liners, woven or non-woven bags, mulch films;

(xlviii) "Sindh Environmental Quality Standards" means standards established by the Agency under clause (e) of sub-section(1) of section 6 and approved by the Council under clause (c) of sub-section(1) of section 4 made under this Act;

(xlix) "standards" means qualitative and quantitative standards for discharge of effluent and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Sindh Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations;

(l) "strategic environmental assessment" mean an analysis of a proposed policy, legislation, plan or programme to determine whether the principles of sustainable development have been integrated therein and to identify its likely environmental effects and such components as require an initial environmental examination or environmental impact assessment;

(li) "sustainable development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;

(iii) "trans-boundary environmental impacts" means environmental impact arising from beyond the boundaries or limits of Sindh province and causing any adverse environmental impact or pollution in the air, land, water and coaster water of Sindh province;

(iiii) "waste" means any substance or object which has been, is being or is intended to be, discarded or disposed-of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

(iv) "waters (coastal waters, internal waters, territorial waters and historical waters)" means such limits of the waters adjacent to the land territory as may be specified in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976).

PART-II

THE SINDH ENVIRONMENTAL PROTECTION COUNCIL.

Establishment of the Sindh Environmental Protection Council.

3 (1) The Government of Sindh shall, by notification in the official Gazette, establish a Council to be known as the Sindh Environmental Protection Council consisting of-

(i)	Chief Minister or such other person as the Chief Minister may nominate in this behalf.	**Chairperson**
(ii)	Minister-in-charge of the Environment Protection Department.	**Vice Chairperson**
(iii)	Additional Chief Secretary, Planning and Development Department, Government of Sindh.	**Ex-officio Member**
(iv)	Secretaries of the Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Live Stock and Fisheries, Forest and Wildlife, Energy, Education, Departments of Government of Sindh and the divisional commissioners of Sindh.	**Ex-officio Members**

(v)	Such other persons not exceeding twenty- five as Government may appoint from representatives of the Chambers of Commerce and Industry and industrial associations, representatives of the Chambers of Agriculture, the medical and legal professions, trade unions, non-governmental organizations concerned with the environment and sustainable development, and scientists, technical experts and educationists.	**Non-official Members**
(vi)	Director General, Sindh Environment Protection Agency	**Member / Secretary**
(vii)	**Two Members of the Provincial Assembly of Sindh amongst the eleven Members of the Standing Committee on Environment nominated by the Speaker**	**Members**

2) The Members of the Council, other than ex-officio members, shall be appointed in accordance with the prescribed procedure.

(3) A non-official member, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-appointment but shall not hold office for more than two terms.

(4)The Council shall frame its own Rules of Procedure.

(5) The Council shall hold meetings, as and when necessary, but not less than two meetings, shall be held in a year.

(6) The Council may constitute committees of its members and entrust them with such functions as it may deem fit, and the recommendations of the committees shall be submitted to the Council for approval.

(7) The Council, or any of its committees, may invite any technical expert or representative of any Government Agency or non-governmental organization or other person possessing specialized knowledge of any subject for assistance in performance of its functions.

Functions and Powers of the Council.

4. (1) The Council shall-

(a) co-ordinate and supervise the enforcement of the provisions of this Act and other laws relating to the environment in the Province;

(b) approve comprehensive provincial environmental and sustainable development policies and ensure their implementation within the framework of a conservation strategy and sustainable development plan as may be approved by Government from time to time;

(c) approve the Sindh Environmental Quality Standards.

(d) provide guidelines for the protection and conservation of species, habitats, and biodiversity in general and for the conservation of renewable and non-renewable resources.

(e) coordinate integration of the principles and concerns of sustainable development into socio-economic and development policies, plans and programmes at the provincial, district and local levels;

(f) consider the annual Sindh Environment report and give appropriate directions thereon and cause it to be laid before the Provincial Assembly;

(g) deal with inter-provincial and federal-provincial issues, and liaise and coordinate with other Provinces through appropriate inter-provincial forums regarding formulation and implementation of standards and policies relating to environmental matters with an inter-provincial impact;

(h) provide guidelines for biosafety and for the use of genetically modified organisms; and

(i) assist the Federal Government or Federal Agency in implementation and or administration of various provision of United Nation Convention on Laws on Seas, 1980 (UNCLOS) in coastal waters of the province.

(2). The Council may, either itself or on the request of any person or organization, direct the Agency or any Government Agency to prepare, submit, promote or implement projects for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, and the sustainable development of resources or to undertake research in any specified aspect of environment.

PART-III

THE SINDH ENVIRONMENTAL PROTECTION AGENCY

Establishment of the Sindh Environmental Protection Agency.

5. (1) Government shall, by notification in the Official Gazette, establish the Sindh Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made thereunder.

(2) The Agency shall be headed by a Director General who shall be appointed by Government on such terms and conditions as it may determine.

(3) The Agency shall have such administrative, technical and legal staff as Government may specify, to be appointed in accordance with such procedure as may be prescribed

(4) The powers and functions of the Agency shall be exercised and performed by the Director General.

(5) The Director General may, by general or special order, delegate any of these powers and functions to staff appointed under sub-section (3).

(6) For assisting the Agency in the discharge of its functions Government shall establish Advisory Committees for various sectors and appoint as members thereof eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

Functions of the Agency.

6. (1) The Agency shall –

(a) administer and implement the provisions of this Act and the rules and regulations;

(b) prepare, in co-ordination with the appropriate Government Agency or local council and, in consultation with the concerned Advisory Committees where established, environmental policies for the approval of the Council;

(c) take all necessary measures for the implementation of the environmental policies approved by the Council;

(d) prepare and publish an annual Sindh Environment Report on the state of the environment in the province;

(e) prepare or revise and establish the Sindh Environmental Quality Standards with approval of the Council:

Provided that before seeking approval of the Council, the Agency shall publish the proposed Sindh Environmental Quality Standards for public opinion in accordance with the prescribed procedure;

(f) ensure enforcement of the Sindh Environmental Quality Standards;

(g)where the quality of ambient air, water, land or noise so requires, the Agency may, by notification in the Official Gazette establish different standards for discharge or emission from different sources and for different areas and conditions as may be necessary:

Provided that where these standards are less stringent than the Sindh Environmental Quality Standards; prior approval of the Council shall be obtained;

(h) establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution, and to estimate the costs of cleaning up pollution and rehabilitating the environment in various sectors;

(i) take measures to promote research and the development of science and technology which may contribute to the prevention of pollution, protection of the environment, and sustainable development;

(j) issue licences, approval for the consignment, handling, transport, treatment, disposal of, storage, handling or otherwise dealing with hazardous substances;

(k) certify laboratories as approved laboratories for conducting tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation for the purposes of this Act;

(l) identify the needs for and initiate legislation in various sectors of the environment;

(m) provide assistance to relevant Federal and Provincial Government Agencies in the management of environment accidents and natural and environmental disasters, including conduct of inquiry thereto;

(n) render advice and assistance in environmental matters including such information and data available with it as may be required for carrying out the purposes of this Act:

Provided that the disclosure of such information shall be subject to the restrictions specified in Part XI (Access to Information);

(o) assist Government Agencies, local councils, local authorities and other persons to implement schemes for the proper disposal of wastes so as to ensure compliance with the Sindh Environmental Quality Standards;

(p) provide information and guidance to the public on environmental matters;

(q) recommend environmental courses, topics, literature and book for incorporation in the curricula and syllabi of educational institutions;

(r) promote public education and awareness of environmental issues through mass media and other means including seminars and workshops;

(s) establish and maintain mechanisms, including its own website, to disseminate information, subject to the provisions of this Act, regarding policies, plans and decisions of the Government, the Council and the Agency, relating to the environment;

(t) specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned persons in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans;

(u) review and approve mitigation plans and give guidance and directions, where necessary, relating to clean up operations ordered under this Act;

(v) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;

(w) take or cause to be taken all necessary measures for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution and promotion of sustainable development; and

(x) perform any function that the Council may assign to it.

(2) The Agency may -

(a) undertake inquiries or investigation into environmental issues, either of its own accord or upon complaint from any person or organization;

(b) request any person to furnish any information or data relevant to its functions;

(c) initiate, with the approval of Government, requests for foreign assistance in support of the purposes of this Act and enter into arrangements with foreign agencies or organizations for the exchange of material or information and participate in international seminars or meetings;

(d) recommend to Government and the Council the adoption of financial and fiscal programmes, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including -

(i) taxes, duties, cesses and other levies; and

(ii) incentives, prizes, awards, rewards, subsidies, tax exemptions rebates and depreciation allowances;

(e) establish and maintain laboratories to help in the performance of its functions under this Act and to conduct research in various aspects of the environment and provide or arrange necessary assistance for the establishment of similar laboratories in the private sector;

(f) arrange, in accordance with such procedure as may be prescribed, financial assistance for projects designed to facilitate in discharge of its functions; and

(g) acquire assistance of concerned authorities of district administration and other relevant agencies, departments and police assistance for enforcement of this Act.

Powers of the Agency.

7. Subject to the provisions of this Act, the Agency may-

(a) lease, purchase, acquire, own, hold, improve, use or otherwise deal in and with any property both moveable and immovable;

(b) sell, convey, mortgage, pledge, exchange or otherwise dispose of its property and assets;

(c) fix and realize fees, rates and charges for rendering any service or providing any facility, information or data under this Act or its rules and regulations;

(d) enter into contracts, execute instruments, incur liabilities and do all acts or things necessary for proper management and conduct of its business;

(e) appoint, with the approval of Government and in accordance with such procedures as may be prescribed, such advisers, experts and consultants as it considers necessary for the efficient performance of its functions on such terms and conditions as it may deem fit.

(f) summon and enforce the attendance of any person and require him to supply any information or document needed for the conduct of any enquiry or investigation into any environmental issue;

(g) Director General may authorize any officer or official to enter and inspect or under a search warrant issued by Environmental Protection Tribunal or a Court, search at any time, any land, building, premises, vehicle or vessel or other place where or in which there are reasonable grounds to believe that an offence under this Act has been, or is being, or likely to be committed;

(h) take samples of any materials, products, articles or substances or of the effluent, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission.

(i) arrange for the testing and analysis of samples at a certified laboratory;

(j) confiscate any article used in the commission of the offence where the offender is not known or cannot be found within a reasonable time:

Provided that the powers under clauses (f), (g), (h) (i), and (j) shall be exercised in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898) or the rules and regulations and under the direction of the Environmental Protection Tribunal or a Court; and

(k) establish the Sindh Environmental Co-ordination Committee comprising the Director-General as its Chairman and such other persons as Government shall appoint as its members to exercise such powers and perform such functions as shall be delegated or assigned to it by Government for carrying out the purposes of this Act and for ensuring coordination among Government Agencies in implementation of environmental policies.

PART-IV
SINDH SUSTAINABLE DEVELOPMENT FUND

Establishment of the Sindh Sustainable Development Fund.

8. (1) There shall be established a Sindh Sustainable Development Fund.

(2) The Sindh Sustainable Development Fund shall be derived from the following sources, namely—

(a) allocations and grants made or loans advanced by the Government of Sindh or by the Federal Government;

(b) aid and assistance, grants, advances, donations and other non-obligatory funds received from foreign governments, national or international agencies, and non-governmental organizations; and

(c) voluntary contributions from private, corporate, multinational organizations and other persons.

(d) Any fees generated under the provision of this act including the fines imposed against contraventions including penalties.

(3)The Sindh Sustainable Development Fund shall be utilized in accordance with such procedures as may be prescribed for -

(a) providing financial assistance to projects designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any specified aspect of the environment; and

(b) any other purposes which, in the opinion of the Board, will help achieve environment objectives and the purposes of this Act.

Management of the Sindh Sustainable Development Fund.

9. (1)The Sindh Sustainable Development Fund shall be managed by a Board known as the Provincial Sustainable Development Fund Board consisting of—

(i)	Additional Chief Secretary, Planning and Development Department, Government of Sindh,	**Chairperson**
(ii)	Such officers of Government, not exceeding five (05), as Government may appoint including Secretaries of the Environment, Finance, Industries and Local Government Departments, Government of Sindh.	**Ex-officio Members**
(iii)	Such non-official persons, not exceeding five(05), as Government may appoint, including representatives of the Chambers of Commerce and Industry, non-governmental organizations and major donors.	**Non-official Members**
(iv)	Director General, Sindh Environmental Protection Agency.	**Secretary/ Member**

(2) The members of the Board, other than ex-officio members, shall be appointed in accordance with the prescribed procedure.

(3) A non-official member of the Board, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-nomination, but shall not hold office for more than two terms.

(4) The Board shall frame its own rules of procedure with the approval of Government.

(5) In accordance with such procedures and such criteria as may be prescribed, the Board shall have the power to —

(a) sanction financial assistance for eligible projects;

(b) invest moneys held in the Sindh Sustainable Development Fund in such profit-bearing Government bonds, saving schemes and securities as it may deem suitable; and

(c) take such measures and exercise such powers as may be necessary for utilization of the Sindh Sustainable Development Fund for the purposes specified in sub-section (3) of section 8.

(6) The Board shall constitute committees of its members to undertake regular monitoring of projects financed from the Sindh Sustainable Development Fund and to submit progress reports to the Board which shall publish an Annual Report incorporating its annual audited accounts and performance evaluation based on the progress reports.

Accounts.

10. (1) The Agency shall maintain proper accounts of the Sindh Sustainable Development Fund and other relevant records and prepare annual statement of accounts in such form as may be prescribed.

(2) The accounts of the Sindh Sustainable Development Fund shall be audited annually by the Auditor General of Pakistan.

PART-V
PROHIBITIONS AND ENFORCEMENT

Prohibition of certain discharges or emissions and compliance with standards.

11. (1) Subject to the provisions of this Act and the rules and regulations, no person shall discharge or emit or allow the discharge or emission of any effluent, waste, pollutant, noise or any other matter that may cause or likely to cause pollution or adverse environmental effects, as defined in section 2 of this Act, in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards; or, where applicable, the standards established under Section 6(1)(g)(i); or direction issued under Section 17, 19, 20 and 21 of this Act; or any other direction issued, in general or particular, by the Agency.

(2) All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other Standards established under section 6(1)(g)(i); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.

(3) Monitoring and analysis under sub-section (1) and (2), shall be acceptable only when carried out by the Environmental Laboratory certified by the Agency as prescribed in the rules.

Prohibition of import of hazardous waste.

12. No person shall import hazardous waste into Sindh province or its coastal, internal, territorial or historical waters, except acquiring prior approval of the Agency.

Handling of hazardous substances.

13. Subject to the provisions of this Act, no person shall import, generate, collect, consign, transport, treat, dispose of, store, handle or otherwise use or deal with any hazardous substance except-

(a) under a licence issued by the Agency; or

(b) in accordance with the provisions of any other law, rule, regulation or notification for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Government is a party.

Prohibition of action adversely affecting Environment.

14. (1) Subject to the provisions of this Act and the rules and regulations, no person shall cause any act, deed or any activity, including-

(a) recycling or reuse of hospital waste and infectious waste;

(b) disposal of solid and hazardous wastes at unauthorized places as prescribed;

(c) dumping of wastes or hazardous substances into coastal waters and inland water bodies;

(d) release of emissions or discharges from industrial or commercial operations as prescribed;

(e) recycling or reuse or recovery of hazardous wastes or industrial by-products in an unauthorized or non-prescribed manner or procedure; and

(f) any activity which may cause adverse environmental affect due to trans boundary projects of Province of Sindh

which lead to pollution or impairment of or damage to biodiversity, ecosystem, aesthetics or any damage to environment and natural resources as defined in section 2 (xxxvi) of this Act.

(2) No person shall generate, handle, transport, dispose of or handle the hospital waste and infections waste except in accordance with the Hospital Waste Management Rules and in such manner as may be prescribed.

(3) No person shall import, manufacture, stockpile, trade, supply, distribute or sell any scheduled plastic product which is non-degradable. The scheduled plastic products must be oxo-biodegradable and the pro-degradant used must be approved by the Agency or any other department or agency and in such manner as prescribed.

Regulation of motor vehicles.

15. (1) Subject to the provisions of this Act, no person shall operate or manufacture a motor vehicle or class of vehicles from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Sindh Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6.

(2) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as prescribed.

(3) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any manufacturer of motor vehicle or class of vehicles shall use such manufacturing standard or design or pollution control devices or other equipment or undergo such testing as may be prescribed.

(4) Where a direction has been issued by the Agency under sub-section (2) and (3) in respect of any motor vehicles or class of motor vehicles, no person shall operate or manufacture any such vehicle till such direction has been complied with.

Certified Environmental Laboratory.

16 (1) The monitoring, testing and analysis carried out in compliance or for the enforcement of any provisions of this Act

(2) The laboratory or organization having any facility for environmental monitoring, testing and analysis, and intend to perform under sub-section (1) shall register with the Agency in accordance with the Environmental Laboratory Certification Rules as prescribed.

PART-VI

ENVIRONMENTAL EXAMINATIONS AND ASSESSMENTS

Initial environmental examination and environmental impact assessment.

17. (1) No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof.

(2) The Agency shall –

(a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental impact assessment by the proponent; or

(b) review the environmental impact assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental impact assessment as being contrary to environmental objectives.

(3) Every review of an environment impact assessment shall be carried out with public participation and, subject to the provisions of this Act, after full disclosure of the particulars of the project.

(4) The Agency shall communicate its approval or otherwise within a period of two months from the date that the initial environmental examination is filed, and within a period of four months from the date that the environmental impact assessment is filed complete in all respects in accordance with the regulations, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations:

(5) The provisions of sub-sections (1), (2), (3) and (4) shall apply to such categories of projects and in such manner as prescribed.

(6) The Agency shall maintain separate registers for initial environmental examination and environmental impact assessment projects, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open for inspection to the public during office hours.

Strategic environmental assessment.

18. (1) All provincial government agencies, departments authorities, local councils and local authorities responsible for formulating policies, legislation, plans and programmes to be implemented in Sindh province which may cause any environmental impact in the jurisdiction of the province shall, before submitting the same to the competent authority for approval, forward to the Sindh Environmental Protection Agency a strategic environment assessment containing —

(a) description of the objectives and features of the proposed policy, legislation, plan or programme that are in consonance with the principles of sustainable development;

(b) assessment of the adverse environmental effects, if any, likely to be caused during implementation of the policy, legislation, plan or programme alongwith proposed preventive, mitigation and compensatory measures;

(c) analysis of possible alternatives; and

(d) identification of those components of the policy, legislation, plan or programme, if any, in respect of which specific environmental impact assessment need to be carried out in due course.

(2) The Agency shall, in consultation with the concerned Government Agencies and Advisory Committees where established, review the strategic environment assessment, within sixty (60) days of its filing, and prepare a report containing its comments and recommendations in respect thereof which shall be forwarded to the initiating Government Agency, authority, local council or local authority and duly considered by it and the competent authority before approval or otherwise of the proposed policy, legislation, plan or programme.

(3) The provisions of sub-sections (1), and (2) shall apply to such categories of policies, plans and programmes and in such manner as may be prescribed.

Environmental monitoring.

19. (1) The Agency shall carry out or arrange environmental monitoring of all projects in respect of which it has approved an initial environmental examination or environmental impact assessment to determine whether the actual environmental impact exceeds the level predicted in the assessment and whether the conditions of the approval are being complied with

(2) For purposes of sub-section (1), the Agency may require the person in charge of a project to furnish such information as it may specify pertaining to the environmental impact of the project, including quantitative and qualitative analysis of -

(a) discharge of effluents, wastes, emissions of air pollutants, noise and any other matter or action that may be found offensive under section 14 from the project on daily, weekly, monthly or annual basis;

(b) ambient quality of the air, water, noise and soil before, during and after construction and during operation of the project.

(3) On review of the data collected by it and information provided, the Agency may issue such directions to the person in charge as it may consider necessary to ensure compliance with the conditions of the approval.

Environmental Audit and Review.

20. (1) The Agency shall from time to time require the person in charge of a project to furnish, within such period as may be specified, an environmental audit or environmental review report or environmental management plan containing a comprehensive appraisal of the environmental aspects of the project.

(2) The report of a project prepared under sub-section (1) shall include -

(a) analysis of the predicted qualitative and quantitative impact of the project as compared to the actual impact;

(b) evaluation of the efficacy of the preventive, mitigation and compensatory measures taken with respect to the project; and

(c) recommendations for further minimizing or mitigating the adverse environmental impact of the project.

(3) Based on its review of the environmental audit report, the Agency may, after giving the person in charge of the project an opportunity of being heard, direct that specified mitigation and compensatory measures be adopted within a specified time period and may also, where necessary, modify the approval granted by it under section 17.

PART-VII
ENVIRONMENTAL PROTECTION ORDER

Environmental Protection Order.

21. (1) Where the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of any provision of this Act, the rules or regulations or of the conditions of a licence, or is likely to cause, or is causing or has caused an adverse environmental effect, the Agency may, after giving the person responsible for such

discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures as the Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include —

(a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, act or omission, or to minimize or remedy the adverse environmental effect;

(b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, act or omission;

(c) action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances;

(d) action to restore the environment to the condition existing prior to such discharge, disposal, handling, act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfaction of the Agency; and

(e) impose a penalty as prescribed.

(3) Notwithstanding the provisions of sub-section (1), in an emergency situation where, for reasons to be recorded, the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act and that circumstances of the case warrant immediate action in the public interest, it may pass an ad-interim order of the nature described in sub-sections (1) and (2) by providing reasonable opportunity of hearing.

PART-VIII
OFFENCES AND PENALTIES

Penalties.

22. (1) Whoever contravenes or fails to comply with the provisions of sections 11, 17, 18 and 21 or any order issued there under shall be punishable with a fine which may extend to five million rupees, to the damage caused to environment and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if the contravention of the provisions of section 11 also constitutes a contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2).

(2) Whoever contravenes or fails to comply with the provisions of sections 13, 14, 15 and 16 or any rule or regulation or conditions of any license, any order or direction, issued by the Agency, shall be punished with a fine, and in case of continuing contravention or failure with an additional fine which may extend to ten thousand rupees for every day during which such contravention continues.

(3) Where an accused has been convicted of an offence under sub-sections (1) and (2), the Environmental Protection Tribunal and Court shall, as the case may be, in passing sentence, take into account the extent and duration of the contravention or failure constituting the offence and the attendant circumstances.

(4) Where an accused has been convicted of an offence under sub-sections (1) or (2), the Environmental Protection Tribunal or Court, as the case may be, shall endorse a copy of the order of conviction to the concerned trade or industrial association, if any, or the concerned Provincial Chamber of Commerce and Industry or the Federation of Pakistan Chambers of Commerce and Industry.

(5) Where a person convicted under sub-sections (1) and (2) had been previously convicted for any contravention of this Act and its rules or regulations, the Environmental Protection Tribunal, as the case may be, may, in addition to the punishment awarded thereunder-

(a) sentence him to imprisonment for a term that may extend up to three years;

(b) order the closure of the factory;

(c) order confiscation of the facility, machinery and equipment, vehicle or substance, record, document or other object used or involved in contravention of the provisions of this Act;

(d) order such person to restore the environment at his own cost, to conditions existing prior to the contravention or as close to such conditions as may be reasonable in the circumstances to the satisfaction of the Agency; and

(e) order that compensation be paid to any person or persons for any loss, or damage to their health or property suffered by such contravention.

(6) The Director General or an officer generally or specially authorised by him in this behalf may, on the application of the accused, compound an offence under this Act with the permission of the Environmental Protection Tribunal or Court in accordance with such procedure as prescribed.

(7) Where the Director General is of the opinion that a person had contravened any provision of this Act, he may, subject to the rules, by notice in writing to that person require him to pay to the Agency a penalty in the amount set out in the notice for each day the contravention continues.

Offences by body corporate.

23. Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been committed with the consent or connivance of, or is attributed to any negligence on the part of, any director, partner, manager, secretary or other officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly:

Provided that in the case of a company as defined under the Companies Ordinance, 1984 (XLVII of 1984), only the Chief Executive as defined in the said Ordinance shall be liable under this section.

Explanation.— For the purposes of this Section, "body corporate" includes a firm, association of persons and a society registered under the Societies Registration Act, 1860 (XXI of 1860), or under the Co-operative Societies Act, 1925 (VII of 1925).

Offences by Government Agencies, local authorities or local councils.

24. Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of, or is attributable to any negligence on the part of, the Head or any other officer of Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

PART-IX
ENVIRONMENTAL PROTECTION TRIBUNALS AND COURTS

Environmental Protection Tribunals.

25. (1) Government may, by Notification in the Official Gazette, establish as many Environmental Protection Tribunals as it considers necessary and, where it establishes more than one Environmental Protection Tribunal, it shall specify territorial limits within which, or the class of cases in respect of which, each one of them shall exercise jurisdiction under this Act.

(2) An Environmental Protection Tribunal shall consist of a Chairperson who is, or has been, or is qualified for appointment as a Judge of the High Court to be appointed after consultation with the Chief Justice of the High Court and two members to be appointed by Government, of which at least one shall be a technical member nominated from amongst the officers of the Agency with suitable professional qualifications and experience in the environmental field.

(3) For every sitting of the Environmental Protection Tribunal, the presence of the Chairperson and not less than one Member shall be necessary.

(4) A decision of an Environmental Protection Tribunal shall be expressed in terms of the opinion of the majority of its members, including the Chairperson, or if the case has been decided by the Chairperson and only one of the members and there is a difference of opinion between them, the decision of the Environmental Protection Tribunal shall be expressed in terms of the opinion of the Chairperson.

(5) An Environmental Protection Tribunal shall not, merely by reason of a change in its composition, or the absence of any member from any sitting, be bound to recall and rehear any witness who has given evidence, and may act on the evidence already recorded by, or produced, before it.

(6) An Environmental Protection Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.

(7) No act or proceeding of an Environmental Protection Tribunal shall be invalid by reason only of the existence of a vacancy in, or defect in the constitution, of, the Environmental Protection Tribunal.

(8) The terms and conditions of service of the Chairperson and members of the Environmental Protection Tribunal shall be such as may be prescribed.

Jurisdiction and powers of Environmental Protection Tribunals.

26. (1) An Environmental Protection Tribunal shall exercise such powers and perform such functions as are, or may be, conferred upon or assigned to it by or under this Act or the rules and regulations.

(2) All contraventions punishable under sub-section (1) of section 22 shall exclusively be triable by an Environmental Protection Tribunal.

(3) An Environmental Protection Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by—

(a) the Agency or any Government Agency or Local Council; and

(b) any aggrieved person, who has given notice of not less than thirty days to the Agency, of the alleged contravention and of his intention to make a complaint to the Environment Protection Tribunal.

(4) In exercise of its criminal jurisdiction, the Environmental Protection Tribunal shall have the same powers as are vested under the Code of Criminal Procedure, 1898 (Act V of 1898)

(5) In exercise of the appellate jurisdiction under section 27 the Environmental Protection Tribunal shall have the same powers and shall follow the same procedure as an appellate court in the Code of Civil Procedure, 1908 (Act V of 1908).

(6) In all matters with respect to which no procedure has been provided for in this Act, the Environmental Protection Tribunal shall follow the procedure laid down in the Code of Civil Procedure, 1908 (Act V of 1908).

(7) An Environmental Protection Tribunal may, on application filed by any officer duly authorised in this behalf by the Director General, issue bailable warrant for the arrest of any person against whom reasonable suspicion exists, of his having been involved in contravention punishable under sub-section (1) of section 22:

Provided that such warrant shall be applied for, issued and executed in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898):

Provided further that if the person arrested executes a bond with sufficient sureties in accordance with the endorsement on the warrant he shall be released from custody, failing which he shall be taken or sent without delay to the officer in-charge of the nearest jurisdiction police station.

(8) All proceedings before the Environmental Protection Tribunal shall be deemed to be judicial proceedings within the meaning of sections 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Environmental Protection Tribunal shall be deemed to be a court for the purpose of sections 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than an Environmental Protection Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of an Environmental Protection Tribunal extends under this Act and the rules and regulations.

(10) Where the Environmental Protection Tribunal is satisfied that a complaint made to it under sub-section (3) is false and vexatious to the knowledge of the complainant, it may, by an order, direct the complainant to pay to the person complained against such compensatory costs which may extend to one hundred thousand rupees.

Appeals to the Environmental Protection Tribunal.

27. (1) Any person aggrieved by any order or direction of the Agency under any provision of this Act or the rules or regulations may prefer an appeal with the Environmental Protection Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

(2) An appeal to the Environmental Protection Tribunal shall be in such form, contain such particulars and be accompanied by such fees as prescribed.

Appeals from orders of the Environmental Protection Tribunal.

28. (1) Any person aggrieved by any final order or by any sentence of the Environmental Protection Tribunal passed under this Act may, within thirty days of communication of such order or sentence, prefer an appeal to the High Court.

(2) An appeal under sub-section (1) shall lie before the High Court of Sindh.

Jurisdiction of Judicial Magistrate.

29. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1898 (Act V of 1898), or any other law for the time being in force, but subject to the provisions of this Act, all contraventions punishable under sub-section (2) of section 22 shall exclusively be triable by the Court of Judicial Magistrate of First Class having of First Class having jurisdiction.

(2) A Judicial Magistrate shall be competent to impose any punishment specified in sub-sections (2) and (4) of section 22.

(3) A Judicial Magistrate shall not take cognizance of an offence triable under sub-section (1) except on a complaint in writing by—

(a) the Agency; and

(b) any aggrieved person.

Appeals from orders of the Judicial Magistrate.

30. Any person aggrieved by any final order or sentence passed by a Judicial Magistrate under section 28 may, within thirty days from the date of the communication of such order or sentence, appeal to the Court of the District and Sessions Judge defined as Green Court under this Act, whose decision thereon shall be final.

PART-X
PUBLIC PARTICIPATION

Public participation.

31.(1)The Agency shall cause relevant details of any proposed project regarding which an Environmental Impact Assessment has been received to be published, alongwith an invitation to the public to furnish their comments thereon within a specified period.

(2) In accordance with such procedure as may be prescribed, the Agency shall hold public hearings to receive additional comments and local submissions.

(3) All comments received under sub-sections (1) and (2) shall be duly considered by the Agency while reviewing the environmental impact assessment or strategic impact assessment, and decision or action taken thereon shall be communicated to the persons who have furnished the said comments.

PART-XI
GENERAL

Power to make and amend schedule.

32. The Agency may, by notification in the official Gazette, make and amend the schedule.

Indemnity

33. No suit, prosecution or other legal proceedings shall lie against Government, the Council, the Agency, the Director General of the Agency, members, officers, employees, experts, advisors, committees or consultants of the Agency or Environmental Protection Tribunal or Court or any other person for anything which is done or intended to be done in good faith under this Act or rules or regulations.

Dues recoverable as arrears of land revenue.

34. Any dues recoverable by the Agency under this Act and rules or regulations shall be recoverable as arrears of land revenue.

Act to override other laws.

35. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

Power to make rules.

36. The Sindh Environment Protection Agency may, by notification in the Official Gazette, make rules for carrying out the purposes not in consistence of this Act with the approval of Government.

Power to make regulations.

37. (1) For carrying out the purposes of this Act, the Agency may, by Notification in the Official Gazette and with the approval of Government, make regulations not inconsistent with the provisions of this Act or the rules.

(2) In particular and without prejudice to the generality of the foregoing power, such regulations may provide for —

(a) submission of periodical reports, data or information by any Government Agency, local authority or local council in respect of environmental matters;

(b) preparation of emergency contingency plans for coping with environmental hazards and pollution caused by accidents, natural disasters and calamities;

(c) appointment of officers, advisors, experts, consultants and employees as per prescribed rules;

(d) levy of fees, rates and charges in respect of services rendered, actions taken and schemes implemented;

(e) monitoring and measurement of discharges and emissions;

(f) categorization of projects to which, and the manner in which sections 17, 18 and 20 applies;

(g) laying down of guidelines for preparation of initial environmental examination, environmental impact assessment and strategic environmental assessment, and development of procedures of their filing, reviews and approval.

(h) laying down standard operating procedures for environmental sampling, examination of water, waste water, gaseous emissions, solid waste and noise;

(i) providing procedures for handling hazardous substances; and

(j) installation of devices in, use of fuels by, and maintenance and testing of motor vehicles for control of air and noise pollution.

BY ORDER OF THE SPEAKER
PROVINCIAL ASSEMBLY OF SINDH

G.M.UMAR FAROOQ
SECRETARY
PROVINCIAL ASSEMBLY OF SINDH

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Annexure – II

SEPA (Review of IEE/EIA) Regulations 2014

GOVERNMENT OF SINDH
SINDH ENVIRONMENTAL PROTECTION AGENCY

Karachi dated the 16th December, 2014.

NOTIFICATION

NO.EPA/TECH/739/2014:- In exercise of the powers conferred by section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government, is pleased to make the following regulations, namely:-

1. Short title and commencement

(1) These regulations may be called the Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014.

(2) They shall come into force at once.

2. Definitions.-

(1) In these regulations, unless there is anything repugnant in the subject or context -

(a) "Act" means the Sindh Environmental Protection Act, 2014 (VIII of 2014);

(b) "Agency" means the Sindh Environmental Protection Agency as defined under section 2(ii);

(c) "Committee" means the Environmental Assessment Advisory Committee constituted under regulation 24;

(d) "Director General" means the Director General of the Agency;

(e) "EIA" means an environmental impact assessment as defined in section 2(xv);

(f) "IEE" means an initial environmental examination as defined in section 2(xxx);

(g) "section" means a section of the Act.

(h) "Firm" means the Environmental Consulting Firm certified by the Agency;

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(i) "Environmental Sensitive areas" means the area which falls under sensitive sites like protected areas, or the sites which may have crucial and growing importance;

(j) "protected area" means any area which safeguards the earths precious bio-diversity protect outstanding areas of natural beauty and conservation of cultural significance;

(k) "Schedule" means the Schedule to these regulations;

(l) "urban area" means an area within the limits of a town, municipality or city and includes any area declared as such by Government by notification in the official gazette;

(2) All other words and expressions used but not defined in these regulations shall have the same meaning as are assigned to them in the Act.

3. Projects requiring an IEE

A proponent of a project falling in any category listed in Schedule-I shall file an IEE with the Agency, and the provisions of section 17 shall apply to such projects.

4. Projects requiring an EIA

A proponent of a project falling in any category listed in Schedule-II shall file an EIA with the Agency, and the provisions of section 17 shall apply to such projects.

5. Projects requiring checklist

A proponent of a project falling in any category listed in Schedule-III shall file environmental checklist with the Agency and the provisions of section 17 shall apply to such projects.

6. Projects not requiring an IEE or EIA

(1) A proponent of a project not falling in any category listed in Schedules-I, II and III shall not be required to file an IEE or EIA:

Provided that the proponent shall file -

(a) an EIA, if the project is likely to cause an adverse environmental effects;

(b) an application for projects not listed in Schedules-I, II and III in respect of which the Agency has issued guidelines for construction and operation for approval accompanied by an undertaking and an affidavit that the aforesaid guidelines shall be fully complied with.

(2) Notwithstanding anything contained in sub-regulation (1), the Agency may direct the proponent of a project, whether or not listed in Schedule I or II or III, to file an IEE or EIA or environmental check list, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendations in writing of the Committee.

(3) The provisions of section 17 shall apply to a project in respect of which an IEE or EIA or environmental checklist is filed under sub-regulation (1) or (2).

7. Preparation of IEE/EIA and environmental checklist

(1) The Agency may issue guidelines for preparation of an IEE or an EIA or an environmental checklist, including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.

(2) Where guidelines have been issued under sub-regulation (1), an IEE or EIA or environmental checklist shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify in the IEE or EIA or in environmental checklist any departure therefrom.

8. Review Fees

The proponent shall pay, at the time of submission of an IEE or EIA or environmental checklist, a non-refundable review fee to the Agency as per rates shown in Schedule-IV

9. Filing of IEE, EIA and environmental check list.

(1) Ten hard copies and two electronic copies for an IEE and EIA reports shall be filed with the Agency prepared by Firm.

(2) Every IEE and EIA shall be accompanied by -

(a) an application, in the form prescribed in Schedule-V;

(b) copy of receipt showing payment of the Review Fee.

(c) no objection certificates from the relevant departments in case of EIA shall be the part of reports:

(d) the environmental check list as per its guidelines.

10. Preliminary scrutiny

(1) Within fifteen working days of filing of the IEE or EIA or environmental check

list, the Agency shall –

(a) confirm that the IEE or EIA or environmental check list is complete for purposes of initiation of the review process; or

(b) require the proponent to submit such additional information as may be specified; or

(c) return the IEE or EIA or environmental checklist to the proponent for revision, clearly listing the points requiring further study and discussion.

(2) Notwithstanding anything contained in sub-regulation (1), the Agency may require the proponent to submit an additional information at any stage during the review process.

11. Public participation

(1) In the case of an EIA, the Agency shall simultaneously with issue of confirmation of completeness under sub-regulation (2) of regulation 9, cause to be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project, a public notice mentioning the type of project, its exact location, the name and address of the proponent and the places at which the EIA of the project can, subject to the restrictions in sub-section (3) of section 17, be accessed.

(2) The notice issued under sub-regulation (1) shall fix a date, time and place of public hearing for any comments on the project or its EIA.

(3) The date fixed under sub-regulation (2) shall not be earlier than fifteen days from the date of publication of the notice.

(4) The Agency shall also ensure the circulation of the EIA to the concerned Government Agencies and solicit their comments thereon.

(5) All comments received by the Agency from the public or any Government Agency shall be collated, tabulated and duly considered by it before decision on the EIA.

(6) The Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

12. Review

(1) The Agency shall make every effort to carry out its review of the environmental checklist within thirty days, IEE within sixty days, and of the EIA within four months of issue of confirmation of completeness under regulation 9.

(2) In reviewing the EIA, the Agency shall consult such Committee of Experts be constituted for the purpose by the Director General, and may also solicit views of concerned Advisory Committee, if any, constituted by the Agency.

(3) The Director-General may, where he considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.

(4) In reviewing the IEE, the Director General may constitute a committee of the officers from within the Agency on case to case basis in view of the jurisdiction and location of the project for the purpose to extend final recommendation about the approval or rejection of the IEE.

(5) In reviewing of the IEE, the Director General may direct the proponent and Firm to present the report before the committee as given under sub-regulation (4) and the Director General may also invite environmental experts from outside the Agency for the purpose of assistance.

(6) The review of the IEE or EIA by the Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under regulation 10, and views of the committees mentioned in sub-regulations (2) and (3) above.

(7) The environmental check list shall be reviewed as per guidelines issued by the Agency.

13. Decision

(1) Subject to regulation 9 and 11, the documentary evidence in the form of videos (soft copies) of public hearing shall be submitted by the proponent at the time of environmental approval or at any stage of review process, to the Agency.

(2) On completion of the review, the decision of the Agency shall be communicated to the proponent in the form prescribed in Schedule-VI in the case of an IEE and environmental check list, and in the form prescribed in Schedule-VII in the case of an EIA and for environmental checklist.

14. Conditions of approval

(1) Every approval of an IEE or EIA or check list shall, in addition to such conditions as may be imposed by the Agency, be subject to the condition that the project shall be designed and constructed, and mitigatory and other measures adopted, strictly in accordance with the IEE or EIA or environmental check list, unless any variations thereto have been specified in

the approval by the Agency.

(2) Where the Agency accords its approval subject to certain conditions, the proponent shall -

(a) before commencing construction of the project, acknowledge acceptance of the stipulated conditions by executing an undertaking in the form prescribed in Schedule-VIII;

(b) before commencing operation of the project, obtain from the Agency written confirmation that the conditions of approval, and the requirements in the IEE or EIA or environmental check list relating to design and construction, adoption of mitigatory and other measures and other relevant matters, have been duly complied with.

15. Confirmation of compliance

(1) The request for confirmation of compliance under clause (b) of sub-regulation (2) of Regulation 13 shall be accompanied by an Environmental Management Plan indicating the measures and procedures proposed to be taken to manage or mitigate the environmental impacts for the life of the project, including provisions for monitoring, reporting and auditing.

(2) Where a request for confirmation of compliance is received from a proponent, the Agency may carry out such inspection of the site and plant and machinery and seek such additional information from the proponent as it may deem fit:

Provided that every effort shall be made by the Agency to provide the requisite confirmation or otherwise within twenty days of receipt of the request, with complete information, from the proponent.

(3) The Agency may, while issuing the requisite confirmation of compliance, impose such other conditions as the Environmental Management Plan, and the operation, maintenance and monitoring of the project as it may deem fit, and such conditions shall be deemed to be included in the conditions to which approval of the project is subject.

16. Deemed approval

The period for communication of decision stipulated in sub-section (4) of section 17 shall commence from the date of filing of an IEE or EIA or environmental check list in respect of which confirmation of completeness is issued by the Agency under clause (a) of sub-regulation (1) of regulation 9.

17. Extension in review period

Where the Agency in a particular case extends the period of four months under the provisions of sub-section (4) of section 17, it may extend the further period as it may

deem fit, for the reasons to be recorded in writing thereof.

18. Validity period of approval

(1) The approval accorded by the Agency under section 17 read with regulation 12 shall be valid, for commencement of construction, for a period of three years from the date of issue.

(2) If construction is commenced during the initial three years validity period, the validity of the approval shall stand extended for a further period of three years from the date of issue.

(3) After issue of confirmation of compliance, the approval shall be valid for a period of three years from the date thereof.

(4) The proponent may apply to the Agency for extension in the validity periods mentioned in sub-regulations (1), (2) and (3), which may be granted by the Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

19. Entry and inspection

(1) For the purpose of verification of any matter relating to the review or to the conditions of approval of an IEE or EIA or environmental check list prior to, before or during and after commencement of construction or operation of a project, duly authorized staff of the Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.

(2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Agency for this purpose and pursuant thereto.

20. Monitoring

(1) After issue of approval, the proponent shall submit a report to the Agency on completion of construction of the project.

(2) After issue of confirmation of compliance, the proponent shall submit an annual report summarizing operational performance of the project, with reference to the conditions of approval and maintenance and mitigatory measures adopted by the project.

(3) The proponent shall, in order to enable the Agency to effectively monitor compliance with the conditions of approval, furnish such additional information as the Agency may require.

21. Cancellation of approval

(1) Notwithstanding anything contained in these regulations, if, at any time, on the basis of information or report received or inspection carried out, the Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved IEE or EIA or environmental check list is incorrect, it shall issue notice to the proponent for show cause within two weeks of receipt thereof as to why the approval should not be cancelled.

(2) In case no reply is received or if the reply is considered unsatisfactory, the Agency may, after giving the proponent an opportunity of being heard -

(i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or

(ii) cancel the approval.

(3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.

(4) Any action taken under this regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.

22. Registers of IEE,EIA and Check list projects

Separate Registers to be maintained by the Agency for IEE, EIA and environmental check list projects under sub-section (6) of section 17 shall be in the form prescribed in Schedule-IX.

23. Environmentally sensitive areas

(1) The Agency may, by notification in the official Gazette, designate an area to be an environmentally sensitive area.

(2) Notwithstanding anything contained in regulations 3, 4 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Agency.

(3) The Agency may from time to time issue guidelines to assist proponents and other persons involved in the environmental assessment process to plan and prepare projects located in environmentally sensitive areas.

(4) Where guidelines have been issued under sub-regulation (3), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the EIA pertaining to the project.

24. **Environmental Assessment Advisory Committee.-** For the purpose of rendering advice on all aspects of the environmental assessment including guidelines procedure and categorization of projects, the following Advisory Committee shall be constituted:-

(i) Director Technical, Sindh Environmental Protection Agency (EIA/IEE)	**Chairman**
(ii) Chief Environment, Planning and Development Department	**Member**
(iii) Four representative on each of industry, non-Governmental organization, legal and other experts	**Members**

25. Repeal and Savings. (1) The provisions of the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Assessment Impact Regulations 2000, to the extent of the Province of Sindh are hereby repealed.

(2) All orders made, notification issued, actions taken under the repealed Regulations shall remain in force until amended, altered or repealed by the provisions of these Rules.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION AGENCY

SCHEDULE I

(See Regulation 3)

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock, stud and fish farms
2. Projects involving packaging, formulation, cold storage and warehouse of agricultural products.

B. Energy

1. Hydroelectric power generation less than 50 MW
2. Thermal power generation less than 100MW
3. Coal fired power plants with capacity less than 50 MW
4. Transmission lines less than 11 KV, and grid station
5. Waste-to-energy generation projects including bio-mass less than 25 MW
6. Solar project
7. Wind project

C. Oil and Gas projects:

1. Oil and gas 2D/3D Seismic survey and drilling activities
2. Oil and gas extraction projects including exploration and production located outside the environmentally sensitive areas
3. Construction of LPG storage facilities
4. Construction of LPG,CNG filling station and petrol pumps

D. Manufacturing and processing

1. Ceramics and glass units less than 500 million
2. Food processing industries with total cost less than Rs. 200 millions
3. Pharmaceutical units.
4. Marble units

5. Carpet manufacturing units

6. Rice mills, ghee/oil mills .

7. Brick kilns

8. Stone crushing units

9. Man-made fibers and resin projects with total cost less than Rs. 200 millions

10. Manufacturing of apparel, textile garments unit , including dyeing, bleaching and printing, with total cost less than Rs.50 million

11. Wood products with total cost more than Rs.100 million

12. Steel re-rolling mills

13. Recycling plants

E. Mining and mineral processing

Commercial extraction of sand, gravel, limestone, clay, sulphur and other minerals not included in Schedule II with total cost less than Rs.100 million

1. Crushing, grinding and separation processes

2. Smelting plants with total cost less than Rs100 millions

F. Transport

1. Flyovers, underpasses and bridges having total length less than 500 meters

G. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume less than 25 million cubic meters of surface area less than 4 square kilometers

2. Small-scale irrigation systems and drainage system with total cost less than Rs. 100 million

H. Water supply and filtration

Water supply schemes and **filtration** plants with total cost less than 100 million (Including projects of maintenance, up gradation, reconstruction of existing projects.)

I. Waste disposal and treatment

1. Solid and non-hazardous waste with annual capacity less than 10,000 tons
2. Waste water treatment for sewage treatment facility with total cost less than 200M
3. Industry specific Waste water treatment facility for Industrial effluent (small scale plant)

J. Urban development

1. Housing schemes less than 10 acres
2. Mutli-story buildings having residential and commercial setup on the total plot size is less than 2000 sq.yards
3. Hospitals with capacity of 50 beds, health care unit/laboratories with 500 OPD/day.
4. Construction of Educational, Academic institutions on land less than 10 acres.

K. Other projects

Any other project for which filing of an IEE is required by the Agency under sub-regulation (2) of Regulation 6.

SCHEDULE II

(*See* Regulation 4)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation over 50 MW
2. Thermal power generation over 100MW
3. Coal power projects above 50 MW
4. Transmission lines (11 KV and above) and distribution projects.
5. Nuclear power plants
6. Wind energy projects if falls under any sensitive, protected area.

B. Oil and Gas projects

1. Petroleum refineries.
2. LPG and LNG Projects(including LNG Terminals, re-gasification units) except LPG filling stations
3. Oil and gas transmission systems
4. Oil and gas gathering system, separation and storage.

C. Manufacturing and processing

1. Cement plants
2. Chemical manufacturing industries
3. Fertilizer plants
4. Steel Mills
5. Sugar Mills and Distilleries
6. Food processing industries including beverages, dairy milk and products, slaughter houses and related activities with total cost more than Rs. 200 Million
7. Industrial estates (including export processing zones)
8. Man-made fibers and resin projects with total cost of Rs 200M and above
9. Pesticides (manufacture or formulation)
10. Petrochemicals complex
11. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel),printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than Rs.

10 million

12. Tanning and leather finishing projects
13. Battery manufacturing plant

D. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs. 100 million and above

E. Transport

1. Airports
2. Federal or Provincial highways or major roads (including rehabilitation or rebuilding or reconstruction of existing roads)
3. Ports and harbor development
4. Railway works
5. Flyovers, underpasses and bridges having total length of more than 500m

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 25 million cubic meters and above having surface area of 4 square kilometers and above
2. Irrigation and drainage projects serving 15,000 hectares and above
3. Flood Protection

G. Water supply and filtration

Large Water supply schemes and **filtration** plants.

H. Waste Disposal and treatment

1. Handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration of hospital toxic waste)
2. Waste disposal facilities for municipal or industrial wastes, with total annual capacity of 10,000 tons and above.
3. Waste water treatment facility for industrial or municipal effluents.

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I. Urban development and tourism

1. Housing schemes above 10 acres
2. Residential/commercial high rise buildings/apartments from15 stories and above.
3. Land use studies and urban plans (large cities)
4. Large scale public facilities.
5. Large-scale tourism development projects

J. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas

K. Other projects

1. Any other project for which filing of an EIA is required by the Agency under sub-regulation (2) of Regulation 5.
2. Any other project likely to cause an adverse environmental effect

SCHEDULE-III

List of projects requiring environmental screening (through check list)

a. Construction of, offices and small commercial buildings (1-6 story),home industrial units, ware houses, marriage / banquet facilities, large scale motor vehicles workshops, restaurants / food outlets ,large baking unit subject to the compliance with existing zoning laws.

b. Reconstruction / rehabilitation of roads (small roads in urban area and farm to market roads more than 2 km.

c. On-farm dams and fish farms.

d. Pulses mills.

e. Flour Mills

f. Projects promoting energy efficiency (small scale).

g. Lining of existing minor canals and /or water courses.

h. Canal cleaning

i. Forest harvesting operations

j. Rain harvesting projects

k. Rural schools (Secondary and Higher Secondary) and rural and basic health units having at least ten beds capacity.

l. BTS Towers

m. Lime Kilns

n. Ice factories and cold storage.

o. Cotton oil mill

p. Warehouses for pesticides and pharmaceuticals

Schedule-IV

(See Regulation 7)

Description	IEE	EIA	Environmental Check list
Projects	Rs.100,000	Rs.200,000	Rs.30,000 except BTS Towers which is Rs.15,000

SCHEDULE V

[See Regulation 8(2)(a)]

Application Form

1.	Name and address of Proponent		Phone: Fax: Telex:	
2.	CNIC No. of proponent			
3.	Description of project			
4.	Location of project			
6.	Objectives of project			
7.	IEE/EIA attached?	IEE/EIA :	Yes/No	
8.	Have alternative sites been considered and reported in IEE/EIA?		Yes/No	
9.	No Objection Certificate of relevant stakeholders		Name(s)	
10.	Existing land use		Land requirement	
11.	Is basic site data available, or has it been measured?	(only tick yes if the data is reported in the IEE/EIA)	Available	Measured
		Meterology (including rainfall)	Yes/No	Yes/No
		Ambient air quality	Yes/No	Yes/No
		Ambient water quality	Yes/No	Yes/No
		Ground water quality	Yes/No	Yes/No
12.	Have estimates of the following been reported, especially Quantitative Analysis?		Estimated	Reported
		Water balance	Yes/No	Yes/No
		Solid waste disposal	Yes/No	Yes/No
		Liquid waste treatment	Yes/No	Yes/No
13.	Source of power		Power requirement	
14.	Labour force (number)	Construction: Operation:		
15.	Environmental Consulting Firm			

Verification. I do solemnly affirm and declare that the information given above and contained in the attached IEE/EIA is true and correct to the best of my knowledge and belief.

Date

Signature. name and _____
designation of proponent
(with official stamp/seal)

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SCHEDULE VI
[See Regulation 12]

Decision on IEE/Environmental Check List

1. Name and address of proponent _____

   _____

2. Description of project

3. Location of project

4. Date of filing of IEE

5. After careful review of the IEE, the Agency has decided –

   (a) to accord its approval, subject to the following conditions:

   _____

   _____

   or (b) that the proponent should submit an EIA of the project, for the following reasons –

   _____

   _____

   [Delete (a) or (b), whichever is inapplicable]

Dated

Tracking no.___

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)

SCHEDULE VII

[*See* Regulation 12]

Decision on EIA

1. Name and address of proponent _____

   _____

2. Description of project _____

3. Location of project _____

4. Date of filing of EIA _____

5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –

   (a) to accord its approval, subject to the following conditions:

   _____

   _____

   or (b) that the proponent should submit an EIA with the following modifications-

   _____

   _____

   or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

   _____

   _____

   [Delete (a)/(b)/(c), whichever is inapplicable]

Dated

Tracking no.___

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)

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SCHEDULE VIII
[See Regulation 13(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that I fully understand and accept the conditions dated , and undertake to design, construct and operate the project strictly in accordance with the said conditions and the IEE/EIA/Environmental Check List.

Signature, name and
designation of proponent
(with official stamp/seal)

Witnesses
(full names and addresses)

_____

_____

SCHEDULE IX

(*See* Regulation 21)

Form of Registers for IEE and EIA and Environmental Check List projects

S. No.	Description	Relevant Provisions
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I, II & III)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Project capital cost	
9.	Date of receipt of IEE/EIA/Environmental Check List	
10.	Date of confirmation of completeness	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	
13.	Conditions of approval/reasons for refusal	
14.	Date of Undertaking	
15.	Date of extension of approval validity	
16.	Period of extension	
17.	Date of commencement of construction	
18.	Date of issue of confirmation of compliance	
19.	Date of commencement of operations	
20.	Dates of filing of monitoring reports	
21.	Date of cancellation, if applicable	

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PART-I

GOVERNMENT OF SINDH
SINDH ENVIRONMENT PROTECTION AGENCY

NOTIFICATION

NO.EPA/TECH/239/2014:- In exercise of the powers conferred under clause (g) of sub-section (1) of section of 6 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Sindh Environmental Protection Council, is pleased to establish the following standards:-

1. (1) These Standards may be called the Sindh Environmental Industrial Waste Water, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Airs, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015.

(2) These Standards shall come into force at once.

2. In these Standards, unless there is anything repugnant in the subject or context –

(a) "Government" means the Government of Sindh;

(b) "Standards" means the Sindh Environmental Quality Standards.

SINDH ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/l, UNLESS OTHERWISE DEFINED)

S. No.	Parameter	Standards		
		Into Inland Waters	Into Sewage Treatment [3]	Into Sea [2]
1	2	3	4	5
1.	Temperature 40 ^{0}C or Temperature Increase *	≤3 ^{0}C	≤3 ^{0}C	≤3 ^{0}C
2.	pH value (H^+)	6-9	6-9	6-9
3.	Biochemical Oxygen Demand (BOD)$_5$ at 20 ^{0}C [1]	80	250	80**
4.	Chemical Oxygen Demand (COD) [1]	150	400	400
5.	Total Suspended Solids (TSS)	200	400	200
6.	Total Dissolved Solids (TDS)	3500	3500	3500
7.	Oil and Grease	10	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3	0.3
9.	Chloride (as Cl^-)	1000	1000	SC***
10.	Fluoride (as F^-)	10	10	10
11.	Cyanide (as CN^-) total	1.0	1.0	1.0
13.	An-ionic detergents (as MBAS) [2]	20	20	20
13.	Sulphate (SO_4^{2-})	600	1000	SC***
14.	Sulphide (S^{2-})	1.0	1.0	1.0
15.	Ammonia (NH_3)	40	40	40
16.	Pesticides [2]	0.15	0.15	0.15
17.	Cadmium [4]	0.1	0.1	0.1
18.	Chromium (trivalent and hexavalent) [4]	1.0	1.0	1.0
19.	Copper [4]	1.0	1.0	1.0
20.	Lead [4]	0.5	0.5	0.5
21.	Mercury [4]	0.01	0.01	0.01
22.	Selenium [4]	0.5	0.5	0.5
23.	Nickel [4]	1.0	1.0	1.0
24.	Silver [4]	1.0	1.0	1.0
25.	Total toxic metals	2.0	2.0	2.0
26.	Zinc	5.0	5.0	5.0
27.	Arsenic [4]	1.0	1.0	1.0
28.	Barium [4]	1.5	1.5	1.5
29.	Iron	8.0	8.0	8.0
30.	Manganese	1.5	1.5	1.5
31.	Boron [4]	6.0	6.0	6.0
32.	Chlorine	1.0	1.0	1.0

Explanations:

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Sindh Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.
2. Methylene Blue Active Substances: assuming surfactant as biodegradable.
3. Pesticides include herbicides, fungicides, and insecticides.
4. Subject to total toxic metals discharge should not exceed level given at S. N. 25.
5. Applicable only when and where sewage treatment is operational and BOD5 =80mg/l is achieved by the sewage treatment system.
6. Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.

* The effluent should not result in temperature increase of more than 3^0C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.

** The value for industry is 200 mg/l

*** Discharge concentration at or below sea concentration (SC).

Note: 1. Dilution of liquid effluents to bring them to the STANDARDS limiting values is not permissible through fresh water mixing with the effluent before discharging into the environment.

2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the STANDARDS limits".

"SINDH ENVIRONMENTAL QUALITY STANDARDS FOR INDUSTRIAL GASEOUS EMISSION (mg/Nm^3, UNLESS OTHERWISE DEFINED)."

S. No.	Parameter	Source of Emission	Standards
1	2	3	4
1.	Smoke	Smoke opacity not to exceed	40% or 2 Ringleman Scale or equivalent smoke number
2.	Particulate matter	(a) Boilers and Furnaces	
	(1)	(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement Kilns	300

		(b) Grinding, crushing, Clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas.	500
3.	Hydrogen Chloride	Any	400
4.	Chlorine	Any	150
5.	Hydrogen Fluoride	Any	150
6.	Hydrogen Sulphide	Any	10
7.	Sulphur Oxides [2][3][3]	Sulfuric acid/ Sulphonic acid plants	
		Other Plants except power Plants operating on oil and coal	1700
8.	Carbon Monoxide	Any	800
9.	Lead	Any	50
10.	Mercury	Any	10
11.	Cadmium	Any	20
12.	Arsenic	Any	20
13.	Copper	Any	50
14.	Antimony	Any	20
15.	Zinc	Any	200
16.	Oxides of Nitrogen	Nitric acid Manufacturing unit.	3000
	(3)	Other plants except power plants operating on oil or coal:	
		Gas fired	400
		Oil fired	600
		Coal fired	1200

Explanations:-

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent Sulphur content in fuel oil. Higher content of Sulphur will ease standards to be pro-rated.
3. In respect of emissions of Sulphur dioxide and Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to Standards specified above, comply with the following standards:-

A. **Sulphur Dioxide**

Sulphur Dioxide Background levels Micro-gram per cubic meter (ug/m^3) Standards.

Background Air Quality (SO_2 Basis)	Annual Average	Max. 24-hours Interval	Criterion I Max. SO_2 Emission (Tons per Day Per Plant)	Criterion II Max. ground level increment to ambient (One year Average)
Unpolluted	<50	<200	500	50
Moderately Polluted*				
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	>100	>400	>100	10

* For intermediate values between 50 and 100 ug/m^3 linear interpolations should be used.
** No projects with Sulphur dioxide emissions will be recommended.

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen oxides, expressed as NO_x should not be exceed the following:-

Annual Arithmetic Mean $100ug/m^3$ (0.05 ppm)

Emission level for stationary source discharge before mixing with the atmosphere should be maintained as follows:-

For fuel fired steam generators as Nanogram (10^{-9} gram) per joule of heat input:

Liquid fossil fuel	130
Solid fossil fuel	300
Lignite fossil fuel	260

Note:- Dilution of gaseous emissions to bring them to the STANDARDS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

Sindh Environmental Quality Standards for Motor Vehicle Exhaust and Noise

(i) For in-use Vehicles

S. No.	Parameter	Standards (maximum permissible limit)	Measuring Method	Applicability
1	2	3	4	5
1.	Smoke	40% or on the Ringleman Scale during engine acceleration mode	To be compared with Ringleman Chart at a distance of 6 meters or more.	Immediate effect
2	Carbon Monoxide	6 %	Under idling conditions: Non-dispersive infrared detection through gas analyzer.	
3.	Noise	85 db (A)	Sound-meter at 7.5 meter from the source.	

For new Vehicles

EMISSION STANDARDS FOR DIESEL VEHICLES

(a) For passenger Cars and Light Commercial Vehicles (g/Km)

Type of Vehicle	Category/Class	Tiers	CO	HC+ NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8
Passenger Cars.	M 1: with reference mass (RW).	Pak-II, IDI	1.0	0.7	0.08		All imported and local manufactured
	up to 2500 kg. Cars with RW over 2500 kg. to meet NI Category standards	Pak-II DI	1.0	0.9	0.10	NEDC (ECE 15+ EUDC.)	Diesel vehicles with effect from 01-07-2012
Light Commercial Vehicles	NI-I (RW<1250 Kg).	Pak-II IDI	1.0	0.70	0.08		
		Pak-II DI	1.0	0.90	0.10		
	NI-II(1250kg< RW < 1700 Kg)	Pak-II IDI	1.25	1.0	0.12		
		Pak-II DI	1.25	1.3	0.14		
	NI-III(RW< 1700 Kg)	Pak-II IDI	1.50	1.2	0.17		
		Pak-II DI	1.50	1.6	0.20		

Parameter Standards (maximum permissible limit) Measuring method

Noise	85 db (A)	Sound-meter at 7.5 meters from the source

(b) For Heavy Duty Diesel Engines and Large Goods Vehicles (g/Kwh)

Type of Vehicle	Category/ Class	Tiers	CO	HC	NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8	9
Heavy Duty Diesel Engines	Turks and Buses	Pak-II	4.0	1.1	7.0	0.15	ECE-R-49	All imported and local manufactured diesel vehicles with the effect 1-7-2012
Large goods Vehicles	N2(2000 and up	Pak-II	4.0	7.0	1.10	0.15	EDC	

Parameter Standards (maximum permissible limit) Measuring method

Noise the Source	**85 db (A)**	**Sound-meter at 7.5 meters from**

Emission Standards for Petrol Vehicles (g/km)

Type of Vehicle	Category/ Class	Tier	Co	HC+ NOx	Measuring Method	Applicability
1	2	3	4	5	6	7
Passenger Cars	M 1: with reference mass (RW), upto 2500 kg. Cars with RW over 2,500 kg. to meet N1 Category standards	Pak-II	2.20	0.5	NEDC (ECE 15+ EUDC)	All imported and new models locally manufactured petrol vehicles with effect from 1st July, 2016**

Light Commercial Vehicles	NI-I (RW<1250 kg) NI-NI-II (1250kg> kg RW < 1700 Kg)	Pak-II	2.20	0.5	
		Pak-II	4.0	0.65	
		Pak-II	5.0	0.08	
	NI-III(RW> 1700 kg)				
Motor Rickshaws & Motor Cycles	2.4 strokes < 150 cc	Pak-II	5.5	1.5	ECER 40
	2.4 strokes > 150cc	Pak-II	5.5	1.3	

Parameter	Standards (maximum permissible limit)	Measuring method
Noise source	85 db (A)	Sound-meter at 7.5 meters from the

Explanations:

DI:	Direct Injection.
IDI:	Indirect Injection.
EUDCL:	Extra Urban Driving Cycle.
NEDC:	New European Driving Cycle.
ECE:	Urban Driving Cycle.
M:	Vehicles designed and constructed for the carriage of passenger and Comprising no more than eight seats in addition to the driver's seat.
N:	Motor vehicles with at least four wheels designed and constructed for the carriage of goods.
*	New model means both model and engine type change.
**	The existing models of petrol driven vehicles locally manufactured will immediately switch over to Pak-II emission standards but no late than 30th June, 2012.

SINDH ENVIRONMENTAL QUALITY STANDARDS FOR AMBIENT AIR

Pollutants	Time-weight average	Concentration in Ambient Air	Method of measurement
Sulphur Dioxide(SO2)	Annual Average*	80 µg/m³	Ultraviolet Fluorescence method
	24 hours**	120 µg/m³	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	40 µg/m³	
Oxides of Nitrogen as (NO2)	Annual Average*	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	80 µg/m³	
O³	1 hour	130 µg/m³	Non dispersive UV absorption method
Suspended Particulate Matters(SPM)	Annual Average*	360 µg/m³	High Volume Sampling (Average flow rate not less than 1.1 m³/minute)
	24 hours**	500 µg/m³	
Respirable Particulate Matter PM10	Annual Average*	120 µg/m³	β Ray absorption method
	24 hours**	150 µg/m³	
Respirable Particulate Matter PM2.5	Annual Average*	40 µg/m³***	β Ray absorption method
	24 hours**	75 µg/m³	
Lead Pb	Annual Average*	1 µg/m³	ASS Method after sampling using LPM 2000 or equivalent filter paper
	24 hours**	1.5 µg/m³	
Carbon Monoxide(CO)	8 hours**	5 mg/m³	Non Dispersive Infra Red(NDIR) method
	1 hours**	10 mg/m³	

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week, 24 hourly and at uniform interval.

** 24 hourly/8 hourly values should be met 98% in a year, 2% of the time. It may exceed but not on two consecutive days.

***Annual Average limit of 40µg/m³ or background annual average concentration plus allowable allowance of 9µg/m³, whichever is lower.

Sindh Standards for Drinking Water Quality

Properties / Parameters	Standard Values for Sindh	WHO Standards	Remarks
Bacterial			
All water intended for drinking (e Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Most Asian countries also follow WHO standards
Physical			
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable	
Odour	Non	Non	

	objectionable/Acceptable	objectionable/Acceptable
Turbidity	(5 NTU	(5 NTU
Total hardness as $CaCO_3$	< 500 mg/l	—
TDS	(1000	(1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
Essential Inorganic	***mg/Litre***	***mg/Litre***
Aluminium (Al) mg/l	≤ 0.2	0.2

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Antimony (Sb)	≤ 0.005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	≤ 0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	*mg/Liter*	*mg/Litre*	
Cyanide (CN)	≤ 0.05	0.07	Standard for Pakistan similar to Asian developing countries
Fluoride (F)*	< 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	
Nickel (Ni)	≤ 0.02	0.02	

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Nitrate (NO_3)	0.50	50	
Nitrite (NO_2)	3 (P)	3	
Selenium (SE)	0.01 (P)	0.01	
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	—	
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Organic			
Pesticides mg/L		PSQCA No. 3639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted.***	Annex II
Phenolic compounds (as Phenols) mg/L		0.002	
Polynuclear aromatic hydrocarbons (as PAH) g/L)		0.01 (By GC/MS method)	
Radioactive			
Alpha Emitters bq L or pCi	0.1	0.1	
Beta emitters	1	1	

*** PSQCA- Pakistan Standards Quality Control Authority

Proviso:

The existing drinking water treatment infrastructure is not adequate to comply with WHO guidelines. The Arsenic concentrations in some parts of Sindh have been found high then Revised WHO guidelines. It will take some time to control arsenic through treatment process. Lead concentration in the proposed standards is higher than WHO Guidelines. As the piping system for supply of drinking water in urban centers are generally old and will take significant resources and time to get them replaced. In the recent past, Lead was completely phased out from petroleum

products to cut down Lead entering into environment. These steps will enable to achieve WHO guidelines for Arsenic, Lead, Cadmium and Zinc. However, for bottled water, WHO limits for Arsenic, Lead, Cadmium and Zinc will be applicable and PSQCA Standards for all the remaining parameters.

Sindh Environmental Quality Standards for Noise

S. No.	Category of Area / Zone	Effective from 1st Jan, 2015		Effective from 1st January, 2015	
		Limit in dB(A) Leq *			
		Day Time	Night Time	Day Time	Night Time
1.	Residential Area (A)	65	50	55	45
2.	Commercial Area (B)	70	60	65	55
3.	Industrial Area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	50	45

Note: 1. Day time hours: 6:00 a.m to 10:00 p.m

2. Night time hours: 10:00 p.m to 6:00 a.m

3. Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

* dB(A) Leq: Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

3. **Repeal and Savings.**

(1) The provisions of the Statutory Notification dated 10th August, 2000 and 18th October, 2010, issued by the Ministry of Environment, Government of Pakistan, to the extent of the Province of Sindh are hereby repealed.

(2) All actions taken, proceedings initiated shall be deemed to have been taken and initiated validly under the the provisions of these Rules.

DIRECTOR GENERAL,
SINDH ENVIRONMENTAL PROTECTION AGENCY

Karachi: Printed at the Sindh Government Press
28-1-2016

Annexure – IV

Environmental Mentoring Reports

Quality TESTING SERVICES

EPA Certified Lab
EPA/LAB/Certificate/QTS-11/2013

QMS/III/018 WA	
Revision : 02	Date 10.09.2013

Lab Report Ref. No.: QTS/K.E-H/20/8099-A

Reporting Date: 07/06/2020

Report to: K. Electric Limited

Sample ID: Air Quality Test

Sample Type: Ambient Air

Sample Collected/Submitted by: QTS representative

Sampling Date : 05/06/2020

Sample Receipt at QTS - Date : 05/06/2020

Site Coordinate: **24°55'28.12"N**
66° 50'1.23"E

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	AQ-1 Grid Station-Location #01	Carbon Mono Oxide	CO	5	mg/m³	0.52	HazScanner - EPAS
2		Oxides of Nitrogen as	NO_2	80	µg/m³	13.8	
3		Oxides of Nitrogen as	NO	40	µg/m³	8.9	
4		Ozone	O_3	130	µg/m³	9.3	
5		Respirable Particulate Matter	PM-10	150	µg/m³	64.5	
6		Respirable Particulate Matter	PM-2.5	75	µg/m³	33.8	
7		Suspended Particulate Matter	SPM	500	µg/m³	187.2	
8		Sulphur Dioxide	SO_2	120	µg/m³	11.6	

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	District West Maripur-Sub Division Karachi	Air Temperature	Temp	N.A	°C	33	HazScanner - EPAS
2		Relative Humidity	R/H	N.A	%	61	
3		Wind Speed	W.S	N.A	Km/hr	13	
4		Wind Direction	W.D	N.A	Degree	SW-°225	
5		Barometric Pressure	P	N.A	mbar	987	

SEQS= Sindh Environmental Quality Standard for Ambient Air
BDL=Below Detection Limit
NA= Not Available

Term & Condition:

- This report is not valid for any negotiations
- Report is valid for current batch(sample)
- This report is intended only for your guidance & not for legal purpose or for advertisement

Comments:
Tested parameter results are within the permissible limits of SEQS established for Air Quality.

Sample Analyzed by: Ather Adil

Signature of Laboratory In charge:
Name : Sumbla Ahmed

Quality Testing Services Karachi Q.T.S

Office No.505, Anum Estate Building, Opposite Duty Free Shop, Main Shahrah-e-Faisal, Karachi.
Tel. No. 92-21-34311466, 92-21-34382860, 92-21-34321532, Fax. No. 92-21-34311467

Email: info@qts.com.pk

Quality TESTING SERVICES

EPA Certified Lab
EPA/LAB/Certificate/QTS-11/2013

BUREAU VERITAS Certification

QMS/III/018 WA	
Revision : 02	Date 10.09.2013

Lab Report Ref. No.: QTS/K.E-H/20/8099-B

Reporting Date: 07/06/2020

Report to: K. Electric Limited

Sample ID: Air Quality Test

Sample Type: Ambient Air

Sample Collected/Submitted by: QTS representative

Sampling Date : 05/06/2020

Sample Receipt at QTS - Date : 05/06/2020

Site Coordinate: **24°55'10.32"N**
66° 50'33.51"E

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	AQ-2 Grid Station-Location Option#02	Carbon Mono Oxide	CO	5	mg/m³	0.63	HazScanner - EPAS
2		Oxides of Nitrogen as	NO_2	80	µg/m³	16.4	
3		Oxides of Nitrogen as	NO	40	µg/m³	10.2	
4		Ozone	O_3	130	µg/m³	11.1	
5		Respirable Particulate Matter	PM-10	150	µg/m³	78.6	
6		Respirable Particulate Matter	PM-2.5	75	µg/m³	41.6	
7		Suspended Particulate Matter	SPM	500	µg/m³	213	
8		Sulphur Dioxide	SO_2	120	µg/m³	9.3	

METEOLOGICAL DATA

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	District West Maripur-Sub Division Karachi	Air Temperature	Temp	N.A	°C	34	HazScanner - EPAS
2		Relative Humidity	R/H	N.A	%	60	
3		Wind Speed	W.S	N.A	Km/hr	12	
4		Wind Direction	W.D	N.A	Degree	SW-°220	
5		Barometric Pressure	P	N.A	mbar	994	

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Comments:
Tested parameter results are within the permissible limits of SEQS established for Air Quality.

Sample Analyzed by: Ather Adil

Signature of Laboratory In charge:
Name : Sumbla Ahmed

Quality Testing Services Karachi Q.T.S

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Quality TESTING SERVICES

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EPA/LAB/Certificate/QTS-11/2013

BUREAU VERITAS Certification

QMS/III/018 WA	
Revision : 02	Date 10.09.2013

Lab Report Ref. No.: QTS/K.E-H/20/8099-C

Reporting Date: 07/06/2020

Report to: K. Electric Limited

SAMPLE DESCRIPTION

Sample ID: Air Quality Test

Site Coordinate: **24°55'31.17"N**
66°51'32.09"E

Sample Type: Ambient Air

Sample Collected/Submitted by: QTS representative

Sampling Date : 05/06/2020

Sample Receipt at QTS - Date : 05/06/2020

AMBIENT AIR TESTING

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	AQ-3 Near KDA Scheme 42 Road Corner	Carbon Mono Oxide	CO	5	mg/m³	0.71	HazScanner - EPAS
2		Oxides of Nitrogen as	NO_2	80	µg/m³	19.2	
3		Oxides of Nitrogen as	NO	40	µg/m³	13.3	
4		Ozone	O_3	130	µg/m³	12.7	
5		Respirable Particulate Matter	PM-10	150	µg/m³	83.4	
6		Respirable Particulate Matter	PM-2.5	75	µg/m³	47.8	
7		Suspended Particulate Matter	SPM	500	µg/m³	238	
8		Sulphur Dioxide	SO_2	120	µg/m³	10.1	

METEOROLOGICAL DATA

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	District West Maripur-Sub Division Karachi	Air Temperature	Temp	N.A	°C	35	HazScanner - EPAS
2		Relative Humidity	R/H	N.A	%	58	
3		Wind Speed	W.S	N.A	Km/hr	11	
4		Wind Direction	W.D	N.A	Degree	SW-°224	
5		Barometric Pressure	P	N.A	mbar	998	

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- This report is intended only for your guidance & not for legal purpose or for advertisement

Comments:
Tested parameter results are within the permissible limits of SEQS established for Air Quality.

Sample Analyzed by: Ather Adil

Signature of Laboratory In charge:
Name : Sumbla Ahmed

Quality Testing Services Karachi Q.T.S

Office No.505, Anum Estate Building, Opposite Duty Free Shop, Main Shahrah-e-Faisal, Karachi.
Tel. No. 92-21-34311466, 92-21-34382860, 92-21-34321532, Fax. No. 92-21-34311467

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Quality TESTING SERVICES

EPA Certified Lab
EPA/LAB/Certificate/QTS-11/2013

QMS/III/018 WA

Revision : 02	Date 10.09.2013

Lab Report Ref. No.: QTS/K.E-H/20/8099-D

Reporting Date: 07/06/2020

Report to: K. Electric Limited

Sample ID: Air Quality Test

Sample Type: Ambient Air

Sample Collected/Submitted by: QTS representative

Sampling Date : 05/06/2020

Sample Receipt at QTS - Date : 05/06/2020

Site Coordinate: **24°52'59.26"N**
66°52'47.00"E

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	AQ-4 Near 220 KV LILO Interconnection Point	Carbon Mono Oxide	CO	5	mg/m³	0.83	HazScanner - EPAS
2		Oxides of Nitrogen as	NO_2	80	µg/m³	20.7	
3		Oxides of Nitrogen as	NO	40	µg/m³	15.2	
4		Ozone	O_3	130	µg/m³	13.8	
5		Respirable Particulate Matter	PM-10	150	µg/m³	91.6	
6		Respirable Particulate Matter	PM-2.5	75	µg/m³	49.7	
7		Suspended Particulate Matter	SPM	500	µg/m³	243	
8		Sulphur Dioxide	SO_2	120	µg/m³	12.3	

METROLOGICAL DATA

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	District West Maripur-Sub Division Karachi	Air Temperature	Temp	N.A	°C	35	HazScanner - EPAS
2		Relative Humidity	R/H	N.A	%	59	
3		Wind Speed	W.S	N.A	Km/hr	14	
4		Wind Direction	W.D	N.A	Degree	SW-°234	
5		Barometric Pressure	P	N.A	mbar	999	

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BDL=Below Detection Limit
NA= Not Available

Term & Condition:

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Comments:
Tested parameter results are within the permissible limits of SEQS established for Air Quality.

Sample Analyzed by: Ather Adil

Signature of Laboratory In charge:
Name : Sumbla Ahmed

Quality Testing Services Karachi Q.T.S

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Quality TESTING SERVICES

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QMS/III/018 WA

Revision : 02	Date 10.09.2013

Lab Report Ref. No.: QTS/K.E-H/20/8099-E

Reporting Date: 07/06/2020

Report to: K. Electric Limited

SAMPLE DETAILS

Sample ID: Air Quality Test
Site Coordinate: **24°57'4.75"N 66°50'0.72"E**
Sample Type: Ambient Air
Sample Collected/Submitted by: QTS representative
Sampling Date : 05/06/2020
Sample Receipt at QTS - Date : 05/06/2020

AMBIENT AIR QUALITY TEST RESULTS

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	AQ-5 Near 500 KV LILO Interconnection Point	Carbon Mono Oxide	CO	5	mg/m³	0.47	HazScanner - EPAS
2		Oxides of Nitrogen as	NO_2	80	µg/m³	8.8	
3		Oxides of Nitrogen as	NO	40	µg/m³	11.6	
4		Ozone	O_3	130	µg/m³	10.3	
5		Respirable Particulate Matter	PM-10	150	µg/m³	73.3	
6		Respirable Particulate Matter	PM-2.5	75	µg/m³	37.7	
7		Suspended Particulate Matter	SPM	500	µg/m³	188.9	
8		Sulphur Dioxide	SO_2	120	µg/m³	5.8	

METROLOGICAL DATA

S.NO.	LOCATION	PARAMETERS TO BE ANALYZED		STANAARD SEQS	UNITS	RESULTS (Avg)	TEST METHOD
1	District West Maripur-Sub Division Karachi	Air Temperature	Temp	N.A	°C	34	HazScanner - EPAS
2		Relative Humidity	R/H	N.A	%	56	
3		Wind Speed	W.S	N.A	Km/hr	12	
4		Wind Direction	W.D	N.A	Degree	SW-°229	
5		Barometric Pressure	P	N.A	mbar	995	

SEQS= Sindh Environmental Quality Standard for Ambient Air
BDL=Below Detection Limit
NA= Not Available

Term & Condition:

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- Report is valid for current batch(sample)
- This report is intended only for your guidance & not for legal purpose or for advertisement

Comments:
Tested parameter results are within the permissible limits of SEQS established for Air Quality.

Sample Analyzed by: Athey Adil

Signature of Laboratory In charge:
Name : Sumbla Ahmed

Quality Testing Services Karachi Q.T.S

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Quality TESTING SERVICES

EPA Certified Lab
EPA/LAB/Certificate/QTS-11/2013

QMS/III/018 WA
Revision : 02 | Date 10.09.2013

Lab Report Ref. No. : QTS/KE/20/8100 Reporting Date: 07/06/2020
Report to: K.Electric Limited.

Sample ID: Noise Level Test
Sample Description: Ambient Noise
No. of samples: 08
Sample Collected/Submitted by: QTS representative
Sampling Date :05/06/2020
Sample Receipt at QTS - Date : 05/06/2020

S.NO.	LOCATION/SOURCE	SEQS Limits : 55dB(A) *Leq			
		Noise Level Readings			
		1	2	3	Mean
1	Near Proposed Grid station Site#1	57.7	55.4	56.2	56.4*
2	Off-road near Grid station Site#1	61.2	63.3	60.1	61.5*
3	Near Proposed Grid station Site#2	57.4	58.4	59.6	58.48
4	Off-road near Grid station Site#2	63.3	61.1	64.3	62.9*
5	KDA Scheme 42 Road	60.2	61.8	59.8	60.6*
6	Near 500 kV LILO Interconnection Point	54.2	55.1	56.3	55.2*
7	Community area near 500 kV LILO Point	56.6	55.9	57.2	56.5*
8	Near 220kV LILO Interconnection Point	61.4	65.2	64.6	63.7*

SEQS= Sindh Environmental Quality Standard (Community Area)
***dB (A) Leq: Time weighted average of the level of sound in decibel on scale which is relatable to human hearing.**

Terms & Conditions:

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Comments:
*Tested Noise level from the sources are not within acceptable level as describe in SEQS.

Sample Analyzed by: Ather Adil	Signature of Laboratory In charge: Name : Sumbla Ahmed

Q.T.S Quality Testing Services Karachi

Office No.505, Anum Estate Building, Opposite Duty Free Shop, Main Shahrah-e-Faisal, Karachi.
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Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
Designing Phase			
Migratory bird flyways / Birds	Chance of Collision of Birds with the conductor string	• All suspension poles shall have detachable bird protection devices, over each suspension insulator string. • Bird flappers and deflectors will be installed on conductors to avoid collision of birds on strings.	CC
Temporary Construction Camps	Deterioration of air & water quality, and social impacts	• Camps are to be located away from residents/commercial activities to minimize nuisance; • Sanitation facilities in the camps, if provided, should be mobile & collect its wastewater or connected to the local sewerage system; • Bathing of construction crew should be prohibited at the camp as it will require large quantity of water and generate large volume of wastage.	CC
Contract clauses	Contractor may not perform the work in environmental friendly manner	• Construction Contractor / Waste Contractor shall be made responsible through contract documents for proper disposal of the spoil / excavated earth and not to dump these spoils/ earth near open plots / open spaces / open storm water drains / in front of residents or leave unattended along the construction site. It should be disposed in KMC designated landfill site. • A proper site rehabilitation plan shall be made by the contractor which includes the spoil / excavated earth disposal arrangements • Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and applicable standards during all the construction operations and ensure compliance of the same through periodic environmental monitoring reports. • Contractors shall be made responsible through contract documents to follow Standard Practices and Standard Operating Procedures (SOPs) to ensure health & safety of workers at the site and public during all construction operations. • As the work is usually completed by contractors and sub-contractors, K-Electric should monitor their works to ensure proper task completion.	KE
Construction Phase			
Excavation, storage of soil and waste, generation of waste	Soil Erosion	• Construction activities should be scheduled to avoid runoff due to rain; • The dredged soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation;	CC

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions; • Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites; • Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.	
Water Resources	Impact on Surface and ground water sources	• All excavated soil left after backfilling should be completely removed; • Debris and vegetation clogging culverts and drains should be regularly cleared; and • Soil runoff from the site leading to off-site contamination (particularly during rainy season) should not be allowed. • Spillage of oil and grease from the vehicles should be avoided.	CC
Fuel, Oil & Chemical handling, storage and disposal	Soil contamination	• Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course; • Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be avoided at construction site; • Oil contaminated materials should be disposed at designated waste disposal facilities.	CC
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase should be developed and implemented; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of waste should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and	CC

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	
Dust Emissions	Deterioration of local Air Quality	• Dust emissions from soil piles and aggregate storage stockpiles should be reduced by keeping the material wet by sprinkling water at appropriate frequency and erecting windshield walls on three sides of the piles; • It should be mandated by KE to Contractor to backfill the excavations after laying of the tower foundations and rehabilitate the excavated area to its original position. If it is a road, the backfilling will be followed by levelling and carpeting of road with bitumen; • Vehicular movement should be restricted to a specific time for dumping of supplies and construction materials; and • Workers should wear dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.	CC
Exhaust Emissions	Deterioration of local Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS; • Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) will be banned from sites; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	CC
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents	• Machinery operation and high noise activities should be carefully planned and scheduled; • To the extent practical batching plants and construction areas should not be located within 500 meters of a settlement; • Where that is not possible, high noise activities should cease between 20:00 hrs. to 06:00 hrs. at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents.	CC

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • The stationary sources of noise such as concrete mixers, batching plant, power generators and pumps will be selected and segregated from work areas and residents; and • Occupational health, safety and environmental procedures and Environmental management plan for proposed project would be followed.	
ROW Clearance	Impacts on Ecology (Flora and Fauna), cutting of trees	• Compensatory plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs; and • By using the best practice for vegetation clearing and disposal practices; will minimize the environmental risk associated with clearing and disturbance of vegetation.	CC
Safety Precautions for the Workers	The construction and civil works pose an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities during construction phase	• Preventive and protective measures including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital will be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work;	CC

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• To maintain safe conditions for the general public, construction camps will be fenced and gated, that must be locked at all times; and To protect workers from heat stress • Move to a cool place e.g. cool shady area; • Provide plenty of drinking water; • Break the working in shifts	
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic flow along the right of way of transmission lines. This increase in traffic may congest the flow of traffic and may cause some accidental injuries and deteriorate the air quality of ambient air.	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines; • The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily; • Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	CC
Social Impacts	Community health & safety issues	• Emergency response plan should be prepared and implemented during entire phase of construction; • Procedures for interaction with local and regional emergency and health authorities should be made; • In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 4:30-6:30 pm; • Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the residential areas and communities; • It should be mandated by KE to Contractor to backfill and rehabilitate the excavated area to its original position.	CC

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Proper lighting at night near trenches will be ensured; and • Diversions, danger points and works at culverts, bridges and construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. For of construction of foundation for Tower, vegetation removal is minimal therefore, impact on ecology are negligible.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities.	CC
Operational and Maintenance Phase			
Wind, fire and earthquakes	Electricity arcing, poles and towers dislodgment	• Transmission towers have been design as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions. • Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads • System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. • Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards: o The fire hazards risk will be minimized through the use of tall towers and wide ROW. o System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. o Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.	KE/CC
Electromagnetic Interference	The corona of overhead TL conductors and high frequency currents of overhead Transmission Line can create radio noise	• Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.	KE

Environmental Management Plan for construction and operation of overhead transmission line			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	which interferes with broadcast signals or electronic equipment.		
Electrocution hazard	High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).	• Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground. • Reduction in the Resistance to Ground of the grounding system • Proper placement of ground conductors	KE
Gaseous Emissions	Air pollution	• All vehicles, power generators and other equipment used during the maintenance work will be properly tuned and maintained in good working conditions in order to minimize emission of pollutants; and • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance with SEQS.	KE
Solid Waste	The maintenance activities may generate some hazardous and non-hazardous waste such as wires and wild vegetation etc.	• Ensure that all solid waste generated during operational or maintenance work is collected and disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.	KE
Notes KE = K-Electric; CC = Construction Contractor; SEQS = Sindh Environmental Quality Standards; PM = Particulate Matter, TL = Transmission Line			

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
Designing Phase			
Social Impacts	Land acquisition & resettlement, Institute near to right of way, traffic jams	• Traffic management plan will be prepared to manage the traffic jam; especially in peak hours; • Land acquisition shall be achieved as per the national rules and KE standards	KE
Waste disposal	Inadequate disposal of all wastes including transformer oil, residual contaminated soils, empty paint bucket and scrap metal.	• Create waste management policy and plan to identify sufficient locations for and storage of waste generated from construction camps and disposal of residual contaminated soils and scrap metal; and • Designate disposal sites in the contract and cost unit disposal rates accordingly.	KE
Contract clauses	Contractor may disown to work in environmental friendly manner	• Include provisions of this EMP in tender documentation and make contractors liable to implement mitigation measures by reference to EIA in contract; • Include Waste Management plan, Emergency Management Plan in contract as a payment milestone(s); and • Require environmental accident checklist and a list of controlled chemicals / substances to be included in the contractor's work method statement and tender documentation.	KE
Natural Hazards	Project Area lies in Zone 2A where minor to moderate damage can occur due to earth quakes.	• An earthquake proof design will be developed so that little or no intensification of the basic accelerations associated with the frequency spectrum of the seismic disturbance is encountered.	KE
Construction Phase			
Social Impacts	Community health & safety issues	• In order to minimize traffic congestion (if applicable), deliveries of materials and equipment will avoid peak traffic hours; • Dust emission from soil piles and aggregate storage stockpiles shall be reduced by keeping the material wet by sprinkling of water at appropriate frequency; • Vehicular movement shall be restricted to a specific time for dumping of supplies and construction material.	Contractor
Water Resources	Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is being met from	• Regular monitoring of water consumption and quality; • Use of leak proof water storage tanks; and	Contractor/ KE

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	external sources such as water tankers supplying water to the construction site		
Air quality	Deterioration of Air Quality	• All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants; • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to SEQS; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited; and • The stack height of the generators used will be at least 3 m above the ground.	Contractor
Noise and Vibration	Construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to workers and local fauna	• As far as possible, those machinery and equipment would be selected that create less noise and vibration; • Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • Occupational health, safety and environmental procedures and Environmental management plan for proposed project will be followed.	KE / Contractor
Construction Waste Disposal	This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. Irregular storage of this waste is hazardous to the workers at the site as well	• A Comprehensive Waste Management Plan for Construction phase will be developed and implemented; • Construction sites will be equipped with temporary refuse bins, and construction wastes will be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas will not be within 50 m of water ways; • Any hazardous waste will be separated and stored in areas clearly designated and labeled, and disposed in environmental friendly manner; • Wastes will be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by SEPA; and	Contractor / KE

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Upon completion of activities at a construction site all solid wastes will be completely removed and the site will be re-contoured or prepared for natural revegetation.	
Safety Precautions for the Workers	The construction and civil works poses an inherent risk of injury to workers from accidents and hazardous working environments. There may be either minor or major accidents due to different activities of construction phase	• Preventive and protective measures including elimination, substitution, or modification of hazardous conditions, with particular attention to live power lines, working at height, EMFs, high noise levels, and exposure to chemicals will be made; • Measures for the management and appropriate disposal of hazardous wastes will be undertaken to ensure protection of the workforce and the prevention and control of releases and accidents; • Appropriate fire extinguishers and fire response plans will be available at the site; • Appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and adequate transport facilities for moving injured persons to the nearest hospital shall be available; • Training for workers and appropriate incentives to use and comply with health and safety procedures and PPEs will be provided; • Procedures for documenting and reporting occupational accidents, diseases, and incidents; • Emergency prevention, preparedness, and response arrangements will be in place; • There will be strict safety requirements for personnel assigned to construction work; • To maintain safe conditions for the general public, all substations will be fenced and gated that must be locked at all times; and • Appropriate signage will be posted that shows the owner of the grid station, the hazardous nature of the substation and contact information.	KE / Contractor
Traffic Movement near construction site	Traffic flow in the locality of project will slightly increase during construction activities of the project, which directly impact the traffic in the vicinity of grid station. This increase in traffic may congest the flow of traffic and may cause	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic jams; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission lines; • The movement of equipment (trucks) during the construction of the proposed project will be limited to 9:30 am - 4:30 pm daily;	CC

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
	some accidental injuries and deteriorate the air quality of ambient air.	• Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complaint launched by community member will be responded and appropriate action will be taken to avoid it in future.	
Impact on Flora and Fauna	Destruction of habitat due to land levelling & vegetation removal. Onsite vegetation clearance will be required only within the boundaries of proposed grid station. Therefore, the impact on ecology of area from construction activities is minimal.	• Implement the best practice for vegetation clearing and disposal practices to minimize the environmental risk associated with clearing and disturbance of vegetation communities. • Compensatory tree plantation shall be provided at a ratio of 1:3; • Selection of plants for landscaping should consider the habitat suitability, trees of national interest, flowering trees and shrubs;	KE/CC
Operational and Maintenance Phase			
Transformer Oils & Fuel Spills	Pollution of soil	• Chemicals and oils will be stored in secure designated areas with permanent impermeable layer; • Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas; • A reservoir may be constructed below transformer for oil containment and spill control in case of leakage or outflow of oil due to severe internal fault. Bunds may also be constructed in transformer area for further protection. • Contaminated residues and waste oily residues will be disposed at an appropriate site approved by the relevant local environmental authority.	KE
Human Exposure to Electromagnetic Fields (EMF)	Adverse health effects	• Principles of careful avoidance will be adopted to ensure exposure levels are well below the generally accepted standards; • Regular health monitoring of workers to assess the possible adverse impacts due to EMF,	KE
SF6	Asphyxiation and Global Warming	• The SF6 Gas insulated switchgears design should comply with relevant IEC standards for the prevention of gas leakage. • The manufacturer is bound to design the switchgear with leakage rate of SF6 per annum for the whole substation within 0.5-1%.	KE

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Temperature compensated Pressure gauges will be installed for each compartment for monitoring of switchgear gas density and pressure. • The GIS switchgear will be equipped with SF6 Alarm, tripping and monitoring system with efficient and quick leakage/loss detection system. • Signals, usually wired up to the control room for operator attention in case of any minor or major loss of SF6 e.g. loss of SF6, SF6 pressure rising, SF6 minimum density, SF6 1st stage, SF6 2nd stage etc., so any loss of SF6 will be noticed. • During maintenance of switchgear or during SF6 gas filling/recovery, a calibrated and purposely designed machine named DILO is used for proper transfer of Gas to and from Gas compartments or specially designed cylinders, also proper pressure is maintained as per manufacturer recommendations. • Only the trained, designated or certified personnel are authorized to use the DILO machine for process of SF6 Gas filling or recovery. • Proper Safety measures and precautions should be taken prior to the start of work.	
Electrocution	Direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices.	• The addition of resistive surface layer • Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season. • Keep extra safety margin from live part during wet season. • There should be strict safety requirements for personnel assigned to work in substation. • To maintain safe conditions for the plant workers, substation should be fenced. • A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be calculated to protect passers-by during short-circuit. Where the substation has a metallic fence, it should be properly grounded to protect the workers from this hazard.	KE
Fire and Earthquake	Risk of Fire and Earthquake	• Maintenance and monitoring of electrical equipment will be done to prevent faults; • Arrangement will be done to prevent the flying Bats and birds to come into contact with the Grid Station;	KE

Environmental Management Plan for construction and operation of Grid station			
Environmental Aspect	**Impacts**	**Mitigation Measures**	**Responsibility**
		• Fire extinguishing arrangements will be ensured; • Designing of structures will be made earthquake resistant; and • Emergency response plans will be developed.	
Noise	Noise Pollution	• Vehicles and other maintenance equipment will comply with SEQS and other international standards for noise and are maintained to meet standards; • If possible, all noise generating equipment will be locked up by acoustic barrier to minimize the extent of impact area; • All operational or maintenance staff will wear mufflers/earplugs while operating or working near high noise sources; and • Back-up power generators will be maintained regularly.	KE
Solid Waste	The operation and maintenance activities of proposed project may generate some hazardous and non- hazardous waste such as wires, metal scrap etc. which if not disposed of properly could have adverse impacts on the environment.	• All solid waste collected during operational or maintenance work will be disposed of in an appropriate disposal site in the locality. • A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Designated waste storage areas should not be within 50 m of water ways; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner. • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation. (To be added in the finalized chapter)	KE
Notes K.E = K. Electric; SEQS = Sindh Environmental Quality Standards			

Environmental Monitoring Plan for construction and operation of overhead transmission line				
Environmental Aspect	**Monitoring Parameters**	**Monitoring Location**	**Monitoring Frequency**	**Responsibility**
Designing Phase				
Migratory bird flyways / Birds	Check the bird protection devices are installed	Entire transmission Line	Monthly / reported quarterly basis	CC/KE
Water consumption	Consumption in liters	Construction sites/camps	Measured on daily basis / reported quarterly basis	CC/KE
Construction Phase				
Excavation, storage of soil and waste, generation of waste	Check any obstruction in existing drains due to construction, check lifting of waste material, check waste management plan	At construction site	Monthly / reported quarterly basis	CC/KE
Water Resources	Check drainage infrastructure	Construction sites near drainage infrastructure	Monthly / reported quarterly basis	CC/KE
Fuel, Oil & Chemical handling, storage and disposal	Check contamination on the ground, check waste disposal	Vehicles/ machinery in working areas	Monthly / reported quarterly basis	CC/KE
Construction Waste Disposal	Domestic waste, Hazardous waste – Chemical waste, electro waste, Paper and Polythene material waste and Wood	Collection, handling, storage areas and disposal	Measured on daily basis and reported quarterly	CC/KE
Dust Emissions	SPM, PM_{10}, $PM_{2.5}$, SOx, NO, NO_2 and CO	Near Construction site (if several construction sites with a buffer distance of 5 km working consecutively or together, each site will be monitored at in a month)	Measured monthly for 12 working hours / reported quarterly basis	CC/KE
Exhaust Emissions	Smoke, CO, Noise, NOx, PM, SO_2	All construction vehicles	Measured monthly/ reported quarterly basis	CC/KE
Noise and Vibration	Noise Intensity (dB)	Near Construction site (if several construction sites with a buffer distance of 5 km working consecutively or	Monthly / reported quarterly basis	CC/KE

Environmental Monitoring Plan for construction and operation of overhead transmission line				
Environmental Aspect	**Monitoring Parameters**	**Monitoring Location**	**Monitoring Frequency**	**Responsibility**
		together, each site will be monitored at in a month)		
ROW Clearance	Check tree cutting, compensatory plantation, inventory of cleared trees / plants	At construction alignment	Monthly / reported quarterly basis	CC/KE
Safety Precautions for the Workers	Accidents, PPEs, Annoyance, Fire Hazards, Safety Protocols, Spill on Land and Spill on Water	All construction areas	Continuous / reported quarterly basis	CC/KE
Traffic Movement near construction site	Traffic flow, timing of activities, near misses and injuries records and reporting	At crossroads and along transmission line Right of Way	Continuous / reported quarterly basis	CC/KE
Social Impacts	Review of complaint register Local Consultations	Near Construction site	Monthly / reported quarterly basis	CC/KE
	Surface topography, Proper backfilling and carpeting	All excavated areas	Continuous / reported quarterly basis	CC/KE
Operational and Maintenance Phase				
Wind, fire and earthquakes	Regular maintenance of the protection system including conductors and circuit breakers will be undertaken	Transmission line Corridor	Monthly / reported quarterly basis	KE
Human Exposure to Electromagnetic Fields (EMF)	Electromagnetic Field (EMF)	Transmission line Corridor	Conducted and reported annually	KE
Gaseous Emissions	Smoke, CO, Noise, NOx, PM, SO_2	All maintenance vehicles	During maintenance activities	KE
Solid Waste	Waste collection and disposal records	Maintenance areas	During maintenance activities	KE

Environmental Monitoring Plan for Grid Station				
Monitoring Areas	**Monitoring Parameter**	**Monitoring Locations**	**Monitoring Frequency**	**Responsibility**
Construction Phase				
Air Quality	Particulate Matter, SOx, NOX and CO	Construction sites/camps	Quarterly	IMC
Wastewater	Temperature, pH, COD, TSS, TDS, BOD5, Copper and Chromium	Outlet of the wastewater discharge	Monthly	IMC
Soil	Soil contamination (Oil & Grease)	All construction areas	Continuous	IMC
Water Consumption	Liters	Construction sites/camps	Measured on daily basis and reported quarterly	HSE Officer/IMC
Solid Waste	Domestic waste, Hazardous waste –Chemical waste, electro waste, Paper and Polythene material waste and Wood	Segregation & Collection, handling, storage areas and disposal	Measured on daily basis and reported quarterly	HSE Officer/IMC
Health & Safety of Workers	Accidents, PPEs, Annoyance, Fire Hazards, Safety Protocols, Spill on Land	All construction areas	Continuous	HSE Officer/IMC
Noise Quality	Noise Intensity (dB)	All construction areas	At start of Construction Phase and Quarterly	IMC
Operational and Maintenance Phase				
Spills	Spills on land	Fuel Storage, Transformers, Capacitor and Switchgear	During Fuel Transportation, Oil changing and Engine Maintenance	IMC
Noise	Noise Intensity (dB)	Grid Station	At start of Operational Phase and Quarterly	IMC
Health & Safety	Accidents, PPEs, Fire Hazards, Safety Protocols	Grid Station	Monthly	IMC
Electromagnetic Field (EMF)	Adverse health effects due to EMF	Grid Station	At defined frequency as per Occupational Health Monitoring Plan	IMC
General				
Compliance Monitoring	IEE Commitments, Mitigation Measures, Implementation of EMMP and Conditions of Environmental Approval	All areas in all phases	Monthly	IMC

Annexure – VI

Change Management Plan

Change Management Plan

Change in Operations

Any change in the project design or project operation if required, will be made in relevance to the EMP and all the impacts associated with changed process will be either similar to the existing impacts and if different, will be assessed and included in the mitigation management plan. This has, on the basis of nature of process change, been distributed into three categories.

a) First-Order Change

Change leading to a significant removal of any operation from the project described in the chapter on description of project of this report and consequently requires a reassessment of the environmental impacts associated with the changes. In such an instance, updated environmental impacts of the proposed change will be sent to EPA for approval.

b) Second-Order Change

Change that entails project activities not significantly different from those described in the EIA report, and which may result in project impacts whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the environmental impacts of the activity will be reassessed. Additional mitigation measures, if required, will be identified and documented for being reported to EPA for their record.

c) Third-Order Change

Change that is of little consequence to the EIA findings. This type of change does not result in impact levels exceeding those already assessed in the EIA report; rather these may be made onsite to minimize the impact of an activity. The only action required in this regard will be to record the details of process change in the record register.

Change in Record Register

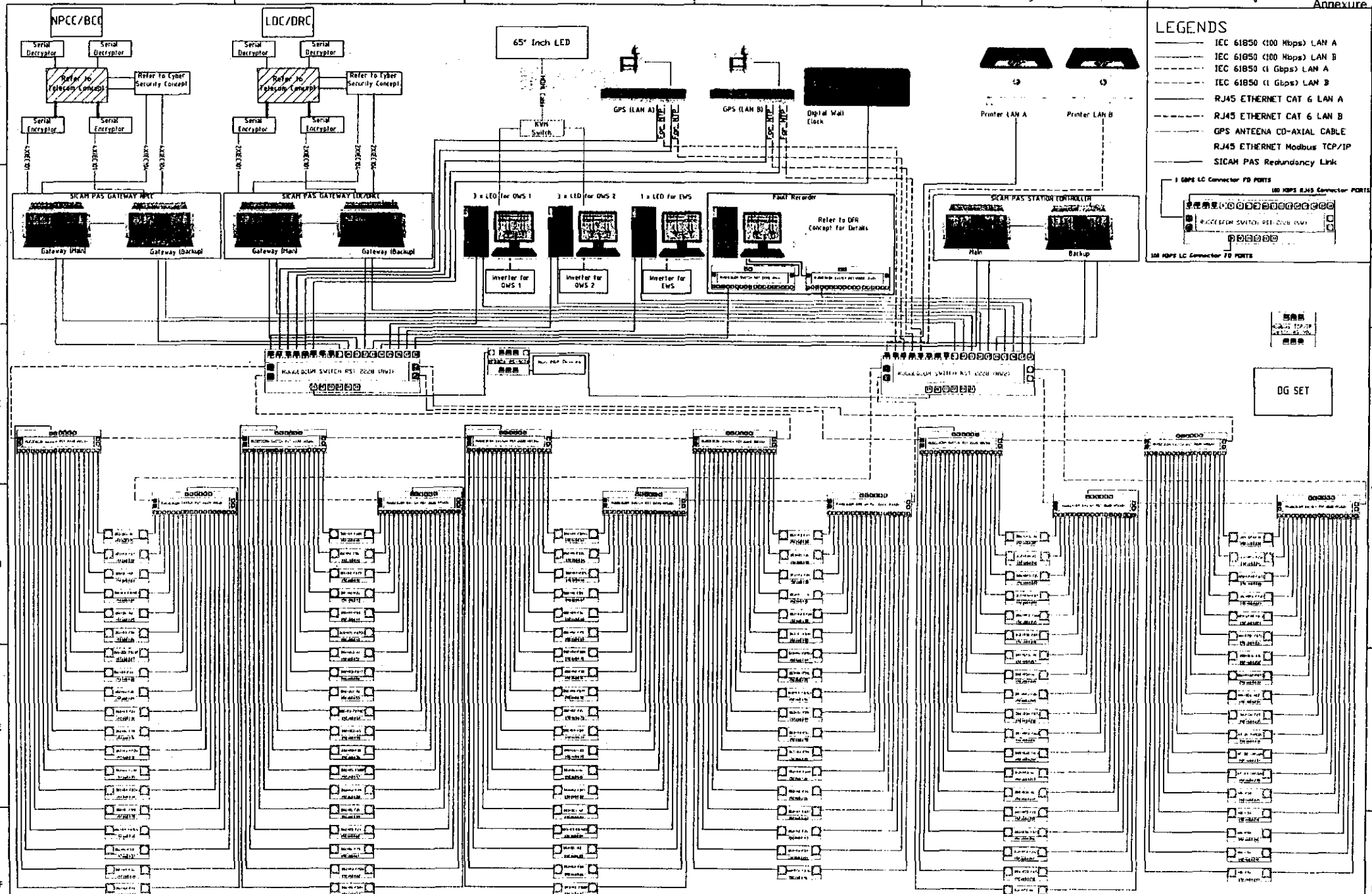
A record register will be maintained at project site at the start of project activities. All the changes to be made will be recorded in this register. This will assist in the step-by-step environmental monitoring and decision-making. Record register will be the responsibility of EHS department, and will be used internally.

Change in EMP

Changes in project design necessitate changes in the EMP. In this case, following actions will be taken:

- A meeting will be held between project management and contractor, to discuss and agree upon the proposed change to the EMP.
- Based on the discussion during the meeting, a report will be produced, which will include the additional EMP clauses and the reasons for their addition.
- Additional EMP clauses will be added to the original EMP as a second volume which will be distributed to the relevant project personnel and contractor.

Annexure A3



REV	DATE	REVISION DESCRIPTION	DRN	CHK	ENG	APP	EMP
C	9.06.22	KE Comments	KU				
D	5.05.23	KE Comments	HA				

SIEMENS

500/220kV KKI Project
Substation Automation System

DATE	5/05/2023	DATE		DATE	
DRAWN	HA	CHECKED	KU	APPROVED	AS

SAS Base Concept

G76001-EA101-KKI-554884

S No.	Details	Reply
1	Line route and territory maps	Karachi- Sindh & Hub-Baluchistan (Sketch attached)-Annexure A1.
2	System studies	Attached Annexure A4
3	Environmental and Social Soundness Assessment (ESSA) study/report	Attached Annexure A2
4	**Information relating to:**	
4(a)	Purpose	Interconnection of 500kV K-Electric Network through KKI GIS G/S to NTDC Network (National Grid) for import of additional power.
4(b)	Line lengths, starting point, termination point, year of completion	3.67km, KKI G/S, NTDC Existing K2K3 500kV T/L at T# 40-41, 2024
4(c)	Structures (type, number/kin)	Lattice Towers (TDD – Heavy Angle / Dead End Towers = 03 & TDA – Medium Angle Dead End Towers = 07) Total = 10 Towers
4(d)	Line characteristics	500kV, 220kV
4(e)	Insulators	160-KN Glass Toughened RTV Coated
4(f)	Shield-wire (number, size)	N/A
4(g)	Compensation employed (series, Shunt, SVC)	Not Required
4(h)	Communication systems (PLC, fiber optics, microwave)	PLC & SDH (OPGW)
4(i)	Conductor, type, current carrying capacity, circuit power transfer	AAAC GREELY, Size 927.5KCM, 37 Strands, 840x4= 3360Amp (Each Conductor carrying Capacity is 840Amp, whereas line is Quad Bundle), 1000-1500MW
4(j)	Grid Station(s) involved: number, existing/new, and details of the following:	500kV KKI (New), Existing 500KV Jamshoro, 500kV K2/K3 & 500k V PQEPC, 500kV HUBCO
4(j)(I)	Scope, size, number of transmission circuits, in and out	2 Ckt. KKI-K2/K3 & KKI-Jamshoro (Interim Arrangement) later on KKI-PQEPC
4(j)(II)	Type: indoor/outdoor, transformation/switching	Indoor, Transformation
4(j)(III)	Arrangement scheme: breaker and a half, double bus	Breaker and a Half
4(j)(IV)	Basic insulation level: kV	1050Kv
4(j)(V)	Control and protection system	Siemens main, backup SEL.Relays
4(j)(VI)	Specification of equipment (breakers-type, re-closing mechanism, duty cycle, etc. isolators, transformers-type, size, cooling system, tap-changer, and protection)	Siemens 500kV GIS Breaker Type 8DQ1. DC Operated Spring Charge operating mechanism., C-0.3-CO-3-CO, Isolator Type 8DQ1, Auto Transformers each 200MVA, type ODFPSZ-200000/525, Cooling ONAN, ONAF, OFAF, Tape

S No.	Details	Reply
		Changer Vacuum type, Mechanical protections and differential protection. (200 per Phase x 3 = 600 x 3 Sets = 1800 MVA) Two 200 MVA as spares.
4(j)(VII)	Lightening arresters, shunt reactors, metering and instrumentation	Surge Arrester and lightening protection provided., Shunt reactors not required. Dedicated CT/VT for tariff metering. CT/VT for instrumentation
4(j)(VIII)	SCADA and communication	Annexure A3
4(j)(IX)	Information relating to metering, installation, and testing facilities	Separate Metering room as per NTDC requirement. Dedicated 500kV GIS metering CT/VT for tariff metering. Testing facility through test plugs provided in the panels.

Certified True Copy (CTC) of Resolution
Passed by K-Electric Limited's (KEL's) Board of Directors in the Meeting Held On Wednesday, 25 September 2024 at KE House, 39-B, Sunset Boulevard, Phase-II, DHA, Karachi

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APPROVAL FOR SUBMISSION OF APPLICATION FOR LICENSEE PROPOSED MODIFICATION IN TRANSMISSION LICENSE OF THE COMPANY

RESOLVED THAT Application for Licensee Proposed Modification in K-Electric (hereinafter referred to as 'the Company') Transmission License for construction, ownership, operation and maintenance of 500kV assets be and is hereby approved for submission with the National Electric Power Regulatory Authority (NEPRA), pursuant to Regulation 10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 read with Section 16 and Section 25 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, as amended.

RESOLVED FURTHER THAT Chief Executive Officer be and is hereby authorized to sign and file the Application for Licensee Proposed Modification in the Company's Transmission License with NEPRA and such other deeds, documents, instruments etc., and take all necessary actions incidental and related to the aforesaid Application and appear before NEPRA and admit execution thereof for and on behalf of the Company.

RESOLVED FURTHER THAT Chief Executive Officer be and is hereby authorized to delegate all or any of the powers vested in him through this resolution, to any officer of the Company and/or revoke the same at his discretion, as he may deem expedient.

Rizwan Pesnani
Chief Risk Officer & Company Secretary

Dated: September 27, 2024

Authority Letter

WHEREAS, I, Syed Moonis Abdullah Alvi s/o Syed Riazuddin Alvi, Chief Executive Officer of K-Electric Limited ("the Company"), having its registered office at KE House, 39-B, Sunset Boulevard DHA, Phase-II, Karachi, in terms of clause 14 of General Power Attorney (the "GPA") dated 11th June 2018 given to me by the Board of Directors (BOD) of the Company, am empowered to make and sign applications to appropriate Federal, Provincial or Local Government Departments, authorities or other competent authority for all and any licenses, filing of any and all applications, petitions with National Electric Power Regulatory Authority (NEPRA) ("the Authority") which include Licensee Proposed Modifications (LPM) and others, permissions and consents required by any order, statutory instrument, regulation, bye-law or otherwise in connection with the business, management and affairs of the Company.

WHEREAS Clause 26 of the GPA empowers me to delegate to any person such of the powers as I deem fit.

Now, therefore, in exercise of powers vested in me by the BOD of the Company through the above GPA, I, hereby authorize M. Imran Hussain Qureshi s/o Ghulam Hussain Qureshi, having CNIC No. 35201-5044493-5, Muslim, Adult, Resident of Islamabad, Chief Regulatory Affairs and Government Relations Officer of K-Electric Limited, to sign and file with the Authority, KE's request for addition of 500/220 KANNUP-Karachi Interconnection (KKI) Grid and associated 220kV Transmission Lines **("the Project")** in the Transmission License of the Company ("the Application") along with such other deeds, documents, instruments, etc. and take all necessary actions incidental and related to the Application and appear before the Authority for and behalf of the Company.

Syed Moonis Abdullah Alvi
Chief Executive Officer
K-Electric Limited

Authorized Person:

M. Imran Hussain Qureshi
Chief Regulatory Affairs & Government Relations Officer
K-Electric Limited

Certified True Copy (CTC) of Resolution(s)
passed by K-Electric Board of Directors at its Meeting No. 1198
held on Thursday, 07 June 2018 at 11:00 hours in KE's Board Room,
3RD Floor, KE House, 39-B, Sunset Boulevard, Phase-II, DHA, Karachi

Re: **Appointment of Chief Executive Officer (CEO)**

RESOLVED THAT in exercise of powers vested through section 187 and 188 of Companies Act, 2017 and Article 76(ii) and (vi) of K-Electric (KE) Articles of Association, Syed Moonis Abdullah Alvi be and is hereby appointed as interim Chief Executive Officer of the Company in place of Mr. Muhammad Tayyab Tareen with effect from 07 June 2018.

RESOLVED THAT a General Power of Attorney as per draft set out in Appendix "**A**" be and is hereby given to Syed Moonis Abdullah Alvi, CEO, K-Electric and any two (2) Directors of the Company be and are hereby jointly authorized to sign, on behalf of the Board of Directors, the General Power of Attorney for Syed Moonis Abdullah Alvi and affix common seal of the Company on the instrument.

Muhammad Rizwan Dalia
Company Secretary
MUHAMMAD RIZWAN DALIA
Company Secretary
K-ELECTRIC LIMITED

Certified True Copy (CTC) of Resolution dated 31 July 2019
Passed by K-Electric Board of Directors

Election of Directors – Appointment of Chairman and Chief Executive Officer

RESOLVED FURTHER THAT Syed Moonis Abdullah Alvi be and is hereby appointed as Chief Executive Officer of the Company for a three (3) year term effective from 30 July 2019. The terms & conditions of appointment of Syed Moonis Abdullah Alvi for the position of CEO, as already approved by the Board, shall remain unchanged.

Rizwan Pesnani
Company Secretary

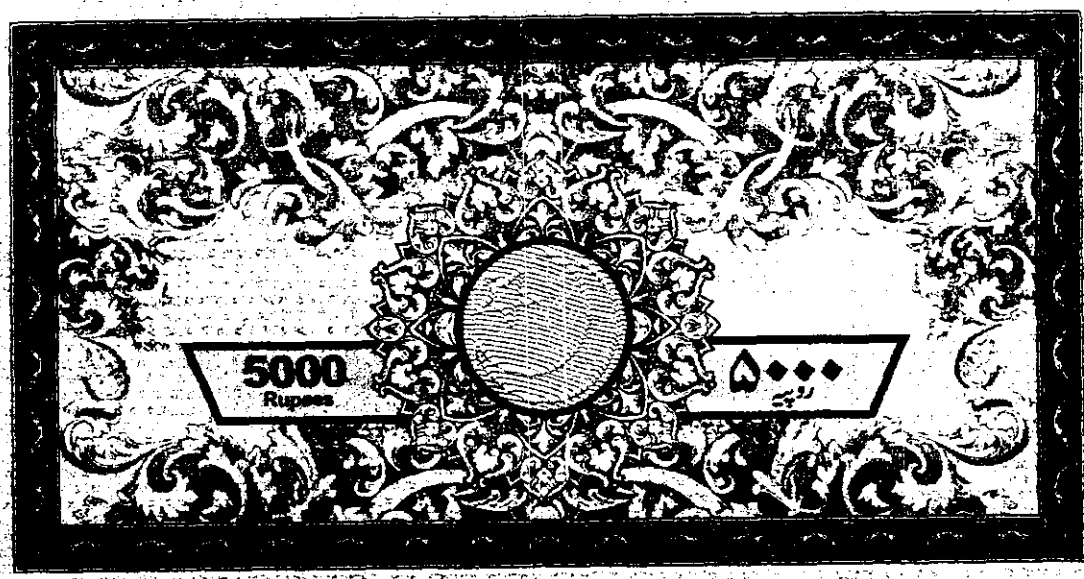
CERTIFIED TRUE COPY (CTC) OF THE
MINUTES OF 1233RD MEETING OF K-ELECTRIC LIMITED BOARD OF DIRECTORS (BOD)
HELD ON THURSDAY, 11 AUGUST 2022 AT 10:30 HOURS (PST) IN KE BOARD ROOM
3RD FLOOR, KE HOUSE, 39-B SUNSET BOULEVARD, PHASE-II, DHA, KARACHI

RE-APPOINTMENT OF CHIEF EXECUTIVE OFFICER

RESOLVED THAT *Syed Moonis Abdullah Alvi be and is hereby appointed as Chief Executive Officer of the Company for a term of three (3) years with effect from 30 July 2022.*

Rizwan Pesnani
Chief Risk Officer & Company Secretary

254887



RUPEES FIVE THOUSAND ONLY

STAMP OFFICE CITY COURT KARACHI
Issued to K. Electric.
CNIC/LEG No. 42101-6298941-9
Vide D.S.R. No. 02 Dt. 11-6-18
On behalf of Challan No. 21 Dt. 11-6-18
for the purpose of A.O.R.
Entry No. 02 Dt. 11-6-18

AIJAZ ALI ADVOCATE M.A.LL.B. KARACHI PAKISTAN Notary Public

GENERAL POWER OF ATTORNEY

TO ALL TO WHOM these presents shall come, K-ELECTRIC LIMITED (KE), having its registered office at KE House, 39-B, Sunset Boulevard, Phase-II, DHA, Karachi (hereinafter called the "Company") send greetings.

WHEREAS the Company was incorporated under the Companies Act 1882 as a company limited by shares and continues to operate as such under the Companies Act, 2017.

AND WHEREAS by virtue of the powers conferred upon them by Article 77 of the Company's Articles of Association, the Board of Directors of the Company have passed the resolution dated 07 June 2018 and entrusted to and conferred upon **Syed Moonis Abdullah Alvi**, the Chief Executive Officer of the Company, the following powers which shall be exercisable by him from the date that a Power of Attorney enumerating the same is executed in his favor by any two (2) Directors of the Company.

NOW THESE PRESENTS WITNESS THAT Syed Moonis Abdullah Alvi son of Syed Riazuddin Alvi CNIC # 42201-6886191-3, the Chief Executive Officer of the Company, is hereby appointed Attorney of the Company to act in the name and on behalf of the Company to do and perform the following acts and things only:

1) To purchase, sell, endorse, transfer, negotiate, encash, receive interest or otherwise deal in securities of all kinds including Government of Pakistan securities and securities of the Provincial Governments of Pakistan;

2) To sign all registers, reports and returns and others documents as may be required by law to be signed or filed with any Federal, Provincial or Local Governmental authority including but not limited to the Securities and Exchange Commission of Pakistan, Stock Exchanges, Registrar Joint Stock Companies, State Bank of Pakistan and Income Tax, Customs and other authorities;

3) To sign all acceptances and endorsements on bills of exchanges, hundies, securities and cheques drawn on behalf of the Company and to receive the amount of bills, hundies, securities and cheques and to give receipts and discharge for the same and to sign all documents drawn on or by the Company to which the signature of the Company as agents is required;

4) To sign for and on behalf of the Company all documents, assurances, deeds, and matters or things in or about the business of the Company as fully and effectively as the Company could do if personally present, to present such documents and deeds to the registering authority and admit execution thereof;

5) To process certificates of shares of the Company and to sign all papers relating to the transfer of shares including temporary receipts thereof;

6) To process Dividend Warrants and their revalidation;

7) To authenticate and or cancel the registration of Debentures;

8) To sign all correspondence that may be necessary in the ordinary course of the business of the Company;

9) To sign all deeds of sale, purchase, lease, mortgage, redemption, re-conveyance and present them before the registering authority and admit execution thereof;

10) To execute all bonds, deeds and documents and give such security as may be required now or at any future time by the Government of Pakistan or by any person, corporate body, company or firm to enable the Company to carry on its business;

11) To appoint and authorize any officer of the Company as his agent or agents to admit execution of deeds and documents of whatsoever nature before the registering authority and to revoke such appointment or appointments;

12) To sign, execute, determine or terminate and negotiate terms and conditions thereto agreements/appointment for employment and training with employees and trainees, in line with requirements of the Companies Act 2017 and Code of Corporate Governance Regulations 2017 as applicable;

13) To sign for and on behalf of the Company all documents, agreements, contracts, assurances, deeds, matters or things in or about the business of the Company as fully and effectively as the Company could do personally and to present such documents, agreements, contracts, assurances, deeds, matters or things to the registering authorities and appear before such authorities and admit execution thereof and to do all such other things and acts that may be necessary for registration;

14) To make and sign applications to appropriate Federal, Provincial or Local Government departments, authorities or other competent authority for all and any licenses, filing of any and all applications, petitions with NEPRA which include Licensee Proposed Modifications (LPMs) and others, permissions and consents required by any order, statutory instrument, regulation, byelaw or otherwise in connection with the business, management and affairs of the Company;

15) To obtain securities from any person, corporate body, company or firm for the due performance of any contract in respect of rendering any service or supplying any material to the Company and to accept the same on such terms as may be deemed proper or expedient by the Attorney;

16) To realize debts due to the Company and to receive any money due to the Company from any person, corporate body, company or firm and to grant receipts and discharges for the same;

17) To make payments to any person, corporate body, company or firm for any service rendered to the Company and for such other purposes of the Company and for carrying on of the Company's business and to sign and deliver all receipts, charges and drafts on the bank and other accounts of the Company or on the customers of the Company and to endorse all bills and bills of

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exchange received by the Company which may be necessary or expedient to be signed, endorsed or given for the purpose of carrying on of the Company's business;

18) To represent the Company before any Court of law, Federal, Provincial or Local Government authority or any other authority in all matters concerning the business or property of the Company;

19) To commence, institute, prosecute, and to defend, compound and abandon all proceedings, actions, suits, petitions, appeals, claims and demands by or against the Company or its officers in relation to the business or property of the Company or otherwise and for such purpose to sign, verify and present any document, pleading, complaint, writ, affidavit, application or other instrument in writing and to appear and make statements on oath or otherwise in relation to the affairs of the Company and to appoint and remunerate any barrister, solicitor, advocate, pleader, vakil, mukhtar or any legal practitioner or any revenue agent, accountants, valuers or surveyors for the said purpose and to obtain legal advice on behalf of the Company on any matter, contentious or otherwise, affecting the Company;

20) To write off amounts as approved by the Board of Directors arising as a result of correction / cancellation / adjustment of electricity bills in the normal course of business of the Company, to approve, formulate for write-offs, adjustment and settlement of electricity bills based on prudent business practices / judgement and within the policy framework approved by the Board of Directors, to sub-delegate such of the powers as he deems fit to the concerned executives / officers of the Company, to fix authority limits thereof, and to revoke the same at his discretion;

21) To obtain refund of stamp duty or repayment of court fees;

22) To appear and act in the offices of the District Registrar and Sub- Registrar of Deeds and Assurances for registration of documents and in any other office of the Federal, Provincial and local Government including without prejudice to the generality of the foregoing, City District Government, Karachi, any Union Council, District Council, Cantonment Board, Municipal Corporation, any Co-operative Society, State Bank of Pakistan, Collector of Customs, Excise & Taxation Offices and the Chief Controller of Imports and Exports in all matters concerning the business or property of the Company;

23) To file and receive back documents, to deposit and withdraw money and to grant receipts therefore;

24) To negotiate and to enter into and complete contracts with any person, corporate body, company or firm for the lease or purchase of any lands and buildings and to alter, repair, add to, and improve any building or structure and to let or sub-let any immovable property held by the Company and to submit plans of buildings relating to the Company's properties or lands on the Company's behalf before any competent authority and to obtain receipts therefor;

25) To use, sign and attest the name and style of the Company in any transaction, deed, document or muniment of title on all such occasions as may be necessary or expedient for conducting the business of the Company or for the due and proper management of the lands and buildings leased or purchased or to be leased or purchased by the Company and to execute and sign all such deeds and documents as may be required or proper for or in relation to all or any of the matters or purposes aforesaid;

26) To delegate to any person such of the powers as he deems fit and revoke the same at his discretion;

27) Generally to do all other acts and things incidental to the exercise of the aforesaid powers; and

28) The Company hereby agrees to ratify and confirm all and whatever the said Attorney shall lawfully do or cause to be done by virtue of this Power of Attorney.

The Power of Attorney executed in favor of Mr. Muhammad Tayyab Tareen pursuant to the Resolution of the Board of Directors passed on 27 November 2014 is hereby revoked. This Power of Attorney will be valid till the time Syed Moonis Abdullah Alvi holds the position of Chief Executive Officer of KE.

IN WITNESS WHEREOF the Common Seal of the Company has been affixed hereto at Karachi on this the 11 day of June 2018 by the undersigned Directors of the Company pursuant to the resolution dated 07 June 2018 passed by the Board of Directors of the Company.

Signature of Syed Moonis Abdullah Alvi

THE COMMON SEAL
of the Company was hereunto
affixed in the presence of

Director

Director

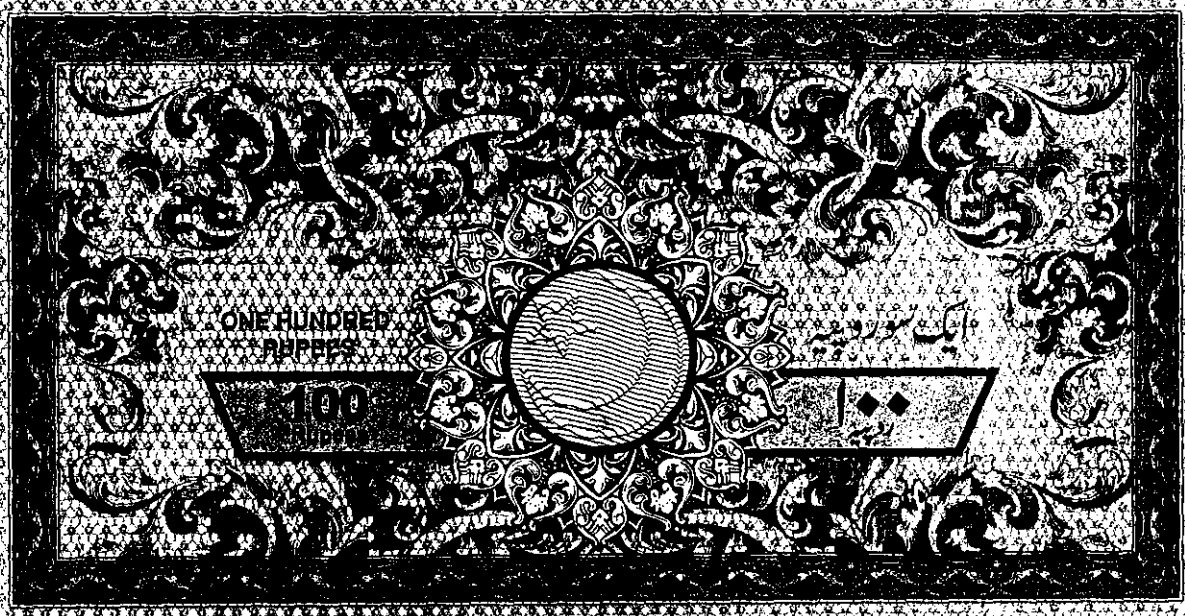
WITNESSES:

1. [signature]
   42201-7393750-5

2. [signature]
   42401-1568587-5

ATTESTED
AIJAZ ALI ADVOCATE M.A.,LL.B.
Advocate & Notary
Public Karachi
12 JUN 2018

AF 176032



SYED RIAZ MUSTAFA RIZVI
Stamp Vendor Licence # 59,
5-C-5/4, Urdu Mehal Nazimabad, Karachi
SR. NO:..... DATE..... 01 AUG 2024
ISSUED TO WITH ADDRESS: Abdul Majeed Khan Advocate
THROUGH WITH ADDRESS: 27, Aziz Chamber Opp. City Court, Khi
PURPOSE:.....
VALUE RS.....ATTACHED.....
STAMP VENDOR SIGNATURE.....

44843

BEFORE THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA)

AFFIDAVIT of Mr. Muhammad Imran Hussain Qureshi s/o Ghulam Hussain Qureshi having CNIC No. 35201-5044493-5, Chief Regulatory Affairs Officer, K-Electric Limited (the "Company"), a company incorporated under the laws of the Islamic Republic of Pakistan, having its registered office at KE House, 39-B, Sunset Boulevard, Phase II, Defence Housing Authority, Karachi.

I, the above-named deponent, being the duly authorized representative of the Company solemnly affirm and declare that the contents of the application requesting addition of 500/220 KANNUP-Karachi Interconnection (KKI) Grid and associated 220kV Transmission Lines **("the Project")** in the Transmission License of the Company being submitted vide Letter dated October 2, 2024 KE/RA&GR/NEPRA/2024/932, including all supporting documents are true to the best of my knowledge and belief and that nothing has been concealed.

ATTESTED

TARIQ IQBAL MAHER
Advocate High Court
Oath Commissioner
ISLAMABAD

MUHAMMAD IMRAN HUSSAIN QURESHI

Dated October 2, 2024