Initial Environmental Examination

July 2017

Islamic Republic of Pakistan: Proposed Multitranche Financing Facility II (MFF II) Second Power Transmission Enhancement Investment Program (Tranche 2)

Prepared by National Transmission and Despatch Company Limited for the Asian Development Bank.

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Sub-Project 4: Construction of new 220 kV Guddu-Shikarpur-Uch-Sibbi Transmission Line

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CURRENCY EQUIVALENTS

As of 28th July 2017 Currency Unit – Pak Rupees (Pak Rs.)
Pak Rs 1.00 = $ 0.009 US$1.00 = Pak Rs. 105

CONVERSIONS

1 meter = 3.28 feet

1 hectare = 2.47 acre

LOCAL TERMINOLOGY

Kacha structure (composed of mud/clay)

Pakka t/strong structure (composed of bricks/concrete)

Tehsil Area of land with a city or town that serves as its administrative centre

Acronyms

ADB	Asian Development Bank
ACGIH	American Government Individual Hygienist
ANSI	American National Standards Institute
AOI	Area of Influence
BEIS	Biological Exposure Indices
BOQ	Bill of Quantities
CLL	Concurrent Legislative List
CO	Carbon Monoxide
COI	Corridor of Impacts
EA	Executing Agency
EC	Electrical Conductivity
EHS	Environment & Health Guidelines
EHV	Extra High Voltage
EIA	Environmental Impacts Assessment
EMF	Electric and Magnetic Field
EMMP	Environmental Management & Monitoring Plan
EMU	Environmental Management Unit
EPA	Environmental Protection Agency
ESIC	Environment and Social Impacts Cell
ft	feet
GHGs	Green House Gases
GOP	Government of Pakistan
GRM	Grievance Redress Mechanism

GSO	Grid Station Operation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEE	Initial Environmental Examination
IPIECA	International Petroleum Industry Conservation Associates
km	Kilo Meter
MFF	Multi tranche Finance Facility
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standards
NESC	National Electrical Safety Code
NGOs	Non-Government Organizations
NOC	No Objection Certificate
NTDC	National Transmission and Despatch Company
Ops	Operational Policies
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PEPA	Pakistan Environmental Protection Act
PMU	Project Management Unit
PPEs	Personal Protective Equipment's
RE	Resident Engineer
REA	Rapid Environmental Assessment
RoW	Right of Way
SOP	Standard Operating Procedure/Practices
SPS	Safeguard Policy Statement
TL	Transmission Line
TLC	Transmission Line Construction
TLV	Threshold Limit Value
TOR	Terms of Reference
TPS	Thermal Power Station
UNDP	United Nations Development Program
WAPDA	Water and Power Development Authority
WMP	Waste Management Plan

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Executive Summary

1. This Initial Environmental Examination (IEE) has been conducted for the proposed Transmission line to be developed under the Tranche 2 of NTDC Power Transmission Enhancement Investment Program II (MFF) under TA 8488 of the Asian Development Bank (ADB).

2. This sub-project will consist of development of a new 220 kV transmission line with a length of 360 km long passing from Guddu to Shikarpur to Uch and terminating in Sibi. This new proposed transmission line will replace the existing transmission line, which will be dismantled and the proposed transmission line will be developed along the existing Right of Way (RoW). Thus, no resettlement or land acquisition will be necessary. The physical environment was observed within an area of 200 meters from either side of the centerline of the transmission line route.

3. This MFF Tranche 2 sub-project will contribute to the improvement of the overall performance of the power distribution sector, improving distribution efficiency, broadly widening access to power to drive economic opportunities. The beneficiaries of this sub-project will be people, companies, and government and non-government agencies in Pakistan that use power distribution services directly and indirectly.

4. Detailed field visits and surveys along with public consultations with the key receptors along the entire route of the sub-project were conducted. Existing primary data was collected which along with secondary data already available was used to develop a clear picture of the environmental and social aspects of the project development landscape for the purpose of this study.

5. No significant adverse environmental impacts have been predicted with the expected negative impacts being local in nature and low in magnitude. There are very few possibilities of adverse impacts on the physical, biological or socio-economic environment of project area with the alignment of the proposed transmission line designed in a manner that majority of the proposed line will pass through agricultural land instead of near communities or other sensitive receptors.

6. Although limited in magnitude, there are some possibilities of producing adverse environmental impacts, which must be mitigated at the earliest. The limiting of noise levels during construction of the project, proper disposal of any solid and liquid waste, preservation of air quality by limiting dust and toxic gas emissions from equipment and vehicle exhaust are some of the measures prescribed for the mitigation of impacts. Similarly, capacity development of all project staff to implement recommended mitigation measures are also prescribed.

7. An action plan with clear roles and responsibilities of stakeholders has been provided in the report. NTDC, Project Contractor and the Construction Supervision Consultant are the major stakeholders responsible for this plan. This action plan must be implemented prior to commencement of construction work.

8. Mitigation will be assured by a program of environmental monitoring conducted during construction to ensure that all measures in the EMP are implemented and to determine whether the environment is protected as intended. This will include observations on-site, document checks, and interviews with workers and beneficiaries and any requirements for remedial action will be reported.

9. Therefore, the proposed project is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design and construction can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of this IEE, the classification of the Project as Category 'B' is confirmed. It is concluded that the proposed project should proceed, with appropriate mitigation measures and monitoring programs identified in the IEE.

10. As a result of this IEE study, it has been determined that no adverse or harmful impacts of any significance are expected. The project falls under the Category 'B' of ADB's Guidelines and thus an IEE is sufficient.

1 Introduction

1.1 Background of MFF Project

1. The NTDC has launched the Multi tranche Financing (MFF) Project with the financial sponsorship of Asian Development Bank (ADB). [1] The objective of the proposed MFF Project is to improve Pakistan's power transmission infrastructure and management. To achieve this objective, the investment program consists of staged physical investments in the high-voltage transmission system, including the rehabilitation, augmentation and expansion of transmission lines, substations and supporting infrastructure.

2. The physical investments will increase transmission capacity to meet growing demand, improve transmission efficiency and energy security and evacuate additional sources of power. Non-physical investments will focus on increasing the financial management, regulatory relations and procurement capacity of the transmission system owner and operator, the National Transmission and Despatch Company (NTDC). The non-physical investments will increase institutional efficiency, cost recovery, competition, transparency and good governance within the sector.

1.2 Objective of proposed sub-project

3. The proposed transmission line will replace the existing transmission line and will play a key role in increasing the transmission capacity in the South region of the country and will help reduce the existing energy shortfall in the country.

1.3 Project Proponent

4. The National Transmission and Despatch Company (NTDC) is the executing agency of the project.

1.4 Project Interventions

5. As per PC-I prepared by NTDC, BOQ for the project will be developed after detailed designing has been completed. The major equipment required for the sub-project is as follows:

    - Towers
    - Conductor
    - Hardware

1.5 Location of the Sub-Project

6. The proposed new TL will replace the existing TL along the same alignment and since no change in alignment will take place, thus no resettlement or land acquisition is expected.

[1] ADB MFF Project Documents.

7. The proposed TL will consist of a total of 360 km with the following sub-sections:

Guddu to Shikarpur section:	**150 km**
Shikarpur to Uch plant section:	**100 km**
Uch plan to Sibi Sub-station section:	**110 km**

8. The existing TL which will be replaced is off-taking its power from the 500 kV and 220 kV Guddu grid stations located in the district of Kashmore in the north of Sindh Province, approximately (16 km) north east of Kashmore City. This existing TL traverses through [2]Rajanpur District of Punjab, Kashmore, some parts of Shikarpur and Jacobabad districts of Sindh and Dera Allah Yar and Sibbi Districts of Baluchistan Province. The project location and existing alignment is shown in **Figures 1.1** and **1.2** respectively.

1.6 Requirements for Environmental Assessment

9. The environmental assessment requirements of the GoP for grid stations and power distribution sub-projects are different to those of ADB. Under GoP regulations, the Pakistan and Provincial Environmental Protection Agencies (EPAs) "Review of Initial Environmental Examination and Environmental Impact Assessment Regulations (2000)" and provincial regulations 2014-15 categorizes development projects into two schedules according to their potential environmental impact.

10. The proponent of any project that has reasonably less foreseeable impacts are required to submit an IEE for their respective subprojects (Schedule-I). Projects that have more adverse environmental impacts (Schedule – II) are required to submit an environmental impact assessment (EIA) to the concerned provincial Environmental Protection Agencies (EPAs),

[2] Small portion of land immediately after Guddu Thermal Power Station.

Figure 1.1: Project Location Map

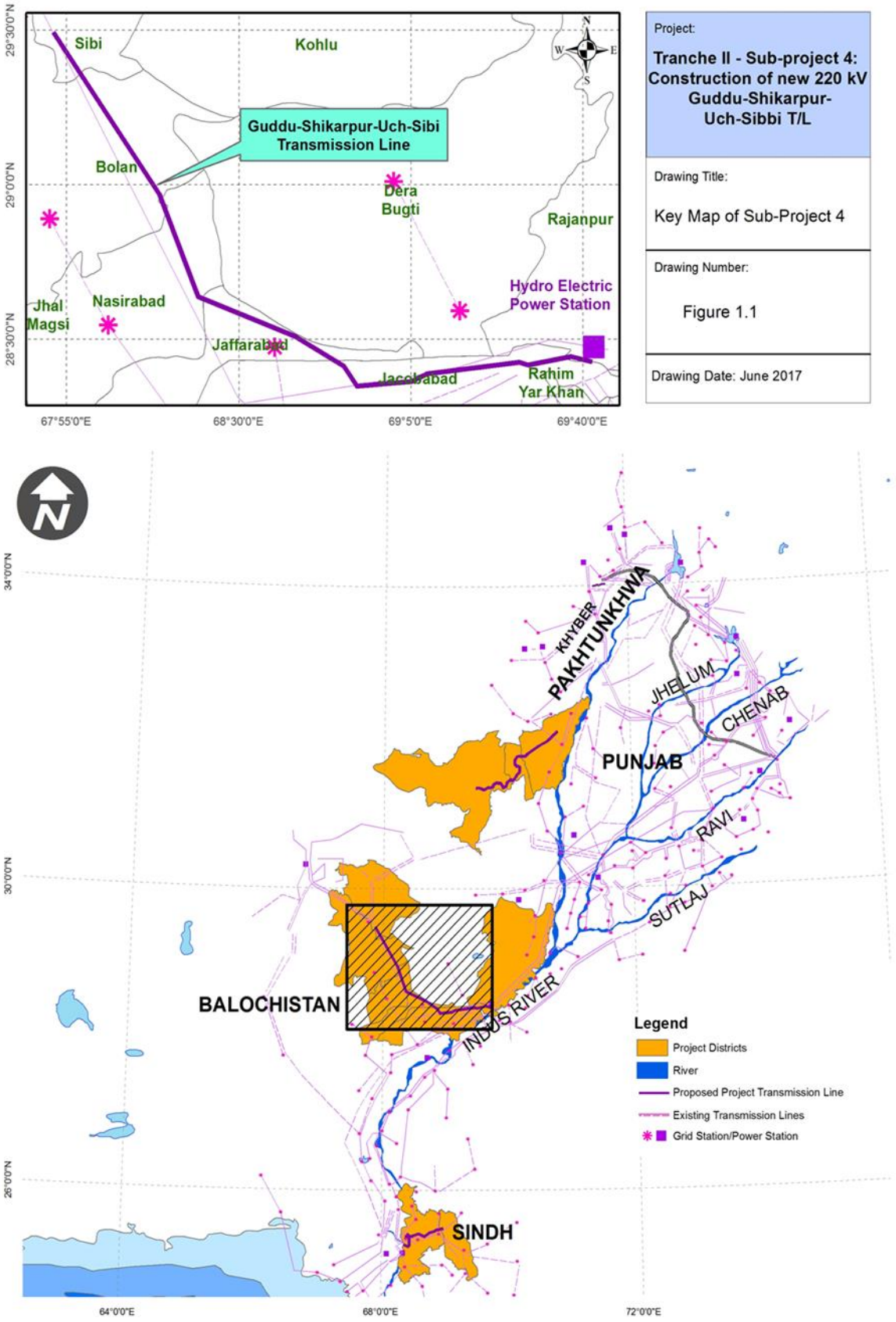
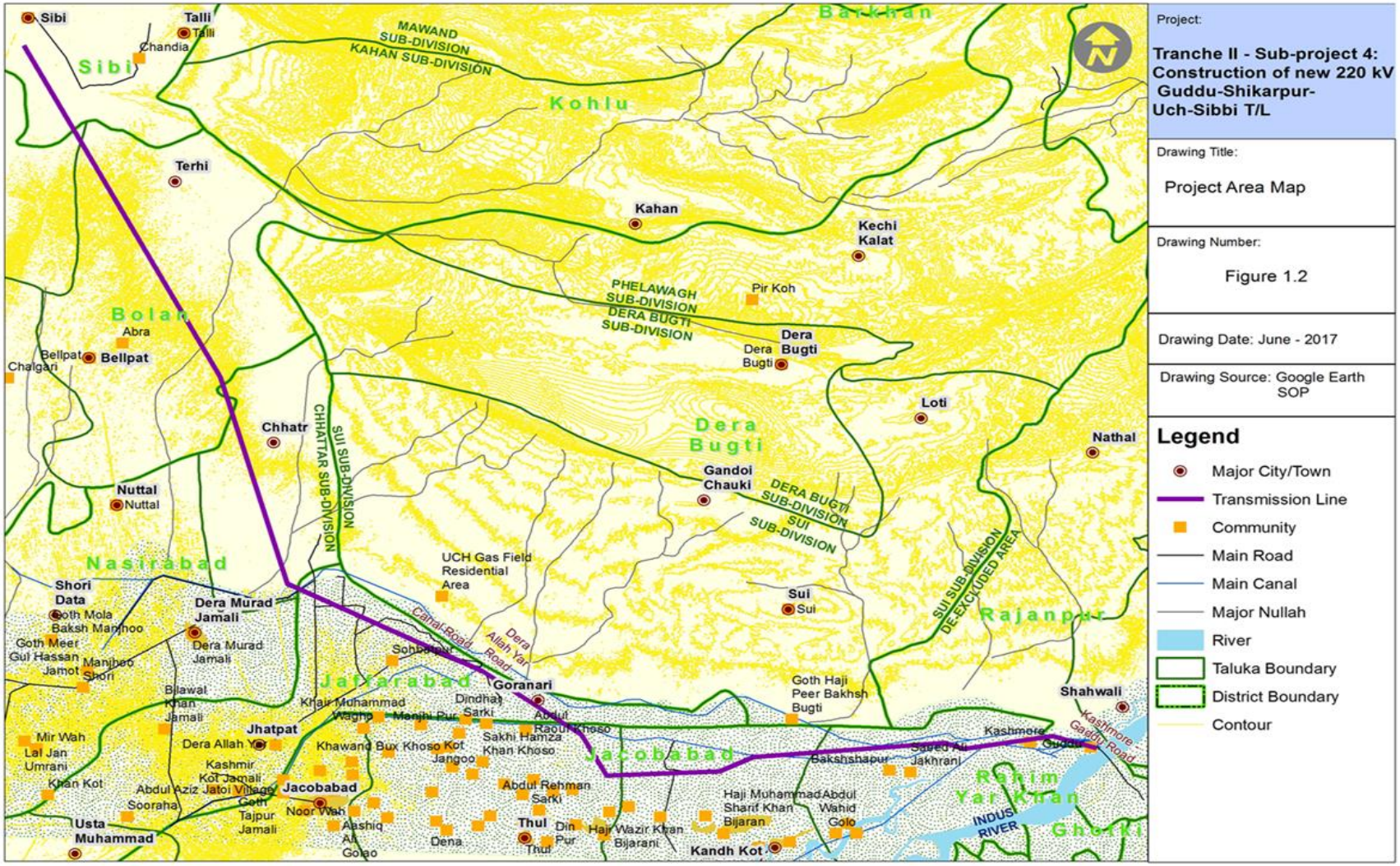


Figure 1.2: Transmission Route Alignment



11. The Rapid Environmental Assessment (REA) Checklist has been prepared for the proposed project and is enclosed as **Annexure I**.. According to aforementioned REA findings, the environmental impacts associated with the sub-project component have limited impacts.

12. Under the Multi Finance Facility (MFF) loan procedures of ADB, implementation of safeguards is to be achieved under ADB's Safeguard Policy Statement (SPS), 2009. Pak-EPA directs that proponent must follow the Section 12 of the Pakistan Environmental Protection Act (PEPA) 1997 and relevant sections of the Provincial Environmental Protection Acts for all sub-projects. Federal and Provincial EPAs direct that the proponents will consult with the relevant provincial EPAs and follow their advice. With the adoption of 18th Amendment to the Constitution, more power regarding environment is delegated to the provinces. Therefore, this IEE report will be submitted by NTDC to the respective provincial Environmental Protection Agencies (EPAs) for issuance of No-Objection certificates (NoCs).

1.7 Scope of the Study

13. The scope of the study as per ToR and requirement of the ADB SPS, includes:

- Collection of required baseline primary and secondary information on physical, biological and socio-economic conditions prevailing within the Right of Way (RoW) of existing transmission line where the primary impacts are anticipated;
- Environmental impact assessment of project interventions;
- Develop mitigation measures for impacts identified;
- Carry out Public Consultation with the concerned stakeholders and communities settled along the RoW of the existing transmission line within the range of 400m (200 m on either sides of the TL); and,
- Prepare environmental management plan including monitoring program and institutional strengthening program.

1.8 Review of Previous Studies

14. The PC-I prepared by NTDC for the replacement of the existing TL was reviewed and the field information collected was supplemented by [3]secondary data extracted from the available relevant reports in compiling this IEE report.

[3] All the reports and secondary information outsourced are referred as footnote under the respective section of this IEE report.

1.9 IEE Methodology

1.9.1 Baseline Survey of the Sub-Projects

15. In accordance to the ADB SPS, the REA checklist specific to the project (**Annex-I**) was prepared and the REA surveys were carried out during the month of July and August, 2016. The various steps undertaken in the IEE preparation included:

- Understanding of the proposed operations
- Review of policy
- Legislation and guidelines
- Collection and review of secondary data including the physical, biological, socioeconomic and cultural environments of the area
- Field data collection
- Community consultation
- Impact identification
- Recommendations for mitigation and monitoring measures
- Development of a project specific Environmental Management Plan (EMP); and Reporting of all findings in an Environmental Impact Assessment Report.

16. As the existing transmission line is traversing through administrative boundaries of the Sindh, Balochistan and Punjab provinces, therefore; during the visit, environmental data were collected for project categorization in accordance with the REA and requirements of the Provincial Environmental Protection Acts of Sindh, Balochistan and Punjab, Pakistan Environmental Protection Act (1997) and the Pakistan Environmental Assessment Regulations, 2000. The approach and methodology during data collection was a combination of qualitative and quantitative techniques.

1.9.2 Environmental Assessment

17. Baseline information on prevailing environmental conditions was collected from both primary and secondary sources. Primary data on flora, fauna and water quality as well as noise levels (through sensory evaluation as well as reviewing the secondary information) were collected. The data pertains to flora and fauna was collected through reviewing the secondary information referenced wherever used, first-hand information through direct observation and interviewing the locals. The field survey pertains to flora and fauna (biodiversity) was conducted along the RoW of the existing TL.

1.9.3 Assessment and Reporting

18. This study has been conducted using a risk based approach and the assessment process consists of a number of elements based on previous studies and incorporation of additional information gathered during site visits. The IEE complies with the environmental guidelines of the ADB and the contents of the report conform to the

requirements of the provincial Environmental Protection Agencies (EPAs).

1.9.4 Public Consultation

19. [4]Public consultation is an integral part of the IEE report. Public Consultation is essentially a tool used for the purpose of information dissemination, exchange of views, and soliciting feedback and suggestions of key stakeholders about the project and the IEE. During the IEE process, meetings were held with various stakeholders and communities settled along the RoW within the range of 400m (200 m on either side of the TL) to solicit and record their views and concerns for inclusion in project design at the project planning phase. The stakeholders consulted primarily included some prominent, government officials, public representatives and communities residing in the project area. Their views and concerns were enquired through different consultation techniques and were incorporated into the IEE mitigation measures.

[4] As most of the areas in Kashmore, Sohbatpur/Lehri and Sibbi is volatile, therefore undertaking public consultation without security forces is a risk. Secondly, the area is predominantly cultivated with rice crops and at the time of baseline survey and public consultation, some of the area was inundated and not accessible.

2 Policy, Legal And Administrative Framework

2.1 Introduction

20. This section provides an overview of the policy, legal and administrative framework that apply to the proposed sub-project. The Project is expected to comply with all national and provincial legislations relating to environmental protection in Pakistan. This section also describes the applicable regulations of ADB and its guidelines as well as other relevant international policies.

21. The Constitution of Pakistan distributes legislative powers between the Federal and the provincial governments through two “lists” attached to the Constitution as Schedules. The Federal List covers the subjects over which the federal government has exclusive legislative power, while the Concurrent List contains subjects regarding which both the federal and provincial governments can enact laws.

22. Subsequent to the 18th Amendment to the Constitution of Pakistan in 2010, ‘Environmental pollution and ecology' was transferred from the Concurrent Legislative List (CLL) to the legislative domain of the Provincial Assemblies. The legislation of Pakistan (now also applicable to, and adapted by, each province) contains many laws in the form of acts and ordinances, which are driven by policies and have direct or indirect relevance and implications in the design, construction and operation of the sub-projects. The sub-project has been assessed for compliance with the existing legal framework in Pakistan including the provinces as well as relevant international policies and guidelines.

2.2 Guidelines for Environmental Assessment

23. The Pak-EPA has published set of environmental guidelines for conducting environmental assessment and the environmental management of different types of development projects. The guidelines relevant to the proposed Project are listed below.

2.3 Guidelines for the Preparation and Review of Environmental Reports, Pakistan Environmental Protection Agency, 1997

24. The guidelines, targeted at project proponents, specify:

- The nature of the information to be included in environmental reports. The minimum qualification of the EIA conductors appointed. The need to incorporate suitable mitigation measures during project implementation. The need to specify monitoring procedures.
- The report must contain baseline data relating to the project area, an interpretation of the data and mitigation measures.

2.4 Guidelines of Public Consultation, Pakistan Environmental Protection Agency, May, 1997

25. These guidelines deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensure that their concerns are incorporated in any impact assessment study.

2.5 National Environmental Quality Standards (NEQS) 2000

26. The National Environmental Quality Standards (NEQS), 2000, specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers);
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources;
- Maximum allowable concentration of pollutants (two parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles;
- Maximum allowable noise levels from vehicles;

27. These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply only during the construction phase of the project. Standards for ambient air quality have also been prescribed.

2.6 Pakistan Environmental Protection Act, 1997

28. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed subproject relate to the requirement for an Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for development subprojects. Section 12 (1) requires that: No proponent of a subproject shall commence construction or operation unless he has filed with the Federal Agency (Pak-EPA) an initial environmental examination (IEE) or, where the subproject is likely to cause an adverse environmental effect, an environmental impact assessment (EIA) and has obtained Approval/NOC in this respect from the Environmental Agency. Thereof, the Pak-EPA has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies; in this case the Provincial EPAs of Sindh, Balochistan and Punjab are the agencies to whom the IEE shall be submitted.

2.7 Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

29. The Pakistan Environmental Protection Act, 1997 provides for two types of environmental assessments: Environment Impact Assessments (EIA) and Initial Environmental Examinations (IEE). EIAs are carried out for subprojects that have a potentially "significant" environmental impact, whereas IEEs are conducted for relatively smaller subprojects with a relatively less significant impact. Under Section 12 (and subsequent amendment) of the PEPA, 1997 a project falling under any category specified in Schedule-II requires the proponent to file an IEE or EIA with the federal agency. These schedules provide guidance for Project screening. Within ten working days of the IEE or EIA having been submitted, the federal agency will confirm that the document submitted is complete for the purpose of review. During this time, should the federal agency requires the proponent to submit any additional information; the IEE or EIA will be returned to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the federal agency shall make every effort to complete an IEE review within 45 days and an EIA review within 90 days of filing of the complete information of report.

30. Distribution lines and grid substations of 11 kV and above are included under energy sub-projects in Schedule II, under which rules GoP requires an EIA. Initial environment examination (IEE) is required for distribution lines less than 11 kV and large distribution sub-projects (Schedule I). A review of the need for EIA/ IEE submission is therefore required.

31. Relevant EPAs in this case are the concerned provincial Environment Protection Agencies (EPAs) as the project alignment passes through Sindh, Baluchistan and Punjab provinces.

32. There are no formal provisions for the environmental assessment of expanding existing distribution lines and grid substations. The details of the subproject will be forwarded to the concerned EPA, in order to commence the local statutory environmental assessment process.

2.8 Other Relevant Provincial and Federal Acts

33. There are a number of other federal and provincial laws that are important in the context of environmental management. The main laws potentially affecting sub-projects in this MFF are listed below:

- **Sindh Environmental Protection Act (2014)**

34. In the light of the provisions of Article 270 AA (6), as amended by section 96 of the18th Amendment, SEPA 2014 shall continue to remain in force until repealed or amended by the competent authority, which is now the Provincial Assembly in respect of the Sindh Province. The act is applicable to environmental parameters such as air, water, soil, and noise pollution, as well as to the handling of hazardous wastes. The Act provides the

framework for protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of standards for the quality of the ambient air, water and land, establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial Environmental Examination (IEE) and EIA approval. Penalties have been prescribed for those contravene the Act. The key features of the Act have a direct bearing on the proposed sub-projects because the project requires an initial environmental examination (IEE). The following are the key features of the Act that have a direct bearing on the project area.

- Section 11 (Prohibition of Certain Discharges or Emissions) states that "Subject to the provisions of this Act and the rules and regulations made there under, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards (NEQS)".
- Section 12 & 13 (Import & Handling of Hazardous Substances) requires that "Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement, or other Instrument to which Pakistan is a party." Enforcement of this clause requires the EPA to issue regulations regarding licensing procedures and to define 'hazardous substance.'
- Section 15 (Regulation of Motor Vehicles): Subject to provision of this clause of the Act and the rules and regulations made there under, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the NEQS, or where the applicable standards established under clause (g) of subsection (1) of Section-6 of the Act. Section 17 (Initial Environmental Examination and Environmental Impact Assessment) requires that "No proponent of a project shall commence construction or operation unless he has filed with the SEPA an IEE or, where the project is likely to cause an adverse environmental effect, an EIA, and has obtained from the SEPA for approval in respect thereof."
- Section 17-2a & b (Review of IEE and EIA): The Provincial Agency shall review the Environmental Impact Assessment report and accord its approval subject to such conditions as it may deem fit to impose, or require that the EIA be re-submitted after such modifications as may be stipulated or rejected, the project as being contrary to environmental objectives.

- **Balochistan Environmental Protection Act (2012)**

35. In the light of the provisions of Article 270 AA (6), as amended by section 96 of the18th Amendment, the Balochistan Provincial Assembly passed this act on 24th December,

2012 and assented by the Governor on 9th January 2013. The Act provides the framework for protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of standards for the quality of the ambient air, water and land, establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial Environmental Examination (IEE) and EIA approval. Penalties have been prescribed for those contravene the Act.

- Section 11 (Prohibition of Certain Discharges or Emissions) states that "Subject to the provisions of this Act and the rules and regulations made there under, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards (NEQS)".
- Section 16 & 17 (Import & Handling of Hazardous Substances) requires that "Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance
- Section 15 (Initial Environmental Examination and Environmental Impact Assessment) requires that "No proponent of a project shall commence construction or operation unless he has filed with the BEPA an IEE or, where the project is likely to cause an adverse environmental effect, an EIA, and has obtained from the BEPA for approval in respect thereof."

- **Punjab Environmental Protection (Amendment) Act, 2012**

36. After 18th Constitutional Amendment in the Constitution of Pakistan, the Federal Ministry of Environment has been dissolved and subject of environment has been handed over to provinces. EPA Punjab has formulated its own act. The major content of the act is same as of PEPA, 1997. Minor amendments/changes have been made viz.,

- The Name of Act has been changed into "Punjab Environmental Protection (Amendment) Act, 2012".
- For the words "Federal Government", wherever occur, the word "Government" shall be substituted;
- For the words "Federal Agency", wherever occur, the words "Provincial Agency" shall be substituted; and
- For the word "National", wherever occurs, the word "Punjab" shall be substituted.

37. All the other clauses, sub-clauses, sections and sub-sections are almost same.

38. The other acts and legislation is provided in **Table 2.1** below.

Table 2.1: Environmental Guidelines and Legislations

Legislation/Guideline	Description
National Environmental Policy (2005) (NEP)	NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, "to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country.
The Forest Act (1927)	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. No protected forest is situated in the Project area.
Punjab Wildlife Protection Act, 1974	This Act was enacted in 1974 for the regulation of activities relating to protection, conservation and management of Wildlife in the province. Enabling rules were notified in the same year to enforce the Act.
Punjab Plantation and Maintenance of Trees Act, 1974	The provincial government enacted this law in 1974 to regulate tree plantation and enforce measures for the protection of tree plantations in the province.
The Antiquities Act (1975)	It ensures the protection of Pakistan's cultural resources. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GOP to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GOP, any archaeological discovery made during the course of the project.
Pakistan Penal Code (1860)	It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.
Sindh Wildlife Protection Ordinance (2001)	The Sindh Wildlife Protection Ordinance of 1972, as amended in 2001, 2010 provides for the preservation, protection, and conservation of

Legislation/Guideline	Description
	wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The project activities will have to be carried out in accordance with this Act. The ordinance also specifies three broad classifications of the protected areas of National Parks, Wildlife Sanctuaries and Game Reserves.
Sindh Forest Act, 2012	The Act authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act empowers the department to protect, conserve, and manage sustainable development of forest and biodiversity. The act prohibits any person to set fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for cultivation or any other purpose. The project activities will have to be carried out in accordance with this Act. No activities will be carried out in any protected forests, and no unauthorized tree cutting will be carried out.
Sindh Fisheries Ordinance (1980)	The Sindh Fisheries Ordinance of 1980 provides rules and regulations for marketing, handling, and transportation, storage of fish and shrimps for commercial purpose and sale of fish used for the provincial trade in the Province of Sindh. Contravention of this Ordinance leads to imprisonment up to 6 months or a fine of 10,000 rupees or both. No government or local people operated or maintained fish hatchery or production site exist in the sub-project area, however; the Indus River and some ponds along the TL RoW is the source of fishing for the local people. Therefore; this act is applicable to the subprojects.
Sindh Cultural Heritage (Preservation) Act, 1994	This provincial Act empowers the Government of Sindh to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected.
Provincial Wildlife (Protection, Preservation, Conservation and Management) Act, Ordinances and Rules	In addition to empowering provincial wildlife department to establish game reserves, parks, and wildlife sanctuaries, these acts regulate the hunting and disturbance of wildlife. This law will help in eliminating any trespassing into protected areas.
Provincial Local Government Ordinances, 2001	These ordinances, issued following the devolution process, establish regulations for land use, conservation of natural vegetation, air, water, and land pollution, the disposal of solid waste and wastewater effluents, as well as matters related to public health and safety. This law will help as and when participatory management of irrigation system becomes the

Legislation/Guideline	Description
	order of the day.
Factories Act, 1934	The clauses relevant to the project are those that are related with the health, safety and welfare of workers, disposal of solid waste and effluent, and damage to private and public property. The Factories Act also provides regulations for handling and disposing of toxic and hazardous materials. There are no factories / industries inside the project area.
The Telegraph Act, 1885	This Act was promulgated for installation of telegraph poles and stringing. This Act makes a provision of installing poles/Towers without acquiring any land. However, provision is there for temporary acquisition of land during the construction period. As such, compensation is made for the loss of crop for a specific period.
Affected Persons Ordinance, 2001	This Ordinance was promulgated in 2001 by the federal government to provide relief to persons or households affected by any Project due to loss of land or displacement. The Project under review is not affected by the provisions of this law as no displacement of population is expected to occur.
Electricity Act, 1910	The Act provides a legal basis for distribution of Power. It enables a licensee to conduct operations for supply of electricity and binds the license to payment of compensation in respect of any damages caused during the construction, operation and maintenance of Power distribution facilities.
The West Pakistan Water and Power Act, 1958	This Act authorizes WAPDA to construct and operate electrical T/Ls with Powers and obligations of a license under the Telegraph Act, 1910. This Act also establishes policy for land acquisition and compensation, as well as the degree of liability of WAPDA for damages sustained by landowners or others.
Land Acquisition Act 1894	Land Acquisition Act (LAA), 1894 is the primary law governing land acquisition in Pakistan. For the acquisition of land, the above-mentioned Act, rules and regulations are followed whether the acquisition is for Government of Punjab or any other agency.
Canal and Drainage Act, 1873	Canals are defined as channels, pipes and reservoirs constructed and maintained by the Government for the supply for storage of water. Under section 27 of the Act a person desiring to have a supply of water from a canal for purposes other than irrigation shall submit a written application to a Canal Officer who may, with the sanction of the Provincial Government give permission under special conditions. The Act under section 61 also prohibits the damaging, altering, enlarging or obstructing the canals without proper authority. The Canal and

Legislation/Guideline	Description
	Drainage Act (1873) prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage. These acts have relevance to the project as the project water requirements will be met through canal water. Any abstraction of water from the canal will only be allowed after getting formal approval from the concerned irrigation department.
NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES	
National Conservation Strategy	Before the approval of NEP, the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment, this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.
Biodiversity Action Plan	The plan recognizes IEE/EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity.
Environment and Conservation	There is a well-established framework for environmental management in Pakistan. The Ministry of Environment deals with environment and biological resources. Within the ministry, the NCS unit established in 1992 is responsible for overseeing the implementation of the strategy. Two organizations, the Pakistan Environmental Protection Council (PEPC) and the Pak EPA are primarily responsible for administering the provisions of the PEPA, 1997. The PEPC oversees the functioning of the Pak EPA. Its members include representatives of the government, industry, non-governmental organizations and the private sector. The Pak EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to and institution of legislations whenever necessary. It is thus the primary implementing agency in the hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces.
INTERNATIONAL CONVENTIONS	
The Convention on Conservation of Migratory Species of Wild Animals (1981.21)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on

Legislation/Guideline	Description
	migratory species. There are no endangered species of plant life or animal life in the vicinity of the Project.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.
International Union for Conservation of Nature and Natural Resources Red List (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the wetlands of Pakistan.
Kyoto Protocol/Paris Agreement	SF6 gas is listed in the Kyoto Protocol as one of the six greenhouse gases subject to monitoring. SF6 has to be used in closed systems in order to avoid emissions. 194 member states agreed to extend the Kyoto protocol until 2020 with the aim of reducing the emission of greenhouse gases. The Paris Convention agreed to reduce climate-damaging greenhouses gases under the United Nations Framework Convention on Climate Change (UNFCCC) as of 2020. 195 member states negotiated and adopted this agreement on the twenty-first session of the Conference of the Parties under the framework convention on climate change in Paris on 12 December 2015.
IEC 62271-4 directive	This directive stipulates SF6 gas recovery down to a final vacuum of < 20 mbar. The IEC requirements are exceeded by far when using DILO devices as DILO service carts enable a final vacuum of < 1 mbar depending on the type of device.
IEC 60480 guideline	This guideline stipulates the limit values for the re-use of SF_6 gas in medium and high voltage switchgear.
EMF Exposure limits by IFC for 'general public' and 'occupational exposure'	These exposure limits have been provided for monitoring of EMF limits in order to prevent any adverse health effects in the general public as well as amongst workers.

2.9 Environment Regulatory Framework

39. The success of environmental assessment as a mean of ensuring that development projects are environmentally sound and sustainable depends in large measure on the capability of regulatory institutions for environmental management. The institutional framework for decision making and policy formulation in environmental conservation is briefly described below.

2.9.1 Ministry of Climate Change

40. Subsequent to the 18th Amendment to the Constitution, the Environment Ministry

functions were devolved to the provinces and a new Ministry of National Disaster Management was created. The Government of Pakistan renamed the Ministry of National Disaster Management in 2012, as the Ministry of Climate Change to deal with the threats posed by global warming and to protect environment in the country. The National Policy of Climate Change was also approved in the same year.

41. The Climate Change policy stipulates the following measures regarding environmental assessment:

- To act as a focal federal institution in order to fulfill international obligations under various Multilateral Environmental Agreements (Conventions, Protocols, Treaties etc).
- To establish National Environmental Quality Standards
- To facilitate and harmonize environmental standards, laws, acts and policies at national level.
- To undertake surveys, assessments and maintain national environmental database. It is mandatory requirement under PEPA'97 to produce State of Environment Report on annual basis; Surveys, assessments and monitoring have to be regularly undertaken to respond to the Multilateral Environmental Agreements (MEAs).
- Coordination and monitoring of the implementation of the environment and Climate Change agreements with other countries, international agencies and forums. Pakistan is party to number of regional and International environmental agreements, forums e.g. UNFCCC Malé Declaration on Trans-boundary Air Pollution, SACEP, SAARC, UNEP, UN Habitat, UNICEF, UNCSD, GLOBE, etc.
- Development of national strategies and action-plans in order to meet international obligations.

2.9.2 Pakistan Environmental Protection Council (PEPC)

42. The PEPC is the highest inter-ministerial statutory body in the country headed by the Chief Executive of Pakistan for formulation of national environmental policy, enforcement of Pakistan Environmental Protection Act (PEPA) 1997, approval of the NEQS, incorporation of environmental considerations into national development plans and policies, to provide guidelines for the protection and conservation of biodiversity in general and for the conservation of renewable and non-renewable resources. The PEPC oversees the functioning of the Pakistan Environment Protection Agency.

43. Through a notification dated 29th June, 2011, the Secretariat of Pakistan Environmental Protection Council under the Pakistan Environmental Act, 1997(XXXIV of 1997)" was assigned to the Inter-Provincial Coordination Division under National Disaster Management Division.

44. After Balochistan and Sindh Environmental Protection Acts, 2012 and 2014, both the provinces are empowered to establish the Environmental Protection Council under Section-3 of these acts.

2.9.3 Pakistan Environmental Protection Agency

45. The Pakistan Environmental Protection Agency (Pak-EPA) headed by a Director General has wide ranging functions given under the PEPA including preparation and co-ordination of national environmental policy for approval by the PEPC, administering and implementing the PEPA and preparation, establishment or revision of the National Environment Quality Standards (NEQS). The Pak-EPA also has the responsibility for reviewing and approving IEE and EIA reports for the following projects:

- Projects on federal land
- Military projects
- Projects involving trans-country or trans-province impacts

46. The responsibility for the review and approval of all other IEE and EIAs was delegated to the relevant Provincial Environmental Protection Agencies.

2.9.4 Non-Government Organizations

47. International environmental and conservation organisations, such as the International Union for the Conservation of Nature (IUCN) and the World Wide Fund for Nature (WWF) are active in Pakistan. Both these Organisations have worked closely with the Government and have played an advisory role with regard to the formulation of environmental and conservation policies. Since the Rio Summit (1992), a number of national environmental Non-Governmental Organisations (NGOs) have also been established, and have been engaged in advocacy and, in some cases, research.

2.10 Balochistan, Punjab and Sindh Institutional Framework

48. The institutions which have the responsibility in Balochistan and Singh to regulate interventions which could have potential impacts on the environment are detailed below.

49. EPA of Balochistan was established in 1982 under the administrative control of Urban Planning & Development Department while the EPA of Sindh was established in 1989 and now is functioning under the Environment and Alternative Energy Department which was established in October 2002 to attend to all issues pertaining to environment and for the propagation of renewable energies. On July 1, 1987, Environmental Protection Agency (EPA), Punjab was formed. Punjab is the first province where an EPA was created. The functions of the these EPAs are;

- **Sindh EPA**

50. It was first established in July 1989 and it functioned under the various Departments of Government of Sindh and now it reports to Environment and Alternative Energy Department since October 2002.

- Monitoring and regulating agency responsible for enforcement of Pakistan Environmental Protection Act 1997

- Enforce National Environmental Quality Standards (NEQS)
- Implement Self-Monitoring & Reporting Tool (SMART)
- Evaluate and approve Environmental Impact Assessment and Initial Environmental Examination
- Advise and coordinate with the government, NGOs etc on preventive measures for abatement of pollution.
- Assist local authorities and government departments to implement schemes for proper disposal of wastes to ensure compliance with NEQS
- Enhance awareness among general public
- Conduct research and studies on different environmental issues
- Attend to public complaints on environmental issues
- Carry out any other task related to environment assigned by the government.

- **Balochistan EPA**

51. Balochistan Environmental Protection Agency's role is to serve as main environment regulatory body for Balochistan Province, responsible for implementing National and Provincial Laws, and improving the protection of the Environmental and Natural Resources of Balochistan, developing policies for improvement and sustainable use of natural resources.

- **Punjab EPA**

52. Environmental degradation is escalating rapidly at the national and global level. Environment Protection Department, Punjab was established to combat this problem. Environment Protection Department, Punjab created Environment Protection Agency (EPA) which is responsible for the protection, conservation, rehabilitation and improvement of the environment; the prevention and control of pollution; and promotion of sustainable development in the province.

53. EPA is building on its successes with the environment through reliable and effective regulations, legislation and high-quality service delivery. EPA sustains qualitative and quantitative standards for the discharge of effluents, wastes, air emissions or noise either for general applicability or for a particular area or from a particular source in the form of Punjab Environmental Quality Standards (PEQS) and other standards established under the laws, rules and regulations.

2.11 ADB Policies

2.11.1 ADB's Safeguard Policy Statement (SPS), 2009

54. The Asian Development Bank's Safeguard Policy Statement (SPS) 2009 requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sound.

Occupational health & safety of the local population should also be addressed as well as the project workers as stated in SPS. A Grievance Redress Mechanism (GRM) to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established and provided in Chapter 8.

55. All loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) checklists, consisting of questions relating to (i) the sensitivity and vulnerability of environmental resources in project area, and (ii) the potential for the project to cause significant adverse environmental impacts. Projects are classified into one of the following environmental categories:

Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required.

Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.

Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

Category FI: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary (FI).

56. As a result of the completion of the REA checklist, the sub-project has been classified as Category ''B'' and thus a detailed and comprehensive IEE study has been prepared including the EMP.

2.11.2 ADB's Public Communication Policy 2011

57. The PCP aims to enhance stakeholders' trust in and ability to engage with ADB, and thereby increase the development impact of ADB operations. The policy promotes transparency, accountability, and participatory development. It establishes the disclosure requirements for documents ADB produces or requires to be produced.

2.11.3 ADB's Accountability Mechanism Policy 2012

58. The objectives of the Accountability Mechanism is providing an independent and effective forum for people adversely affected by ADB-assisted projects to voice their concerns and seek solutions to their problems, and to request compliance review of the alleged noncompliance by ADB with its operational policies and procedures that may have caused, or is likely to cause, them direct and material harm. The Accountability Mechanism a "last resort" mechanism.

2.12 Comparison of International and Local Environmental Legislations

59. The ADB SPS requires application of pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

60. A comparison of applicable local and international guidelines for ambient air quality has been provided in **Table 2.5** below. In the case of most pollutants, the NEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards. The applicable and most stringent parameters for each respective pollutant are highlighted in green.

61. Similar to the standards for air quality, the comparison of noise standards provided in **Table 2.6** clearly shows that NEQS standards for noise are more stringent in comparison to the WHO/IFC standards. The only exception is the daytime noise level standard for Industrial areas where the World Bank/IFC standard is more stringent (70 dB(A)) in comparison to NEQS (75 dB(A)) and so for this particular parameter, the WHO/IFC standard will be used. Apart from this one exception, the NEQS standards have been used for this sub-project.

62. As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e. NEQS take precedence over any other international regulations such as WHO/IFC since these specific IFC standards only cover a limited number of parameters relating to effluent disposal etc and the NEQS are generally more stringent.

2.13 Implications of national policies and regulations on proposed project

63. The Pak-EPA formulated regulations in 2000 for 'Review of IEE and EIA' which categorise development projects under three schedules - Schedules I, II and III. Projects are classified on the basis of expected degree and magnitude of environmental impacts and the level of environmental assessment required is determined from the schedule under which the project is categorised.

64. The projects listed in Schedule-I include those where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule-I projects require an IEE to be conducted, rather than a full-fledged EIA, provided that the project is not located in an environmentally sensitive area.

65. The proposed sub-project has been categorized as Schedule-I and thus an IEE study has been conducted.

66. This IEE study will be submitted to the relevant provincial EPAs for review and any comments in order to receive the respective NOC from each province where the scope

of work is to be conducted. Each provincial EPA will respond within 10 working days from receipt of the IEE report and confirm the completeness of the report for detailed review or request additional information to be provided in order for the review to take place.

67. Each provincial EPA will make every effort to review the IEE report within 45 days of the issuance of completeness of the report. Upon completion of the review, an NOC will be issued, with conditions from the EPA if felt necessary.

2.14 Implications of ADB's safeguard policies on proposed project

68. The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems.

69. ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- environmental safeguards,
- involuntary resettlement safeguards, and
- Indigenous Peoples safeguards.

70. The objective of the environmental safeguards is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. ADB's policy principles are summarized in **Table 2.2** below.

Table 2.2: ADB Policy Principles

S/No.	Policy principle	Summary
1	Screening and categorization	Screening process initiated early to determine the appropriate extent and type of environmental assessment.
2	Environmental assessment	Conduct an environmental assessment to identify potential impacts and risks in the context of the project's area of influence.
3	Alternatives	Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts, including no project alternative.
4	Impact mitigation	Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts. Prepare an environmental management plan (EMP).
5	Public consultations	Carry out meaningful consultation with affected people and facilitate their informed participation. Involve stakeholders early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation. Establish a grievance redress mechanism.
6	Disclosure of environmental assessment	Disclose a draft environmental assessment in a timely manner, in an accessible place and in a form and language(s) understandable to stakeholders. Disclose the final environmental assessment to stakeholders.
7	Environmental management plan	Implement the EMP and monitor its effectiveness. Document monitoring results, and disclose monitoring reports.
8	Biodiversity	Do not implement project activities in areas of critical habitats.
9	Pollution prevention	Apply pollution prevention and control technologies and practices consistent with international good practices. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges. Avoid the use of hazardous materials subject to international bans or phaseouts.
10	Occupational health and safety Community safety.	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities
11	Physical cultural resources	Conserve physical cultural resources and avoid destroying or damaging them. Provide for the use of "chance find" procedures.

2.15 EMF Exposure Guidelines

71. Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, 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.

72. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern. Table 2.3 lists exposure limits for general public exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) while Table 2.4 provides the exposure limits for occupational exposure.

73. It is important to mention that no national guidelines on EMF exposure exist at present.

Table 2.3: ICNIRP exposure limits for general public exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (uT)
50 Hz	5000	100
60 Hz	4150	83

Source: *ICNIRP (1998): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).*

Table 2.4: ICNIRP exposure limits for occupational exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (uT)
50 Hz	10,000	500
60 Hz	8300	415

Source: ICNIRP *(1998): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).*

2.16 International Standards and Guidelines

74. The following international guidelines may be applicable to the project;

A. World Bank Guidelines on Environment: The principal World Bank publications that contain environmental guidelines are listed below. „ Environmental and Social Framework (ESF) 2016. Environmental Assessment Sourcebook, Volume I:

Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991.

B. Environmental Health and Safety (EHS) Guidelines, International Finance Corporation (IFC) World Bank Group, 2008.

C. Occupational Health and Safety Guidelines:

75. Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV) occupational exposure guidelines and Biological Exposure Indices (BEIs) published by American Conference of Governmental Industrial Hygienists (ACGIH), the Pocket Guide to Chemical Hazards published by the United States National Institute for Occupational Health and Safety (NIOSH), Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA), Indicative Occupational Exposure Limit Values published by European Union member states, or other similar sources. Additional indicators specifically applicable to electric power sector activities include the ICNIRP exposure limits for occupational exposure to electric and magnetic fields.

2.17 NTDC Environmental and Social Impacts Cell (ESIC)

76. NTDC has established the Environmental and Social Impacts Cell (ESIC) manned by two professionals and support staff .The cell is attached to both Implementing Agencies, the Chief Engineer EHV (General Manager Grid System Construction, NTDC) and the planning agency Project Director Technical Assistance (General Manager Planning, NTDC). ESIC enable address the environmental and social issues in a timely and effective manner during operation, maintenance, construction of transmission lines and Grid stations. ESIC may also be involved as an independent environmental monitoring organization during construction phase of this sub-project.

Table 2.5: Comparison of International and local Air Quality Standards*

Pollutants	USEPA		WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr 10 min	20 ug/m^3 500 ug/m^3	Annual Mean 24 hrs	80 ug/m^3 120 ug/m^3
CO	8 hrs 1 hr	9 ppm (11 mg/m^3) 35 ppm (43 mg/m^3)	-	-	8 hrs 1 hr	5 mg/m^3 10 mg/m^3
NO_2	Annual Mean 1 hr	100 ug/m^3 (53 ppb) 100 ppb	1 yr 1 hr	40 ug/m^3 200 ug/m^3	Annual Mean 24 hrs	40 ug/m^3 80 ug/m^3
O_3	8 hrs	0.07ppm (148 ug/m^3)	8	100 ug/m^3	1 hr	130 ug/m^3
TSP	-	-	-	-	Annual Mean	360 ug/m^3

					24 hrs	500 ug/m^3
PM_{10}	24 hrs	150 ug/m^3	1 yr 24 hr	20 ug/m^3 50 ug/m^3	Annual Mean 24 hrs	120 ug/m^3 150 ug/m^3
$PM_{2.5}$	Annual Mean 24 hrs	15 ug/m^3 35 ug/m^3	1 yr 24 hr	10 ug/m^3 25 ug/m^3	Annual Average 24 hrs 1 hr	15 ug/m^3 35 ug/m^3 15 ug/m^3

Table 2.6: Comparison of International and Local Noise Standards*

Category of Area/Zone	Limit in dB(A) Leq			
	NEQS		WHO/IFC	
	Day Time	Night Time	Day Time	Night Time
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

**: The standards highlighted in green for each respective Area/Zone are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.*

3 Description Of The Project

3.1 Background

77. This chapter describes the sub-project description based on the PC-I report prepared by NTDC.

3.2 Type of the Project

78. The subproject in this IEE is the construction of a new 220 kV transmission line along the Guddu-Shikarpur-Uch-Sibbi route. The proposed TL will replace the existing transmission line and will pass through the administrative territories of Punjab, Sindh and Balochistan. The site-specific pictures of the existing transmission line are given in the photo gallery (**Annex-III**) of this report.

3.3 The Existing Transmission Line

79. 500 & 220 kV substations associated with Thermal Power Station at Guddu in Northern Sindh were constructed in the year 1969. After decades of operation and aging factor most of the equipment installed at these substations become outdated and consequently reduced the efficiency. In addition, the associated 220 kV transmission lines, which connect with TPS Guddu also cannot meet the growing demand of electricity requirement. Therefore, refurbishment and enhancement in existing capacity of these substations along with associated transmission lines is required to meet with the power transformation requirements.

80. In view of the above, it has been planned to refurbish and upgrade the existing 500 kV & 220 kV switchyard equipment & construct a new 220 kV transmission line. The following equipment components shall be installed during the project activity:

- Towers
- Conductor
- Hardware
- Insulators

3.4 Project Objectives

81. The main objective of the proposed project is the construction of a new 220 kV transmission line by replacement of the existing TL along the same route since the existing TL lacks capacity and reliability and is unable to meet the growing demand of electricity requirement.

82. As per PC-I prepared by NTDC, this improvement is aimed to decommission the existing structures and replace with the new structures. This improvement will be carried out within the same route. As a result of implementation of the proposed project, the frequent

tripping occurring due to out-dated transmission structures will be avoided and system will be able to provide stable power supply to the grid stations.

3.5 Categorization of the Sub-Project

83. As per SPS 2009, categorization is based on the most environmentally sensitive component of a sub-project. The aspects of the sub-project with potential for significant environmental impacts need to be assessed in detail and this environmental assessment has therefore focused on the significant impacts possible from the construction activities of the sub project.

84. The Pakistan Environmental Protection Agency (PEPA) in its review of Initial Environmental Examinations (IEE) and EIA regulations, 2000 (adopted by Sindh, Balochistan and Punjab Environmental Protection Agencies) describes those projects, which require an IEE and EIA as Schedule I and Schedule II respectively. Projects have been categorised in the regulations on the basis of expected degree of adverse environmental impacts. Project types listed in Schedule II are designated as potentially seriously damaging to the environment and require EIAs. Those listed in Schedule I are seen to have potentially less serious effects and only require IEEs, unless the projects are located in environmentally sensitive areas. The construction of the new 220 kV transmission line sub- project is categorized in Schedule I and requires an IEE.

85. The ADB undertakes environmental screening of each proposed project to determine the appropriate extent and type of Environmental Assessment (EA) needed. The ADB classifies the proposed projects into three categories, A, B and C, depending on the type, location, sensitivity, and scale of the project, as well as the nature and magnitude of its potential environmental impacts. As per ADB REA process, the proposed project has been classified as Category 'B' and requires an IEE.

3.6 Safety Parameters

86. As the detailed design is not available, therefore as normal safety practices observed in Pakistan and globally, for Extra High Voltage (EHV) lines, safety considerations are of two types. One is related to the safety of the system, while others are those that are related to the public. During the detailed design, the NTDC is to adopt a 100 m wide (50 m either side from the centre line) corridor as the ROW for the replacement of the existing T/L by the construction of the new TL. The aspects to be considered during the detailed design stage of the sub-project are as [5]follows:

3.6.1 System Safety

87. **System Safety Conductor to Tower Clearance**: For the safety of the system, it is imperative that any factor that may interrupt the power supply should be considered in the design. The clearance of the conductor from tower legs and trusses is of prime importance. Therefore, in the design, a minimum clearance of 6.4 m is to be adopted by

[5] based on the previous experiences and globally recognized standards/practices.

NTDC under extreme wind conditions. This is based on minimum requirements of National Electric Safety Code (NESC) (ANSI C2). With this clearance, there is 99% probability of withstanding switching surge of 3-sigma margin due to maximum over voltage under adverse climatic conditions.

88. **Earthing of the System**: Every tower is connected to an earthing system. This is to keep tower footings resistance at a level lower than 10 Ohms. For this purpose, it is suggested that two (02) earth electrodes of copper-clad steel rods needs to be sunk vertically into the ground to a minimum depth of 3 m and at the locations where the required resistance is not achieved, crow footing to be done or any other feasible engineering solution need to be adopted.

89. **Lightning Performance**: The tower geometry, clearance and insulation of the system are designed to perform safely within the permitted lightning intensities. In this respect, consideration should be given to the tower footing resistance and Isokeraunic level of the area. The accepted level is one trip out/ 100 km/ year due to lightning.

3.6.2 Public Safety

90. **Public Safety General Aspects**: In view of public safety, NTDC needs to adopt a policy of keeping a 100 m wide corridor clear of all obstructions (50m on either side from the centre line). However, NTDC allows general farm practices within this corridor, but tree plantation that exceed a height of 2.5 m will not be allowed. As such, the existing orchards or fruitless trees with a height of not exceeding 2.5 m are allowed to remain under the lines. Similarly, open wells, including Persian wheels, are allowed to remain under the T/Ls. However, tube wells and peter pumps are not permitted under the high voltage conductors. This is due to the possibility of piping and cranes that are being used to refurbish such wells could come in contact with the lines.

91. No residential or other public buildings such as factory, school, hospital etc., are permitted within the corridor. However, farm buildings, which are not used for residential purposes are allowed to remain under the high voltage lines, a 10.2 m minimum clearance is to be maintained. The height of the towers can be increased to accommodate such buildings.

92. **Conductor to Ground Clearance**: NTDC has developed design parameters for the planning and design of transmission systems in Pakistan (see **Table 3.1**). The design parameters are based on standard NTDC's existing specifications and practices for the existing as well as proposed Grid Stations and transmission lines. The design of associated Transmission line is based on following parameters (see **Table 3.1**).

Table 3.1: Permissible Conductor Clearance at 65º C (for 220 kV line)

No	Description	Clearance (m)
1	Across country (including across/along street)	7.01
2	Roads and highways	7.92
3	Rivers and major canals (from high flood line)	9.14
4	Railway track – inside station Railway track – outside station	11.28 8.84
5	Building part – vertical Building part – horizontal	6.10 7.62
6	Earth part of lines	3.96
7	Telegraph lines	3.96
8	400 volt (and below), 11 kV, and 33 kV lines	3.35
9	66 kV and 132 kV lines	4.27

NESC, Rev.12

3.7 Decommissioning and Disposal of Materials

93. Decommissioning of the existing towers, conductors and insulators of the subproject will be recycled and reused within the NTDC system. No waste will be generated that can be classified as hazardous and requiring special disposal. In addition, in case any old equipment is replaced, it will not be disposed off or discarded and shall be recycled and reused by NTDC. As a policy, WAPDA has stopped using transformers that contain PCBs since 1969.

94. Since the sub-station was constructed in 1969 but WAPDA stopped using PCBs in 1969, which means depending on the exact dates, there could be a potential overlap e.g. WAPDA may have used some previously purchased transformer. Thus, all transformer oil must be tested for PCBs. In addition to removing transformers and appropriately disposing of PCB containing oil, surrounding soil exposed to PCB leakage must be subjected to soil testing and if PCBs are present, the soil must be removed and/or remediated.

95. In case any existing poles that might be made of wood need to be replaced, since the possibility of any such poles containing wood preservatives cannot be ruled out, it shall be ensured that they are appropriately disposed to licensed contractors in a lined landfill with leachate treatment, and not disposed by burning.

3.8 Proposed Schedule for Implementation

96. Designs arrangements, access, review of environmental management and construction processes could take one year once the tendering and award of contract have taken place. Civil works pertaining to foundation, shipment of equipment and its installation will commence before testing of equipment. At present, tentative implementation time frame is [6]two (02) years for the project implementation. However, on approval of this subproject, a comprehensive schedule will be prepared and made a part of this report.

97. Once the detailed design work has been completed, NTDC will review these designs before contracts are finalized and modifications will be incorporated, if considered necessary. Certification to ADB that the detailed designs comply with IEE (including EMP) recommendations will be required before contracts can be made effective.

3.9 Construction Camps

98. Camp sites will be located keeping in view the availability of an adequate area for establishing camps including parking areas for machinery, stores and workshops, access to communication and local markets and an appropriate distance from the sensitive areas in the vicinity. Final locations will be selected by the Contractor with the approval of site Engineer in-charge.

3.10 Access to the Construction Sties

99. The towers falling in the Kashmore and Jacobabad Districts of Sindh of the existing T/L are mostly not approachable, especially in the rice season when there is stagnant water along the RoW. However, the existing towers falling in the Dera Allah Yar and Sibbi are mostly aligning with the Quetta-Jacobabad National Highway and are approachable. In the earlier discussed areas, the Contractor has to develop a few new tracks with the consultation of the local people/land owners minimising the impacts on crops, agriculture land and other infrastructures. In this case, the access could be more difficult and would require possibly tractor mounted blades with a normal width of about four (04) to five (05) m. According to usual terms and conditions of NTDC, the Contractor will be bound to prevent any damage to the existing roads and village tracks during construction works and due to movement of heavy vehicles. However, in case of any damage, the Contractor will be responsible for its repair. In this regard, NTDC shall bound the Construction Contractor by withholding a 10% amount from the Contractors' 'interim' bills submitted to the Engineer for payments to exert the Contractor to complete the pending works.

3.11 Clearing of ROW

100. Since the existing alignment will be used for replacement of the existing TL and replacing it with the new TL that shall be constructed, thus much clearing of the ROW is not expected. Since the existing TL is evacuating power from the power plant, thus

[6] Source: PC-I prepared by NTDC.

during the project construction phase, this existing TL will be de-energized and only then will the decommissioning commence, until the new TL has been completely installed. However, in order to minimize any potential environmental impacts, NTDC needs to impose restrictions on the clearing of natural vegetation from ROW (100m). This is allowed to the extent that is necessary for the safe construction and operation of the lines. For this, the area required for the placement of tower footings will be completely cleared of vegetation, crops and trees. In the rest of the ROW, selective clearing will be carried out.

101. Trees more than 2.5 m high, which may obstruct stringing or create hazard/danger to the T/L, will be removed. On the other hand, the clearing of desert vegetation is restricted to what is required for placement of footings and for the assembly and erection of towers and wire pulling at site. While no such clearance is allowed in orchards or other areas having fruit bearing trees, except as specifically approved by the Engineer in the case of having no other alternative.

102. NTDC allows that the cleared materials such as trees, crops etc., will be the property of landowners. While other materials such as fossils, coins and antiquities discovered on the site of the work will be deemed as the property of GOP. The clearance of ROW from the vegetation is normally done by mechanical means.

3.12 Tower Foundations and Erection

3.12.1 Siting of Towers

103. Since the proposed sub-project is at the feasibility stage and detailed survey and design will be carried out by the NTDC, the spotting of tower locations has not been indicated at this stage of the sub-project. If the subsoil conditions do not allow for any type of foundation specified by the designer, the location of the towers needs to be changed along the centreline in consultation with the Engineer, without affecting the overall alignment of the T/L.

3.12.2 Excavation, Concreting and Backfilling of Foundation

104. Depending upon the type of tower and subsoil condition, the tower footings have variable dimensions. However, as experienced on previous projects of NTDC, on an average 400m^2 working area may be required for the excavation of normal foundation and 500m^2 for pile foundation. The depth of excavation for the normal foundation varies from about 2.5 to 5 meters. The excavation for tower footing is carried out either manually or by mechanical excavator, as per site requirements. After fixing steel re-bars and concreting, the ditch is refilled with excavated material and the site is brought to the original ground level.

3.12.3 Tower Erection

105. As per standard practice, the tower erection needs to be carried out on the concreted locations with the help of Derrick poles or crane. The required working area for this activity will be about 900 m^2 for each tower. The tower will be erected in panels of 2

to 3 meter height. The panels will be assembled on the ground, lifted in parts with the help of Derrick Poles/crane and then joined together with nuts and bolts, which are tightened at the specified torque.

3.13 Stringing of Conductors and Overhead Ground Wire

106. As the detailed design is to be performed by NTDC, keeping in view the normal practice, after tower erection is completed, stringing activity shall commence. This shall involve preparing the tower to access for tractor movement by clearing a strip of about 10 m wide from all obstacles. Positioning of tensioner and puller will be temporarily anchored on both ends of the stringing stretch, which will be normally 3 to 6 km. At road, railway and telephone line crossings, rider poles will be provided during stringing to avoid any interruption to traffic or shutdown of the power in the existing line. Shut down will be arranged for power lines crossing transmission routes and temporary delinked and un-dipped from the towers.

3.14 Operation and Maintenance (O&M)

107. The 220kV T/L will become a vital link in the transmission grid system in the North part of the NTDC system. Any outage on the line would seriously disrupt the power supply to major load centres of Balochistan, possibly causing extensive damage and losses. Grid Station Operation (GSO) Division of NTDC (WAPDA) maintains regular patrolling/ inspection staff for patrolling and inspection of the lines. NTDC's patrolling crews will be required to carry out a general inspection of the T/L every three (3) months, while a comprehensive inspection needs to be carried out every 3 years. The O&M activities for different components are provided below.

3.14.1 Foundations

108. The following mitigation corrective actions are suggested;

- Check for any soil settlement around the foundation chimney, any unusual cracks between the stub angle and concrete and/or cracks in the concrete chimney;
- Check for erosion in and around the tower foundations. Where erosion exists, locations and extent is noted on the inspection form, take measurement from the centreline. Note if a stream (Nullah) or dry wash is causing the erosion. Also, note any damage done by farming operations near or under the tower. Towers located in the active hill-torrent zone will require inspection on a continual basis; and
- In areas where the line crosses hills/lowest slopes, very careful checking of the ground clearance and the amount of foundation chimney that is exposed must be done. It is anticipated that during different times of the year, either soil may be drifted up on the tower legs or chimney may be exposed. These should be noted and immediate corrective measure taken to ensure uplift capability by

replacing backfill or re-establishing minimum ground clearance.

3.14.2 Steel Works

109. Look for bent or missing steel members, missing or loose bolts. An excellent test in addition to visual inspection is to strike the tower leg angle sharply with a stick of wood or rubber hammer. Any loose bolts or members will produce a rattling sound.

3.14.3 Conductor, Overhead Ground Wire, Hardware and Insulators

110. Conductor is the most important part of the line. A thorough visual inspection will be made. The checklist for this component includes the following:

- Check every bolt, nut, pin and cotter pin on the conductor shoe, shackles connecting links and other hardware fittings for looseness or missing components;
- Check for chips, dirt and/or lightning —Tracks or marks on the insulators. This lightning mark will especially show up on the first few insulators nearest to the tower attachment point;
- There will not be cracks of any size in the insulators because before porcelain cracks, a piece of the insulator will break off. Always look around the base of every tower for pieces of insulators, pins, bolts, nuts etc.;
- Check every ball in the insulator strings for missing cotter pins. Note that ball can work itself half way out and still holds. First, the cotter pin falls out, next with the continual vibration the ball can very slowly work itself out to a point where the ball is only held by half of the socket. One can spot this condition by a slight tilting of the insulator below or beyond the loose ball. This also applies to shackle or hardware pins and is a very serious condition. Report it immediately;
- Check the stock-bridge dampers on the conductor and OPGW to make sure these are in the proper position;
- On dead end towers, check the jumpers to see that all the bolts are tight in the jumper pads. Also there should be no missing or loose slots; and
- Along the line, check the conductors for frayed or broken strands. Spot-check ground clearance and observe if any building or structure is being constructed under the line. Also, check for any tree growing near or under the line. Report these conditions immediately.

3.14.4 Principle for Clearing of Route

111. When HVDC transmission line is adjacent to private houses, the undistorted synthetic electric field on the ground surface in the location of private house under circumstance of wet conductor shall not exceed 15kV/m. The scope of house demolition in the line corridor shall be as follows in principle:

- It shall be demolished without exception when it is located at and within 6.5m from the ground projection of side conductor.

- For houses outside 6.5m, the clear distance shall be guaranteed to be 14m at the time of maximum wind deflection, and can be left unremoved when the synthetic electric field of house ground 7m outside the side conductor is less than the restricted value of 15kV/m, otherwise, all houses within the line corridor shall be removed.

4 Project Alternatives

4.1 Background

112. Alternatives are presented and examined to determine the best method of achieving project objectives, while minimising environmental and social impacts. Alternatives that have been reviewed for the proposed transmission line sub-project include the 'Do-Nothing' Alternative and alternative routes for alignment of the transmission line.

113. The analysis has been carried out critically so as to justify the need of the Project and the selected options. The alternatives that have been considered during the IEE study are presented below.

4.1.1 'Do-Nothing' Alternative

114. Pakistan, like most developing countries, faces a shortfall of power because of the excess of industrial and residential demand over the existing power-generating capacities. The currently installed generation [7]capacity in Pakistan is 19,540 MW, of which 17,405 MW is in the regions covered by Water and Power Development Authority (WAPDA).

115. However, the available generation capacity in the WAPDA regions is only about 13,000 MW because: (i) hydropower plants are dependent upon reservoir capacity and hence are affected by rainfall, reservoir silting, and irrigation, (ii) the generation portfolio is ageing and subject to rating limitations and increased maintenance requirements, and (iii) the plants are increasingly unreliable. According to the Government's power system estimates, at least 8% annual growth in electricity demand in Pakistan is forecast during 2005–2015. Pakistan will require an additional 2,000 megawatts (MW) of power annually to meet this demand and this additional power will need to be evacuated through the transmission system.

116. Substantial investments are required to strengthen the system to (i) urgently address current shortfalls, (ii) evacuate power generated by additional power plants, and (iii) supply electricity to meet the growing demand. Brisk pace of economic activity, rising levels of income of people, the double digit growth of large scale manufacturing, higher agricultural production and village electrification programme have all resulted in higher demand of power in Pakistan.

117. The power shortage is especially during the peak hours when power blackouts (load shedding) are required to regulate the power supplies. Load shedding continued during year 2007. The average load shedding duration was up to four hours per day during summer and two hours per day during winter months. The economic loss due to power load shedding is estimated to be enormous. In 2001, it was estimated that the loss

[7] ADB Report and Recommendation of the President to the Board of Directors.

of industrial output due to load shedding alone cost Pakistan Rs 250 billion a year.

118. Considering the current shortages and future demands of power in Pakistan, the proposed improvement and capacity enhancement of the existing transmission lines will play a significant role and can contribute much for Pakistan's future. Therefore, the 'do-nothing' alternative is highly unfavourable as it shall exacerbate the power shortages. In view of the above, the "no project" option is not a preferred alternative.

4.1.2 New T/L Route

119. The existing TL shall be removed and will be replaced by the proposed new 220 kV TL along the same alignment. This is a highly favourable scenario since it will ensure that all land acquisition and/or resettlement issues will be avoided. Due to this rationale, a new TL route has not been selected and the existing TL shall be used.

4.1.3 Existing T/L Route

120. The route for the existing alignment has the following environmental and social benefits;

- No additional land will need to be acquired for the project, thus avoiding any issues associated with resettlement and/or conversion of arable land to non-agricultural uses.
- The existing site was selected at the time of installation of both transmission lines by NTDC. The existing route was found to be socially and environmentally the most favourable.

121. Therefore, this option has been adopted.

5 Description Of The Environment

5.1 Overview

122. This section describes the physical, biological and socio-economic environment in the project area. It also examines the existing environmental conditions of the project area to provide a baseline against which the project impacts can be measured and monitored in the future.

123. The information provided in this section is both quantitative and qualitative and is based on primary and secondary data, collected through field surveys conducted specifically for this study and desk studies related to the project area.

5.2 Project Area Introduction

124. The project area is falling in Rajanpur, Kashmore, Jacobabad, Dera Allah Yar and Sibbi districts of Pakistan.

5.3 Right of Way (RoW)

125. The potential impacts of the sub-project on its surrounding physical and biological environment are expected averagely within the range of 100m (50m from the centre line on either sides of the existing transmission line). Therefore for IEE of this subproject, [8]Right of Way (RoW) was determined 100m on either side from the centre line of the existing transmission line. Accordingly, a study area of 100m along the existing transmission line was considered to assess the baseline conditions (sensitive receivers) in the areas likely to be affected by the sub-project due to its proximity to the project site. This is referred to as the " RoW or Study Area" in this report.

126. The key receptors in the project area of the proposed transmission line are provided in **Table 5.1** below.

Table 5.1: Sensitive receptors in project area along TL alignment

S#	Receptor Name	Receptor Type
1	Sohbalpur	Community Settlements
2	Abdul Raouf Khoso	Community Settlements
3	Kashmore	Community Settlements
4	Guddu	Community Settlements

[8] In case, during detail design or construction phase, the existing RoW is changed by NTDC, this IEE report needs to be updated/ revised by NTDC accordingly.

5.4 Landform and Soil

127. Most of the project area lies in the south eastern portion of the Balochistan province. This area of the Balochistan province is an extensive plateau, which is the continuation of the geological configuration of the Iranian plateau and about 50% of the mountain ranges are of those found in southern Iran. The plateau is an extensive rough surface divided into basins by ranges of sufficient height to form obstacles to movement.

It is sharply divided from the Indus plain by the Sulaiman, Khirthar and Pub ranges. There are only three sizable plains in the province namely Kachhi, Lasbela, and Dasht. The project area lies in the Kachhi plain, which consists of flat valley amid various ranges. It is surrounded on the west by the Khirthar and central Bolan ranges and on the northeast by the Marri and Bugti hills. Other than these ranges skirting the basin, there is a range of low hills called Pabs. The land is flat plain which slopes from north to south and elevates from 50 to 100 m above sea level, in the south-north direction.

128. The area falling in [9]Sindh province is flat with alluvial and moving sand bodies. The major topographical features are the main Indus River, Pat feeder canal, water ponds, irrigation channels/water courses flowing through the area and the agriculture fields along the existing transmission line.

129. The project area is part of the piedmont plain. This plain has been formed by the deposition of fine sediments during the quaternary age brought down by wide spread sheet floods caused by hill torrents originating from the surrounding hills. The parent material of the plain originated from limestone, shale, sand stone and conglomerate sedimentary rocks. The sediments of the plain are mainly fine silty approaching to clayey. Clayey soils of the area are very hard when dry and very sticky when wet because of the swelling properties of the clay mineral. The Bugti hills located on the eastern side of the project area consist of rocks of Jurassic to Tertiary ages.

130. Soils of the area are extremely rich in calcium and magnesium because of calcareous parent material but are deficient in nitrogen due to rapid decomposition of the organic matter under arid climate conditions. The natural surface of the soil show intersecting cracks and theses further develop on artificial irrigation and drying. The infiltration rate in the initial stage of wetting is very high, but thereafter it decreases considerably due to swelling nature of the clays. The soils are also rich in minerals and nutrients required for the plant growth. They have only minor problems of workability and seedbed preparation. More than 90% of the soils in the project area are well to moderately suit for agriculture.

5.5 Geology

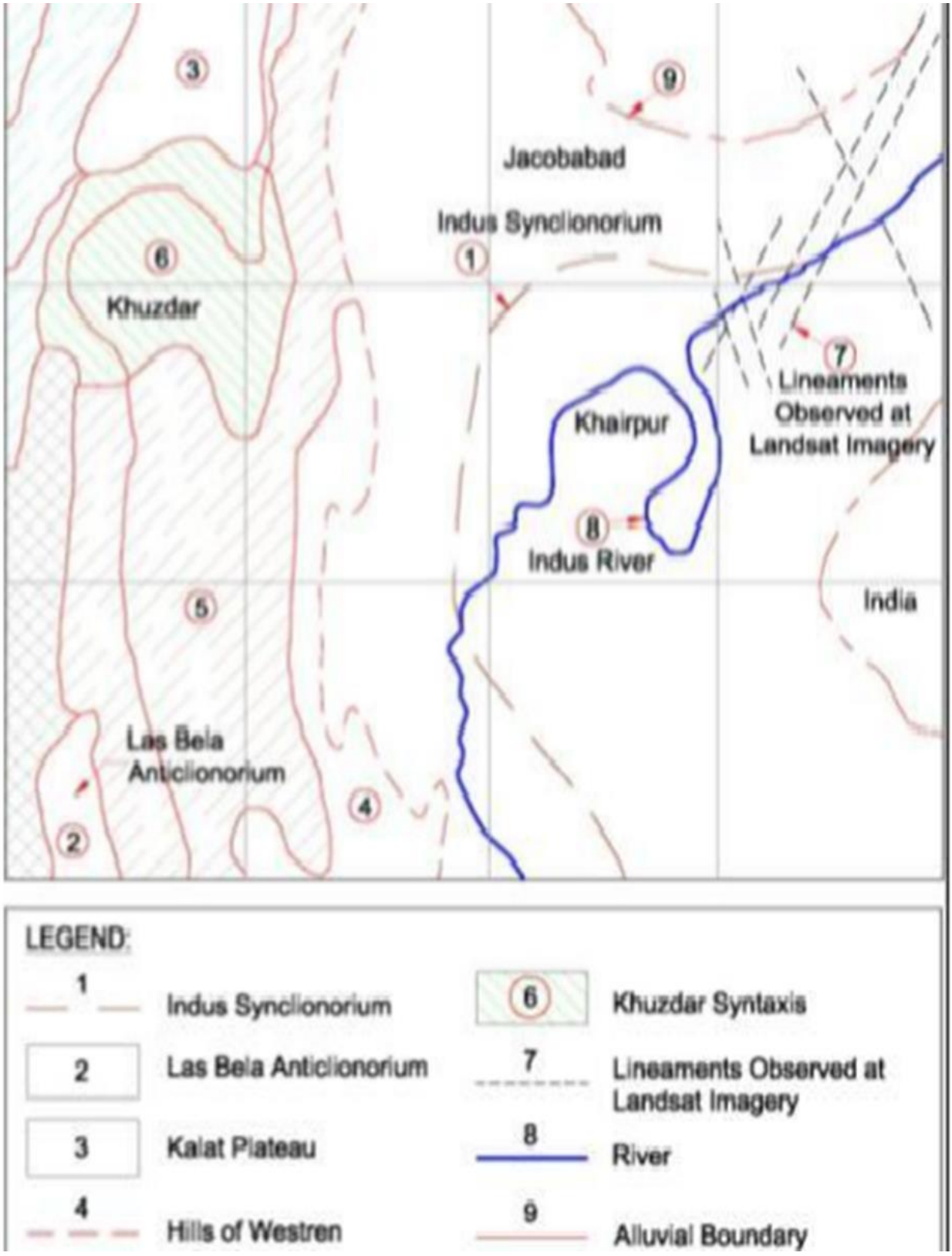
131. Pakistan geologically overlaps both with the Indian and the Eurasian tectonic

[9] ESIA of Guddu Barrage by MMI in 2014-15.

plates. Sindh province lies on the north-western corner of the Indian plate. The study area lies on the southeastern fringe of the Kirthar range, a hill range that runs in the north to south direction for about 400 km along the Sindh-Balochistan provincial boundary. Primary lithology in the study area is of sedimentary origin, consisting of limestone with occasional shale and sandstone of Laki Formation. Laki Formation is very rich in fossils of Eocene age (56-34 million years ago). Study area mostly consists of flood plain deposits. Two major active fault lines located near the study area are Surjam Fault, about 30 km to the west and the Jhimpir Fault, about 25 km to the southwest. The maximum recorded earthquakes on the Surjam and Jhimpir Faults were 6.1 and 5.6 on the Richter scale, respectively10. The regional geological setting of the project area is shown in the **Figure 5.1** below**.**

[10] Geology and tectonics of Pakistan, Kazmi. A. H and Jan. M. Q, 1997

Figure 5.1: Regional Geological Setting of the Project Area



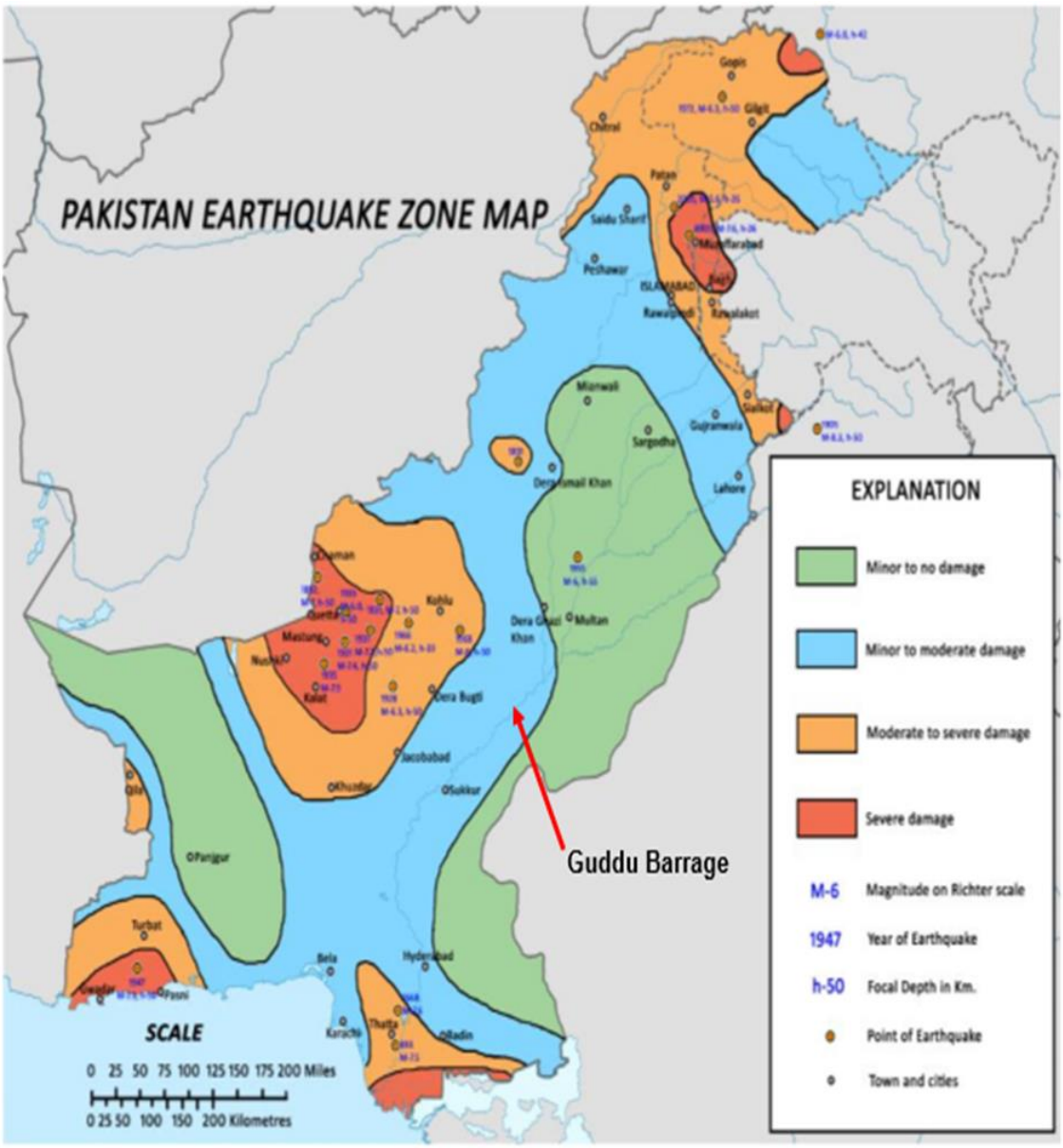
Source: *WAPDA.*

5.6 Seismicity

132. The project area is located in seismic Risk Zone 1, which corresponds with minor damage and Modified Mercalli Intensities between V and VI. Ground acceleration has been considered during the design of the structures, where appropriate. The seismicity of the project area is shown in **Figure 5.2** below.

133. The proposed route as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone 1, which is the region of minor to moderate seismic risk. Hence, all the applicable provisions of BCP, Mechanical and Electrical System should be met during the design and construction11 for safety against seismic hazards.

Figure 5.2: Seismic Zoning Map of Pakistan



(***Source**: Geological Survey of Pakistan)*

Building Code of Pakistan (Seismic Provisions – 2007), Ministry of Housing and Works

5.7 Land Use in the Project Area

134. Main irrigation canals including Pat feeder is off-taking from the Guddu barrage and agriculture is reasonably good in the area falling in the Sindh province and a considerable section of the population (approximately 60%) depends on agriculture for its livelihood.

135. Land use in the project area can be broadly categorised as:

- Indus river (active channel and creeks);
- Agriculture and agriculture land, approximately 90% of the existing towers are aligning in the agriculture and agriculture land in Kashmore and Jacobabad districts while approximately 20% of the existing towers are located in the agriculture land;
- Stagnant water bodies;
- Settlements including villages and associated structures such as agricultural sheds, places of worship, graveyard, and other community buildings;
- Irrigation network including the main Pat Feeder canal;
- Roads (unsealed tracks and paved road);
- Wasteland that includes areas which have been rendered unusable for agriculture due to water logging, salinity, or due to other shortage of water for irrigation etc.

5.8 Climate

136. The climate of the project area is broadly described as hot and arid. Various meteorologists have developed classification schemes to describe local climatic features of Pakistan. (Shamshad 1998) has classified the climate of Pakistan on the basis of characteristic seasons found in the country. Taking into account topography, proximity to the sea, rainfall, temperature, and winds, Shamshad has defined eleven climatic zones for Pakistan. Under his scheme, the climate of the project area is classified as ‘Subtropical double season hotland.’

137. The characteristic features of this climatic zone are low rainfall, (less than 250 millimetres per annum) absence of a well-defined rainy season, and high temperatures that increase from east to west. The nearest meteorological stations are located in Jacobabad and Sibbi. The project area experiences extreme temperatures and in July and August are the wettest months. Precipitation during these two months accounts for more than half of the total annual rainfall. October and November are among the driest months. May, June, July and August are among the hottest months of the year with temperatures rising close to 50°C. December and January are the coldest months. The western hot winds blow particularly in the months of June and July. Infrequent dust storms also blow during the hot season. The northern winds blow during winter season.

The humidity increases in the summer particularly in the areas adjacent to the Pat Feeder Canal.

5.9 Ambient Air Quality

138. Pakistan lacks a comprehensive and effective air quality monitoring system that can be used to track and address specific instances of air pollution and air quality degradation. At present, monitoring of urban air pollution in Pakistan is limited to isolated instances where air pollutants are measured for brief periods at selected locations. Urban locality, city, region, or countrywide continuous or repeated air quality monitoring data does not exist. Similarly, there is no formal system of air quality data storage and reporting. The region in which the existing transmission line is trespassing is predominantly flat and semi-arid, although irrigation has been introduced to provide water to enable crops to be grown. The immediate vicinity of the existing transmission line is sparsely populated.

139. [12]Ambient air quality studies carried out for different projects in the sub-project corridor (Balochistan) reveals that the ambient air quality of the area is generally good with all the concentration values of the pollutants within the guideline values (i.e. NEQS and WHO). This means that the air shed is non-degraded with enough assimilation capacity to accommodate other facilities including the reconstruction of the new 220 kV TL.

140. The ambient air quality in the vicinity of Guddu Thermal power plant of the key ambient air [13]quality parameters like NOx,CO, $PM_{10}$and $PM_{2.5}$ are within the permissible limits of NEQS & WHO. However, in the other areas of the project corridor, no stationary potential sources of contaminating the ambient air quality were observed.

5.10 Noise

141. There is no continuous major source of noise in the project corridor. Intermittent sources include farm tractors, farm equipment, road and rail traffic. Considering the intermittent nature of these noise sources, it can be concluded that the noise pollution in the area is low.

5.11 Water Resources

142. The existing TL is running immediately after the Guddu Grid Station and is crossing the Pat feeder and Begari canals, which are offtaking from Sukkur Barrage. In addition, there are a number of secondary and tertiary canals as well as water courses from the where the existing TL is aligned up. Water resources of the area are discussed under two broad headings, surface water resources and groundwater resources.

[12] Vehicular exhaust emissions carried out on the national highway (N65) as well as Uch Power Station by Halcrow for Expansion of 404MW Power Generation Capacity at Uch Power Station.
[13] ESIA Guddu Barrage prepared by MMI in 2014-2015.

5.11.1 Surface water Resources

River Indus

143. The major surface water feature in the area is the Indus river. [14]The Indus drains an area of about 950,000 km^2, which generates a mean annual discharge of 6,682 m^3/s. The hydrograph of the river is strongly seasonal with a long low water season between October and March and a high water season between April and September – driven primarily by snowmelt in the upper catchment and monsoon rainfall. The river usually peaks in mid-August or early September.

Pat feeder Canal

144. The only perennial surface water channel in the project area is the Pat Feeder canal. The Pat Feeder canal is a branch of Desert Pat Feeder canal, which off takes from the right bank of Indus River at Guddu barrage. Water from this canal is used for agricultural purposes in Balochistan province. This [15]canal was constructed between 1963 and 1969 by WAPDA and started operation in 1970. The canal serves cultivated command area (CCA) of about 458,425 hectares (132,788 acres) through a network of 13 distributaries and 164 minors. The canal is perennial except for a closure/maintenance period of about one month. The existing transmission line is crossing the Pat feeder canal on at least three different locations.

Rabi Canal

145. The Rabi canal is a branch of [16]Pat Feeder canal. It is a non-perennial canal operating only in the Rabi season. It was completed in June 2002. Total length of the canal is 47 km and has a design discharge of 9.9 m^3/s (350 cusecs). The canal serves 20,234 hectares (50,000 acres) of CCA, including areas surrounding the TL corridor.

Seasonal Rivers and Streams

146. Some seasonal streams also originate from the Dera Bugti hills. These streams flow during rains, but with limited flows.

Nari River Basin

147. [17]Nari basin lies in the northern part of Balochistan between latitudes 290 40' and 310 00' N and longitudes 670 10' and 690 45'E. Catchment area of the basin is 22,298 km^2 out of which 6,680 km^2 is covered by alluvium. The basin is divided into 11 sub-basins: Anambar Rud, Beiji River, Dabbar Rud, Dukki, Gumbaz, Harnai, Kahar Rud, Lakhi Rud, Loralai, Mara Rud, Sangan Rud, Sehan Rud, and Ziarat. Most of the streams are ephemeral in nature, but there are perennial flows in Loralai River, Sehan Rud, Anambar Rud and Khost River. The base flow in Nari River when it leaves the basin ranges from 89 to 107 million m^3. The principal stream is the Nari River and is formed

[14] Hydrological studies carried out for Guddu Barrage Rehabilitation Project by MMI.
[15] Irrigation and Power Department Govt: of Balochistan.
[16] Irrigation and Power Department Govt: of Balochistan.
[17] Potential Recharge Zones of Over-drawn River Basins of Balochistan, Pakistan, TA-4560 (PAK) Project for "Supporting Implementation of IWRM Policy in Balochistan" – Government of Balochistan - ADB and Royal Government of Netherlands.

with the confluence of Loralai, Beiji and Khost rivers. Overall, surface flows follow the north-south path with some local changes. The mean annual precipitation is 274 mm. The main river is aligning up to Notal parallel with the existing TL.

5.11.2 Groundwater Resources

148. Sweet groundwater is found in ample quantity in areas along the canal network and river Indus. However, communities reported a relative decline from previous years. This has mainly been due to over abstraction through deep tube wells installed for supplementing canal irrigation. Groundwater remains an important source of water as it is used to supplement canal irrigation and supply water for domestic consumption. Communities prefer groundwater for domestic consumption as it is cleaner and safer compared to the canal and Indus water and is also easily accessible through shallow hand pumps.

149. The groundwater quality is mostly sweet. Industrial activities in the area are limited, so soil and water quality is generally good. At present, the sources of soil and water contamination are agricultural pesticides and uncontrolled disposal of domestic waste by the local community.

150. Geologically, the Kachhi Plain is made up of unconsolidated deposits several hundred meters thick. Clay is the dominant component, with presence of appreciable amounts of gravels, clayey silts, and minor sand. The unconsolidated deposits constitute the major groundwater reservoir in the region. Groundwater use in the region is predominantly limited to the alluvial plain areas at the head of the Kachhi Plain.

151. WAPDA installed 18 test holes and 14 tube wells in the plain during a groundwater investigation study of the area. The groundwater potential of an extensive area from roughly Jacobabad to Sibbi has been characterised by WAPDA to yield less than 10 cubic meters per hour per screened meter down to a level of at least 150 m (492 ft). The aquifer is described as poor and patchy. This zone of low potential extends from Jhatpat to Sibbi and includes all of the area of the proposed site near Dera Murad Jamali. This aquifer is not capable of sustaining a reliable water supply to serve any purpose.

152. Study of the ground water resources during the construction of Pat Feeder Canal has shown that the water table in larger part of the area ranges from 8 to 15 m below the natural ground surface. The water table would take about 25 to 30 years rise to within 2.5 m of the surface. Recharge to groundwater is principally due to infiltration of precipitation falling within the basin. However after the construction of irrigation network, canal water infiltration will also be a significant source of recharge.

153. The groundwater quality of the upper areas is 150 m of the aquifer is brackish with a total dissolved solid (TDS) content of greater than 3,000 parts per million (ppm). The UNDP study reports TDS levels greater than 5,000 ppm near the site. The EIA study conducted for Uch Power Limited (1990), notes that well water is very brackish with a TDS of 30,000 ppm near the site. Detailed information about aquifer productivity and the

quality of water from possible aquifers below the upper water bearing unit(s) is limited; however, all reports indicate the aquifer is highly mineralised, with low transmissivity, and discontinuous in nature. Groundwater is of such poor quality that it is not economically viable to pre-treat it for industrial use. Large pockets of land to the south of the project site near Jacobabad exhibit serious problems of water logging and salinity. These problems result from the application of irrigation water to soils combined with the high evaporation rate of the dry climate. The high evaporation rate in the region enhances this potential use of evaporation ponds for the project.

5.12 Temperature

154. The coldest season extends from December to February when dominating influence is the eastern winds. Mean monthly temperature during winters varies from 20°C near the coast to 14°C in the north. Forests are very rare in south of Nawabshah. Mean daily temperature rises rapidly from February onwards to its peak in May and June, rather earlier in the south than in the north. Mean maximum temperature reaches about 24°C in May in the south and as high as 45°C in June in the north. The severity of the heat varies from year to year - the highest temperature ever recorded on the subcontinent was 53°C at Jacobabad.

155. Winters are mild on the plains, with temperature never falling below freezing point. Summers are hot and dry, especially in the arid zones of Chagai and Kharan districts. The plains are also very hot in summer, with temperatures reaching 50 °C (122 °F).The record highest temperature, 53 °C (127 °F), was recorded in Sibi on 26 May 2010, exceeding the previous record, 52 °C (126 °F). Other hot areas includes, Turbat, and Dalbandin.

5.13 Humidity

156. The average humidity is 40-60% in Sindh province. Monthly rate of evaporation in the irrigated areas varies from 76mm in the north to 114mm in the south. Rainfall for the three months is less than 25mm. Winds are rather variable, being transitional from the northeast to southwest as the season develops. Humidity is at its lowest generally below 40%, but increases as the sea breeze becomes dominant. Evaporation is correspondingly at its highest exceeding 25mm in rocky desert areas.

157. July to mid-September is the monsoon season and is characterized comparatively by low day temperature, high humidity (over 60% in the south and 50% in the north), reduced evaporation (only 15 or 18mm at some stations in August) and a considerable increase in clouds in coastal areas. Occasional depressions from the east result in a 4 or 5-day period of rain and thunderstorm, especially in the south. The rainfall is very variable; instances have been recorded where a single day has considerably exceeded the highest annual average. Mid-September to November is the period of sea breeze with occasional north winds. Temperature rises slightly then falls back in November. Humidity falls to about 10 to 15% of the monsoon level and the evaporation decreases

about 100mm in the north, 125mm in the south.

158. Generally, humidity is low in Balochistan ranging 40% and 50% but increases in the higher areas during the winter months under the influence of western depression and over most of the Balochistan in July and August when the monsoon penetrates the Province. Annual evapotranspiration often exceeds 2,000mm

5.14 Biodiversity

5.14.1 Flora

159. Ecologically the project area is a part of the tropical thorn forest ecozone. The area is characterised by low rainfall, high summer temperatures, high velocity winds, poor soil and low diversity of plant species. Most of this region has been cleared for cultivation and last remnants of the forest are heavily degraded due to over grazing and felling of trees. Plant communities in the project area are also faced with the threats of livestock grazing. The project area surrounding the existing transmission line (Sindh Belt) is predominantly irrigated agricultural land, and does not support rare or threatened plant species.

160. Tree species including *Acacia nilotica, Dalbergia sisso, Albizia lebbek, Eucalyptus camaldulensis, Zizyphus numularia* are planted along the margins of agricultural fields. These plants are mostly used by the local for fodder and fuel wood purposes. Some natural vegetation is present along the Indus. Major plant species include *Prosopis Sp. Acacia nilotica,Tamarix sp., Zizyphus numularia, Arundo donax, Saccharum spontenium, Aerva javanica, Tribulus sp., and Calotropis procera*. Mostly the domestic livestock graze and browse the natural vegetation in this area.

161. Exotic species like *Prosopis juliflora* and *Eucalyptus camaldulensis* are present in uncultivated land along the road side and around the settlements in the project area. These exotic species are fast spreading and covering most of the bare land of the area.

162. No endemic or rare species exist within the project area. All species have a wide range of distribution. The species found in the project area which are of importance in terms of medicinal and economical use include *Aerva javanica, Capparis decidua, Desmostachya bipinnata, Salvadora oleoides and Typha elephantina.*

163. There are no areas of wildlife significance near the sub-project RoW in both Balochistan and Sindh provinces.

Forest Areas

a) Riverine Forest-Indus River

164. This habitat type is a non-critical habitat as per criteria given in ADB SPS 2009. Sindh Forest department is responsible for management of the riverine forests. All the forest areas are beyond the RoW of this project.

165. Total area covered by the 12 riverine forests/plantations is 37613.14 ha along the Indus River. The main species of flora recorded in this habitat type are Babul (*Acacia nilotica*), Kandi (*Prosopis spicigera/Prosopis cineraria*) and Lai (*Tamarix dioica).* These forest areas are far away from the existing TL.

b) Forests of Balochistan

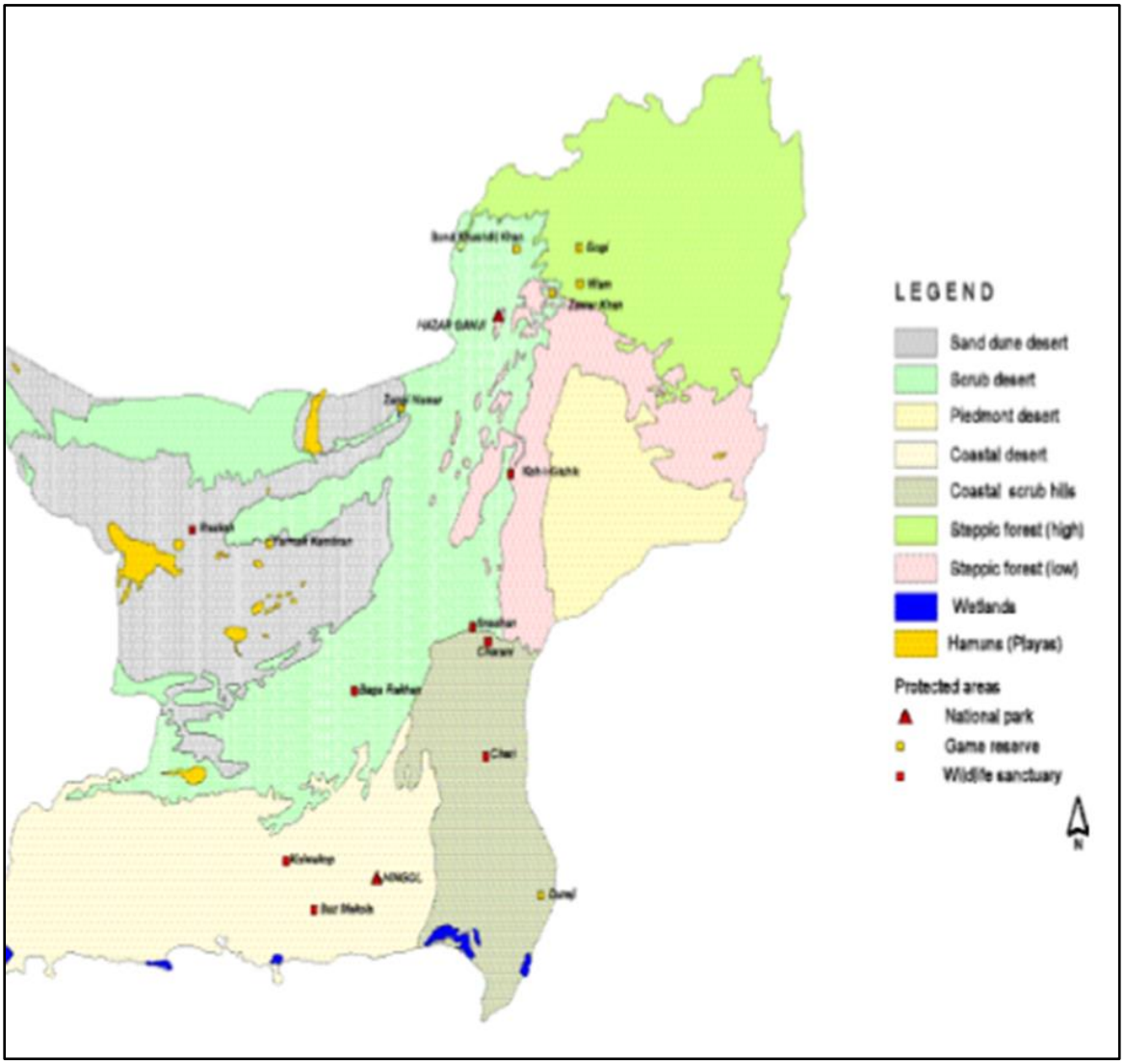
166. Balochistan has both tropical thorn and mangrove forests in Gwadar, Pasni and Lasbela. According to Balochistan's Forest department, the forestland and state protected forest area is 2,306,910 hectares. Juniper, Chilghoza Pine, Olive-Pistachia, Olive Acacia, Desert, Mangrove, Alien and Tropical desert Thom forests are located in different districts of Balochistan.

167. In the north of Balochistan, the Zhob and Sherani districts have unique forests of Pine-nuts and olives which are much valuable in terms of exporting and usage for medicines and other purposes.The type of forest in Khuzdar is Dry Sub-Tropical and temperate Semi-Evergreen Scrub Forest. The climax formation has reduced to scrub condition due to grazing and fuel wood pressures. Presently, it is with very open cover and with a moderate amount of bushes and grasses.

168. Major tree species are Hapurse (Junperus excels polycarpos), Zaithoon (*Olea cuspidate*), Gawan (*Pistacia khinjjak*), Phulai (*Accacia modesta*), Kabar (*Salvadora oleoides*), Kandi (*Prosopis specigera*), Pissi (*Zizyphus Jujuba*), Jangli Ber (*Zizyphus nummularia*), Kikar (*Accacia nolatica*) and (*Acacia jacquemontii*). There are only four Notified natural forest in Sibbi and Deral Allah Districts of the project i.e. Lehri Forest, Nari Bank Fores, Thali and Kera Dhori and all of these forest areas are away from the project RoW. There is no reserved/protected forest areas in the RoW of the TL subproject selected for rehabilitation under MFF.

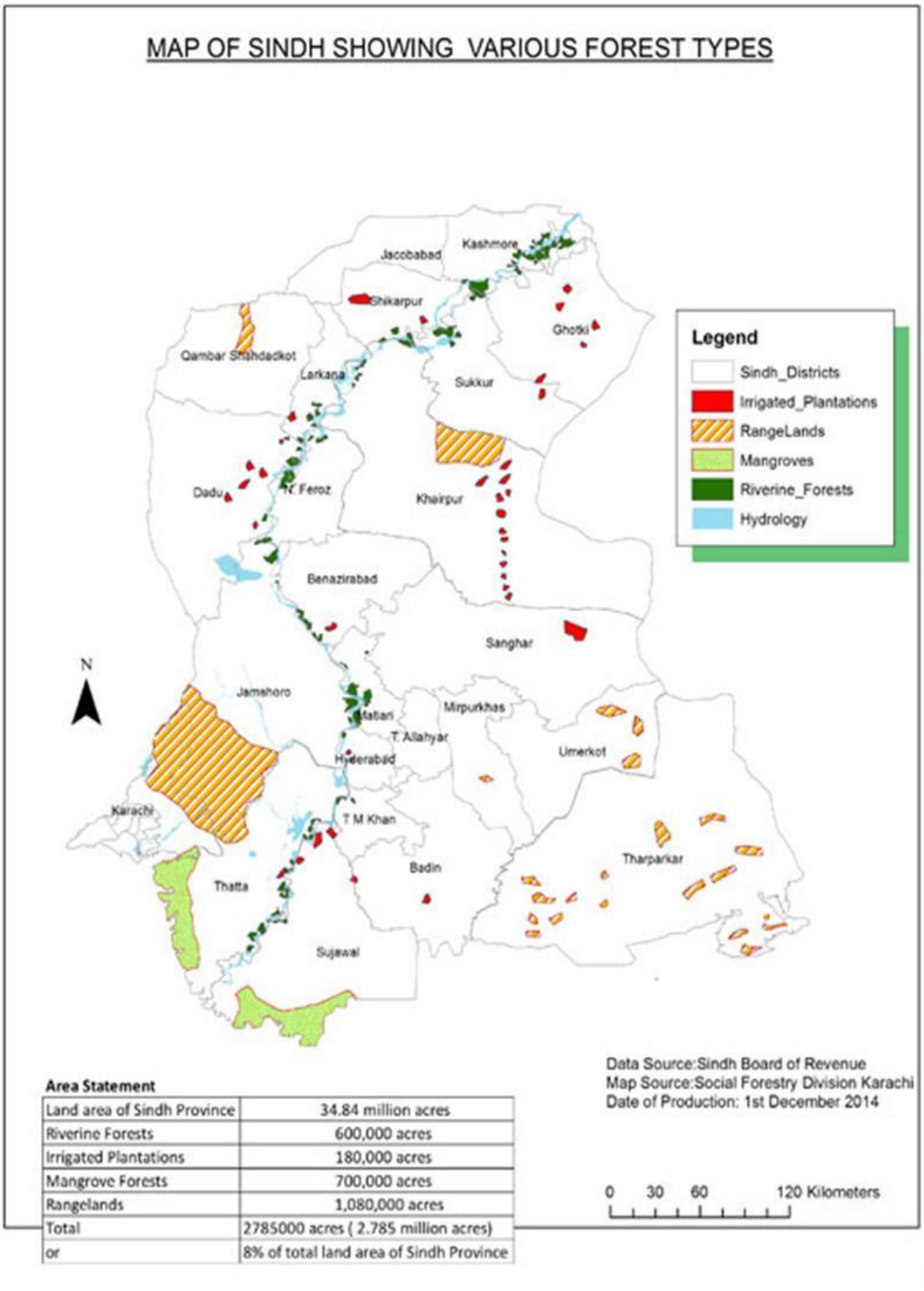
169. The type and location of forest area falling in Balochistan and Sindh provinces are shown in the **Figures 5.3** and **5.4** respectively.

Figure 5.3: Protected Areas of Balochistan.



Source: *BCS*

Figure 5.4: Type and Location of Reserved Forest Areas in Sindh



Area Statement

Land area of Sindh Province	34.84 million acres
Riverine Forests	600,000 acres
Irrigated Plantations	180,000 acres
Mangrove Forests	700,000 acres
Rangelands	1,080,000 acres
Total	2785000 acres (2.785 million acres)
or	8% of total land area of Sindh Province

***(Source:** Forest Department Govt of Sindh)*

170. The **Figure 5.3** and **Figure 5.4** above are showing that none of the protected forest is falling in the proposed sub-project RoW.

5.14.2 Habitats & Protected Areas

171. There are three main habitats related to the project area in Kashmore i.e. Indus River and associated marshes, riverine forests and islands, and farmlands and villages situated approximately 2.5 km away from the starting towers of the sub-project. Except farmland and villages, the remaining habitats are away from the project corridor. In Baluchistan, there is no habitat within the corridor of TL. In Balochistan, there is no habitat within the corridor oh existing TL. The habitat is mostly modified due to human interventions in the area for many decades.

Indus Dolphin Reserve

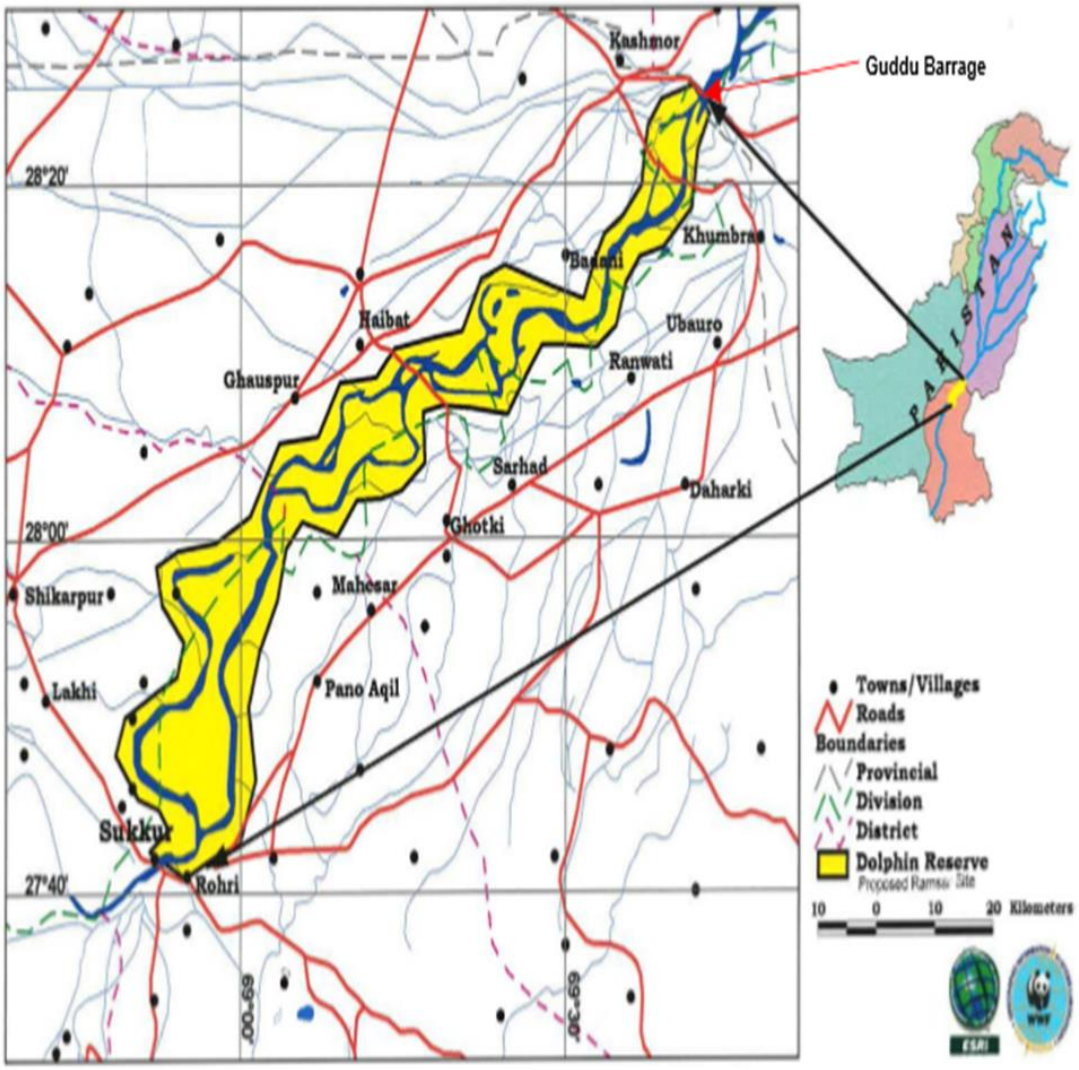
172. Indus River between the Guddu Barrage and Sukkur Barrage (downstream of Guddu Barrage) is a very important habitat for Indus or Blind Dolphin. It is a critical natural habitat declared by the government as a protected area meeting the criteria of the World Conservation Union [IUCN] classifications. This part of the river contains almost 60% of entire population of this river dolphin, which is endemic to Pakistan.

173. The starting towers of the existing TL corridor/RoW is approximately 2-2.5 km away from the area of Indus Dolphin Reserve, which was established as a reserve in 1974 and was designated as a Ramsar site in 2001. 18The reserve covers an area of approximately 125,000 ha and follows the alignment of the Indus River between Guddu and Sukkur Barrages over a length of approximately 170 km, as shown in **Figure 5.5**. The river varies in width throughout the reserve from 300 to 1,250 m and has a depth varying from 3 m to 15 m and a river bed and plain made up of alluvial deposits.

174. The site was declared as a wetland as it is considered a representative example of a natural wetland featuring perennial river flow and has consistently recorded over 500 Indus river dolphins (*Plastanista gangetica*), which are considered as an internationally important species. Currently the number of dolphins within the Reserve is believed to be 2012 (Braulic 2012) - this is the largest known population of this species. This unique species is endemic to Pakistan and is listed in the IUCN (International Conservation Union) Red List. As well as the River Dolphin, the reserve also supports many fresh water fish and migratory birds when they travel to their wintering grounds (during autumn) and breeding grounds (during spring).

[18] WWF,IUCN and Sindh Wildlife Department.

Figure 5.5: Indus Dolphin Reserve



*(**Source:**www.wetlands.org)*

Farmland and Villages

175. This non-critical habitat comprises agricultural fields and villages located in entire length of the existing transmission line. The ecology in such areas has been altered with passage of time due to different human interventions and impact of livestock presence/grazing. Some of the river islands have been cleared for seasonal agriculture during the low flow season. This habitat type is scattered in different parts of the project area. Besides the weed species, anthropogenic trees species like *Acacia nilotica, Azardica spp., Albizia lebbeck, Ficus religiosa and Zizyphus mauritiana* are scattered around the edges of the agricultural fields in Kashmore, Jacobaabd and Dera Allah Yar. Such tree species have been introduced by the farmers for their use in daily life. These trees are the roosting places for raptor species like Kestrel, Black kite and Black-winged kite.

5.14.3 Fauna

176. The Indus river basin forms a variety of habitats; the field findings[19] as well as cross checking the data with the available reports are detailed in the following sections.

Mammals

177. 16 species of mammals were recorded in the District Kashmore during the field visit. Out of these 16, two are abundant, nine are common, and two are less common while three are rare. Out of these 16 mammals, four species are of global significance including the Indus dolphin, Fishing cat, Hog deer and Smooth-coated otter which are listed in IUCN Red List 2006 and can be found upstream and downstream of the Guddu Barrage. However; the habitats of these species are not falling in the project corridor/RoW. Small mammals mainly gerbils, jirds and rats are abundant as was noticed by their burrow system. These small mammals are a main source of food for raptors and carnivore species and have a role in the food chain which are critical habitat triggers in the project area, as listed in the IBAT report. A complete list of the mammalian species observed or reported in the project area can be seen in Table 5.2.

178. While 17 species are recorded in Sibbi and Deral Allahyar Districts and there are only three species which are declared protected under the Balochistan Wildlife Protection Act. A complete list of the mammalian species observed or reported in the project area can be seen in Annexure IV.Amphibians

179. The amphibian species reported to be found in this habitat shown in **Table 5.2** below.

Table 5.2: Amphibian Species Reported in the Project Area

S#	Common Name	Zoological Name
1	Indian Toad	*Bufo stomaticus*
2	Toad	*Bufo surdus*
3	Skittering Frog	*Rana cyanophlyctis*
4	Tiger Frog	*Rana tigrina*
5	Burrowing Frog	*Rana breviceps*

Source: *Direct field observation, interview of local people and cross checking with the secondary information*

Reptiles

180. A total of 11 reptile species were recorded from the project area (District Kashmore) of which 7 are common, 4 are less common and none are rare. The Indian

[19] Direct observation in the field during walk through the survey area along the RoW of TL and by interviewing local people.

Fringe-toed sand lizard, Indian spiny-tailed lizard, and saw-scaled viper are commonly found in the semi desert and loamy soil habitat that provides a favourable habitat for such reptiles.

181. Comparatively uncommon species include Black cobra, which is encountered in riverine densely vegetative areas.

182. The appearance of reptile species varies with seasons. Most of the reptiles hibernate from the autumn to spring. The maximum population appears during monsoon season. The ecological amplitude of the reptiles is high so these exist in different habitats in the project area.

183. In Sibbi and Dera Allahyar Districts of Balochistan, 21 reptilian species were recorded out of which, 10 species are common, 11 species are less common. Four species out of total 21 species are declared protected under the Balochistan Wildlife Protection Act.

184. A list of reptiles observed/informed during the field visit is provided in **Annexure IV**.

Avifauna (Sedentary and Migratory) and the Indus Flyway

185. The Indus River is important international flyway for bird migration known as "*The Indus Flyway*". The migratory flocks of ducks, grebes, cormorants, daters, storks, gees, coots waders and gulls diverge from the main Indus flyway and disperse in local wetlands and marshes during winter and fly back in late spring.

186. The project area is a blend of different habitats and supports a variety of avifauna; both resident and migratory including winter visitor ducks, geese, waders, gulls, herons and egrets. Since the barrage pond area provides habitat for the migratory species and is a protected area, but there may be some threats such as illegal hunting during project activities, hence barrage pond area could be considered a "Hot Spot" during construction phase of the project. Famous game birds including Grey and Black partridges are also recorded almost throughout the project area. However, Black partridges are confined to riverine and thick vegetative covers. The marshy areas are filled with the arrival of migratory birds during the winter season and with typical water oriented species. The agricultural fields at the river banks and river islands provide food and shelter to a number of species, which have adapted with the human settlements. Houbara bustard sometimes is recorded from sandy islands but there has been no recent sighting from the project area.

187. A total of 102 bird species were recorded in the project area during the October 2011 [20]study of which 41 are migratory while 61 are resident. Out of all recorded species, 39 are abundant to the area, 52 are common, 7 are less common and 4 are rare. 17 species of birds enjoy the status of protection under the Sindh Wildlife Protection

[20] This study was conducted for the preparation of ESIA by MMI Consultant for World Bank funded Guddu Barrage Rehabilitation Project.

Ordinance, 1972 which include raptors, egrets, herons and vultures.

188. In order to protect migratory birds during the project construction phase, it shall be ensured that sections of the transmission line within about 10 km of this wetland habitat shall be marked with bird deflectors.

189. Also, all efforts shall be made to ensure that the construction activity shall be undertaken as far as possible outside the migratory bird season, especially any sections of the TL alignment that lie in water, if applicable, which may be used by migratory birds.

190. The common birds of the project area are Cattle (small) egret, Common babbler, Common moorhen, Common and Bank myna, House crow, House sparrow, Indian roller; Sindh pied kingfisher, Rose-ringed parakeet, Red-wattled lapwing, Black-winged stilt, Pond heron, collared dove and little brown dove. A complete list of the bird species observed/Informed in the project area can be seen in **Annexure IV**.

Fish

191. In Kashmore District of the project area, the volume of water contained in the Guddu Barrage pond area supports a complete ecosystem, the fish being the main component of the fresh water ecosystem. The commercial fish species occurring in Guddu Barrage according to some occasional observations made on those fish caught in the River Indus (presently commercial fishing is not practiced in the Pond area), official reports and University papers include the species shown in **Annexure IV**. In addition, there are also some commercial/private fish farms in the RoW of the existing TL.

192. Many species of fish specially the Tilapia, Common carp, Grass carp, Silver carp, big head carp have been introduced into the River Indus. These species specially the Tilapia have negatively impacted the indigenous major carps and their population is considered to have declined. The Tilapia is a prolific breeder and its population increases exponentially. This rapid increase in population of this fish puts the local species in a strong competition for food, and breeding grounds.

5.14.4 Private Fish Farms in RoW

193. There are number of private Fish Farms developed by the local farmers situated within or close to the Row. The summary of these private fish farms are summarized in the **Table 5.3** below;

Table 5.3: Private Fish Farms in the RoW of Existing TL

S#	Fish Farm Location (Tower# Reference)
1	8
2	101

3	195-196
4	428

Source: *Direct field observation.*

5.15 Physical and Cultural Resources

194. There are no officially protected heritage sites or historic, religious or archeologically important sites located in the sub-project work areas. There are no major historic or archaeological features of note within about 500 meters of the works.

5.16 Socio-Economic Environment

5.16.1 Administrative Setup

195. The administrative setup of the five districts; Kashmore; Jacobabad; Rajanpur, Dera Allah Yar and Sibbi is similar to the other districts of Pakistan. District administration is headed by the Deputy Commissioner (DC) who is assisted by heads of other departments. The DC is responsible for the coordination of functions of all the departments in the district. The main district departments include: administration; judiciary; police; education; health; communication and works; agriculture; forestry; irrigation; telecommunication; and livestock and fisheries.

196. The head of each district department is responsible for the performance of his department and is generally designated as the Deputy Director or District Officer. On the judicial side, the Deputy Director/Officer is assisted by an Additional district Magistrate and on the revenue side by an Assistant Deputy Commissioner.

5.16.2 Population

197. According to the census of 1998, the total population of Kashmore is 963,703, Jacobad is 138,780, Dera Allah Yar/Jaffar Abad is estimated 725,000 and Sibbi is 180,398.

5.16.3 Social Profile of the Project Area

A. Ethnicity and Tribes of the Project Area

198. The dominant ethnic group in the project area of Kashmore is the Mazari Baloch tribe (50%). The Mazari Sardars are the controlling authority in the project area and hold the majority of the agricultural land. Other tribes include the Mirani (30%), Soomro (10%),Solongy (4%), Sheikh (3%) and the Chacher, Arain, Sher, Datsi, Malik, Indhar, Bhatti and Khosa (3%). Member of the Mirani tribe are commonly working as fishermen or employed as labourers in the city. Ethnic minorities include Pathan and Daya that are living in the vicinity of Kashmore town.

B. Language

199. In Kashmore, the Balochi is the dominant language spoken in the project area

about 95 percent of the population speaks Balochi, Sindhi and Saraiki are also spoken and understood by the majority. Urdu and Punjabi are also understood by a few, mainly educated, people in the project area.

200. In Dera Allah Yar and Sibbi, Balochi is the dominant language spoken in the project area about 95 percent of the population speaks Balochi, Sindhi and Saraiki are also spoken and understood by the majority. Urdu and Punjabi are also understood by a few, mainly educated, people in the project area.

C. Family System

201. The majority of those in the study area live together with their extended family (parents living with married children and their families). Families believe this is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives who are unable to work. It is also thought to be more efficient to share basic amenities such as water, electricity, housing and food rather than for each immediately family to purchase or source their own.

D. Religion

202. About 95 percent of the population is Muslim whereas about five percent consist of Hindu and other minority religions.

E. Pattern of settlement

203. In Balochistan and most parts of Kashmore, the settlement in the project area has emerged after construction of Pat Feeder Canal and mainly after construction of Rabi canal in the year 2002. Settlements are mainly in the form of scattered hamlets comprising small clusters of houses. Villages in the area are named after the local headman.

F. Migration

204. In-migration due to favourable environmental and economic conditions, in-migration exists in the project area. In Balochistan, the livestock owner migrate from area to area in search of better pastures and water. During winter season, when the pastures are totally dried and grazing is no more possible, the livestock owners from high lands take their herds and move towards Kachhi and Naseerabad plains where they purchase sorghum field and stay in the area till February.

205. Some Pashtuns also migrate to the project area and work as manual labour, sale dry fruit, second hand cloth and so on. Suleman Khail tribe also migrate into the project area to de-silt the Canals and return back after completing the work. As soon as the summer starts they move back towards mountainous areas. The project area has seen a recent increase in in-migration as farm labour in the immediate vicinity and North of the power plant after the construction of Rabi canal. Out-migration Permanent out-migration of the land owners is rare and none of the respondents interviewed during fieldwork

indicated any significant trends of permanent out-migration from the area. However, there are few incidences of seasonal migration of tenants in the Rabi canal command area, where the water is available to cultivate Rabi crops only.

5.16.4 Social Cohesion and Conflict in the Project Area

206. The area is dominated by tribes originating from Balochistan, in particular the Mazari tribe. After the construction of Guddu Barrage people migrated from Balochistan and purchased the land in the canal command areas. These people have settled in the area but have maintained the customs and traditions from the homeland. People from each province have different traditions and customs, and the way of life of people from each province is very different.

207. Social organization in all villages is strongly based on Biradari (tribal) system, where each tribe has a tribal leader. The Tribe Leaders are mostly landlords and political leaders. All families belonging to the same tribe have strong interactions with one another but mostly remain separate from other tribes. This extends to marriages, where it is the preference for young tribal members to marry a member of the same tribe. Interactions between different tribes are less common.

208. There is a large number of villages in the area. Separate villages have been established as tribes and families have grown and the land owned by one family becomes sub-divided between the brothers of successive generations.

209. During the survey, it was found that most communities had built their own mosques and maintenance of these mosques is the joint responsibility of residents.

5.16.5 Conflict Resolution within Tribes and Villages

210. In the project corridor, the decisions about conflict, right of vote, marriage settlements and other matters are usually resolved by the village head, while the head of a tribe shall resolve major disputes. It was found during survey that 90 percent of the conflicts were resolved at village level. Those living within communities of the project area feel obliged to accept the decision of the village or tribal leaders.

211. In case of serious matters, local influential politicians (who are often also tribal leaders) intervene to settle the dispute. Occasionally, when parties do not agree on the decision of caste or tribal leaders, matters may go to the police and ultimately a court of law. The police and the court of law are the last options and these are rarely exercised.

5.16.6 Inter-Tribal Conflict

212. In Rajanpur and Kashmore Districts, the dominant tribe within the project area is the Mazari tribe. As well as being dominant in numbers, the Mazari tribe is also powerful within the project area, and their number includes a member of the Sindh Provincial Assembly, a member of the Punjab Provincial Assembly and a member of the National Assembly.

213. In Dera Allah Yar and Sibbi Districts, the project area is inhabited mainly with Baloch tribes which is further sub classified linguistically as Brahvi and the rest are Samāt locally known as Jamote. Therefore the main tribes found in the project area are Baloch, Brahvi and Jamote.

214. Conflicts have been common in recent years (especially in 2010 & 2011) between the Mazari & Khosa tribes and the Solangi & Khosa tribes, however conflict has reduced since 2011. The chance for conflict is heightened during elections, when parties shall oppose each other due to their political affiliations which are often aligned with their tribal leaders.

215. The root causes of the conflicts between the Mazari & Khosa tribes within the project area appear to be similar in nature to conflicts within a single tribe, including:

- Purchase and sale of land;
- Theft of irrigation water;
- Theft of food & fodder;
- Theft of animals;
- Marriage settlements between families;
- Disputes between women and children;
- Disputes over voting during elections

216. Without the defined resolution system, which exists within a single tribe, these disputes appeared to escalate and manifest as physical fights between parties, resulting in the injury or murder of individuals of one tribe by another. Following such incidents, the leaders of each tribe (including landlords and politicians) entered into dispute and revenge killings between the tribes became common, carried out by an isolated group from each tribe.

217. The conflict peaked in 2010 and 2011, and at the end of 2011, influential figures from Districts Ghotki, Kashmore, Rahim Yar Khan and Rajanpur arranged a meeting between all local landlords and politicians to understand the causes of the conflict. Following this meeting, local politicians and landlords reached agreements and compromises to resolve their grievances. The meeting also set a precedent for meetings between leaders of different tribes in order to resolve inter-tribal conflict and it is reported that this is now commonplace following intertribal conflicts.

218. Following the agreements reached at the end of 2011, those who carried out the killings in each tribe were no longer aligned with the tribal leaders in the region and as a result, were viewed as criminals by the communities. It was reported that the Moazari & Khosa tribes, supported by the police, sought out and eliminated these criminals.

219. While the security situation within the project area is now viewed as greatly

improved since its peak in 2010/2011, there still appears to be distrust by communities of the Mazari tribe towards new comers to the project area. Without support and introduction from tribal leaders, strangers within the project area are viewed as suspicious by communities within the Mazari tribe. There are no particular villages within the project area which are considered to have a greater security concern than any other.

220. It is also noted from field visits that a Chinese contractor has been working at the Guddu Thermal Power for the past two years without any threat. Security has been provided to this contractor by police and rangers, arranged by WAPDA.

221. Also, the Head Regulator of Rainee Canal was constructed by "DESCON" Consultant and Canal construction is carrying out by two local companies M/s Ramzan and Sons and M/s Haque Nawaz consultants. M/s DESCON has completed Head Regulator works and shifted to other project, while two local companies have been working in the Guddu barrage command area for the last five years. The security has been provided by WAPDA through police and consultants also hire the services of private guards with the consultation of influential members of the local community. The companies are working in the area smoothly without any hindrance from local community.

5.16.7 Housing

222. It is evident from the 1998 Census that in about 70% and 78%, of the houses in Kashmore and Ghotki districts are single room houses. In rural as well as urban areas, the predominant roof material used by 80.54%, 59%, 68.45% and 44.9% housing units is of wood/ bamboo in Kashmore, Ghotki, Rajanpur and Rahim Yar Khan respectively. A percentage of 27.30 % 33.9%, 21.7% and 25.4 % have roofs constructed with cement/iron sheets respectively.

223. The project area is consisting of rural population lives in comparative isolation. There are very few villages of the conventional type. Majority of the population live in small settlements of five to twenty houses scattered all over the project area. Mud houses or huts are built without layout or plan and without any regard to blocks (84%). All mud houses usually have a boundary wall enclosing enough space for cattle and storage. Only 10% houses are built semi pucca (mud, bricks, iron, or cement and bricks, with roof of wood and grass) and 6% are pucca (bricks or blocks with iron and cement roof). The roof of a mud house consists of wooden beams of all shapes and sizes, cover of thick date-palm mats and a layer of mud with clay plaster at the top. It was observed that all the people were living in self-owned houses.

5.16.8 Education & Health

A. Literacy Ratio

224. A person who can read and write statements with an understanding, in any language prevalent in Pakistan, is considered as literate. The literacy ratio is measured as the number of literate people compared to the population of the age of 10 years and

above.

225. According to the population Census of 1998, in Kashmore; Ghotki; Rajanpur and Rahim Yar Khan Districts 23.66 %, 29.01%, 20.7% and 33.1% respectively of the population are literate. However, the literacy ratio is considerably lower within the project area, at just 6% (2,221 people).

B. Health

226. It is found that many of the people have suffered from hepatitis, typhoid, eye problems, diarrhoea and other hygiene related complaints. Some of women expire during delivery cases. Majority of the women are malnourished usually being the last ones to eat their meals in the family

5.16.9 Economic Conditions

A. Source of Income

227. Agriculture is the most widespread source of income in the project area. Livestock rearing and labouring is the second major sources of income while Government jobs is the third major source of income.

228. Livestock is a significant, albeit often a secondary, source of income. Most of the farming communities own livestock with significant numbers. Majority of the households own 3 or 4 animals. Cow and buffalo are most commonly owned. Livestock is a prestigious symbol and an additional source of income for the farming community, providing milk, ghee and meat.

229. Small businesses, the private sector and fishing do not represent significant income sources in the project area.

B. Banking

230. Banking services are available only at Guddu and Bhong towns in the project area. There are three banks; United Bank Ltd, Habib Bank Ltd and National Bank of Pakistan, The residents of the surrounding areas have to go to these banks for banking services.

C. Cropping Pattern

231. The lands in project area are fertile and farmers grow rice, sugarcane, cotton, sorghum and vegetables during the Kharif season (April to November) and wheat, oil seed, pulses and vegetables during Rabi season (April to October). Kharif crops are often flooded by the high floods in the river Indus and Rabi crops are usually sown on the residual flood moisture. Sugarcane is a cash crop and is the most commonly grown crop in the project area due to the availability of the surrounding sugar mills making it easy to sell.

D. Agriculture Marketing

232. For the purchase of farm inputs and sale of crops the landlords and farmer commonly use one of the surrounding city markets located in Kashmore, Khandhkot,

Ubauro, Daharki, Jafarbad, Sibbi and Ghotki. The farm inputs and outputs are transported through Trucks Trailer and Tractor Trolley. The animals from the project area transported to Hyderabad and Karachi by Trucks. Sugarcane is cash crop of the area and cultivated in the waste areas. Due to the presence five sugar mills in the project area, demand for sugar cane is high - as a result, sugar cane accounts for approximately 65% of cultivation in Ghotki and Rahimyar khan districts.

E. Livestock in Project Area

233. Livestock and animal rearing was the second largest occupation after agriculture in the project area. Majority of the farmers hold between three to four animals, of which cow, buffalo and goats are most common. Farmers in the project area generally own high quality breeds. Livestock was the main source of milk, meat and ghee of the population. Livestock was also a source of income as people sell livestock in nearby towns. Animal feed is available in the shape of green and dry fodder. Donkeys, horses and camels are used for travelling and load carrying.

F. Grazing Lands

234. People were asked whether they have grazing land for feeding their animals. The participants replied that a limited area surrounding the river banks are available for animal grazing. Some villages have fallow or uncultivated area for animal grazing. It is the tradition here that the individuals feed their animals by providing fodder/rice straw, wheat straw and also grow fodder crop to feed their animals.

G. Transport

235. Most of surveyed villages have village tracks or unsurfaced (Kacha) roads that are in bad condition except Punho khan Mazari village and union council Jhak. Construction and maintenance of village roads is the responsibility of local government. Three provincial highways also pass through the project area and connect Sindh with Punjab and Baluchistan.

236. Guddu Barrage is linked to Kashmore and Kandhkot by Indus highway. Indus highway passes through Punjab and Baluchistan on the right side of the Barrage. The Kashmore road cross the Guddu barrage to Ubaro town at national high way that further go to Lahore and Peshawar. The district Ghotki, Kashmore, Rahim yar Khan and Rajanpur are also served by Pakistan railway.

237. The major source of the human transport is Railway, Buses, Suzuki Van, Rickshaw and Private Cars. The farm inputs and outputs are transported through Trucks Trailer and Tractor Trolley. The animals from the project area transported to Hyderabad and Karachi by Trucks. The Firewood and Furniture wood is also transported through Trucks and Trolleys.

238. There are five fertilizer factories surrounding the project area and producing millions of tons of different types of fertilizer, which is also transported through trucks and

trailers to far away cities and through tractor trolleys in the vicinity of the factories. Sugar mills of the project area transport their product through trucks and trailers.

239. There are no airports or airfields located in a distance of over 50 kilometers from the transmission line corridor. Thus, there is no risk to any aircrafts from the proposed transmission lines. In addition, the proposed transmission line alignment is not in the vicinity of any flight paths and thus no impacts in this regard are foreseen.

H. Telecommunications

240. During the field survey the respondents reported that there is no landline facility available in the project corridor. Mobile phone communication is widely spread in the RoW and the project area, the frequent use of mobile phone was observed during the project field visits. Landline facilities are available in the project area outside the RoW. The landline facilities are available in Ubauro town Daharki town, Ghotki city and Sadiqabad city.

I. Energy Sources

241. Electricity is available in 65 percent villages in the study area. This energy source is being utilized mainly for lighting of the houses and operation of tube wells for drinking water supplies and irrigation etc. The Sui Southern Gas pipeline passes through the Guddu barrage and their reservoir/control station is located on the left side of the river adjacent to the Ghotki Feeder. People of the area demanded the gas supply mainly for cooking purposes but yet the facility is not provided by the Gas company. Instead people collect the firewood from the surrounding area and some people purchase firewood from nearby town.

J. Drinking water

242. It is observed that women and children are responsible for fetching of water for drinking and domestic use. The underground water is fresh in the project area and the population use hand pumps and electric motors to get fresh groundwater for daily usage. All the population of the project area use fresh ground water through hand pumps which are easily available in the area.

243. Survey results showed that overall average ground water depth in sample area was 20 feet for hand pumps and 50 feet for tube wells respectively as reported by representatives of the local communities.

244. Within the command area of Guddu Barrage, ground water is generally used for drinking water, except for within the command area of Desert Pat Feeder Canal, where the ground water is saline and unsuitable for drinking water purposes. In this area, the population relies on the canal to supply drinking water. Prior to closure of the canal for scheduled maintenance (during April - exact dates are confirmed annually by the Irrigation Department) ponds are excavated and filled with canal water to meet the drinking water needs of the population for the duration of the closure period.

K. Sanitation

245. The sanitation conditions of the Rahim Yar Khan district are relatively better than those in the Ghotki, Rajanpur and Kashmore district. Urban settlements have drainage facilities to some extent, but there is an improperly functioning sanitation system which limited its proper and environmentally safe use. In Guddu town area, an open drainage system is available but there are no arrangements for the disposal of domestic solid waste and sewage.

246. Within the project area people drain out used water in open places and dump solid waste in the open.

5.16.10 Role of Women in Decision Making

247. The women of the project area have no any role in the decision making such as marriage of children, sale and purchase of property, sale and purchase of animals, decision regarding schooling of children and to attend social events. It was found during the field survey that the oldest male member of the family has the power of decision making and he determines the family interests and makes decisions with regards to the family.

6 Public Consultation and Disclosure

6.1 Background

248. This section describes the outcome of the public consultation sessions held with stakeholders/groups that may be impacted by the project. The consultation process was carried out in accordance with the Asian Development Bank's Safeguard Policy Statement (ADB SPS 2009).

249. Given the dimension and nature of the Project, T/L Project Management (NTDC or Designing/ Supervision consultants) are committed for undertaking public consultation at local level as a part of project planning/design, getting necessary environmental permissions/NOCs, land acquisition, compensation for land and other assets and management of infrastructure.

250. Under the proposed project, public consultation was carried out for all [21]accessible villages within or close to RoW in Kahomor district. The areas in Sibbi are sparsely populated with no villages within or close to the RoW. In case of any settlements, there is the option for minor shift in the alignment. These consultations were conducted during the baseline survey carried out during the month July and August, 2016. The major categories participated in public consultation were local population, community groups, landowners. The feedbacks and issues raised during the consultation were recorded and documented.

6.2 Identification of Stakeholders

251. Stakeholders were identified before commencement of the consultation process. The major stakeholders related to the proposed sub-project are as follows:

- NTDC;
- Forest and Wildlife Departments of Sindh;
- Farmers;
- PAPs (men).

6.3 Public Consultation

252. Feedback received during public consultation includes both project related concerns and other/general concerns. Project related concerns and suggestions are related to the willingness of the communities to accept the proposed project.

6.3.1 Consultation with Forest & Wildlife Department

253. Consultations with the Forest and Wildlife were carried out during the baseline

[21] As most of the areas in Kahsmore is volatile, therefore; undertaking public consultation without security forces is a risk. Secondly, the area is predominantly cultivated with rice crops and at the time of baseline survey and public consultation, the area was inundated and not accessible.

surveys in July and August, 2016. The representatives of the department were briefed about the proposed interventions and alignment of the existing TL was presented on Google earth maps. The findings of the consultations are as follows;

- There is no state forest in the RoW of the existing TL and these state reserved forests or protected wildlife habitats in the RoW are away from the TL route.
- The departments have no concern over the replacement of the existing TL with a new 220 kV TL which shall be constructed along the same alignment.

254. The concerns of the Forest and Wildlife department consulted during the course of the baseline survey are presented in **Table 6.1** below.

Table 6.1: Consultation with the Forest and Wildlife Department Balochistan

S #	Name of the Participant	Contact #	Designation
1	Mr.Aslam Buzdar	03005881026	Deputy Conservator (North) Forest & Wildlife Department Quetta Balochistan.
2	Mr.Jaffar Aali	03337898277	DFO Sibbi Forest & Wildlife Department Balochistan.
3	Mr. Ali Dad	03337710831	Range Forest Officer Sibbi Forest & Wildlife Department Balochistan.
4	Mr.Samandar Khan Khosa	03327110533	DFO Dera Allah Yar Forest & Wildlife Department Balochistan.
5	Mr.Ghulam Sarwar	03339997700	Range Forest Officer Dera Allah Yar Forest & Wildlife Department Balochistan.

6.3.2 Consultation with NTDC

255. Consultation with the NTDC staff deployed on the Guddu and Sibbi Grid stations was conducted and the representatives of the department were briefed about the proposed interventions and alignment of the existing TL was presented on Google earth maps. The concerns/views of the NTDC representatives consulted during the course of baseline survey are presented in **Table 6.2** below while the findings of the consultations are provided below.

Table 6.2: Consultation with the NTDC Staff Guddu and Sibbi GSs

S #	Name of the Participant	Contact #	Designation
1	Mr.Kapil Dev	03357401806	Acting RE 500kv Guddu G/S.
2	Mr.Ghulam Mustafa Sheikh		XEN-Electrical TMP
3	Mr.Qasim Khan	03330300323	Line Superintendent 500kv Guddu G/S.
4	Mr.Imran Magsi	03357401843	RE Sibbi GS
5	Mr.Abdul Baqi Abro	03357401846	SDO Sibbi GS
6	Mr. Abid Rasheed	-	Line Superintendent Sibbi GS

Guddu

- Existing Relay is out of order and new relays for both Grid Stations were requested.
- Replacement of the transformers of 20 MVA, 220kV/ 6.6kV were requested.
- The replacement of 14 Circuit breakers for 220 kV was requested.
- Deputations of skilled/trained staff for O&M of both grid stations were requested.

Sibbi

256. Over the course of REA surveys, it was known through the NTDC staff (Sibbi) that the existing Guddu-Uch-Sibbi TL is trespassing into highly turbulent areas in terms of security and without any inspection access to the tower locations in the region of Balochistan and Kandkot district of Sindh. Even as yet, without forces, the NTDC staff cannot move in the areas of Sohbatpur and Lehri of the TL. The regular inspection by NTDC is not possible without local police in Sindh and paramilitary forces in Balochistan and they were of the view to realign this portion of the transmission line.

6.3.3 Consultations with Local People in the RoW

257. The key findings of public consultation carried out during the REA and baseline surveys are summarised below.

Public Consultation Meeting in Meher Ali Mazari Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Meher Ali Mazari Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • The existing conductors loss height and is damaging crops as well as posing community health hazards; therefore; the people requested for the rehabilitation of the existing TL. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Meher Ali Mazari Goth

Date:11-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Manzoor (Line Man NTDC)	Not available	Mazari	Not Available	Not Available
2	Muhammad AKram	Naseer Muhammad	Mazari	Not Available	0333-7366559
3	Buzdar Mazari	Meher Ali Mazari	Mazari	43104-1571516-1	0333-7364786
4	Meher Ali	Buzdar Ali	Mazari	Not Available	Sam as above
5	Rahu Khan	Rahim Khan	Mazari	Not Available	0333-7361264
6	Abdul Razzaq	Shah Murad	Mazari	Not Available	0333-7342444
7	Hafiz Saifullah	Ghulam Asghar	Lund	Not Available	0341-3082125

Public Consultation Meeting in Shah Jehan Mazari Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Shah Jehan Mazari Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Two years back, a child was killed due to low height of conductors. Although specific details relating to the exact circumstances leading to the accident are not clear, it has been ensured that the conductor height for the proposed sub-projects is based on international H&S standards. • Compensation for loss of crops due to the project activities should be provided; • The PCC poles needs to be replaced. • If possible; avoid construction during the peak cropping season i.e. July to Sep. • The existing conductors loss height and is damaging crops as well as posing community health hazards; therefore; the people requested for the rehabilitation of the existing TL. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Shah Jehan Mazari Goth

Date:12-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Ali Sher	Muhammad Azeem	Jakrani	43504-0350669-1	0333-7365799
2	Jamu	Dilwash	Jakrani	43504-1380138-5	0334-2556229
3	Shadi Muhammad	Mandan	Jakrani	43504-1388396-7	N/A
4	Hairdeen	Noordeen	Jakrani	43504-0413836-1	0336-3709663
5	Abdul Karim	Shadi Khan	Jakrani	43504-1388406-5	0332-7361429

Public Consultation Meeting in Zahir Peer Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Zahir Peer Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • The existing conductors loss height and is damaging crops as well as posing community health hazards; therefore; the people requested for the rehabilitation of the existing TL. • The TL creates noise in summer season. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Village Zahir Peer

Date:13-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Faiz Ali Mazari	Jela Khan Mazari	Mazari	43504-0381918-3	0306-3196993
2	Abdul Qadeer Mazari	Muhammad Sharif	Mazari	Not Available	0334-2466190
3	Khan Muhammad	Rozan Khan	Mazari	32404-1380742-1	0332-365687
4	Nawab	Khamiso	Mazari	43503-0347749-1	03073119046
5	Sher Muhammad	Kabil	Mazari	Not Available	0307-3119046
6	Liaquat Ali	Mor Khan	Sheikh	43504-0356853-7	Not Available
7	Shaklu Khan	Khudadad Khan	Mazari	Not Available	0333-7366016

Public Consultation Meeting in Rafiq Khosa Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant*** ***(Farmers, tenants, women, land owner, traders or laborers)***	
Mehe Rafiq Khosa Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • The bushes within vicinity caught fire due to low height of conductors. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Rafiq Khosa Goth

Date:14-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Abdul Sattar Khoso	Muhammad Essa Khoso	Khoso	43104-0565552-7	0333-2432596
2	Imdad Ali	Abdul Sattar	Khoso	43504-0343372-5	0345-3875662
3	Rafiq Khoso	Abdul Nabi	Khoso	43104-0535365-1	Not Available
4	Muhammad Ibrahim	Dhani Bux	Khoso	43104-7338398-3	Not Available
5	Morzada	Shah Ali Khoso	Khoso	43504-0343480-1	0333-7365861

Public Consultation Meeting in Raees Samaro Khan Chachar Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Raees Samaro Khan Chachar Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • The exting TL is posing health and safety risk for the people. • A year ago, the bushes within vicinity caught fire due to low height of conductors. • Tractor trolleys could not cross the existing TL. • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Raees Samaro Khan Chachar Goth

Date:15-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Abdul Hameed	Muhammad Salman Mirani	Mirani	43504-0438151-1	0333-3460673
2	Asif Ali	Hakim Ali	Chachar	43504-0475083-7	0334-2048462
3	Sajawal	Baghay	Chachar	43504-0464608-7	0334-3682378
4	Niaz Ali	Raees Samano	Chachar	Not Available	0333-7369364
5	Raees Samano	Muhammad Ibrahim	Chachar	Not Available	0333-7369364
6	Imam Bux	Muhammad Suleman	Mirani	Not Available	0333-7071120
7	Raees Hakim	Muhammad Ibrahim	Chachar	Not Available	0334-2711727

Public Consultation Meeting in Boro Dashti Goth Darkan Bunglow

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Poro Dashti Goth Darkan Bunglow	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • Tractor trolleys could not cross the existing TL. • If possible; avoid construction during the peak cropping season i.e. July to Sep. • The bushes within vicinity caught fire due to low height of conductors. • The existing conductors loss height and is damaging crops as well as posing community health hazards; therefore; the people requested for the rehabilitation of the existing TL. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Boro Dashti Goth

Date:16-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Arsala Khan	Karim Bux	Dashti	43104-0367141-7	0347-3861696
2	Misri Khan	Karim Bux	Dashti	43104-7982545-1	0344-3142939
3	Muhammad Khan	Arsala Khan	Dashti	Not available	0347-3861696
4	Abdul Ghaffar	Misri Khan	Dashti	43504-0452247-7	0340-3679083
5	Zafarullah	Jamshed Khan	Dashti	Not available	0342-3322414

Public Consultation Meeting in Etbar Brohi Goth-Kashmore

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Etbar Brohi Goth-Kashmore	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons; • The existing conductors loss height and is damaging crops as well as posing community health hazards; therefore; the people requested for the rehabilitation of the existing TL. • Five years ago, a child lost his life due to low height of the conductors.

Participants of Public Consultation Meeting in Etibar Brohi Goth

Date:17-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Haji Etibar Brohi	Atta Muhammad Khan	Barohi	43103-1401775-3	0306-3391611
2	Atta Muhammad Khan	Mola Bux	Barohi	43103-9288045-5	0300-317221
3	Atta-u-Rehman	Mir Muhammad Khan	Barohi	43503-0345167-7	0301-2352905
4	Sanaullah	Mola Bux	Barohi	43103-5750764-5	0306-9839364
5	Gulzar Ahmad	Muhammad Ramzan	Barohi	Not Available	0300-3418375

Public Consultation Meeting in Rainjo Bugti Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant*** ***(Farmers, tenants, women, land owner, traders or laborers)***	
Rainjo Bugti Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Last year rice crop caught fire due to low height of conductors. • Compensation for loss of crops due to the project activities should be provided; • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Rahijo Bugti Goth

Date:18-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Munir Ahmad	Bashir Ahmad	Bugti	43503-0367540-5	0301-2614433
2	Shoukat Ali	Lashar Bugti	Bugti	43502-0349290-9	0305-3682695
3	Mehmood Khan	Atta Muhammad	Bugti	43502-0372410-3	0303-2396994
4	Javed Ali	Abdul Haq	Bugti	43502-0372417-7	0308-3269726
5	Waqar Ahmad	Darhyan	Bugti	43502-0372502-3	0302-2752298
6	Bashir Ahmad	Lal Muhammad	Bugti	Not Available	0302-3612433
7	Nawaz Sharif	Khair Muhammad	Bugti	43502-0415371-9	0307-3035294

Public Consultation Meeting in Cheel Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers))***	
Cheel Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons; • Alignment needs to be changed wherever the existing TL is trespassing into settlement.

Participants of Public Consultation Meeting in Cheel Goth

Date:19th & 20st -08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Muhammad Ayoub	Muhammad Murad	Domki	43103-140851-9	0306-2861610
2	Obaidullah	Muhammad Ayoub	Domki	43503-0355334-1	0306-2861610
3	Liaquat Ali	Muhammad Aleem	Domki	43103-6811056-5	0307-7090593
4	Ali Dost	Muhammad Murad	Domki	Not Available	Not Available
5	Manzoor	Muhammad Amin	Domki	Not Available	0302-3637254
6	Faiz Muhammad	Muhammad Amin	Domki	43103-1401376-5	0305-3284385

Public Consultation Meeting in Baho Khoso Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Brohi Goth	Project Team 1. Mr. S.M Kakar Environment Expert 2. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Baho Khoso Goth

Date:21 & 22-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Zahoor Ahmad	Ghulam Fareed	Lashari	43105-3549191-3	0300-3549665
2	Jan Muhammad	Khan Muhammad	Marito	43105-9090441-3	0306-3746761
3	Zangi Khan	Shafi Muhammad	Jakrani	43105-2431422-1	0300-3670679
4	Dr.Muhammad Malook	Shah Mir	Jakrani	43105-8246087-3	0300-3120652
5	Nizamuddin	Dil Murad	Jakrani	Not Available	0306-3687103
6	Anees-u-Rehman	Shamsuddin	Jakrani	43105-5156709-1	0302-3493797
7	Abrar Ahmad	Ghulam Farid	Jakrani	43105-0574986-3	0301-8997659
8	Ghulam Sarwar	Adam Khan	Jakrani	43105-0338839-7	0306-2987891

Public Consultation Meeting in Gul Muhammad Merito Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Brohi Goth	**Project Team** 3. Mr. S.M Kakar Environment Expert 4. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • Low height always threat for human being and livestock. Last year, the conductor were on dropped on land and killed livestock. A young boy was also killed duw to this reason. • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Gul Muhammad Marito Goth (4-Households)

Date:23-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Jan Muhammad	Khan Muhammad	Marito	43105-9090441-3	0306-3746761

Public Consultation Meeting in Afghan Lashari Goth Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant*** ***(Farmers, tenants, women, land owner, traders or laborers)***	
Brohi Goth	Project Team 5. Mr. S.M Kakar Environment Expert 6. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • Towers are near the settlement, needs to be realigned away from the settlement. • One tower near settlement needs immediate replacement. • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Afghan Lashari Goth (4-Households)

Date:24-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Ghulam Sarwar	Adam Khan	Jakrani	43105-0338839-7	0306-2987891

Public Consultation Meeting in Passandi Khan Goth

Location	***Stakeholders participating***		***Findings/ views of the Public Consultation***
	Names of Project Proponent & PPTA Consultants	***Type of Participant (Farmers, tenants, women, land owner, traders or laborers)***	
Brohi Goth	Project Team 7. Mr. S.M Kakar Environment Expert 8. Mr. Farooq Memon (Environmentalist)	Land owners/Local People	• Compensation for loss of crops due to the project activities should be provided; • If possible; avoid construction during the peak cropping season i.e. July to Sep. • There should be employment opportunities for skilled and unskilled local people, preference should be given to the project affected persons;

Participants of Public Consultation Meeting in Passandi Khan Goth

Date:25-08-2016

S#	Name of Participant	Father's Name	Tribe	Available CNIC Numbers	Available Contact Numbers
1	Darya Khan	Passandi Khan	Mazari	N/A	N/A
2	Lakmir Khan	Passandi Khan	Mazari	N/A	N/A
3	Passandi Khan	N/A	Mazari	N/A	N/A

7 Environmental Impacts and Mitigation

7.1 General

258. This section discusses the potential environmental impacts of the proposed sub-project activities, predicts the magnitude of the impact, assesses significance, identifies mitigation measures to minimise adverse impacts and evaluates the residual impacts of the project.

7.2 Methodology

259. Determining the area and significance of environmental impacts and their effects enables the identification of necessary mitigation and environmental enhancement measures as well as the related financial costs of mitigation. An impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the conditions when the project is under implementation or operation.

7.3 Tools used for Impact Assessment

260. In addition to the methodology described for this study, the following tools were used for the identification of the potential environmental and social impacts.

7.3.1 Project REA Checklist

261. The first step in the identification of potential environmental and social impact is to classify the significant and insignificant potential adverse impacts. The insignificant potential adverse impacts are screened out using the ADB REA checklist. The anticipated environmental impacts of the sub-project were broadly assessed in the perspective of two major components i.e. the decommissioning of the existing T/L and construction of the new 220 kV TL. After the completion of field visits, compilation of baseline information, processing of available Google Earth Satellite Imagery, the REA checklist was filled and the subproject was categorised.

7.3.2 Delineation of Project RoW

262. Before proceeding to the environmental analysis of the sub-project, it is imperative to delineate the RoW. The RoW (100m) has already been described in Chapter-1, 2, 3 and 4 of this report.

263. ROW is the corridor where direct impacts of the proposed T/L due to the construction of towers are envisaged. In the ROW, there will be direct impact on the environment like relocation of the physical infrastructure, clearing of vegetation, cutting of trees, loss of crops due to the installation of towers and some indirect impacts on shrubs, ornamental trees etc. are also envisaged. ROW is taken as 100 m wide strip through which the T/L will pass.

7.4 Environment Impacts

7.4.1 Anticipated Positive Impacts

264. With the implementation of the proposed refurbishment of the existing T/L sub-project, the following major positive impacts are foreseen.

7.4.2 Availability of Electricity and Reduction in Load Shedding

265. The construction of the new 220 kV T/L will indirectly increase the supply of electricity by despatching power from Guddu to Sibbi. This will reduce the prevailing load shedding for Balochistan province.

7.4.3 Employment Opportunities

266. During the construction and operation phases of the project, jobs will be created for the unskilled and skilled labour. Locals will be employed in these jobs to fulfill skilled and unskilled labour requirements. This will bring prosperity among locals and help in increasing the confidence of locals towards development of the proposed project.

7.4.4 Socio-Economic Uplift

267. Development of business during the construction stage will cause socio-economic uplift of the locals along the RoW. The socio-economic impacts like employment, education, living standard and cultural uplift during the interaction with locals are the indirect benefits due to the Project implementation. T/L will create new job opportunities for local residents during the construction stage of the Project. This will uplift the socio-economic situation of the area hence living standard of the local population will improve.

268. There are many indirect benefits associated with the proposed Project. The benefit of decrease in electricity load shedding will facilitate other services, such as health facilities, schools, water supply etc., which are dependent on electricity. This will also result in the improvement of the socio-economic conditions of the locals. Indirect positive impacts of the proposed sub-project on environment and social settings of the Project area are as under:

- Due to the implementation of the Project, availability of electricity will be increased;
- Due to increased electricity availability opportunities will be available to develop a large area of barren land into agriculture land by installation of tube wells.
- This will not have any significant adverse impact on the biodiversity of the area;
- Expansion of the industrial base is expected due to the availability of electricity;
- Better quality of life will be available for the residents of the Study Area; and
- Electrification of a number of villages where the present day basic necessities are not available, will result in the spread of knowledge, education and provide recreation through mass media communication by television in the rural areas of the country.

7.4.5 Detailed Design and Pre-Construction Phase

269. The EMP will be reviewed during the implementation phase at the detailed design

stage in line with best practice as required by ADB. A check will be made at the detailed design stage that the placement has been finalised as planned to ensure the location is as described in the IEE. If there are changes in project scope or location/alignment, these will be disclosed to the concerned EPA and the IEE will be revised. The revised IEE and EMP will be resubmitted to ADB, incorporating any recommendations and requirements from EPA.

7.4.6 Project Disclosure

270. The preliminary design will be disclosed to the EPA and public consultations will be conducted based on the preliminary alignment.

7.4.7 Social Impacts and Resettlement

271. A separate Land Acquisition and Resettlement Framework (LARF) as well as Land Acquisition and Resettlement Plan (LARP), if required, be prepared in line with the ADB SPS and implemented by the NTDC before commencement of the physical works.

272. The Contractors will require temporary land acquisition for:

- The development of Contractor camps and facilities i.e. storage, workshops, equipment parking and washing areas;
- Access roads/tracks for haulage, transportation etc.

273. This impact can be categorized as direct, low, site-specific, short term, temporary, medium probability and reversible.

274. The social preparation will be completed prior to commencement of construction. All temporary acquisition and monetary compensation will be completed to minimize the uncertainty of people. All the payments/entitlements will be paid according to the principles established in the entitlement matrix prepared as an integral part of the plan

7.4.8 Environmentally Responsible Procurement (ERP)

275. Aim to provide some enhancements in line with ADB policy on environmentally responsible procurement and avoid negative impacts. The ADB guidelines recommend identification of opportunities to enhance design and avoid environmental pollution by choosing non-polluting or enhancing methods. In order to introduce this process as early as possible in the project the contractor will be required to submit with their tender a Method Statement and schedule of environmental mitigation measures in response to EMP. Contractual clauses will be included in the tender documents to tie the implementation of environmental mitigation measures to a performance milestones. The ESIC cell will check that contractors Method Statements submitted with tenders have made sufficient provisions and include plans and sufficient resources to implement the mitigation measures in the EMP that will be reviewed and updated as necessary at the detailed design stage.

276. In order to comply with best international practice and ADB SPS 2009 all the new

equipment will not contain PCB or other hazardous or persistent polluting chemicals. Therefore in procurement documents, it always shall be specified that transformers, transformer oil and other equipment are to be free from PCB and other petroleum fractions that may be injurious to environment or equipment. Although to date it has not been possible to identify any PCB containing equipment in the sites so far investigated, it is required that a plan will be made by NTDC to gradually phase out any isolated remaining items of existing equipment with transformer oil, breaker oil or other equipment that may contain PCB and this shall be done as soon as practicable.

7.4.9 Planning for Erosion Control

277. The designs or method installation of that equipment's resulting erosion will provide for redistributing sheet flows from surfaces to reduce erosion and other impacts. Design method of installation of that equipment will also include adequate major and minor lead off drainage facilities to the nearest water courses, as necessary. In order to minimize and manage hydrologic flow at bridges and culverts during construction, a Drainage Plan will also be prepared by the contractor to control construction runoff and prepare to prevent flooding.

278. It shall be necessary that a 50-meter buffer to the watercourse from the stockpile must be kept as risk of sediment-laden runoff is high.

7.4.10 Planning for Construction Camps

279. As the proposed work is only replacement/installation of equipment and the proposed interventions are on minor scale to be completed within short period. In case, If the establishment of camp was required, uncontrolled worker camp operations and stockpiling of construction materials is anticipated. The sites selected for worker camps and back up areas for stockpiling materials and equipment will be planned in advance in consultation with the local community and located to avoid the most productive agriculture and will use waste/barren land and non-agricultural plots as far as possible. Construction camps however needs to be on government owned land.

280. No construction camps are to be set up within 100 meters of any ground water well.

7.4.11 Temporary Traffic Management

281. There are also minor concerns about blocking existing village roads and many other footpaths and tracks near the transmission corridor during construction. Therefore a provisional Temporary Pedestrian and Traffic Management plan will be prepared by the contractor while transporting the proposed equipment's and other associated construction material that can be updated by the contractors and agreed with ESIC cell one month prior to start of works.

7.4.12 Institutional strengthening and capacity building

282. The ESIC cell currently has few staff and there will be a need for more human resources as discussed earlier. A substantial amount of training will be undertaken in order to ensure that the Cell officials are trained to understand how to apply the EMP.

283. A comprehensive capacity development program shall be developed and implemented to ensure relevant ESIC and particularly the NTDC project staff is sensitized regarding the key environmental and social issues to be considered during the project construction activities in order to implement the EMP in its true letter and spirit. The enhanced capacities of the ESIC and NTDC staff shall ensure that no significant impacts take place along the project corridor.

7.4.13 Preparing the Contractor(s) to Address Mitigation Measures

284. The contractor will be primed by including the EMP and environmental assessments in the bidding and contract documentation. The contractor(s) will be informed that they will be required to produce method statements and plans in advance as required in the EMP for, Temporary Pedestrian and Traffic Management Plan, Drainage Plan, Erosion Control Plan, Waste Management Plan and Noise, Occupational Health and Safety Plan, SSEMP when and wherever required and Dust Control Plan, and a schedule of costs for implementation of mitigation measures.

7.5 Construction Phase

7.5.1 Contractor Mobilization

285. The source of the construction impacts will mainly be from the installation of towers and stringing of conductors, clearance of vegetation, construction of access, minor earthworks as the foundations for the towers are required. This section provides a brief explanation of each factor, also suggesting a line of action towards mitigation measures for the adverse impacts.

- **Orientation for Contractor**

286. Prior to the commencement of construction the contractor, the contractor(s) and all his workers will need to be trained on the requirements for environmental management. In order to ensure that the contractor, subcontractors and workers understand and have the capacity to implement the environmental requirements and mitigation measures there will be regular and frequent training sessions and tool-box talks.

- **Advance planning of environmental mitigation measures**

287. The contractor will be required to produce method statements and plans in advance of commencement of construction as required in the EMP for:

- Drainage Management plan,
- Temporary Pedestrian and Traffic Management plan,
- Erosion Control and Temporary Drainage Plan,
- Waste Management plan,
- Material Management Plan, if required,
- Noise and Dust Control Plan, and

- Occupational Health and Safety Plan.
- SSEMPs when and wherever required.

288. All the above plans will be submitted one month in advance of any construction activities to ESIC cell to check and agree and verify requirements from EPA have been complied with.

7.5.2 Ambient Air Quality

Impacts

289. Ambient air quality will be affected by the fugitive dust and emissions from the construction machinery and vehicular traffic during the construction phase. Emissions may be carried over long distances depending on the wind speed, wind direction, temperature of the surrounding atmosphere, atmospheric stability, topography, occurrence of any significant obstruction such as buildings and type of terrain. The critical sources of air pollution during the construction phase are:

- Construction material haulage trucks that generate dust, particularly during the loading and unloading processes. This impact can be categorized as direct, moderate, local, medium term, temporary, high probability and reversible.

Mitigation measures

290. The following effective measures need to be adopted for controlling the potential adverse impacts on ambient air quality:

- If required, the existing quarries should be used to borrow the aggregate materials;
- Concrete batching plants should be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions and will be located at a minimum distance of 500 meters from any residences;
- Ensure the proper and periodic tuning of the vehicles;
- Dust emissions from trucks will be reduced by a regular sprinkling of water for keeping the dust settled at least twice a day;
- Haul-trucks carrying sand aggregate and other materials will be kept covered with tarpaulin to reduce the dust pollution;
- NTDC should set up a system to monitor the air quality along the Project corridor in accordance with the accepted Pak NEQS, WHO and IFC standards. The system will cover protocols for sampling and analysis, assessment of air quality at sensitive locations, reporting and information sharing. NTDC will coordinate all the efforts in this area with the concerned EPAs and the local authorities; and
- NEQS provisions for ambient air quality, stack emission, noise levels and vehicular exhaust should be used for reference during the construction works.

7.5.3 Noise Level

Impacts

291. Noise generated by the construction machinery during the construction stage is likely to affect the RoW particularly the sensitive receptors like nearby settlements, schools, hospital etc. This is a potentially significant adverse environmental and social impact of temporary nature. This impact can be categorized as direct, moderate, local, short term, temporary, high probability and reversible.

Mitigation measures

292. Mitigation As the proposed refurbishment of the existing T/L route some sections are passing near the settlements, so special care must be taken for noise producing activity by providing casing to the noise generating part of the machinery or use of noise absorbing materials. Properly tuned vehicles and oiling of moving part of equipment may also reduce the noise levels. Construction timing should be coordinated with locals. Normally noise generating activities are allowed from 9 AM to 5 PM during day time to avoid disturbance to humans as well as fauna. NTDC will also set up a system to monitor the noise levels in the RoW near the construction activities to facilitate the concerned EPAs in enforcing the noise standards as prescribed in the NEQS, WHO and IFC.

293. In order to mitigate high noise levels, temporary acoustic barriers shall be used, wherever felt necessary.

7.5.4 Liquid and Solid Waste from Construction Camps

Impacts

294. As a general rule, the water consumption will be about 20 gallon/capita/day (75.7 liter/capita/day) and will subsequently generate about 70 to 80% of this water as sewage. Total amount of water required for the camps domestic and drinking water requirements are not much. However, a proper planning should be done for the source of water to be used to provide water for the camp area. Regular testing is required if using groundwater and not purchasing bottled drinking water for staff from a water supplier.

295. Disposal of wastewater without treatment will pollute the soil and groundwater. Based on the rough estimate, labour camps will generate 0.5 kg/person/day solid waste of domestic nature comprising kitchen waste, garbage, putrescible waste, rubbish and small portion of ashes and residues. Improper waste management activities can increase disease transmission, contaminate ground and surface water and ultimate damage to the ecosystem. This impact can be categorized as direct, moderate, site-specific, short term, temporary, high probability and reversible. Solid waste will be disposed of to a suitably licensed sanitary landfill.

Mitigation measures

The following mitigation measures shall be implemented.

296. Groundwater should be the first priority after pumpout Test and resistivity survey if

it is available at reasonable depth, quantity and quality.

297. If the sources are far apart, then the option of bowser trucks should be considered.

298. Regular sampling and testing of water against the drinking water quality guidelines are recommended.

299. To dispose the liquid and solid waste generated from the construction activities, the following steps should be taken by the Contractor:

- Domestic and chemical effluents from the construction camp should be disposed by the development of on-site sanitation systems i.e. septic tanks along with soakage pits. Proper monitoring to check the compliance of NEQS will be carried out;
- Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit;
- All the solid waste from the camps should be properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration concerned department for the disposal of solid waste;
- The concerned department must develop a plan of action for transporting the waste to the disposal site for final disposal. It is the responsibility of the concerned department to ensure that the disposal site is properly lined to prevent the leachate from contaminating the groundwater;
- Secondly, the disposal site must be located away as far as practical from populated areas and regions that have a high density of Wildlife;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.

7.5.5 Siltation of Natural Streams and Irrigation Channels

Impacts

300. Natural streams and irrigation channels may be prone to increase in sedimentation and silt due to excavated material (loose aggregate) with the runoff from the construction area, workshops and equipment washing-yards. The irrigation/drainage channels and natural streams running along the Project corridor in the Project Area may also become silted, if unmanaged excavation is carried out for the Tower foundations and other construction activities. This impact can be categorized as indirect, moderate, site-specific, long term, permanent, high probability and irreversible.

Mitigation measures

301. The excavated material will be managed by ensuring proper storage areas located far away from the water bodies. It will not cause the siltation of the irrigation channels. All the areas disturbed due to erosion need to be protected against soil erosion by stripping and stockpiling of all the available topsoil for later re-vegetation.

7.5.6 Public Infrastructure

Impacts

302. Construction stage of the proposed Project may affect the existing infrastructure within the ROW of the T/L where Towers are to be installed and stringing activities. Exact number will be identified after the finalization of the spotting of Towers.

Road Crossings:

303. Field surveys revealed that the proposed T/L will cross some roads. The time of stringing of proposed T/L, interference to the traffic movement is expected. This will be a significant adverse physical and social impact during the construction stage. This impact can be categorized as direct, moderate, local, medium term, temporary, high probability and reversible.

Mitigation measures

304. SOPs for the clearing of existing infrastructure including buildings and their compensation are required. During the detailed design stage, NTDC will coordinate with NHA and local road department/authorities for the installation of the Towers and during stringing of the conductors where the line is crossing the existing roads for the provision of alternate traffic route and management. NTDC will provide adequate line clearance from the road. Further, during the installation process, proper traffic management plan will be prepared to avoid the traffic hazards and the construction should be carried out in off peak hours.

Canals:

305. The proposed T/L will also cross canals at different locations. Crossing of canals will not have any significant adverse impact on environment during the stringing stage.

Mitigation measures

306. No specific mitigation measure can be suggested for this impact. Moreover, it is suggested that no tower footings are to be spotted in the canal or river beds. Some towers may be required to be placed on river bed of those rivers flushing the hill torrents from Bugti hills in Balochistan. In such case, the tower design shall be adopted keeping in view design flood along with scouring depth etc. in order to avoid any adverse impact.

Power Transmission Lines:

307. The selected route of the proposed T/L involves the crossings of the some existing T/L. Crossing may be dangerous during the stringing action and operation stage, if proper clearance is not provided at the design stage of the Project. This impact can be

categorized as direct, low, site-specific, short term, temporary, low probability and reversible.

Mitigation measures

308. Special care is required during the construction of Towers as well as stringing of conductors. During the stringing of conductors, temporary shutdown of the existing T/Ls will be ensured to safeguard the workers and the surroundings. A proactive coordination is required between the construction staff and relevant Grid Station operation staff to ensure the shutdown schedule.

7.5.7 Impact on Water Resources

Impacts

309. The existing TL is crossing Patfeeder canal and number of minors/distrys and water courses. Therefore; this section explains how RoW will be affected in terms of the water resources use and water body contamination during construction phase. It also describes the mitigation measures to manage these impacts. Contamination of surface and groundwater resources may get contaminated by the fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at the construction camp sites. Moreover, runoff from the chemical storage areas may also contaminate the surface water bodies. This impact can be categorized as direct, moderate, local, medium term, temporary, high probability and reversible.

Mitigation measures

310. As a mandatory step, all the effluents should be disposed as per the requirements of NEQS. Moreover, to reduce the risk of surface and groundwater contamination, good management practices will be adopted to ensure that fuels, chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner. These measures are described below:

- Construction camps should be established in areas with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that NEQs are met; and
- Wastewater effluent from the Contractors‘ workshops and equipment washing-yards should be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the NEQS, the BOD concentration in sewage must be brought down to less or equal to 80 mg/l before being discharged into a natural stream having capacity to dilute the effluent. Furthermore, since the national regulation of 80 mg/l is quite lenient, thus in spirit all efforts shall be made to minimize the pollution load to meet the standard of 30 mg/l. For wastewater apart from BOD, COD of 150 mg/l should also be checked; and similarly, if the sewage after treatment is to be discharged on to the land it should meet the requirements of the NEQS for disposal of wastewater.

- Adequate facilities for drinking water that meet applicable standards must be provided, along with a suitable number of toilets for the work force with running water, a stocked first aid kit and trained first aider at each tower location etc. Any waste produced must be disposed off in a licensed sanitary landfill with the waste transported outside the project area for disposal.

7.5.8 Land Resources

- **Waste Management and Spoil Disposal**

Impacts

311. There may be in rare cases some surplus rock and soil based materials. The waste management plan (WMP) will be required to ensure waste from construction is managed properly and to reduce, reuse and recycle waste wherever possible. The contractor will prepare the WMP one month before the commencement of construction with disposal sites identified for agreement by project supervision consultants (ESIC/NTDC). The WMP will cover all aspects of construction waste disposal. It is preferable to use the wasteland for dumping of material. If private land is to be used for the purpose of dumping, it shall commence only after written permission from the land owner and is to be checked by the ESIC in NTDC.

Mitigation measures

312. The mitigation measures in the waste management plan (WMP) will include but not necessarily be limited to:

- Spoil will not be disposed of in the irrigation canals, water courses, rivers and streams or other natural drainage path,
- Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, religious or other culturally sensitive areas or areas where a livelihood is derived,
- Use surplus spoil for local repair works to fill eroded gullies and depression areas and degraded land in consultation with local community,
- Disposed spoil will be spread in 15cm and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent erosion following NTDC/GESU guidelines[22].
- Any oil contaminated gravel/sand left after the construction activity will be handed over to a pre-approved third party that shall be responsible for incineration and/or disposal of this material in accordance with NEQS and international best practices.

- **Soil erosion and surface runoff**

Impacts

313. In the construction stages, there is the potential for the works to have impact on local water resources (canals and water courses). The works are not close to any major streams and rivers at any places and there are no crossings of significant tributaries.

[22] Guide to Slope Protection Works–. NTDC GOP 2007.

There are no potentially major impacts from all the works near the rivers and streams. The drainage designs for the Project should be cleared with the local drainage and irrigation authorities before works commence.

Mitigation measures

314. Combinations of alternative methods should be considered including but not necessarily limited to:

- Schedule work so clearing and grading are done during the time of minimum rainfall,
- Clear only areas essential for construction,
- Locate potential area pollutant sources away from steep slopes, water bodies, and other critical areas,
- Route construction traffic to avoid existing works or newly planted vegetation,
- Protect natural vegetation with fencing, and retaining walls or tree wells.
- Stockpile topsoil and reapply to re-vegetate the site,
- Cover and stabilize topsoil stockpiles,
- Use wind erosion controls,
- Intercept runoff above disturbed slopes. Convey to permanent channel or storm drain.
- On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff,
- Use retaining walls,
- Use check dams,
- Install bioengineering in line with NTDC manuals and seed and fertilize,
- Use seeding and mulch/mats,
- Use turfing,
- Use wildflower cover.

315. Stockpiles should be covered before heavy rain to prevent wash out due to runoff. Stockpiles should not be located within 20m of water courses and there should be an intervening vegetated buffer to control any un-expected run-off. As a long-term benefit of the project, the drainage infrastructure may be able to be modified as water harvesting structures to collect water for irrigation and other uses and such options should be discussed and investigated at the detailed design stage.

- **Worker camps, maintenance yards and canteen operation**

Impacts

316. Uncontrolled worker camp operations can cause significant impacts. The sites for

worker camps will be planned in advance in consultation with the local community.

317. In consultation the public have expressed concerns about nuisances from construction camps. The main issues of concern are uncontrolled defecation by construction workers, unmanaged disposal of solid and liquid wastes into watercourses, natural drains and improper disposal of storm water and black water in the village areas. The contractors will therefore adopt good management practices to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of under controlled conditions to reduce the risk of contamination.

Mitigation measures

318. Prior to the close out of the Project construction in the project area, the worker camps will be removed and restored to the original condition as far as is reasonably practicable construction contractors and notified to ESIC Cell / NTDC for approval as follows.

- Confirm location of work camps in consultation with ESIC and local authorities with location subject to approval by the ESIC. If possible, camps shall not be located near settlements or near drinking or irrigation water supply intakes,
- Cutting of trees beyond the RoW shall be avoided and removal of vegetation shall be minimized,
- Water and sanitary facilities shall be provided for workers and employees,
- Construction camps will be established in areas with adequate natural drainage channels in order to facilitate flow of the treated effluents.
- If the establishment of a camp was required for month times, the portable lavatories or at least pit latrines will be installed and open defecation shall be discouraged and prevented by keeping lavatory facilities clean at all times.
- Wastewater effluent from contractors' workshops and equipment washing yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed Waste Management Plan.
- Predictable wastewater effluent discharges from construction works shall have the necessary permits from concerned EPA before the works commence.
- Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed of to the nearest site approved by the local authority.
- The Contractor shall organize and maintain a waste separation, collection and transport system.
- The Contractor shall document that all liquid and solid hazardous and non-hazardous

waste are separated, collected and disposed of according to the given requirements and regulations.

- At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed by the contractor and exposed areas shall be planted with suitable vegetation.
- The ESIC Cell shall inspect and report that the camp has been vacated and restored to pre-project conditions as far as is reasonably practicable to the satisfaction of the local authority.

319. Before construction commences arrangements will be reconfirmed by the concerned authority.

▪ **Soil contamination**

Impact analysis

320. Possible contamination of soil may occur from oils and chemicals at workshop areas, and equipment washing-yards. The contamination may limit the future use of land for agricultural purposes.

Mitigation measures

321. The following practices will be adopted to minimize the risk of soil contamination:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination. Good housekeeping techniques will be used to control oil spillage by ensuring transformers are placed on an impermeable surface bunded to 110% of capacity in case of oil spill or leak.
- If waste oils or other contaminants are accidentally spilled on open ground, the waste including the top 2cm of any contaminated soil shall be disposed of as chemical waste to a disposal site acceptable to the NTDC and agreed with the local authority / community. Debris generated by the dismantling of existing structures will be recycled subject to the suitability of the material in line with the EMP. It shall be ensured that no PCB containing transformer oil is used.
- Solid waste generated during construction and at worker camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites identified and agreed with the local community.
- Control measures for oily residues, lubricants and refuelling are prescribed in the EMP. The maintenance yards, that will be created will have dedicated drainage which can capture run-off. Oily residues and fuel should be captured at source and refuelling and maintenance should take place in dedicated areas away from surface water resources. With these measures in place, no significant impacts should be arise in construction.

▪ **Contamination from Diesel and other oil spills from Construction machinery**

322. At places it may be inevitable and may exceed the maximum permissible limit. In case it is allowed to be as rule rather than an exception, the dumping site will be permanently damaged along with allied physical biological and social losses. This is mitigable through effective application of the maximum spill regulations.

323. "Guide Lines for Oil Spill Waste Minimization and Management issued by International Petroleum Industry Environmental Conservation Associate (IPIECA) are as follows:-

- **Soil contaminated** by minor spills/leakages (defined as leaks from vehicles, machinery, equipment or storage containers such that the area and depth of soil contaminated is less than 10 sq ft and 3 inches respectively) is to scraped and burnt in a burn pit.

- **Moderate spills** defined as spills of volume less than or equal to 200 liters is to be contained and controlled using shovels, sands and native soil. These equipments and materials are to be made available at camp sites during the operation. The contaminated soil is to be excavated and stored in a burn area lined with an impermeable base. Depending on the volume, the contaminated soil is either disposed-off through by specialized treatment such as bioremediation or through approved contractor.

- **Major spills** (defined as spills of volume much greater than 200 liters) require initiation of Emergency Response Procedures and Oil Spill Contingency Plan. These spills are to be handled and controlled according to the Plan and require special treatment such as bioremediation and through approved contractors.

Mitigation

324. Contractor's contractual obligation to impose strict rules on his workers and labour and ensures that no spill are caused. If it the spills, do take place, it must be followed by the treatment prescribed above as per the degree of spill.

325. Damage to, roads, cross drainages by machinery such a situation can arise through carelessness of the heavy machinery drivers/operators. Such carelessness can cause considerable damage to paths, roads and drainages if the drivers/operators are not made aware, trained and bound to be careful. An effective sinology can reinforce the instructions to drivers. It is a concern of moderate significance but is mitigable through care and regulation. Sewage will be connected to sewage network for offsite treatment or will be connected to septic tank.

Mitigation

326. Contractor's contractual obligations to impose strict control over operators and drivers of all types of vehicles. If the damage takes place, the contractor must be bound

to carry out repair immediately.

- Discharge from unstable slope or leakage on construction. Such an impact can destroy the structure leading to unprecedented damage. Though significant, it can be set aside through a careful planning of the work. If such a situation does appear, it becomes highly significant though a mitigable impact.

Mitigation

327. Contractor's contractual obligation is not to let such leakage develop. Should such leakage develop, the contractor must remain fully prepared to immediately control the discharge.

- Soil Compaction due to labour camps, and machinery yards The human and mechanical activity normally compact the soil and turns it non-productive.
- Mitigation Contractor's contractual obligation to mitigate the impact of compaction and leave the site almost in the same state in which it is occupied. Pictures of the area should be taken before handing it over to contactor which will help the RE to ensure an acceptable state of soil while getting the area back from the contractor.

7.5.9 Hydrological, Drainage and Irrigation Impacts

328. As the existing transmission line is crossing sizeable number of main and secondary irrigation canals, water courses, therefore; the Project will be designed not to interfere with the existing irrigation and drainage lines on adjacent lands and paths and to prevent soil erosion and retain the existing irrigation system in the operational phase. However in the construction stages, there is the potential for the works to have impact on local water resources. The plans to avoid and retain such drainage and irrigation works shall be included in the Drainage Management Plan and the contractors will include plans for any necessary temporary drains to cater for worst case flow. The designs will also provide for protection of the works that are in progress and for redistributing flash flows from prepared surfaces during heavy rain to reduce erosion and other impacts. The contractor(s) will be required to have a drainage engineer / erosion control officer to check implementation of the temporary drainage mitigation on site and make modifications on a daily basis as necessary mitigation

7.5.10 Air Quality and Noise Pollution

Impact analysis

329. Dust and smoke and other pollutants due to contractor machinery and installing/replacing the equipment are anticipated.

Mitigation: Contractor's contractual obligation to keep the dust and smoke low by using machinery which is well maintenance and is almost noiseless. And all dirty (Kacha) roads and paths are sprinkled with water many times a day.

- **Dust control**

Impact analysis

330. Some of the residences in the settlements are close enough to the RoW and to be disturbed by dust. Water is available in the study area although surplus water may not always be available to suppress dust in the dry season. Therefore as a general approach, it is recommended that if works are within 15m of any sensitive receivers, the contractor should install segregation between the works at the edge and the sensitive receivers. The segregation should be easily erectable 2.5m high tarpaulin sheet and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration, the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base. These can be moved along as the work proceeds.

Mitigation

- If the working surfaces become dry and dusty, water will be sprinkled on the dust prone areas and exposed surfaces when work is carried out within 50m of the side sensitive receivers.
- If works give rise to complaints over dust, the contractor shall investigate the cause and review and propose alternative mitigation measures before works recommence.
- All heavy equipment and machinery will be fitted in full compliance with the national and local regulations.
- Fuel-efficient and well-maintained haulage trucks will be employed to minimize exhaust emissions. Smoke belching vehicles and equipment will not be allowed and will be removed from the project.
- Vehicles transporting soil, sand and other construction materials will be covered with tarpaulin sheets to avoid impact from dust. Speeds limits will be established for vehicles within the works sites and on unpaved edge areas of the project.

- **Smoke from burning of waste material or burning firewood**
  - A large number of big and small fires in the labour camp can produce smoke and smog which can cut off visibility, and cause suffocation along with causing diseases of the respiratory tract.

Mitigation

331. Contractor's contractual obligation to use clean and smoke free fuel in the labour camp. Cutting and burning trees/shrubs for fuel shall be prohibited. Instead Gas Cylinders should be used in the labour camp for cooking purposes.

- **Noise**

332. Powered mechanical equipment such as generators, stabilizers and concrete-mixing plant can generate significant noise and vibration. Whereas various modern machines are acoustically designed to generate low noise levels there is not much

evidence that acoustically insulated plant is available in Pakistan. The cumulative effects from several machines can be significant and may cause significant nuisances.

Mitigation

333. To minimize impacts, the contractors should be required by to;

- maintain and service all equipment to minimize noise levels, and
- locate equipment to minimize nuisances and
- install acoustic insulation or use portable noise barriers where practicable to limit noise at sensitive receivers. Insulation should be provided to minimize noise impacts such that the measured noise at the edge of the works nearest residential areas will be less than 50 dB(A) Leq during night time (9 p.m. to 6 a.m.) and 75 dB(A) Leq at other times during the day.

7.5.11 Ecological Environment

334. The impacts on the flora and fauna and corresponding mitigation measures are provided below.

- **Impacts on Flora**

Impact analysis

335. T/L section is passing through agriculture land where trees have been raised by the farmers along the boundaries of their agricultural fields or along the water channels and some orchards (mostly Mangos, Banas, Guava and Citrus in Sindh and Punjab etc.), were observed during the field surveys. Trees also exist along the highways and canals, where these trees have been grown by the Government Departments. Sporadic growth of trees, coming within the RoW have to be removed if these are located within the Tower foundations during construction. As these are small in number, their removal will cause no significant adverse environmental impact. With the erection of T/L Towers, tree need to raised away from the location of Towers. This impact can be categorized as direct, low, site-specific, long term, permanent, high probability and irreversible.

Mitigation

336. Following mitigations are suggested:

- Land holders should be paid reasonable compensation for the loss of their standing trees, in accordance with the prevailing market rates. This will mitigate the financial losses of Land holders. They should be encouraged to plant new trees, outside the ROW of the T/L;
- Replanting of trees at appropriate locations shall be conducted with the details provided in the LARP developed for this sub-project.
- While making paths for carriage of equipment and material to the site of Towers, care should be taken that minimum land is utilized and minimum area of crop is

disturbed cutting of trees should be avoided by making diversions;

- Areas for construction camps, established for labour and other personnel, should be kept to the minimum. The camp sites should be located in plain areas, with minimum vegetation cover. Clearing of land and cutting of trees and vegetation should be avoided as far as possible;
- Staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the existing roads for travel without damaging fields;
- While setting up construction camps, for the erection of Towers, stringing of conductors or Converter Stations, care should be taken that no obstruction is placed in natural streams nullah or natural drainage;
- Vehicle speed should be controlled to avoid any damage to existing vegetation, environment and to avoid accidental mortality of small mammals and reptiles; and
- Shrubs and herbs existing within the RoW will be subjected to a significant adverse impact as these may be tangled and destroyed due to the movement of heavy vehicles. These shrubs may also be subjected to cutting for use as firewood in the labour camps to be set up along the proposed T/L route.

Impact on Fauna

- **Mammals**

Impact Analysis

337. The key mammalian species protected under the Sind Wildlife Protection Ordinance are the Asiatic Jackal, Indus Dolphin (Endangered),Fishing Cat, Five Stripped Palm Squirrel, Hog Deer (Endangered),Smooth Coated Otter (Vulnerable) and Small Indian Mongoose. The habitats of these species are along the strip of the Indus River which is away from the RoW of the existing TL around 5km and no adverse impacts are anticipated during the construction phase of the project.

338. While the species protected under the Balochistan Wildlife Protection Act are the Asiatic Jackal, Five Stripped Palm Squirrel and Small Indian Mongoose. During the baseline survey along the RoW of the existing TL, no habitat was observed and therefore; no adverse impacts are anticipated.

339. During the construction phase, there are no significant adverse impacts on the big mammals of the area due to the activities involved in the construction of access roads, Towers, stringing of conductors, movement of labour, carriage of goods and machinery to various sites, within the RoW of T/L route. Mammals such as small Indian Mongoose, Stripped Palm Squirrel and Asiatic Jackal will move away from these areas. Thus no significant impacts on the fauna along the project corridor are expected. However, certain necessary mitigation measures are provided below to ensure no impact on the fauna in the project area takes place.

Mitigation

340. The following measures are suggested:

- Hunting and harassing of wild animals will be strictly prohibited and the Contractors will warn their labour not to indulge in any such activity;
- Activities such as construction of towers, stretching of conductors and carriage of materials will not be allowed during the night
- Lights used in the camps during the construction will be kept to the minimum; and
- Vehicle speed should be controlled to avoid incidental mortality of small mammals and reptiles.
- Special measures need to be adopted to minimize impacts on important resources, such as activities during critical periods of migration, breeding and feeding;

- **Impacts on Amphibians and Reptiles**

Impact Analysis

341. In the baseline, no key specie of threatened amphibian specie is reported. The species of reptiles are in the Kashmore-Sindh is the Black Cobra which is uncommon and encountered in riverine densely vegetative areas of Indus River at the distance of around 5km from the existing TL route. The other species which are protected under the SWPO are the Desert Montior, Garden Lizard, Naja naja (also IUCN redlist), Indus Sand Boa, Indus Spiny Tailed Lizard and Indian Monitor.

342. In Balochistan, 4 species of reptiles (Indian sand Boa, Indian Fringed Toad Lizard, Pakistan Ribbon Snake and Sindh Sand Jecko) are protected under the Balochistan Wildlife Protection Act and 4 species are listed in the IUNC redlis i.e. Naja naja, Indian Monitor, Desert Monitor and Garden Lizard.

343. The impacts of the proposed TL refurbishment is not anticipated as the construction works is for a shorti time period and these species can easily move to other safe areas.

Mitigation measures

No measures required.

- **Avi Fauna**

Impact Analysis

344. The Indus River is important international flyways for bird migration known as "*The Indus Flyway*". The migratory flocks of ducks, grebes, cormorants, daters, storks, gees, coots waders and gulls diverge from the main Indus flyway and disperse in local wetlands and marshes during winter and fly back in late spring. A total of 102 bird

species are reported in the project area during the October 2011 study for Guddu ESIA of which 41 are migratory while 61 are resident. Out of all recorded species, 39 are abundant to the area, 52 are common, 7 are less common and 4 are rare. 17 species of birds enjoy the status of protection under the Sindh Wildlife Protection Ordinance, 1972 which include raptors, egrets, herons and vultures. This important hotspot is along the Indus River and Guddu Barrage vicinity and is away from the existing TL corridor at least 5km and no impacts are associated with the proposed TL refurbishment.

345. In Balochistan, there are some key bird species protected under the BWPA like Black Kite, Black Winged Kite, Greater Spotted Eagle, Grey Heron, Little Cormorant, Little Egret, Long Legged Buzzard, Marsh harrier, and Preigrine Falcon. In addition with it, there are two bird species listed under the IUCN red list are Little Stint and Northern Pintil,

346. The common birds of the project area are Cattle (small) egret, Common babbler, Common moorhen, Common and Bank myna, House crow, House sparrow, Indian roller; Sindh pied kingfisher, Rose-ringed parakeet, Red-wattled lapwing, Black-winged stilt, Pond heron, collared dove and little brown dove. A complete list of the bird species observed/Informed in the project area can be seen in Table 6.6 and 6.7.

347. The key fauna as reported above and in the baseline (except the Indus Flyway species) chapter may exist in and around the RoW. These birds have been subjected to excessive hunting and catching on account of their good quality and tasty meat or their commercial value as a prey bird. These birds will try to find shelter and food somewhere else and will tend to move away from the route of T/L due to the activities mentioned above for fear of being hunted / trapped or killed. This impact can be categorized as indirect, moderate, local, medium term, temporary, high probability and reversible.

Mitigation

348. Trees having habitat of birds should not be allowed to be cut;

- Special mitigation measures needs to be adopted to minimize impacts on the birds, such as avoiding construction activities during the critical periods of breeding and feeding; and
- Staff working on the Project should be given clear orders not to shoot, snare or trap any bird.

- **Migratory Birds**

Impact Analysis

349. Construction of the proposed T/L will not have any pronounced impact on the migratory birds because their migration route (Green Flyway International) along River Indus is around 5km and is quite far away. The proposed T/L route is also away from any major water bodies, therefore, no impact on the migratory birds is foreseen.

Mitigation

350. As the alignment of the existing T/L is far away from the established route of the migratory birds from Siberia to the major wetlands in Sindh, which is normally along the River Indus, no mitigation measures are foreseen at this stage.

351. In case any migratory birds are present in the project area, in order to protect them during the project construction phase, it shall be ensured that sections of the transmission line within about 10 km of this wetland habitat shall be marked with bird deflectors.

352. Also, all efforts shall be made to ensure that the construction activity shall be undertaken as far as possible outside the migratory bird season, especially any sections of the TL alignment that lie in water, if applicable, which may be used by migratory birds.

- **Impacts On Fish**

Impact Analysis

353. Guddu Barrage pond area supports a complete ecosystem, the fish being the main component of the fresh water ecosystem. However; the Guddu Barrage is around 2.5km away from the starting towers of the existing TL route and the construction works for that section close to the Guddu Barrage is for very short time period and therefore; no adverse impacts are anticipated. In addition, there are also some commercial/private fish farms reported in section 4.15.6 are falling in the RoW of the existing transmission line. The following impacts to fish in the project are may arise during the implementation of the works:

- The ponds of fish farm act as breeding and nursery grounds for almost all species of reported fish species which is the source of income for the people. The contamination of the ponds during the installation of towers and stringing of conductors shall result in the loss of these breeding grounds.
- Any pollution incident shall have a negative impact on fish for the reported private fish farms.

Mitigation Measures

354. The following mitigations are suggested:

- The minor change in the alignment of the TL is the best option to avoid any impacts on the production of fish a source of income for the people.
- If unavoidable, construction works shall not be carried out during the breeding season (mid-May to mid-August).Adoption of mitigations relating to surface water quality monitoring is required.

7.5.12 Risk of Bird Collisions with Transmission Cables

Impact Analysis

355. As discussed in the above section, the Indus River is a major fly-way for bird migration. Huge flocks of migrating birds follow the Indus fly-way with south ward

migration starting from November and northward migration starting from March. Fatal collisions occur mostly with cables hanging perpendicular to the flight direction particularly with the top neutral conductor because of its poor visibility.

356. However; some of the starting towers are located near the Indus River-Guddu Barrage while the flight of the birds will be at lower altitude as the Indus River and vicinity of the Guddu Barrage is the staging location for the migratory birds. In addition, power line structures (towers) provide perching, roosting, and nesting substrates for some avian species especially for birds of prey (raptors). Birds and bats may be electrocuted by power lines in one of three ways: i) Simultaneously touching an energized wire and a neutral wire; ii) Simultaneously touching two live wires; and iii) Simultaneously touching an energized wire and any other piece of equipment on a pole or tower that is bonded to the earth through a ground wire. Larger species (e.g. hawks, falcons, owls, vultures, cranes, egrets, and ravens) are at particular risk of simultaneously touching two wires or components while flying due to their long wingspans.

357. Although raptors are most often considered when addressing electrocution risk, other birds such as crows, small flocking birds and wading birds can also be electrocuted. Closely-spaced exposed equipment, such as jumper wires on transformers, poses an electrocution risk to small birds.

Mitigation Measures

358. Visibility enhancement objects such as marker balls, bird deterrents, or diverters will be attached to the 220 kV transmission line at the Indus crossing to avoid any bird collision. The electrical design factor most crucial to avian electrocutions is the physical separation between energized and/or grounded structures, conductors, hardware, or equipment that can be bridged by birds to complete a circuit. As a general rule, electrocution can occur on structures with the following characteristics:

- Phase conductors separated by less than the wrist-to-wrist or head-to-toe (flesh-to flesh) dimensions of a bird. The wrist is the joint toward the middle of the leading edge of a bird's wing. The skin covering the wrist is the outermost fleshy part on the wing.
- Distance between grounded hardware (e.g., grounded wires, metal braces) and any energized phase conductor that is less than the wrist-to-wrist or head-to-toe (flesh-to-flesh) distance of a bird. Avian risk assessment is a prerequisite for designing the transmission line. The assessment includes development of a database for morphological features (wrist-to-wrist or head-to-toe) for all the large birds, raptors and threatened species. Morphological features, in terms of length of the birds and wingspan of all large birds, raptors and threatened species of the project area are presented in the Environmental Baseline Chapter. Maximum length and wingspan of some of the birds reported in the Environmental Baseline Chapter are summarized below.
- Maximum length is 1 m and maximum wingspan is 1.8 m for large water birds and

waders (stork, goose, crane, etc.);

- Maximum length is 1.5 and maximum wingspan is 3 m for birds of prey (vultures, eagles: Short toed etc);
- Length is 0.65 and wingspan is 1.8 m for Egyptian vulture;
- Length is 0.5 and wingspan is 1.2 m for harrier. The maximum length and wingspan of all the above birds are within 1.5 m and 3 m, respectively. Hence, mitigation to prevent or reduce the bird electrocution is possible by maintaining a minimum vertical distance of 1.5 m and horizontal distance of 3 m between the energized parts of the transmission line. However, in the proposed design of the 220 kV transmission line, the distance between vertical conductors is 4.1 m and horizontal conductors is 6.8 m, much higher than the morphometric features of the birds. Hence no bird electrocution is expected with 220 kV transmission line through touching of two conductors. In addition, the exposed coverings and parts of the structure will be insulated to avoid any electrocution of birds.

359. The maximum length and wingspan of all the above birds are within 1.5 m and 3 m, respectively. Hence, mitigation to prevent or reduce the bird electrocution is possible by maintaining a minimum vertical distance of 1.5 m and horizontal distance of 3 m between the energized parts of the transmission line. However, in the proposed design of the 220 kV transmission line, the distance between vertical conductors is 4.1 m and horizontal conductors is 6.8 m, much higher than the morphometric features of the birds. Hence no bird electrocution is expected with 220 kV transmission line through touching of two conductors. In addition, the exposed coverings and parts of the structure will be insulated to avoid any electrocution of birds.

7.5.13 Impact on Reserve Forests

Impact Analysis

360. The proposed refurbishment of the existing T/L will not cause any major impact on the flora and fauna of the any Reserve Forest. So, no mitigation measures are foreseen at this stage.

Mitigation measures

No measures required.

Socio-economic Environment

361. This section describes the impacts of the proposed Project during construction stage on the local communities, construction workers, indigenous and vulnerable people as well as on structures or sites of cultural and religious significance.

i. Agriculture

Impact Analysis

362. Based on the Google images and field surveys, the total cultivated area, which will

be affected due to this Project. The agriculture of the tract in Sindh and some parts of Balochistan will receive significant adverse impact due to various operations such as movement of heavy machinery, erection of Towers, dragging, stretching and stringing etc. This impact can be categorized as direct, moderate, site-specific, medium term, temporary, high probability and reversible.

Mitigation measures

363. Land holders will be paid compensation for the loss of their standing agricultural crops in accordance with the prevailing market rates as per LAA, Telegraph Act, NTDC practices, Land Acquisition and Resettlement Framework (LARF) and Land Acquisition and Resettlement Plan (LARP) specific to the Project. The landholders will also be allowed to salvage the agricultural crops and other vegetation from the affected fields.

ii. Loss of Crops

Impact Analysis

364. The damages may occur to existing crops during the construction stage due to the following activities:

- Considerable vehicular movement for the transportation of materials/water and steel work will be involved at the time of concreting of Tower foundations. This movement and storage of materials will cause damage to the existing crops; and
- The stringing of conductors involves movement of equipment and vehicles along the corridor, which may involve the cutting of trees and considerable damage to the existing crops. Since the Project is at the feasibility stage and detailed design is to be carried including the exact spotting of the Towers on ground. So in the absence of the availability of the spotting of Tower (project foot print), it is very difficult to calculate the exact amount of the crop losses. However, based on the route alignment, field visits, maps and experience of similar Projects already implemented, It is also estimated that the Project activities will continue round the year at each Tower from the start of survey to the stringing of conductors. So the affectees will lose their crops and fruits may be for two or more seasons i.e. Rabi (Spring Harvest) and Khraif (Autumn Harvest). The major crops which are being sown in the Project Area are wheat, rice, cotton, maize and vegetables apart from the Orchards of Banana, Mango, Citurs etc. This impact can be categorized as direct, moderate, site-specific, medium term, temporary, high probability and reversible.

Mitigation measures

365. The following measures are recommended to minimize the impact of crop losses.

- Compensation for the loss of crops to the land owners and cultivators as the

case may be will be paid, in accordance with the prevailing market prices and uniformity in rates will be ensured within the local areas;

- The whole process of the payment to the farmers should be made transparent, judicious and without any discrimination or favour;
- Minimum possible area should be disturbed for the construction of new paths or roads for carriage of machinery and materials; and
- As far as possible, barren land without any crop should be selected for the camp sites and disturbance to the crops and natural vegetation should be avoided as much as possible.
- Orchards compensation is a complex issue. However, efforts should be made to avoid damage to fruit trees otherwise compensation for the whole is required. Similarly, banana plant/tree if damaged needs to be compensated on loss of tree basis.

7.5.14 Conflict over Resources

Impact Analysis

366. It is anticipated that local water resources will be utilized to meet the camp and construction requirements, bringing its use into competition with the local use especially in the desert areas of Balochistan province where the water availability is limited. This may cause conflicts between the locals and the Contractors. This impact can be categorized as direct, low, local, short term, temporary, low probability and reversible.

Mitigation

367. The following measures will be carried out to mitigate the impacts of tapping local community water resources, where required:

- In areas of concern where the potable water is in short supply; the water will be provided through vehicles from the nearby cities;
- As already mentioned in the mitigation of temporary land acquisition impact, the camps should be located at least 500 m away from the nearest local settlements to prevent the contamination of community-owned water resources;
- Approval from the local administration and representatives of the concerned irrigation departments or other relevant authorities will be obtained before using the local surface water resources;
- The Contractors will be required to maintain close liaison with the local communities to ensure that any potential conflicts relating to the common resource utilization are resolved quickly; and
- Guidelines will be established to minimize the wastage of water during the construction activities and at campsites.

7.5.15 Impacts on Local Communities/Workforce

Impact Analysis

368. Local communities will be affected during the construction phase as follows:

- During the construction phase, the general mobility of the locals and their livestock in and around the RoW will be affected temporarily on specific locations. The movement of the Towers and conductors from the stocking area to the construction site may cause traffic problems on the road for the locals. This may affect their mobility at times. During the stringing operations, interference to the traffic movement is also expected. This will have low adverse impact on the locals on temporarily basis;
- Community have to face the noise and dust problems during the construction activities, which may have adverse impact on the health of the locals. However, these impacts are of temporary nature;
- Induction of outside workers by the Contractor may cause conflicts with the locals on the cultural issues related to social and gender due to the unawareness of the local customs and norms. These issues may adversely affect the construction phase of the Project. This is a medium adverse social impact of temporary nature; and
- Theft problems to the community by the Contractor‘s workers and vice versa may also create social issues if outside labour is used by the Contractor. Overall these impacts can be categorized as direct, moderate, local, medium term, temporary, high probability and reversible.

Mitigation

369. Potential social conflict between the outside labour and local community may be avoided by implementing the measures listed below:

370. During the construction phase, mobility of the workers in the nearby areas should be strictly restricted by the Contractor to avoid any inconvenience to the local communities.

371. The Contractor should select specific timings for stringing so as to cause least disturbance to the local population considering their peak movement hours; and To avoid pollution problems due to noise, smoke and fugitive dust following mitigation should be followed:

- Use of good engineering practices such as water sprinkling, encasement and provision of silencer and mini stacks of generators etc. should be adopted to avoid inconvenience to the locals due to noise, smoke and fugitive dust; and To avoid conflicts between Contractor staff and locals, following mitigation should be adopted:

- Contractor will take care of the concerns of the local community and the sensitivity towards the local customs;
- Good relations with the local communities will be promoted by encouraging the Contractor to provide opportunities for skilled and unskilled employment to the locals, as well as on-job training for workers. Contractor will restrict his permanent staff to mix with the locals to avoid any social issues;
- Local vendors will be provided with regular business by purchase camp site goods and getting services from them; and
- The Contractor will warn the workers not to indulge in any theft activities and if anyone gets involved in such activities, he will have to pay heavy penalty and would be handed over to the police. Similarly at the time of employing, the Contractor has to take care that the workers should be of good repute. The Contractor camp should be fenced properly and main gate will be locked at night with a security guard at guard to avoid any theft incidence.

7.5.16 Loss of Income

Impact Analysis

372. During the construction activities of the Tower foundations, erection and stringing of conductor, people will suffer loss in their annual income due to the loss of crops, trees etc.;

- The land under the Towers during the operation stage may restrict the current landuse for agriculture purposes;
- The restriction of plantation of trees above 2.5 m height during the operation stage may also cause the inconvenience to the locals; and
- Due to the erection of Towers and the passing of T/L, the value of land may decrease on the long term basis. This impact can be categorized as indirect, moderate, local, medium term, permanent, high probability and irreversible.

Mitigation

373. Fair, prompt and negotiated compensation for the crops and trees on private land will be provided to the affectees. Generally, the area is devoid of forest and very few trees exist along the Project corridor;

- Affectees will be involved in the valuation process at all stages of the Project i.e. soil investigations, Tower footings, Tower erection and stringing of conductors;
- Orchards with height less than 2.5 m can be grown. Similarly, cultivation of the crops can be carried out without any hindrance. However, at certain locations where other T/Ls crossing land value may depreciate. This is a residual impact.

7.5.17 Relocation of Private/Public Infrastructure

Impact Analysis

374. Removal of the infrastructure like buildings, huts, animal sheds, tube wells etc. will cause the loss of community shelters and sources of income. Although the number of public infrastructure fall into the proposed T/L route, no relocation is expected as the Project has the flexibility to provide proper horizontal/vertical clearance for safe passage over the existing infrastructure. This impact can be categorized as direct, low, site-specific, long term, temporary, low probability and reversible.

Mitigation

375. In order to mitigate or compensate the impact of land acquisition and resettlement LARP needs to be prepared;

- Utmost efforts will be made to minimize the relocation/damage to infrastructure especially houses. For this purpose, the route alignment will also be changed subject to the site conditions;
- No relocation of settlements (group of people) will be involved as the Project has flexibility to change the alignment;
- Compensation will be paid to the affectees for the built-up areas like buildings, huts, animal sheds, peter engines/electric motor sheds etc. on replacement cost basis and the land on existing agricultural land value;
- Payment of three (03) months house-rent will be made to the affectees while they will construct a new abode for their families;
- Full market price of any equipment (not shiftable) and cost of reconstruction including labour charges will be paid to the affectees;
- Affectees will be allowed the salvaging of the demolished materials; and
- All the provision of LARP should be followed.

7.5.18 Religious, Cultural and Historical Sites

Impact Analysis

376. There are no notified religious, cultural and historical sites exist in the existing/L RoW . However some graveyards were observed within existing TL RoW and there is the option to shift the alignment of the TL to some open areas. This impact can be categorized as negligible.

Mitigation

377. During detail design, efforts will be made to avoid the crossing of mosque. Incase of relocation, NTDC will compensate the owner (community/imam/caretaker) on replacement value basis and will pay the land value on agricultural land basis;

- No other religious and cultural sites like mazars/shrines, graveyards, community center etc. will be affected due to the implementation of the proposed Project; and
- No residential or other properties are located within 100 meters of the RoW of the

proposed Transmission Line.

- Similarly, no known archaeological site is located within the Project corridor; therefore, no impact on any archaeological site is envisaged. However, the Contractors will be required to train the construction crews and the site supervisors in archaeological site recognition, conservation procedures and temporary site protection. In case of a chance archaeological find during excavation, the Contractors must halt work at the site immediately and notify the concerned department through Project Director, NTDC. Chance find procedures must be developed and communicated to the contractors.

7.5.19 Health & Safety

Impact Analysis

378. The health and safety of the workforce and NTDC staff is of major concern during installation of the proposed towers and stringing of conductors as well as O&M of the system.

379. Occurrence of accidents/incidents during the construction stage is a common phenomenon and workers as well as locals will be more prone to serious accidents; and

380. The RoW falls in Sindh and Balochistan in which area is sensitive from the law and order point of view and the security of the Contractor and Consultant staff will be a major issue. This impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation

381. Following mitigation is given to avoid the accidental risks:

- Complying with the safety precautions for the construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the Project Contract;
- Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves and protective masks, goggles, shields and monitoring their proper and sustained usage.
- Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site.
- Contractors should instruct their staff to use Personnel Protective Equipments (PPEs) (e.g., wire containment, displaying warning signs along the work site, communicating advance warnings to mats) to enhance the safety.
- Safety lookouts will be built to prevent people and vehicles from passing at the time of hot or cold work.
- In the security vulnerable areas, special measures should be adopted by the

Contractor as well as the Consultant staff with the consultation of the local responsible agencies to control the law and order.

- **Safety of the workforce**

382. The Contractor will only allow trained and certified workers to install the equipment's.

383. The Contractor and NTDC will follow the ICNIRP exposure limits for occupational exposure to electric and magnetic fields during construction phase.

384. In addition, the IFC Occupational Health and Safety guidelines shall also be followed. Section 2 of the IFC General EHS Guidelines provide guidance in terms of health and safety which should be adopted by the Contractor. In particular, the contractor's attention shall be drawn to the following sections:

- Section 2.1: General Facility Design & Operation
- Section 2.2: Communication and Training
  - OHS Training
  - Visitor Orientation
  - New Task Employee and Contractor Training
  - Basic OHS Training
  - Area Signage
- Section 2.3: Physical Hazards
  - Noise
  - Vibration
  - Eye Hazards
  - Welding/Hot Work
  - Working at Heights
- Section 2.4: Chemical Hazards
- Section 2.5 Biological Hazards
- Section 2.7: Personal Protective Equipment (PPE)
- Section 2.8:
  - Confined Space
  - Lone and Isolated Workers

385. The Contractor shall prepare a Health and Safety Plan which is relevant to his chosen methodology and incorporates section 2 of the IFC General EHS Guidelines. In addition, the plan shall include the following:

- Identification of potential hazards to workers, particularly those that may be life

threatening

- Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances
- Training of workers
- Documentation and reporting of occupational accidents, diseases and incidents
- Emergency prevention, preparedness and response arrangements – including details of emergency evacuation of labour following a life threatening accident to the nearest hospitals
- Provision of security

386. This plan must be submitted to the Engineer for approval prior to any works commencing on site.

387. If required, in order to maintain proper sanitation around construction sites, temporary toilets will need to be provided. Construction worker camps will not be located in settlement areas or near sensitive water resources.

388. The comfort and health of the workforce and surrounding local residents may be affected to some extent from emissions of dust, noise and construction litter. The chances of serious injury or accident during the construction activities are moderate and can be mitigated by safety training and monitoring. Insufficient toilet provisions may give encouragement to defecation in the open and may increase transfer of water or air borne diseases. Local labor will be used wherever possible and where worker camps are needed they will include proper sanitation facilities (at lease pit latrines and showering facilities).

389. Existing health services in the localities near the project such as health posts and clinics have limited resources and may lack sufficient medicines and health personnel to accommodate any additional patients from the construction workforce.

390. Therefore in the construction stages the contractor shall provide first aid facilities for the workers on the and at the worker camps with at least one qualified first-aider.

7.5.20 Anticipated Socio-economic Impacts on the overall Project Area

7.5.20.1 Social Benefits

Impact Analysis

391. The power system equipment is subject to wear and tear with the passage of time. Also the equipment has some definite life and thus it needs replacement after its useful life. The old equipment result in frequent faults/trippings and power interruptions which hamper economic activity and production. Replacement of depleted equipment with new will reduce loss of load probability and resulting smooth and reliable power supply.

392. The continuity and reliability of electricity will be used for farm mechanization. The

much needed requirements for tube wells electrification will be adequately met which will not only provide steady water supply for irrigation but as well as reduce the ground water reservoir level in water logged and salinity hit areas. The reclamation of land will help in maintaining the cropped areas and also production. The steady availability of motive power will provide incentive for the establishment of industries based on local raw materials, creating gainful employment opportunities to the increasing work force. This is envisaged to considerably alleviate disguised unemployment on the farms.

393. In the overall analysis, the improvement in ecological environments coupled with steady production is envisaged to bring about substantial economic gains for the people living in the project area.

394. In the overall analysis, the improvement in ecological environments coupled with higher production is envisaged to bring out substantial economic gains for the people living in the project area.

Mitigation measures

No measures required.

7.6 Adverse Impacts during Operation Stage

7.6.1 Air Quality

Impact Analysis

395. The air quality during operation phase is not expected to be different than at planning and design phase and will be better than the air quality during construction phase due to the absence of large vehicular movements etc. However, the use of machinery and vehicles for routine inspection may affect the air quality to some extent but it is expected to be insignificant. This impact can be categorized as direct, low, site-specific, short term, temporary, low probability and reversible.

Mitigation measures

396. Good engineering practices such as use of properly tuned vehicles, use of silencers, prohibition of pressure horns, scheduling of O&M at appropriate timing and compliance of NEQS applicable for vehicles and ambient air quality is recommended.

397. Before installation of equipment, ensure supplied equipment commissioning is free from CFCs as required in procurement specifications. Also, SF6 gas insulated equipment to be effectively leak free with nominal SF6 top up less than 1% per year. Monitor top up of SF6 and report annually.

7.6.2 Excessive Noise Problem

Impact Analysis

398. During the operational stage some people may have to tolerate a higher noise level

due to the current flow in the conductors especially in the rainy season. Noise is generated during the ionization of the ambient air due to the electromagnetic field (EMF) around the T/L. Such a situation occurs with more severity in the rainy season when moisture in the air is relatively high. The community residing under or along the T/L may feel discomfort due to the noise generated through the passage of electric current. This impact can be categorized as direct, low, local, long term, permanent, high probability and reversible.

Mitigation

399. To overcome this problem, the route has been selected to pass through the least populated areas. Construction of houses and building structure within the RoW will be avoided and NTDC will make sure to check noise level should not cross the level of NEQs. For an area at an altitude above 1000m, the audible noise limit (L.50) caused by corona at 20m from the projection at the ground of the positive polarity conductor of DC overhead transmission line in a sunny day shall not exceed 45dB (A); in the case of the above sea level above 1000m and the line is passing through a non-residential area, it shall be controlled below 50dB (A). Considering the availability and economic costs, noise barriers will be provided between the living area and the AC filters and in the zone of converter transformers.

7.6.3 Electric Current

Impact Analysis

400. During the operational stage, electric current (induction) may travel into the towers due to short circuiting and may become a hazard to the public and livestock. This impact can be categorized as indirect, low, site-specific, long term, permanent, low probability and reversible.

401. The electromagnetic field (EMF) due to current flow in proposed T/L can cause the risk of leukemia during operational stage.

Mitigation

402. It is recommended that NTDC at the planning stage of the Project would plan necessary arrangements in the form of earthling system of the towers to avoid accidents. As exact location of towers spotting is not yet finalized at this stage. However, it is recommended that at least two diagonal legs of the towers should be properly grounded to avoid any such incident.

403. Check will be kept by the NTDC that no construction will be allowed within 100 meters of the proposed T/L.

404. The Project has been planned to pass through the least populated area and the T/L will be kept at least 100 m from the populated areas even if some effects due to EMF are envisaged, they will be minimal due to safe distance.

405. A vertical clearance required as per IFC/WHO and ICNIRCP will be maintained, especially near the populated areas.

7.6.4 Collapsing of Towers

Impact Analysis

406. Collapse of the Towers due to the high wind or earthquake will be dangerous for human as well as animal life and can cause loss to property. This impact can be categorized as direct, low, site-specific, long term, permanent, low probability and reversible.

Mitigation

407. The Towers are designed on the basis of proper subsoil investigations and climatic conditions of the area including maximum wind velocity and earthquakes, which are normally based on last 50 years data. At the time of detailed survey for fixing the Tower positions proper soil investigations needs to be carried out to check the presence of collapsible soils and if detected, Engineer will be informed immediately for design change. It needs to be ensured that no accident due to collapsing of Towers would occur during the life of the Project.

7.6.5 Breaking of Conductors

Impact Analysis

408. Breaking of conductors due to any mishap will cause a safety hazard due to the current flow in the fields and crossing over roads, canals, streams etc. This impact can be categorized as indirect, low, site-specific, long term, permanent, low probability and reversible.

Mitigation

409. The conductors are selected on the basis of local climatic conditions including maximum wind velocity, temperature and humidity conditions. So, there is almost no risk of breaking of conductors. However, due to some unavoidable circumstances, if such a situation occurs, NTDC has provided such an arrangement that the flow in the conductors will be automatically tripped instantaneously. So, no risk to human or animal life is envisaged due to the breaking of conductors.

7.6.6 Danger to Bird Movements

Impact Analysis

410. The T/L may become a danger for the movement of indigenous birds and species and fatalities may occur if the birds sit on the conductors especially in the wet conditions. Since there is an EMF around the high voltage T/L and excessive noise, no birds sit over the conductors. However, even if the birds sit over the conductors particularly in the wetland areas, the danger will arise if two phases of the current meet, but as there is

4.75 m to 5.50 m distance between the two opposite phased conductors, no danger to the birds is envisaged. This impact can be categorized as indirect, low, local, long term, permanent, low probability and reversible.

Mitigation

411. Proper clearance between the two conductors needs to be ensured.

7.6.7 Danger to Aquatic Life

Impact Analysis

412. Passing of T/L from water bodies/wetland will be a continuous danger to the aquatic life due to the erosion and chances of flow of current into the water due to short circuiting. This impact can be categorized as indirect, low, local, long term, permanent, low probability and reversible.

Mitigation

413. Buffer zones between Indus River and the existing TL (at the distance of around 2.5km from the starting towers) should be left on the banks to minimize erosion and habitat destruction; and due to the provision of insulators at the junction of the conductors and Towers, no risk of flow of current from the conductors to the wetland/water bodies is expected. No such type of accident has been observed at the existing T/L passing through the Indus River and Pat feeder canal.

7.6.8 Safety

Impact Analysis

414. The flow of electric current in the T/L will have an impact on the safety of the locals. The burning electrical equipment due to short circuiting can create a fire which can spread. This will become a safety hazard for the locals. This impact can be categorized as direct, low, local, long term, permanent, low probability and irreversible.

Mitigation

415. During the operational phase of the Project, a security plan should be employed and good engineering practices will be used for carrying out operation and maintenance activities. An effective communication system must be established so that the concerned authorities are notified in case a conductor wire falls loose.

7.6.9 Biological Resources

416. Damage to biological resources Flora, Fauna (Biota). No major change is expected in the habitat of the natural flora or fauna.

Mitigation

417. Contractor's obligation not to cause any additional destruction to Flora and Fauna of the area by respecting the limits of construction site and not to enter other territories. No unauthorized tree or bush cutting should be allowed. Should it be necessary, it

should not be done without an express permission of the RE. If the number of trees is above a limit fixed by RE, professional advice should be obtained from local Forest officer.

- **Damage to Fisheries;**

418. During construction phase, by changing the alignment of the new TL, the proposed refurbishment of the existing TL project will not result in any damage to fish population.

- **Impact on migratory birds**

419. The project site does not fall on the recognized route of globally recognized migratory water fowl or ducks. However a number of migratory birds do pass this way and stay for wintering in the river side. Since the water: land ratio is not going to change, there shall be no or slight influence of the replacement/installation on the temporary habitat of the migratory water birds.

Mitigation

420. Contractor's contractual responsibility to facilities a regular inspection by the Wildlife Department to ensure that the process of construction does not cause any hindrance to the migratory birds.

7.7 Management Structure and Manpower Requirements

421. The existing staff of NTDC will undertake the execution and operation of the project. Therefore no additional staff will be required for this project.

7.8 Cumulative Impacts

422. The IFC Performance Standard 1 (Paragraph 5) defines the broader Project area to include areas potentially impacted by cumulative impacts from further planned development of the Project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken."

423. In addition, the IFC Performance Standard 1 (Paragraph 6) states that the *"… assessment will also consider potential trans-boundary effects, such as pollution of air, or use or pollution of international waterways, as well as global impacts, such as the emission of greenhouse gases."*

424. Cumulative impacts are those impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors. Cumulative impacts are therefore generally impacts that act with others in such a way that the sum is greater than the parts. This is, however, not always the case – sometimes they will simply be the sum of the parts, but that sum becomes significant.

425. These developments may worsen or enhance the impacts identified in ***this Chapter***. Where the impacts are anticipated to be intensified by cumulative factors, these are discussed in the following sections. Given the limited information available regarding such future known and unknown developments, the assessment that follows is necessarily of a generic (qualitative) nature and focuses on key issues and sensitivities, and how these might be influenced by cumulative impacts with other planned developments.

426. The improvement in the existing transmission line project environmental impacts/effects were evaluated in the context *of* the combined effect of all past, present, and reasonably foreseeable future projects that may have or have had an impact on the resources in project area. Currently; there are only two transmission lines i.e. Guddu-Uch-Shikarpur-Sibbi and Guddu-Uch-Sibbi (see Fig: 7.1) considered for improvement under the ADB MFF and there is no further transmission lines or any other [23]Project in the pipeline within the project corridor except [24]Guddu Barrage Rehabilitation Project. However; it is confirmed by NTDC staff during consultation for this IEE that there is no overlap in the corridor of any other proposed or under construction transmission line with the existing transmission line.

427. The anticipated impacts ascertained/discussed on ambient air, noise, water, soil and biodiversity in **this Chapter** is of temporary nature during the project construction period and there is no anticipated irreversible impacts during construction or operation phase of the transmission line.

428. Although specific management measures are described for later in this Chapter, the following measures will help to holistically mitigate and manage all cumulative impacts:

[23] [23] As the targeted transmission lines are the existing transmission lines and therefore; as per NTDC policy not construction is allowed within the corridor of these existing transmission lines.

[24] This project is approximately at a distance of 3-5km from the existing TL corridor. This project is funded by World Bank and a full-fledged ESIA as well as ESMP is prepared in line with the World Bank OPs and IFC performance Standards. For mitigating any impact of the project on Indus River Dolphin, Surface Water resources and Important Bird Areas, an Indus Dolphin Management Plan as well as other relevant Environmental Code of Practices (ECoPs) are prepared and are part of the ESMP to be implemented by the Irrigation Department Government of Sindh.

Table 7.1: Risk of Potential Cumulative and Induced impacts and Mitigation

Risk of Potential Impacts	Recommended Best Practices and Risk Analysis
1. Biodiversity	
There may be anticipated intrusion in to natural habitat of Indus Dolphin as well as Fish/aquatic fauna along the Indus River and exploitation of flora and fauna. Left bank canals are expected to increase turbidity level.	The works on the section of TL aligning close to the Guddu Barrage is for very short time period and these temporary impacts can be mitigated by implementing the mitigation measured devised in this chapter as well as in the EMP (Chapter-7). In addition, the ESMP, Indus Dolphin Management Plan and impacts specific ECoPs framed for the Guddu Barrage Rehabilitation project is also in place which recommend the principles of responsible environmental stewardship; Institutional strengthening and capacity of resource agencies, such as WWF, forest and fisheries departments to meet expectations of integrated resource management. Consistent involvement and interest of all sectors of local communities/ stakeholders is part of the said ESMP.
2. In-migration Growth	
After completion of the proposed transmission Project, it is anticipated that the project area (along the corridor of TL) may attract in-migrants to the project area while the TL is commissioned. They may overwhelm the local population, infrastructure, create political tension and adversely influence the local culture and social fabric, services and utilities and may convert the productive agriculture land into settlements, contaminate the water resources and may occupy the legally entitled land and allocated.	The project is envisaged to only improve the existing infrastructure and the tail user of this TL is in Quetta and some other districts of Balochistan. The project will attract workforce only during construction phase when the requirement of workforce is high. Over the course of construction period, the ADB Core Labor Standards shall be followed by the NTDC and Contractor. There are no indigenous people in the area and all the people along the TL corridor are belonging to Baloch ethnic group and the risk of political tension or adverse influence on local culture and social fabric is not anticipated in the project area.
Shared Infrastructures	
Development of extra access routes and disturbance of the standing crops as well as agriculture land.	Proposed project developers (*NTDC and on other part if any*) should agree between them where possible, to share infrastructure (viz. access roads and transportation routes inside their project areas) to reduce the potential disturbance caused by installing several similar infrastructure in close proximity to each other.

8 Environment Management Plan

8.1 Introduction

429. The Environmental Management Plan (EMP) for the subprojects covered under this IEE has been prepared keeping in view the anticipated environmental impacts during pre-construction, construction and operational stages of the project on the existing environmental conditions including air, soil, water, socio economic and wildlife of the project area and suggests appropriate measures to mitigate the potential adverse impacts and enhance the positive impacts.

430. The compliance monitoring of mitigation measures would be ensured through the implementation of the Environmental Monitoring Plan, reporting and feedback for identifying the necessary corrective actions.

431. The Contractor shall be responsible for the complete implementation of the mitigation measures detailed in this EMP.

432. The mitigation included in the EMP will be included by NTDC as specification of the construction contract binding the Contractor to carry out the works assigned in accordance with EMP.

8.2 Objectives of the EMP

433. To facilitate the implementation of the mitigation measures, the EMP has been prepared to manage anticipated adverse environmental impacts due to the project interventions in a way which minimises these adverse impacts on the environment and socio-economics of the Project area.

434. The specific objectives of the EMP are to:

- Define the responsibilities of the project proponents, contractors, construction, supervision consultants and environmental monitors;
- Facilitate the implementation of the mitigation measures identified in the IEE;
- Define a monitoring mechanism and identify monitoring parameters;
- Provide a procedure for timely action in the face of unanticipated environmental situation;
- Maximise potential project benefits and control negative impacts;
- Draw responsibilities for project proponent, contractors, and other members of the Project team for the environmental and social management of the Project;
- Define a monitoring mechanism to ensure that the EMP achieves its desired objectives;
- Ensure the complete implementation of all mitigation measures,

- Ensure the effectiveness of the mitigation measures.
- Maintain essential ecological process through preserving biodiversity, and
- Assess training requirements for different stake holders at various levels.

435. A detailed EMP is provided in Table 8.1 that describes the respective sets of mitigation measures, monitoring and institutional arrangements to be followed during design, construction and operational stages of subprojects. The EMP also identifies the responsible parties to implement the various activities falling under EMP and to monitor its compliance.

8.3 Components of the EMP

436. The EMP has the following components.

- Organizational structure; roles and responsibilities
- Environmental monitoring plan
- Communication and documentation
- Traffic management
- Waste disposal
- Traffic Management
- Environmental training
- Restoration and Construction

8.4 Organizational Structure and Responsibilities

437. This section provides institutional arrangements for environmental management during the proposed activity and defines the roles and responsibility of the various Organizations/departments.

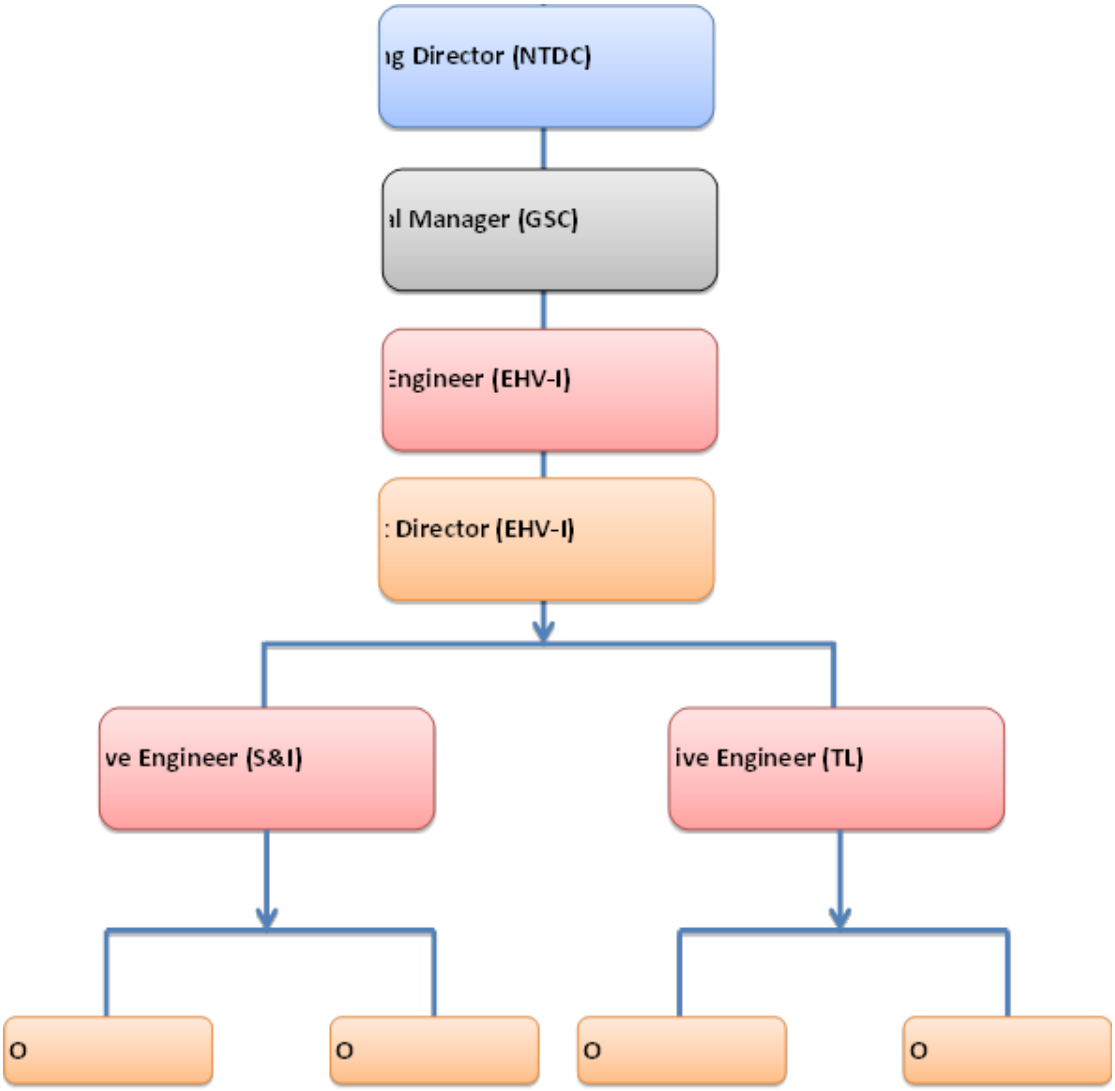
8.4.1 Management Approach

438. The responsibilities of different organizations/departments are summarized below:

8.4.2 Institutional Structure for Implementation and Operation of the Project

439. The proposed Project will be administrated by NTDC during the implementation stage as described in detail below, and the existing institutional setup of NTDC for implementation of the project is illustrated in Fig. 8.1. The existing organizational setup of NTDC for all the stages of the project (design, construction and operation) is fully integrated with handling of environment and social issues.

Figure 8.1: NTDC's Institutional Setup for Project Implementation



440. The NTDC federal headquarter is based in Lahore, and is responsible for managing the project at the policy level. At the highest level, the Chief Engineer (EHV-I) will be responsible for day-to-day project management at project implementation stage. He will report directly to the General Manager (GSC), who will have ultimate responsibility for planning and managing implementation of the projects.

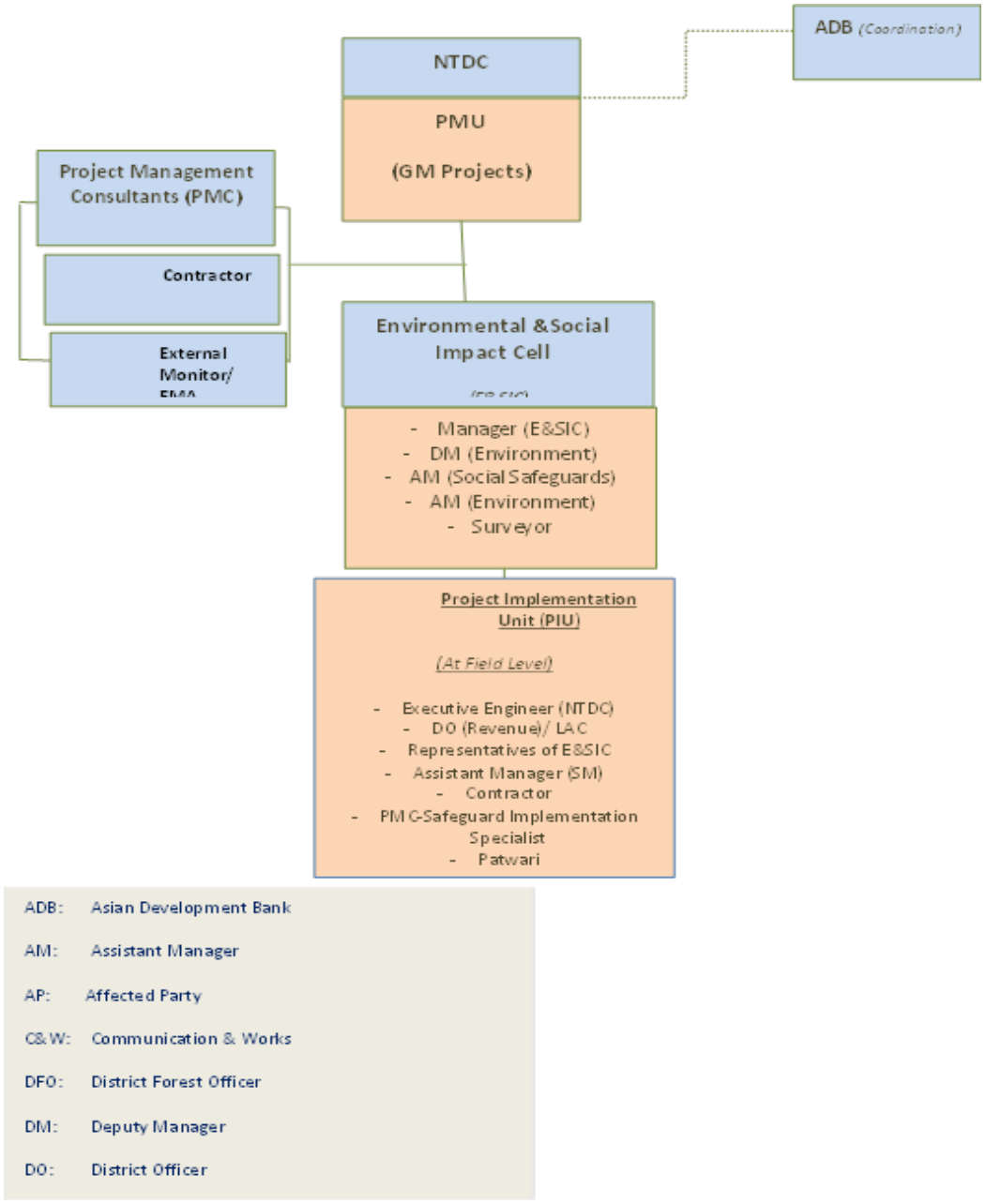
441. The Chief Engineer (EHV-I) will be assisted by Project Director, who will have overall responsibility for ensuring the project compliance with the EMP. The Project Director (PD) will be supported by two Executive Engineers i.e. Survey and Soil Investigations (SI) and Transmission Line Construction (TLC) who, will further be assisted by the concerned Sub-Divisional Officers and their teams.

442. After completion of the Project, the Project will be handed over to the GSO Division of NTDC, which is working under the Chief Engineer (GSO). He reports to the General Manager (GSO) for operation and maintenance of grid stations and transmission lines.

The Chief Engineer GSO will be supported by the Superintending Engineer for the proposed Project, who will also be assisted by Executive Engineer, Sub-Divisional Officer and his field team.

443. To ensure the community participation and to provide the environmentally and socially viable conditions, the Environment and Social Impact Cell of NTDC will extend its services and support the field teams. The Organogram of ESIC for the implementation of EMP is depicted in **Figure 8.2** below.

Figure 8.2: Organogram of NTDC Environment and Social Impact Cell



444. The EMP was prepared taking into account the capacity of the NTDC to conduct environmental assessments of the subprojects. But it is envisaged that the NTDC's Environmental and Social Impact Cell (ESIC) will conduct monitoring of subproject to check the compliance of EMP provisions and will obtain environmental approval from EPA Punjab. The ESIC is composed of one Manager, one Deputy Manager, two Assistant Managers and one surveyor (refer to Fig 8.2). Most of the environmental work is delegated to consultants. Specific areas for immediate attention are in EMP auditing, environmentally responsible procurement, air, water and noise pollution management, Social and ecological impact mitigation. It is recommended that an environmental specialist should be made part of team of supervisory consultants for effective monitoring of EMP provisions.

445. The duties of the ESIC include but not limited to followings:

- Provide review and technical support to PMU, including review of papers, feasibility studies, appraisal reports and other relevant documents from the perspective of environment and land acquisition and resettlement management, on assignment basis.
- Supervise and scrutinize the consultants hiring process for environmental and social documents preparation.
- Oversight of construction contractors for monitoring and implementing mitigation measures.
- Preparing and implementing environment policy guidelines and environmental good practices.
- Liaising with the PIUs and seeking their help to solve the environment related issues of project implementation.
- Providing awareness training workshop on environmental and social issues related to power transmission to PIU staff.
- Preparation of monthly/quarterly progress report on environmental and social safeguards for submission to financing agencies.
- Conduct seminars / local training workshops on environment safeguards matters with the help of NGOs / PIU / IFIs, etc. and
- Prepare EIAs/IEEs of new projects.
- Seek environmental approvals (NOCs) from respective EPA.

8.4.3 The PMC

446. The Project Management Consultant (PMC) is to be engaged by the project proponent (NTDC) and shall be responsible for day to day monitoring of the EMP on behalf of the Client during execution of the proposed TL refurbishment Works and shall submit periodic reports to the PMO/NTDC regarding the EMP implementation status. In general the PMC has the following responsibilities pertaining to the environmental

aspects of the project:

- Review all documents relevant to the Project (including IEE) and those to be prepared by the Contractor;
- Monitor the implementation of EMP on a regular basis during execution of civil works by the Contractor.
- Undertake effects monitoring of the pre-identified ambient air water and soil parameters in the EMP and report it in their month EMP compliance monitoring reports.
- An Environmental Unit (EU) of the Consultant shall be established and include the following key positions:

  (i) Environmental Specialist
  (ii) Environmental Inspector(s)

8.4.4 The Contractor

447. The Contractor will be overall responsible for the implementation of the EMMP as well as maintaining responsibility for environmental protection liabilities under Pak EPA Act, 1997 and Sindh, Balochistan and Punjab provincial EPA acts as well as ADB SPS, 2009, and relevant EMMP provisions for the Project. The Contractor will also be responsible for training his crews in all aspects and implementation of the EMMP. The bid should include an environmental and social mitigation budget as part of the engineering costs of the respective works. The Contractor will also be responsible to undertake effects monitoring of the pre-identified ambient air water and soil parameters in the EMP and report it in their month EMP implementation reports. The contractor's responsibilities should include the preparation of SSEMPs as required, and having them approved by ADB at least 10 days before being given access to site. Also, no access to the site will be allowed until the SSEMP is approved by the PMU. The key positions to be filled within the contractor's staff for implementation of the EMMP include:

- Environmental Coordinator
- Health & Safety Officer

8.5 Environmental Management Plan (EMP)

448. The EMP is provided in **Table 8.1** below and clearly defines the necessary mitigation measures that shall be implemented as well as the respective responsibility to implement these measures and frequency of monitoring and the responsible focal persons for the monitoring activity.

8.6 Environmental Monitoring Plan

This section provides a Monitoring plan that identifies the roles and responsibilities of Project staff involved in environmental and social monitoring, and lists the parameters that will be used in the monitoring process. **Table 8.2** presents the Monitoring plan for the different performance indicators that have been developed

Table 8.1: Environmental Management Plan-Matrix

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
Project disclosure	Ensure compliance with Provincial EPAs requirements	○ Design all changes in project and disclosed to EPA. ○ Ensure all changes in project are included in the revised/updated EMP. ○ Determine whether changes in project need additional environmental assessment and LAR surveys, these surveys shall be carried out, if necessary.	Completion of detailed design.	All project alignment.	ESIC NTDC	ESIC Cell/ Environmental Specialist	Once at the design stage
Environmentally Responsible Procurement (ERP)	Ensure environmentally responsible procurement in line with the ADB SPS 2009	○ Require in procurement specifications that the proposed equipment's are to be free from PCB and other petroleum fractions that may be injurious to	Method statement during contractor selection, prior to contract signing. No later than prequalification or tender	ESIC Cell to check contractors Method Statements include resources for mitigation measures during	ESIC NTDC and Project Design Consultant	ESIC Cell/ Environmental Specialist	A the design and Construction stages

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		environment, human health or equipment. ○ Choose non-polluting or enhancing methods. Contractor to submit Method Statement and schedule of environmental mitigation measures in response to EMP with tender. Include enhancements, techniques to reduce impacts. ○ Contractual clauses included to tie the implementation of environmental mitigation measures to a performance bond.	negotiations.	negotiations.			
Social Impacts	To ensure any	○ The social	At design stage	-	ESIC NTDC	ESIC Cell/	During

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
and Resettlement	necessary temporary land acquisition or resettlement is conducted in accordance with LARF and LARP.	preparation will be completed prior to commencement of construction. ○ All temporary acquisition and monetary compensation will be completed to minimize the uncertainty of people. ○ All the payments/entitlements will be paid according to the principles established in the entitlement matrix prepared as an integral part of the plan				Environmental Specialist	compensation process
Planning for Construction Camps	To ensure any construction camps to be developed along project corridor do not cause any	○ The sites selected for worker camps and back up areas for stockpiling materials and equipment will be planned in	At design stage	-	ESIC NTDC and Project Design Consultant	ESIC Cell/ Environmental Specialist	At the design stage

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	significant impacts related to waste disposal etc.	advance in consultation with the local community and located to avoid the most productive agriculture and will use waste/barren land and non-agricultural plots as far as possible. ○ Construction camps need to be on government owned land.					
Temporary traffic management	To ensure the movement of construction vehicles do not pose a threat to the receptors in the project area.	○ A provisional Temporary Pedestrian and Traffic Management plan will be prepared by the contractor while transporting the proposed equipment's and other associated construction material that can	At design stage	-	ESIC NTDC and Project Design Consultant	ESIC Cell/ Environmental Specialist	At the design stage

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		be updated by the contractors and agreed with ESIC cell one month prior to start of works.					
Temporary drainage and erosion control	Prevent runoff and control erosion. Include preliminary designs for Erosion Control in NTDC contract.	○ Identify locations for Erosion Control and Temporary Drainage around G/S. ○ Include designs for EC and TD in contract (s) Agree detailed EC and TD plan with NTDC / ESIC at least one month prior to construction	During first month after contract is signed but before construction. Include in the NTDC contract.	Locations based on drainage where slopes indicate erosion will be a problem based on observation	ESIC NTDC and Project Design Consultant	NTDC / and ESIC Cell.	Once at the design stage
Institutional strengthening and capacity building	Prepare ESIC Cell for implementation of EMP.	Develop strengthening plan for the environmental management by ESIC Cell as the Project rolls out.	As soon as practicable no later than one month before contract award.		ESIC NTDC and Project Design Consultant	Environmental Specialist	Once before contract award
Prepare contractors for implementation	Full and effective implementation	○ Prepare contractors to co-operate with the	During preconstruction no later than	Throughout the project	ESIC cell.	NTDC / and Environmental Specialist	Once. Before physical works and

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
of EMP	of environmental mitigation measures.	executing agency, project management, supervising consultants and local population in the mitigation of impacts. Include the approved IEE and the EMP in the contract documentation. ○ Contracts must require full implementation of the EMP. ○ Contractor to engage capable and trained.	one month after contract award				after contract award
CONSTRUCTION PHASE							
Orientation for Contractor, and Workers	To ensure that the Contractor, subcontractors and workers understand and have the capacity to ensure that the	○ Conducting special briefing and / or on-site training for the contractors and workers on the environmental requirement of the project. Record	Induction for all site agents and above before commencement of work. At early stages of construction	All staff members in all categories. monthly induction and six month refresher	ESIC Cell and PMC and Contractor and record details	ESIC Cell to observe and record success	Once. Before physical works and after contract award

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	environmental requirements for mitigation measures are implemented.	attendance and achievement. ○ Conducting special briefing and training for Contractor on the environmental requirement of the project. Record attendance and achievement. ○ Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. ○ Periodic progress review sessions to be conducted every six months	for all construction employees as far as reasonably practicable.	course as necessary until contractors comply / improve			
Submission of SSEMPs	To ensure the compliance of EMP	○ The contractor is responsible to prepare the SSEMPs as and when required, and	Before commencement of physical works and when wherever	Project corridor	Contractor	ESIC of NTDC and PMC	Before commencement of physical works and when and

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		having them approved by NTDC and ADB at least 10 days before being given access to site.	required				wherever required.
Land Resources	Temporary acquisition of land for Tower Construction, Contractors Camps, access roads, aggregate quarries etc	○ Land would be acquired through short term lease agreement between the Landowners and Contractors. Rental terms should be negotiated up to the satisfaction of the concerned landowner. ○ Compensation for loss of crops, cropping seasons, and trees to be removed from the Tower locations in the 100 m wide ROW. ○ The other general guidelines to minimize the					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		impacts on land use are: ○ Project facilities should be located at a minimum distance of 500m from the major receptors i.e. built-up areas, wildlife habitats, archaeological, cultural monuments etc. ○ Prior to the commencement of the construction activities, the Contractor should submit a development plan to the Engineer in charge and the concerned EPA (if required) for its scrutiny and approval. ○ Waste/barren land and natural areas located at high					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		elevation should be used for setting up the Project campsite.					
	Excavation of pits during the subsurface investigations for Tower foundations.	○ Backfilling, compaction and leveling to original state will avoid the accidental mishaps to people and cattle as well as check the potential land erosion.					
	Air Pollution due to the use of construction machinery and heavy vehicle during construction phase.	○ If required, concrete batching plant should be equipped with dust control equipments i.e. fabric filters, wet scrubber etc. ○ Quarterly Instrumental monitoring shall be conducted by Contractor and PMC. ○ NEQS should be enforced;	During construction stage	Construction site in particular wherever sensitive receptors exists	Contractor and PMC	ESIC	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		○ Proper tuning of vehicles should be ensured. ○ Haul trucks should be covered with tarpaulin. ○ NTDC should setup air quality monitoring system along Project corridor.					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	Noise Pollution due to the use of construction machinery and heavy vehicle during construction phase.	○ Provide the casing to the noise generating machinery as use of noise absorbing material. ○ Proper tuning of vehicle and oiling of equipment's moving parts. ○ Weekly Instrumental monitoring of sound level as per NEQS and IFC/WHO Standards. ○ NTDC should setup noise level monitoring system along the RoW near construction activities.	During construction stage	Construction site in particular wherever sensitive receptors exists	Contractor and PMC	ESIC	Weekly
	Soil erosion due to the construction activities such as clearing and	○ All disturbed areas should be protected against severe soil erosion by stripping and	During construction stage	Construction site	Contractor	ESIC and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	grabbing, excavation, filling, laying down concrete foundation for Towers and setting up construction camp.	stockpiling of the available topsoil for later re-vegetation. ○ Special slop protection in the sensitive areas i.e. desert or semi desert areas.					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	Soil contamination due to the spillage of fuel, chemicals and lubricants during the construction of T/L.	○ Contractors will train their workers in the handling and storage of the chemicals that can cause soil contamination. ○ Quarterly Soil testing will be carried out as per NEQS and IFC/WHO and Protocols by PMC and Contractor. ○ Soil contamination due to concrete transportation will be minimized by placing all containers in casings. ○ Solid waste generated at the camp sites will be properly treated and safely disposed of only in the demarcated waste disposal	During construction stage	Construction site	Contractor & PMC	ESIC	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		sites.					
	Impacts on Public infrastructure i.e. roads, canals, existing power lines etc. during construction stage.	○ For road crossings NTDC will provide adequate line clearance from road. ○ Proper traffic management plan will be prepared and construction work will be carried out at off peak hours. ○ Irrigation Canals and water courses crossing will not have any significant impact during the stringing action stage. - For Power lines crossing temporary shutdown of the existing T/Ls will be carried out and proactive coordination will be made between the construction staff	During construction stage	Construction site	Contractor	ESIC and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		and concerned grid station operation staff.					
	During the construction stage local people have to tolerate an excessive noise level due to the current flow in the conductors especially in the rainy season.	○ To proposed refurbishment is restricted to the existing rout of the TL except on some sections where this kind of structures, settlements/population or graveyards falling within RoW, the alignment may be changed. ○ Construction of houses and building structure within the RoW will be avoided and NTDC will make sure to check such type of construction during the operation stage.	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
Water Resources	Contamination of surface and ground water resources from fuel and lubricants generated from the Contractors' camps, equipment wash yards, etc.	○ The work will be carried out in such a manner that pollution of water resources is avoided. Fuel storage will be in proper bounded areas. Above surface storage tanks with polythene separators shall be used. All the spills and collected, waste products will be collected, stored and taken to the approved disposal sites as directed by the Supervisory Consultants. ○ Construction camps should be established in areas with adequate natural	During construction stage	Construction site (along the Pat feeder Canal, Secondary canals, water courses, ponds and fish farms).	Contractor and PMC	ESIC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		drainage channels in order to facilitate the flow of the treated effluents. ○ ○ For wastewater effluent according to the NEQS, the BOD5 concentration in sewage must be brought down to less than 80 mg/l and COD of less than 150 mg/l should also be checked on monthly basis. ○ ○ Similarly, if the sewage after treatment is to be discharged on to the land, it should meet the requirements of the NEQS for disposal of wastewater.					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	Siltation of Natural Streams, fish farms and Irrigation Channels	○ The excavated material will be managed by ensuring proper storage areas at location should be far away from the water bodies - At sand dunes, proper slope protection should be provided to reduce the erosion of the slopes, which may cause the siltation of natural streams.	During construction stage	Construction site (along the Pat feeder Canal, Secondary canals, water courses, ponds and fish farms).	Contractor	ESIC and PMC	Weekly
Ecological Resources	Trees and shrubs clearing at the Tower locations for foundations, stacking of materials and assembly.	○ Land holders should be paid reasonable compensation for the loss of their standing trees, in accordance with the prevailing market rates.	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly
	Clearing of vegetation at location of	○ Areas for construction camps should be kept to the minimum	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	camp facilities.	required. The camp sites should be located in plain areas, with minimum vegetation cover					
	Use of ecological resources for fuel purposes at camps.	○ Staff and labour should be strictly directed not to damage any vegetation such as trees or bushes.	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly
	Adverse impact on agriculture in RoW.	○ Land holders will be paid compensation for the loss of their standing agricultural crops in accordance with the prevailing market rates as per LAA, Telegraph Act, NTDC practices, LARF and LARP specific to the Project. ○ The landholders will also be allowed to salvage the	During construction stage	Construction site	Contractor	ESIC and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		agricultural crops and other vegetation from the affected fields. ○ Tree planting shall be conducted at suitable locations in project area, as near as possible from locations where any trees might be uprooted, if necessary. ○ Required measures for vegetation management shall be taken such as minimizing use of chemicals, avoiding invasive plant species, risk of forest fires etc.					
	Wild animals will move away from the construction areas and may get hunted by	Activities such as construction of Towers, stretching of conductors and carriage of materials will not be allowed	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	labour. Some reptiles may get killed during digging and dragging operation	during the night. ○ Lights used in the camps during the construction will be kept to the minimum required. In the wildlife sensitive areas, upward scattering lights will preferably be used. ○ Vehicle speed should be controlled to avoid incidental mortality of small mammals and reptiles.					
	Birds will try to find shelter and food somewhere else and will tend to move away from the route of T/L due to the construction activities and fear of being	○ Trees having habitat of birds should not be allowed to cut. ○ Special mitigation measures needs to be adopted to minimize impacts on the birds, such as avoiding construction activities during the	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	hunted/ trapped or killed.	critical periods of breeding and feeding. ○ Staff working on the Project should be given clear orders not to shoot, snare or trap any bird					
Social and Cultural Resources	Loss of crops	○ Compensation for the loss of crops to the land owners as per prevailing market prices. ○ The whole process of the payment should be transparent, judicious and without any discrimination or favour. ○ Minimum possible area should be disturbed for the construction of new paths or roads for carriage of machinery and	During construction stage	Construction site	Contractor	ESIC and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		materials. ○ Barren land without any crop should be selected for the camp sites.					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	Removal of the infrastructure	○ Utmost efforts will be made to minimize the relocation/damage of infrastructure especially houses. ○ Compensation will be paid to the affectees for the built-up areas like buildings, huts, animal sheds, peter engines/electric motor sheds, etc. on replacement cost basis and the land on existing agricultural land value. ○ Affectees will be allowed the salvaging of the demolished materials	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly
	Relocation of cultural and religious structures like	○ Contractors will follow the realigned route of the T/L to avoid the	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	mosques, shrines, graveyards, etc.	relocation of cultural and religious structures.					
	Conflict over the use of local water resources between locals and Contractor to meet the camp and construction requirements.	○ In areas of concern where the potable water is in short supply; the availability of water will be assessed to evaluate the impacts on the community resources. ○ Camps should be located at least 500 m away from the nearest local settlements. ○ Approval from the local administration and representatives of the concerned irrigation departments will be obtained before using the local surface water	During construction stage	Construction site	Contractor	PMC	Daily

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		resources. ○ The Contractors will be required to maintain close liaison with the local communities to ensure that any potential conflicts relating to the common resource utilization are resolved quickly. ○ Guidelines will be established to minimize the wastage of water during the construction activities and at campsites.					
	Induction of outside workers by the contractor may cause conflicts with the locals on the cultural issues related to social and	○ Contractor will take care of the concerns of the local community and the sensitivity towards the local customs. ○ Good relations with the local	During construction stage	Construction site	Contractor	ESIC and PMC	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	gender due to the unawareness of the local customs and norms. Theft problems to the community by the Contractor's workers and vice versa may also create social issues if outside labour is used by the contractor	communities will be promoted by encouraging the contractor to provide opportunities for skilled and unskilled employment to the locals, as well as on-job training for workers. Contractor will restrict his permanent staff to mix with the locals to avoid any social issues. ○ Local vendors will be provided with regular business by purchase of the camp site goods and services from them. ○ The Contractor will warn the workers not to indulge in any theft activities.					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		The Contractor camp should be fenced properly and main gate will be locked at night with a security guard to avoid any theft incidence.					
	Construction activities will create health and safety issues for workers as well as locals will be more prone to serious accidents.	○ fety precautions for the construction workers as per ILO and IFC Convention No. 62, as far as applicable to the Project contract. ○ Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves, and protective masks, goggles, shields	During construction stage	Construction site	Contractor	PMC	Daily

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		and monitoring their proper and sustained usage. ○ Ensure the provision of medicines, first aid kits, ambulance, etc. at the camp site. ○ Contractors should be warned to their staff about using Personnel Protective Equipment (PPEs) (e.g., wire containment, displaying warning signs along the work site, communicating advance warnings to mats) to enhance the blasting safety. ○ Safety lookouts will be built to prevent people and vehicles from					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		passing at the time of blasting. ○ In the security vulnerable areas, special measures should be adopted by the Contractor as well as the Consultant staff with the consultation of the local responsible agencies to control the law and order.					
Plans to control environmental and associated impacts	Avoid impacts from unplanned activities by penalizing contractors for not committing to properly planning works	○ Drainage management plan, ○ Temporary pedestrian and traffic management plan, ○ Erosion control and temporary drainage plan, ○ Materials management plan, ○ Waste management plan; 6. Noise and dust	Deliverable in final form to NTDC one month before construction commences for any given stretch.	NTDC proposed project site.	Contractor	ESIC Cell and PMC.	Once before construction works commencement

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		control plan, ○ Safety Plan ○ Prepare SSEMPs where and when and when required					
Water quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively.	○ Proper monthly instrumental monitoring of TDS, TSS, EC etc. to measures the quality of water in compliance with the NEQS and IFC/WHO. ○ training of operators and other workers to avoid pollution of water bodies by the considerate operation of construction machinery and equipment and reporting and feedback to ESIC cell, ○ Storage of	Prior to construction, 50m from water bodies Timing will depend on the construction timetable.	Relevant locations of Pat Feeder Canal, other secondary canals, Minors/Distrys and water courses are construction within 50m of any water body.	Contractor and PMC	ESIC Cell	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. ○ No stockpiles next ling to water bodies. ○ Proper disposal of solid waste from construction activities & worker camps.					
Spoil disposal and construction waste disposal	To minimize the environmental impacts arising from generation of spoil waste, reuse where possible and provide adequate disposal options for	○ Implement Waste Management Plan. ○ Confirm conditions and safety of proposed disposal sites. ○ Confirm amounts of surplus rock based materials that can be reused in the project or by other interested	Before construction commences, Include in the contract. UPDATE Once a month	Locations approved by ESIC Cell/ local authority. A list of temporary dumping sites to be prepared at the bidding stage for agreement.	Contractor.	ESIC Cell and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	unsuitable soils.	parties for public projects. ○ Confirm sufficient locations in the contract for disposal of at least 4,000,000m^3 spoil (or best updated estimate). ○ In contracts specify locations for disposal of all construction waste and spoil at unit rates for measurement. ○ Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. ○ Waste oil must not be burned. – Oil and solid waste disposal location to be agreed with					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		NTDC and local authority.					
Noise	To minimize noise level increases and ground vibrations during construction operations	○ Open burning will not be allowed. ○ Weekly instrumental noise monitoring by PMC and Contractor ○ The project equipment, particularly transformers to be installed at the grid stations will meet the noise standards (NEQS and IFC/WHO) (70 dB(A) for industrial zones day and night; 45 dB(A) night and 55 dB(A) daytime for residential ○ To minimize noise level increases and ground vibrations during construction operations.	Maximum allowable noise levels are 70dB(A)LEQ.	Strong follow up from ESIC Cell required to update locations monthly Potential noise impact locations will be within 100m near all settlements and towns.	Contractor and PMC.	ESIC Cell	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		○ Install, maintain and monitor all requisite mitigation as per contract all transformers and machinery shall be fitted with acoustic insulation.					
Air quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere	○ Control all dusty materials at source. ○ Quarterly Instrumental air quality monitoring in compliance with the NEQS and IFC/WHO by PMC and Contractor. ○ Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. ○ Fuel-efficient and well-maintained haulage trucks shall be employed to minimize	Dust control planning will be a line item in the approval of setting up dust producing activities. A schedule of spraying water to be revised monthly	A list of locations to be included in contract and other sensitive areas identified during works	Contractor and PMC.	ESIC Cell	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		exhaust emissions. ○ Vehicles transporting soil, sand and other construction materials shall be covered. ○ Limitations to speeds of such vehicles necessary. ○ Transport through densely populated area should be avoided. ○ Spray bare ground areas with water.					
Soil Contamination	Contamination Avoid soil contamination	○ Contractors to instruct and train workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination. ○ Instrument soil quality monitoring	Instruct before works commence and throughout all construction works.	NTDC proposed project site.	Contractor.	ESIC Cell and PMC	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		by PMC and Contractor. ○ Accidentally spills on open ground including the top 2cm of any contaminated soil shall be disposed of as chemical waste to a disposal site acceptable to the local authority / community.					
Safety Precautions for Workers	To ensure physical safety of workers	○ Follow the IFC OHS guidelines and ICNIRP exposure limits for occupational exposure to electric and magnetic fields during replacement of the equipment's. ○ Submit Safety Plan one month before commencement of construction. 2. Providing adequate warning signs. 3.	During construction	NTDC proposed project site.	Contractor.	ESIC Cell and PMC	Weekly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		Providing every worker with skull guard or hard hat and safety shoes. 4. Establish all relevant safety measures as required by law and good engineering practices. 5. The Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment.					
Grievance Redress	To ensure that the stakeholder or affected people's concerns, complaints and grievances about the project environmental performance	○ Official in charge of people's grievance will be designated. ○ A leaflet outlining environmental protection measures and listing grievance contact points will be distributed. ○ Community leaders	Throughout the project	Villages close to TL corridor sites.	Contractor	ESIC Cell Grievance/Community Liaison Specialist and PMC	Regularly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	will be received recorded and replied in a systematic way	will be given detailed information on the grievance. ○ NGOs will be informed in the same manner as the community leaders.					
OPERATION PHASE							
Air Quality	To minimize and monitor air pollution and release of greenhouse gasses	Before installation of equipment ensure supplied equipment commissioning is free from CFCs as required in procurement specifications. 2. SF6 gas insulated equipment to be effectively leak free with nominal SF6 top up less than 1% per year. Monitor top up of SF6 and report annually	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Quarterly
Noise	To minimize noise levels	○ Construction of houses and	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	and ensure they do not exceed the WHO/IFC and applicable national guidelines on noise	building structures within the RoW will be avoided and NTDC will make sure to check noise level should not cross the level of NEQS. ○ For an area at an altitude above 1000m, the audible noise limit (L.50) caused by corona at 20m from the projection at the ground of the positive polarity conductor of DC overhead transmission line in a sunny day shall not exceed 45dB (A); in the case of the above sea level above 1000m and the line is passing through a non-residential area, it shall be controlled					

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		below 50dB (A). ○ Considering the availability and economic costs, noise barriers will be provided between the living area and the AC filters and in the zone of converter transformers.					
Safety hazards	Impacts on physical health of the NTDC staff	NTDC O&M staff will be provided essential protective gears and equipment. ○ NTDC O&M staff will be provided safety training. ○ Refresher courses will be arranged on regular basis. ○ Firefighting equipment will be made available at the grid stations.	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Quarterly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	The restriction of plantation of trees above 2.5 m height during the operation stage may also cause the inconvenience to the locals.	Orchards with height less than 2.5 m can be grown. Similarly, cultivation of the crops can be carried out without any let or hindrance.	During Operation	Along the route of TL	NTDC	NTDC ESIA Cell	Monthly
	During the operational stage, electric current (induction) may travel into the Towers due to short circuiting and may become a hazard to the public /animals.	Earthing system of the Towers to avoid accidents and at least two diagonal legs of the Towers should be properly grounded.	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly
	Collapse of the Towers due to the high wind or earthquake will be dangerous for human as well as animal life	○ The Towers are designed on the basis of proper subsoil investigations and climatic conditions of the area including maximum	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	and can cause loss to property.	wind velocity and earthquakes which are normally based on last 50 years data. o At the time of detailed survey for fixing the Tower positions proper soil investigations will be carried out to check the presence of collapsible soils and if detected, Engineer will be informed immediately for design change. It will be ensured that no accident due to collapsing of Towers would occur during the life of the Project.					
	Limited use of agricultural land under the Towers during operation	After construction of Towers, the land can mostly be used for agriculture, as observed along the	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	phase.	existing 66/132/220/500kV T/Ls in Pakistan.					
	The electromagnetic field (EMF) due to current flow in proposed T/L can cause the risk of leukemia during operational stage	○ The Project has been planned to pass through the least populated area and the T/L will be kept at least 100 m from the populated areas even if some effects due to EMF are envisaged will be minimal due to safe distance. ○ A vertical clearance required as per IFC/WHO and ICNIRCP will be maintained especially near the populated areas. ○ Check will be kept by the NTDC that no construction will be allowed within 100 m of the	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
		proposed T/L.					
	Breaking of conductors due to any mishap will cause a safety hazard due to the current flow in the fields and crossing over roads, canals, streams etc.	The conductors are selected on the basis of local climatic conditions including maximum wind velocity, temperature and humidity conditions. So, there is almost no risk of breaking of conductors. However, due to some unavoidable circumstances, if such a situation occurs, NTDC has to provide such an arrangement that the flow in the conductors will be automatically tripped instantaneously.	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly
	During operation the T/L may become a danger to the movement of indigenous	Since there is an EMF around the high voltage T/L and excessive noise, no birds sit over the conductors. - However, even if the	During operation	RoW of TL	NTDC	NTDC and ESIC Cell	Monthly

Environmental Impacts/aspects	Objectives	Mitigation Measures Recommended	Timing to Implement Mitigation Measures	Locations to implement MM	Responsibility to implement MM	Monitoring	Frequency of MM
DESIGN PHASE							
	birds and species and fatalities may occur if the birds sit on the conductors especially in the wet conditions	birds sit over the conductors particularly in the wetland areas, the danger will arise if two phases of the current meet, but as there is 4.75 m to 5.50 m distance between the two opposite phased conductors, no danger to the birds is envisaged.					

Table 8.2: Environmental Monitoring Plan for Performance Indicators

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
Review of EMP	EMP is reviewed	During detailed design (later monthly by Contractor to cover any unidentified impacts)	By completion of detailed design	NTDC proposed Grid Stations.	Contractor	Initially NTDC Cell / later Contractor cost	NTDC, ESIC cell / Environmental Specialist	ESIC cell staff cost
Project disclosure	Design changes notified	During detailed design by Contractor.	Complete on of detailed design.	NTDC proposed Grid Stations.	Contractor	Contractor cost	NTDC, ESIC cell / Environmental Specialist	ESIC cell staff cost
Environmentally Responsible procurement (ERP)	Contract follows ADB Guidelines on ERP Performance bond. Deposited Contractual clauses include implementation of environmental mitigation measures tied to a performance bond.	Once, before Contract is signed	Once, before Contract is signed	Method Statements	NTDC Project Cell	Contractor cost	NTDC, ESIC cell / Environmental Specialist and PMC	ESIC cell staff cost and PMC consultancy services
Waste disposal	Disposal options for all waste transformer oil, residually contaminated soils, scrap metal agreed with NTDC and local authority	1. Monthly or as required in waste management plan to identify sufficient	1.Prior to detailed design stage no later than prequalification on or tender negotiate ones	Locations approved by local waste disposal authorities	NTDC cell with the design/supervision consultant.	ESIC	ESIC	NTDC

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
		locations for, storage and reuse of transformers and recycling of breaker oils and disposal of transformer oil, residually contaminated soils and scrap metal 2. Include in contracts for unit rates for re-measurement for disposal. 3. After agreement with local authority, designate disposal sites in the contract and cost unit disposal	2. Include in contract					

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
		rates accordingly.						
Noise and air quality mitigation in design.	Design changes included in IEE (supplementary) & EMP approved by provincial EPAs	During detailed design by Contractor	Complete on of detailed design	As defined in IEE (supplementary) & EMP	NTDC Cell /PMC Contractor	Contractor cost	NTDC / /Environment specialist	NTDC Cell staff cost
Hydrological Impacts	Temporary Drainage Management plan.	During detailed design by Contractor and monthly to cover any unidentified impacts	One month before commencement of construction on	Considered locations to be as identified in the Detailed Drainage Report	Contractor	Contractor cost	NTDC / and NTDC Project Cell	NTDC Cell staff cost
Planning construction camps	Use of land agreed with surrounding residents & villages.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	Locations agreed NTDC cell in consultation with community and the Contractor	Contractor NTDC Cell facilitates and PMC.	Contractor cost	NTDC / and NTDC Project Cell.	NTDC Cell staff cost
Traffic Condition	Temporary Pedestrian and Traffic Management Plan agreed.	During detailed design updated by Contractor monthly to	One month before construction commences.	Locations agreed with NTDC cell in consultation with community and the	Contractor	Contractor cost	NTDC / and NTDC Project Cell.	NTDC Cell staff cost

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
		cover any unidentified impacts.		Contractor.				
Institutional strengthening and capacity building	Strengthening plan agreed for NTDC cell.	Once	As soon as practicable e	Throughout the project	NTDC Project Cell.	NTDC Cell staff cost	NTDC / and / Environmental Specialist.	NTDC Cell staff cost
Health & Safety	To ensure all health and safety aspects are considered during the project design phase.	At project design stage	Design Stage	Project Area	NTDC Project Cell.	NTDC Cell staff cost	NTDC / and / Environmental Specialist.	NTDC Cell staff cost
CONSTRUCTION PHASE								
.Orientation for Contractor, and Workers	• Contractor agreed to provide training to professional staff and workers. • Special briefing and training for Contractor completed. 3. Periodic progress review sessions.	1. Once	1. Before contract is signed 2. Before construction areas are opened up 3. Every six months	All staff members in all categories. monthly induction and six month refresher course	Contractor with ESIC-NTDC and PMC assistance and record details.	Contractor cost	NTDC and PMC to observe and record success	NTDC Cell staff cost and PMC consultancy services
Preservation of biodiversity	• A few birds may shift to other trees in nearby localities.							
Trees cutting	• Cutting / felling of carefully selected trees Compensatory							

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
	plantation of required number of trees at suitable sites,							
Impacts on the existing commercial fish farms within RoW is anticipated.	• Alignment may be changed to avoid any adverse impacts on the existing Fish Ponds.							
Plans to control environmental impacts	1. Drainage Management plan 2. Temp. Pedestrian & Traffic Management plan, 3. Erosion Control & Temp. Drainage plan 4. Materials Management plan, 5. Waste Management plan; 6. Noise and Dust Control plan, 7. Safety Plan 8. Agreed schedule of costs for environmental mitigation.{N.B. Forest Clearance and Compensatory Planting	Deliverable in final form to NTDC cell one month before construction commences for any given stretch.	One month before construction commencement	All of NTDC Grid Stations	Contractor	Contractor cost	NTDC Project Cell and PMC	NTDC Cell staff cost and PMC consultancy services

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
	plan is prepared by NTDC cell}							
Spoil disposal and construction waste disposal	1. Use of land agreed with surrounding residents & VILLAGEs. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	NTDC proposed project site.	Contractor	Contractor cost	NTDC and PMC	NTDC Cell staff cost and PMC consultancy services
Noise	Noise mitigation measures implemented in line with guidelines for noise reduction from ISO/TR116881:1995(E)	Monthly (line item when opening up construction).	Maximum allowable noise levels are 70dB(A)L EQ.	At and around NTDC proposed Grid Stations.	Contractor should maintain the accepted NEQS and IFC/WHO	Contractor cost	NTDC / NTDC Project to be assisted by PMC	NTDC Cell staff cost and PMC consultancy services
Air quality	Noise and dust control plan implemented.	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed Grid Stations.	Contractor	Contractor cost	PMC and NTDC Cell	NTDC Cell staff cost and PMC consultancy services
Soil Contamination	Contractors workforce instructed and trained in handling of chemicals	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed Grid Stations.	Contractor	Contractor cost	PMC and NTDC Cell	NTDC Cell staff cost and PMC consultancy services
Work Camp Location and Operation	1. Use of land agreed with surrounding residents & villages. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed Grid Stations.	Contractor	Contractor cost	PMC and NTDC Cell	NTDC Cell staff cost and PMC consultancy services

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI super vision	Cost of Supervision
DESIGN PHASE								
Safety Precautions for Workers	Safety Plan submitted	Once (update monthly as necessary)	One month before constructi on and update quarterly.	At and around NTDC proposed Grid Stations.	Contractor	Contractor cost	PMC and NTDC Cell	NTDC Cell staff cost and PMC consultancy services
OPERATION PHASE								
Air Quality	1. Roadworthiness of vehicles on NTDC. 2. Monitor NO2 and PM10 as indicators	1. Road worthiness s of vehicles on NTDC Daily during operations 2. Yearly intervals for 3 years after opening for reassurance	During operation	At and around NTDC proposed Grid Stations.	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost

8.7 Estimated Environmental and Social Management Costs

449. **Table 8.3** provides the estimated costs for the compensation of trees damages and implementation of EMP. The compensation costs include the costs for cutting of trees due to construction of subproject. It should be noted that as referred earlier that the project is at a preliminary stage and detailed surveys including tower spotting is to be carried out for the project showing the actual position of the towers, so at this stage only tentative and lump sum amount has been allocated for the expected losses and is based on the environmental and social field surveys.

450. The cost for implementation of mitigation measures prescribed in Environmental Management Plan (EMP) has also been given. The mitigation measures include; water sprinkling, provision of PPEs to workers, arrangement of first aid kits at site, waste management etc.

451. The total estimated cost for the environmental and social management comes to about Pak **PKR 9,682,000**. This includes the cost of environmental implementation of mitigation measure. Cost estimates of mitigation and other environmental management measures are summarized in **Table 8.3**.

Table 8.3: Estimated Environmental and Social Management Costs

Particulars	Details	Total Cost (PKR)
Staffing, audit and monitoring	1 person for 3 years[1]	2,160,000
Effects Monitoring	As detailed under EMP[2]	10,00,000
Mitigation measures	As prescribed under EMP and IEE[3]	30,00,000
	(i) Dust Suppression	10,00,000
	(ii) Tree replanting	500,000
	(iii) Visibility enhancement objects (marker balls etc)	15,00,000
Transport	1 dedicated vehicle 3 years[4]	3,240,000
Contingency	3% contingency	282,000
Total		**9,682,000**

Note:

[1] @ rate of PKR 60,000/month

[2] Laboratory charges for: testing of construction materials; water quality tests; ambient air tests; emissions measurements; and noise measurements.

[3] Includes; Compensatory tree plantation under supervision of forest department and training on counterpart staff

[4] @ PKR 90,000 per month rental charges and fuel and operating cost.

9 Grievance Redress Mechanism

9.1 Overview

452. In order to receive and facilitate the resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance an Environmental Grievance Redress Mechanism (GRM) will be established for the sub-project. The mechanism will be used for addressing any complaints that arise during the implementation of projects. In addition, the GRM will include a proactive component whereby at the commencement of construction of sub-project (prior to mobilization) the community will be formally advised of project implementation details by NTDC, the design and supervision consultant (DSC) and the contractor (designs, scheduled activities, access constraints etc) so that all necessary project information is communicated effectively to the community and their immediate concerns can be addressed. This proactive approach with communities will be pursued throughout the implementation of each project.

453. The GRM will address affected people's concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. The mechanism will not impede access to the Country's judicial or administrative remedies.

9.2 Redress Committee, Focal Points, Complaints Reporting, Recording and Monitoring

454. The Grievance Redress Mechanism, which will be established at sub-project level is described below:

455. The NTDC will facilitate the establishment of a Grievance Redress Committee (GRC) and Grievance Focal Points (GFPs) on sub-project location prior to the Contractor's mobilization to site. The functions of the GRC and GFPs are to address concerns and grievances of the local communities and affected parties as necessary.

456. The GRC will comprise representatives from local authorities, affected parties, and other well-reputed persons from health or education sectors, as mutually agreed with the local authorities and affected persons. It will also comprise the Contractor's Environmental Specialist, DSC's Environmental Specialist and NTDC Safeguards/Environmental specialist. The role of the GRC is to address the Project related grievances of the affected parties that are unable to be resolved satisfactorily through the initial stages of the Grievance Redress Mechanism (GRM).

457. The NTDC will assist affected communities/villages identify local representatives to act as Grievance Focal Points (GFP) for each community/village.

458. GFPs are designated personnel from within the community who will be responsible for i) acting as community representatives in formal meetings between the project team (contractor, DSC, NTDC) and the local community he/she represents and ii) communicating community members' grievances and concerns to the contractor during project implementation. The number of GFPs to be identified for each project will depend on the number and distribution of affected communities.

459. A pre-mobilization public consultation meeting will be convened by the NTDC Environment Specialist for sub-project and attended by GFPs, contractor, DSC, NTDC representative and other interested parties (eg. District level representatives, NGOs). The objectives of the meeting will be as follows:

(i) Introduction of key personnel of each stakeholder including roles and responsibilities,

(ii) Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a brief summary of the EMP - its purpose and implementation arrangements;

(iii) Establishment and clarification of the GRM to be implemented during project implementation including routine (proactive) public relations activities proposed by the project team (contractor, DSC, NTDC) to ensure communities are continually advised of project progress and associated constraints throughout project implementation;

(iv) Identification of members of the Grievance Redress Committee (GRC)

(v) Elicit and address the immediate concerns of the community based on information provided above

460. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below and shown in **Figure 9.1** below.

(i) Individuals will lodge their environmental complaint/grievance with their respective community's nominated GFP.

(ii) The GFP will bring the individual's complaint to the attention of the Contractor.

(iii) The Contractor will record the complaint in the onsite Environmental Complaints Register (ECR) in the presence of the GFP.

(iv) The GFP will discuss the complaint with the Contractor and have it resolved;

(v) If the Contractor does not resolve the complaint within one week, then the GFP will bring the complaint to the attention of the DSC's Environmental

Specialist. The DSC's Environment Specialist will then be responsible for coordinating with the Contractor in solving the issue.

(vi) If the Complaint is not resolved within 2 weeks the GFP will present the complaint to the Grievance Redress Committee (GRC).

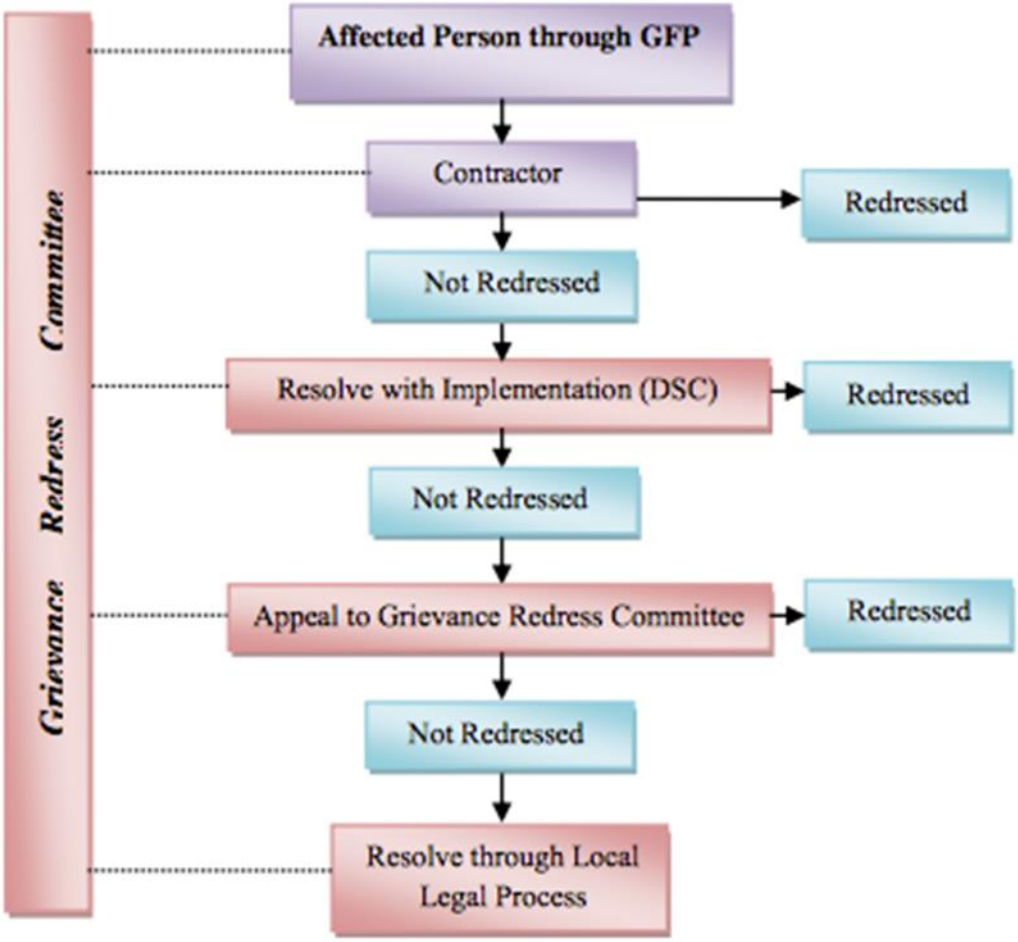
(vii) The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the community. The Contractor will then record the complaint as resolved and closed in the Environmental Complaints Register.

(viii) Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes.

(ix) In parallel to the ECR placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution.

(x) EA will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the DSC and will ensure that they are resolved in a timely manner.

Figure 9.1: Grievance Redress Mechanism



10 Conclusion And Recommendations

10.1 Conclusion

461. The construction of the new 220 kV TL by replacement of the existing TL along the same alignment will have many positive impacts for Pakistan and in particular for Balochistan province. The development of this transmission line sub-project is of national significance and is of critical importance considering the significant energy deficit being faced by the country since several years.

462. Primary and secondary data has been used to assess the environmental impacts of the sub-project. This IEE report highlights any potential environmental impacts associated from the transmission line development and recommends mitigation measures, wherever felt necessary. All environmental impacts associated with the sub-project development need to be properly mitigated, wherever required, through the existing institutional arrangements described in this report.

463. The majority of the environmental impacts, however minimal and temporary in nature, are associated with the construction phase of the sub-project. The implementation of mitigation measures during this period will be the responsibility of the Contractor. Therefore, the required environmental mitigation measures will have to be clearly defined in the bidding and Contract documents, and appropriately qualified environmental staff retained by the Consultant to supervise the implementation process.

464. This IEE concludes that no significant negative environmental impacts are likely to occur due to construction and normal operations of the proposed sub-project, provided mitigation measures are implemented and the proposed monitoring program is adequately carried out. The EMP includes measures to minimize project impacts due to noise and air pollution, waste generation etc.

465. The sub-project has been assigned environmental category ‘B’ in accordance with the ADB’s Safeguard Policy Statement (SPS) 2009 and Schedule II as per PEPA, IEE and EIA Gazette Notification, 2000. Thus, this IEE report with the associated EMP is regarded as sufficient environmental assessment of this project and a full EIA is not required.

10.2 Recommendations

466. Although comprehensive mitigation measures have been proposed in the report to minimize the negative impacts and to enhance the positive impacts of the Project, however, major recommended mitigation measures are summarized as under:

- Soil erosion and contamination, water contamination, air pollution and high

noise levels should be controlled with the use of good engineering practices.

- Contractor should develop plan such as traffic management, Solid waste management and material management etc. before commencing the construction activities.
- Contractor should warn the workers not to hunt the water birds, fish resources, etc.
- The Contractor will have to adopt some suitable timing for the construction activities so as to cause the least disturbance to the local community particularly women considering their peak movement hours.
- Contractor should take due care of the local community and its sensitivity towards local customs and traditions.
- EMP proposed in Chapter 8 shall be implemented in the true letter and spirit.

ANNEXURE-I: Rapid Environmental Assessment Checklist

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: TA-8818 PAK: Power Transmission Enhancement Investment Program-II- Sub-project 4: Construction of new 220 kV Guddu – Shikarpur – Uch – Sibbi Transmission Line.

Sector Division: Energy Division, CWRD

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site		X	Some local graveyards are falling within the wayleave/RoW of the existing transmission line. This aspect will be further investigated during IEE baseline surveys and mitigation measures will be devised in the EMP.
▪ Protected Area		X	The location of Nari River Bank Protected Forest Sibi is at the distance of 1.5 to 2km from the existing transmission line and no adverse impcts are anticipated.
▪ Wetland		X	Some fish farms are falling within the exiting wayleave/RoW of overhead transmission line and mitigation measures will be devised in the EMP to mitigate the anticipated negative impacts.
▪ Mangrove		X	
▪ Estuarine		X	
▪ Buffer zone of protected area		X	
▪ Special area for protecting biodiversity		X	

Screening Questions	Yes	No	Remarks
B. Potential Environmental Impacts Will the Project cause…			
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?		X	This aspect will be further investigated during IEE baseline surveys.
▪ encroachment on precious ecosystem (e.g. sensitive or protected areas)?		X	
▪ alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?	X		The existing transmission line is crossing the Patfeeder Canal, secondary canals, minors/Distrys, water courses and private fish farms. But the impact will be minimum and limited to the tower foundation sites. The siting of the towers may be changed or appropriate mitigation measures will be devised in the EMP to address the anticipated impacts.
▪ damage to sensitive coastal/marine habitats by construction of submarine cables?		X	Such activities are not involved in proposed project.
▪ deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	X		The respective mitigation measure in line with international good practices will be devised in the EMP.
▪ increased local air pollution due to rock crushing, cutting and filling?	X		Appropriate mitigation measure will be adopted in the EMP to minimize the impacts.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		The major OHS hazards are the live power line, working at height, electric and magnetic fields and exposure to chemicals (if required). The impacts will be short term and will be observed only in construction phase. Respective mitigation measures in line with international good practices like IFC general EHS guidelines and ICNIRP exposure guideline for occupation exposure will be adopted in the EMP to minimize the impacts.
▪ chemical pollution resulting from chemical clearing of vegetation for construction site?		X	NTDC does not use any chemicals like pesticides for vegetation removal and use of (if avoidable) PCBs as well as SF6.
▪ noise and vibration due to blasting and other civil works?		X	Blasting will not be involved, but the noise and vibration will be generated during construction phase by heavy machinery.
▪ dislocation or involuntary resettlement of people?	X		Some of the communities are settled within existing RoW of the existing overhead transmission line. These communities are to be impacted during decommissioning and construction of the transmission line. This impact can be mitigated through minor change in alignment or adoption of internationally good practices like adoption of IFC general EHS guidelines.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable		X	

Screening Questions	Yes	No	Remarks
groups?			
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?	X		Contractors will be strictly advised not to interfere with the local community resources.
▪ hazardous driving conditions where construction interferes with pre-existing roads?	X		The drivers will be advised to keep the speed below 30km/hr to avoid hazardous circumstances.
▪ creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?	X		This impact can be minimized by proper waste management at camp sites.
▪ dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?	X		Some of the communities are settled within existing RoW of the existing transmission line. These communities are to be impacted at the stage of decommission existing transmission line or some towers, during construction and after commissioning of the transmission line. This impact can be mitigated through change in alignment and adoption of international good practices in the EMP.
▪ environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	X		
▪ facilitation of access to protected areas in case corridors traverse protected areas?		X	There is no protected area along the wayleave/ RoW of existing transmission line.
▪ disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		X	NTDC does not use any herbicide for vegetation control or removal.
▪ large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?	X		Contractors will be advised to arrange their own resources for project construction activities.
▪ social conflicts if workers from other regions or countries are hired?	X		The NTDC in coordination with the local police and other law enforcement agencies will devise security management plan for the safety of workers and project staff.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		These impacts can be mitigated by proposer implementation of EMP provisions regarding health and safety.
▪ risks to community safety associated with maintenance of lines and related facilities?	X		These impacts are to be mitigated in line with the international good practices like IFC general EHS guidelines.
▪ community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?	X		All these impacts will be mitigated by implementing EMP provisions during all the stages of project implementation.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during	X		Explosive material will not be used, but other materials like fuel, oil etc. will be kept in the construction camps only.

Screening Questions	Yes	No	Remarks
construction and operation?			Transport and disposal of such materials will be according to protective measures to be devised in EMP. Therefore, risk to community health and safety will be manageable.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., high voltage wires, and transmission towers and lines) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	X		These impacts are to be mitigated in line with the international good practices like ICNIRP and IFC general EHS guidelines.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	**Yes**	**No**	**Remarks**
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?		**X**	
▪ Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost?		**X**	
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		**X**	
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)?		**X**	

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change
Arid/Semi-arid and desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.
River valleys/ deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.
Small islands	Small islands generally have land areas of less than 10,000km^2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.

ANNEXURE-II: National Environmental Quality Standards (NEQS)

Table 1: Selected NEQS for Waste Effluents

Parameter	Unit	Standards (maximum allowable limit)
TEMMPerature increase	^{o}C	<3
pH value (acidity / basicity)	pH	6-9
5-day biochemical oxygen demand (BOD) AT 20 ^{O}C	mg/l	80
Chemical oxygen demand (COD)	mg/l	150
Total dissolved solids	mg/l	200
Total dissolved solids	mg/l	3,500
Grease and oil	mg/l	10
Phenolic compounds (as phenol)	mg/l	0.1
Chloride (as Cl)	mg/l	1.0
Fluoride (as F)	mg/l	10
Sulfate (SO_4)	mg/l	600
Ammonia (NH_3)	mg/l	40
Cadmium	mg/l	0.1
Chromium (trivalent and hexavalent)	mg/l	1.0
Copper	mg/l	1.0
Lead	mg/l	0.5
Mercury	mg/l	0.01
Selenium	mg/l	0.5
Nickel	mg/l	1.0
Silver	mg/l	1.0
Total toxic metals	mg/l	2.0
Zinc	mg/l	5
Arsenic	mg/l	1.0
Barium	mg/l	1.5
Iron	mg/l	8.0
Manganese	mg/l	1.5
Boron	mg/l	6.0
Chlorine	mg/l	1.0

Notes:

1. The standard assumes that dilution of 1:10 on discharge is available. That is, for each cubic meter of treated effluent, the recipient water body should have 10 m^3 of water for dilution of this effluent.
2. Toxic metals include cadmium, chromium, copper, lead, mercury, selenium, nickel and silver. The effluent should meet the individual standards for these metals as well as the standard for total toxic metal concentration.

Source: Government of Pakistan (2000) (SRO 549(I)/2000).

Table 2: NEQS for Industrial Gaseous Emissions
mg/Nm³ unless otherwise stated

Parameter	Source of Emission	Standards (maximum allowable limit)
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
matter [1]	(a) Boilers and furnaces: i. Oil fired ii. Coal fired iii. Cement Kilns	300 500 300
	(b) Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas.	500
hloride	Any	400
Chlorine	Any	150
uoride	Any	150
ulphide	Any	10
Sulphur Oxides [2,3]	Sulfuric acid/Sulphonic acid plants	5,000
	Other Plants except power Plants operating on oil and coal	1,700
noxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
itrogen [3]	Nitric acid manufacturing unit	3,000
	Other plants except power plants operating on oil or coal: i. Gas fired ii. Oil fired coal fired	400 600 1,200

Explanations:

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause 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 NEQS specified above, comply with the standards provided separately.

Source: Government of Pakistan (2000) (SRO 549 (I)/2000).

Table 3: National Environmental Quality Standards for Ambient Air [7]

Pollutants	Time-Weighted Average	Concentration in Ambient Air		Method of Measurement
		Effective from 1st July 2010	Effective from 1st January 2013	
Sulfur Dioxide (SO_2)	Annual Average *	80 µg/m3	80 µg/m3	Ultraviolet Fluorescence
	24 hours**	120 µg/m3	120 µg/m3	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m3	40 µg/m3	Gas Phase Chemiluminescence
	24 hours**	80 µg/m3	80 µg/m3	
Ozone (O_3)	1 hour	180 µg/m3	130 µg/m3	Non dispersive UV absorption
Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m3	360 µg/m3	High Volume Sampling, (Average flow rate not less than 1.1 m3/minute).
	1 hour	180 µg/m3	130 µg/m3	
Respirable Particulate Matter. PM_{10}	Annual Average*	200 µg/m3	120 µg/m3	β Ray absorption
	24 hours**	250 µg/m3	150 µg/m3	
Respirable Particulate Matter. $PM_{2.5}$	Annual Average*	25 µg/m3	15 µg/m3	β Ray absorption
	24 hours**	40 µg/m3	35 µg/m3	
	1 hour	25 µg/m3	15 µg/m3	
Lead (Pb)	Annual Average*	1.5 µg/m3	1.0 µg/m3	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	2.0 µg/m3	1.5 µg/m3	
Carbon Monoxide (CO)	8 hours**	5 µg/m3	5 µg/m3	Non dispersive Infra-Red (NDIR)
	1 hour	10 µg/m3	10 µg/m3	

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

24 hourly / 8 hourly values should be met 98% of the in a year. 20% of the time, it may exceed but not on two consecutive days.

Source: *Government of Pakistan (2010) (SRO 1062 (I)/ 2010).*

Table 4: NEQS for Motor Vehicles Exhaust and Noise [8]

(A) For In-use Vehicles

Sr. No.	Parameter	Standard (Maximum permissible Limit)	Measuring Method	Applicability
1	Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode	To be compared with Ringlemann Chart at a distance 6 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 meters from the source.	

(B) For New Vehicles

(i) 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
Passenger Cars	M 1: with reference mass (RW) upto 2500 kg. Cars with RW over 2500 kg to meets NI category standards.	Pak-II IDI	1.00	0.70	0.08	NEDC (ECE 15+ EUDCL)	All imported and local manufactured diesel vehicles with effect from 01-07-2012
		Pak-II DI	1.00	0.90	0.10		
Light Commercial Vehicles	NI-I (RW<1250 kg)	Pak-II IDI	1.00	0.70	0.08		
		Pak-II DI	1.00	0.90	0.10		
	NI-I (1250 kg< RW< 1700 kg0	Pak-II IDI	1.25	1.00	0.12		
		Pak-II DI	1.25	1.30	0.14		
	NI-III (RW>1700 kg)	Pak-II IDI	1.50	1.20	0.17		
		Pak-II DI	1.50	1.60	0.20		
Parameter	Standard **(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
Heavy Duty Diesel Engines	Trucks and Buses		4.0	1.1	7.0	0.15	ECE-R-49	Pak-II
Large goods Vehicles	N2 (2000 and up	Pak-II	4.0	7.0	1.10	0.15	EDC	
Parameter	Standard (maximum permissible limit)					Measuring Method		
Noise	85 db (A)					Sound meter at 7.5 meters from the source.		

(ii) Emission Standards for Petrol Vehicles (g/km)

Type of Vehicle	Category/Class	Tiers	CO	HC+ NOX	Measuring Method	Applicability
Passenger	M 1: with reference mass (RW) upto 2500 kg. Cars with RW over 2500 kg to meets NI category standards.	Pak-II	2.20	0.50	NEDC (ECE 15+ EUDCL)	All imported and new models* locally manufactured petrol vehicles with effect from 1st July, 2009**
Light Commercial Vehicles	NI-I (RW<1250 kg)	Pak-II	2.20	0.50		
	NI-I (1250 kg> RW< 1700 kg0	Pak-II	4.00	0.65		
	NI-III (RW>1700 kg)	Pak-II	5.00	0.80		
Motor Rickshaws & motor Cycles	2.4 strokes < 150 cc	Pak-II	5.50	1.50	ECER 40	
	2.4 strokes < 150 cc	Pak-II	5.50	1.30		
Parameter	**Standard (maximum** permissible **limit**				Measuring Method	
Noise	85 db (A)				Sound meter at 7.5 meters from the source.	

Explantations:

DI: Direct Injection
IDI: Indirect Injection
EUDCL: Extra Urban Driving Cycle
NEDC: New Urban Driving Cycle
M: Vehicles designed and constructed for the carriage of passengers 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 carriages of goods.
* New model means both model and engine type change
** The existing models of petrol driven vehicles locally manufactured will immediately switch ever to Pak-II emission standards but not later than 30th June, 2012.

Source: *Government of Pakistan (2009) (SRO 72 (KE)/ 2009).*

Table 5: National Standards for Drinking Water Quality[9]

Properties/Parameters	**Standard Values for Pakistan**
Bacterial	
All water intended for drinking (E.Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml samples
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml samples
Treated water in the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml samples 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.
Physical	
Color	≤ 15 TCU
Taste	Non objectionable/ Accept able
Odor	Non objectionable/Accept able
Turbidity	< 5 NTU
Total hardness as $CaCO_3$	< 500 mg/l
TDS	< 1000
pH	6.5-8.5
Chemical	
Essential Inorganic	*mg/Litre*
Aluminum (Al)	≤ 0.005(P)
Antimony	≤ 0.05(P)
Arsenic (As)	≤ 0.05(P)
Barium (Ba)	0.7
Boron (B)	0.3
Cadmium (Cd)	0.01
Chloride (Cl)	<250
Chromium (Cr)	≤ 0.05
Copper (Cu)	2
Toxic Inorganic	**Mg/Litre**
Cyanide (Cn)	≤ 0.05
Fluoride (F)*	≤ 1.5
Lead (Pb)	≤ 0.05
Manganese (Mn)	≤ 0.5
Mercury (Hg)	≤ 0.001
Nickel (Ni)	≤ 0.02
Nitrate (NO_3)*	≤ 50

Properties/Parameters	Standard Values for Pakistan
Nitrate (NO_2)*	≤ 3 (P)
Selenium (Se)	0.01 (P)
Residual chlorine	0.2-0.5 at consumer end; 0.5-1.5 at source
Zinc (Zn)	5.0
Organic	
Pesticides mg/l	PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted.**
Phenolic compound (as phenols) mg/l	WHO standards: ≤ 0.002
Polynuclear Aromatic hydrocarbon (as PAH) g/L	WHO standards: ≤ 0.01v (by GC/MS method)
Radioactive	
Alpha Emitters bq/L or pCi	0.1
Beta Emitters	1

***** Indicates priority health related inorganic constituents which need regular monitoring.

****** PSQCA: Pakistan Standards Quality Control Authority.

Source: Government of Pakistan (2010) (SRO 1063(I)/2010).

Table 6: National Environmental Quality Standards for Noise [10]

Limit in Db(A) Leq*

Category of Area/Zone	Effective from 1st July 2010		Effective from 1st July 2012	
	Day time	Night time	Day time	Night time
Residential area	65	50	55	45
Commercial area	70	60	65	55
Industrial area	80	75	75	65
Silence zone	65	45	50	45

Notes:

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 that are declared as such by the competent authority. An area comprising not less than 100 m around the hospitals, educational, and courts.
4. Mixed categories of areas may be declared as one of the four above-listed 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.

Source: Governments of Pakistan (2010) (SRO 1064(I)/ 2010).

ANNEXURE-III: Photographs of Project Areas

PHOTO GALLERY

SITE SPECIFIC PICTURES OF GUDDU-SHIKARPUR-UCH-SIBBI TRANSMISSION LINE PROPOSED FOR REFURBISHMENT UNDER MFF II

SITE SPECIFIC PHOTOGRAPHS

PCC Poles passing into thick vegetative zones

Existing PCC transmission line passing into standing crops.

PCC Poles passing into thick vegetative zones

The existing transmission line crossing the Indus Highway

Existing transmission line passing into uncultivated land

Transmission towers passing into fish farm

Transmission towers passing into fish farm

Transmission line crossing the minor/distry

Transmission line trespassing into thickly grown bushes and trees

Transmission towers passing into standing crops

Transmission line passing into secondary canal

Transmission line crossing into water course

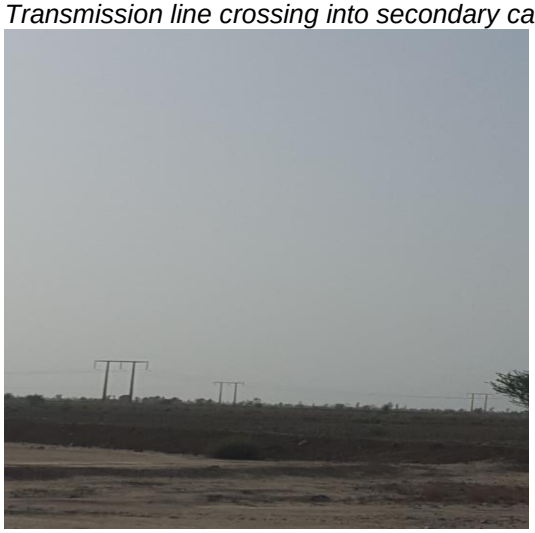
Transmission line crossing into private fish farm

Transmission line crossing into secondary

canal

Transmission line crossing into secondary canal

Transmission line crossing into rice crops



PCC Towers near Sibbi

Existing land use pattern along the corridor of PCC Poles

Land use pattern and trees along the existing PCC Poles

Uncultivated Plains along the existing transmission line in Nothal

In-Out to Uch Power Station

Uch Power Station

Existing PCC Poles in Deral Allah Yar

Graveyard in the RoW of existing PCC transmission Line

In-Out to Shikarpur Grid Station

In-Out to Shikarpur Grid Station

In-Out to Shikarpur Grid Station (Close View)

Existing Tower#531 trespassing into tree thickets and agriculture productive land.

Close view of a PCC Pole erected in the agriculture productive land

Existing transmission line alignment in the standing rice crops.

Existing PCC Tower # 525 erected in the standing crop in Kashmore Area

The existing transmission line crossing irrigation canal

Height loosed towers

Irrigation and drainage works by the farmers kept conductors height at risk.

Existing transmission line along the irrigation canal

No ground clearance

Tower#579 passing into Bohri Goth

Existing tower#315

Existing transmission line from tower#315

Existing transmission line tower # 312 passing into Cheel Goth

Existing transmission line tower#307 and onwards

Existing transmission line crossing the irrigation canal

Existing transmission line passing into commercial fish famrm

Existing transmission line passing into a Graeyard

Existing transmission line passing into agriculture land

No ground clearance

ANNEXURE-IV: List of Flora and Fauna in Project Area

Table IV.1: List of Reptiles in Kashmore district-Sindh

S #	Common Name	Scientific Name	Occurrence				Listing		
			Common	Abundant	Less Common	Rare	SWPO	IUCN Red List	CITES APPENDIX
1	Common ground Agama	Trapelus ruderata balucbiana			X				
2	Indian fringe toed lizard	Acantbodactylus cantoris cantoris	X						
3	glossy bellied racer	Coluber vetromaculatus	X						
4	Saw scaled viper	Echis Carinatus pyramidum	X						
5	Cobra	Naja naja			X			ii	
6	Indus sand Boa	Eryx Jobnii jobnii			X			ii	
7	Indian Spiny tailed lizard	Uromastyx bardwickii	X					I	
8	Indian Monitor	Varanus bengalensis	X					I	
9	Desert monitor	Varanus Griseus koniecznyi			X		II		
10	Garden Lizard	Calotes versicolour	X				II		
11	Brown River turtle	Kacbuga smitbii	X					ii	

Source: *Direct field observation, interview of local people and cross checking with the secondary information*

Table IV.2: List of Reptiles in Dera Allah Yar and Sibbi Districts-Sindh

S#	Common Name	Scientific Name	Occurrence				Listing		
			Common	Abundant	Less Common	Rare	BWPA	IUCN Red List	CITES APPENDIX
1	Brilliant Agama	Trapelus agilis isolepis	X						
2	Indian Cobra	Naja naja	X					ii	
3	Indian Sand Boa	Eryx johnii johnii			X		X		
4	Indian Sand Swimmer	Ophiomorous tridactylus	X						
5	Indian fringe toed lizard	Acantbodactylus cantoris cantoris	X				X		
6	Spotted Ground Agma	Trapelus ruderatua			X				
7	Bronze Grass Shink	Mabuya macularia			X				
8	Checkered Keelback	Xenochrobis piscator piscator			X				
9	Eastern Diadem Snake	Spalerosophis diadema diadema			X				
10	Fat Tailed Gecko	Eublepharis macularius			X				
11	Glossary Bailed Racer	Coluber ventro maculatus			X				
12	Indian Krait	Bungarus caeruleus			X				
13	Pakistan Ribon Snake	Psammophis leithii			X		X		
14	Sindh Snad Gecko	Crossobamon orientalis			X		X		

S#	Common Name	Scientific Name	Occurrence				Listing		
			Common	Abundant	Less Common	Rare	BWPA	IUCN Red List	CITES APPENDIX
15	Spotted Indian House Gecko	Hemidactylus brookii brookii	X						
16	Yellow Bailed House Gecko	Hemidactylus flaviviridis	X						
17	Saw scaled viper	Echis Carinatus pyramidum	X						
18	Indian Spiny tailed lizard	Uromastyx bardwickii	X					I	
19	Indian Monitor	Varanus bengalensis	X					I	
20	Desert monitor	Varanus Griseus konieczny i			X			II	
21	Garden Lizard	Calotes versicolour	X					II	

Source: *Direct field observation, interview of local people and cross checking with the secondary information*

Table IV.3: List of Birds Observed during the Site Visits in Kashmore Districts of Sindh

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
1	*Accipiter nisus*	Eurasian Sparrow Hawk		X			X		X		II
2	*Acridotheres ginginianus*	Bank Myna		X		X					
3	*Acridotheres tristis*	Indian/Common Myna		X		X					
4	*Actitis hypoleucos*	Common Sandpiper	X		X						
5	*Alcedo atthis*	Common / Blue Kingfisher		X	X						
6	*Amaurornis phoenicurus*	White breasted Waterhen		X	X						
7	*Ammomanes deserti*	Desert lark		X	X						
8	*Anas clypeata*	Shoveler	X			X					II
9	*Anas crecca*	Common Teal	X			X					II
10	*Anthus novaeseelandia e*	Richard's pipit		X	X						
11	*Anthus spinoletta*	Water pipit	X		X						
12	*Anthus trivialis*	Brown Tree Pipit	X			X					
13	*Apus affinis*	House Swift		X		X					
14	*Aquila clanga*	Greater Spotted eagle	X		X				X	VU	I/II
15	*Ardea cinerea*	Grey Heron	X		X				X		
16	*Ardeola grayii*	Paddy Bird/Indian Pond Heron		X			X		X		

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
17	*Athene noctua*	Little Owl		X			X				
18	*Bubulcus ibis*	Cattle Egret		X	X						
19	*Calidris minuta*	Little Stint	X			X					
20	*Ceryle rudis*	Pied Kingfisher		X		X					
21	*Calidris temminckii*	Temminik's stint	X			X					II
22	*Charadrius alexandrinus*	Snowy plover	X			X					II
23	*Charadrius dubius*	Little Ringed Plover	X			X					II
24	*Centropus sinensis*	Crow Pheasant		X	X						
25	*Chettusia leucura*	White tailed plover	X		X						
26	*Circus aeruginosus*	Marsh harrier	X		X				X		
27	*Columba livia*	Blue Rock Pigeon		X		X					
28	*Coracias benghalensis*	Indian roller		X	X						
29	*Corvus splendens*	House crow		X			X				
30	*Dendrocitta vagabunda*	Indian tree Pie		X	X						
31	*Dendrocopos assimilis*	Sindh Pied Woodpecker		X				X			
32	*Dicrurus macrocercus*	Black Drongo / King Crow		X			X				

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
33	*Dinopium benghalense*	Golden backed woodpecker		X	X						
34	*Egretta alba*	Large/Great Egret	X		X				X		
35	*Egretta garzetta*	Little Egret		X	X				X		
36	*Egretta intermedia*	Intermediate Egret	X				X		X		
37	*Elanus caeruleus*	Black-Shouldered Kite	X			X			X		II
38	*Eodice malabarica*	White throated Munia		X	X						II
39	*Eremopterix nigreceps*	Black-Crowned Finch Lark		X	X						
40	*Falco columbarius*	Merlin	X					X	X		
41	*Falco jugger*	Laggar Falcon		X			X		X	NT	II
42	*Francolinus francolinus*	Black partidge		X		X					
43	*Francolinus pondicerianus*	Grey partridge		X	X						
44	*Galerida cristata*	Crested Lark		X		X					
45	*Gallinago gallinago*	Common Snipe	X		X						
46	*Gallinula chloropus*	Indian/Common Moorhen	X			X					
47	*Glareola lactea*	Small Indian Pratincole		X		X					
48	*Halcyon smyrnensis*	White-breasted Kingfisher		X	X						

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
49	*Himantopus himantopus*	Black-winged Stilt	X		X						II
50	*Hoplopterus indicus*	Red-wattled Lapwing		X			X				
51	*Lanius excubitor*	Great Grey Shrike		X	X						
52	*Lanius schach*	Rufous backed Shrike		X	X						
53	*Lanius vittatus*	Bay-backed Shrike		X	X						
54	*Luscinia svecica*	Blue Throat	X				X				
55	*Larus ridibundus*	Black headed Gull	X		X						
56	*Limosa limosa*	Black tailed Godwit	X			X					
57	*Motacilla cinerea*	Grey Wagtail	X		X						
58	*Merops orientalis*	Little Green Beeeater		X		X					
59	*Milvus migrans*	Black Kite		X		X					
60	*Motacilla alba*	White / Pied Wagtail	X			X					
61	*Motacilla flava*	Yellow Wagtail	X		X						
62	*Nectarinia asiatica*	Purple Sunbird		X	X						
63	*Neophron percnopterus*	Egyptian Vulture	X		X						
64	*Oenanthe alboniger*	Hume's Wheatear		X				X			

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
65	*Oenanthe deserti*	Desert Wheatear	X		X						
66	*Orthotomus sutorius*	Indian Tail Bird		X	X						
67	*Pandion haliaetus*	Osprey	X		X					X	
68	*Passer domesticus*	House Sparrow		X		X					
69	*Passer pyrrhonotus*	Sindh Jungle Sparrow		X			X				
70	*Pericrocotus cinnamomeus*	Small/Wandering Minivet		X	X						
71	*Petronia xanthocollis*	Chestnut shouldered Rock Sparrow		X	X						
72	*Phalacorcorax carbo*	Large Cormorant	X			X					
73	*Phalacrocorax niger*	Little Cormorant		X	X						
74	*Philomachus pugnax*	Ruff	X			X					
75	*Phoenicurus ochruros*	Black Redstart	X		X						II
76	*Phoenicurus phoenicurus*	Common Redstart	X					X			
77	*Phylloscopos collybita*	Chiffchaff	X		X						
78	*Phylloscopus trochiloides*	Greenish Warlbler	X		X						
79	*Prinia buchanani*	Rufous fronted Wren Warbler		X	X						
80	*Prinia burnesii*	Long-tailed Grass Warbler		X			X			NT	

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
81	*Psittacula krameri*	Rose-ringed Parakeet		X		X					III
82	*Pycnonotus cafer*	Red-vented Bulbul		X		X					
83	*Pycnonotus leucogenys*	White-cheeked Bulbul		X		X					
84	*Rhipidura aureola*	White-browed Fantail Flycatcher		X	X						
85	*Riparia paludicola*	Indian Sand Martin		X		X					
86	*Saxicola caprata*	Pied Bushchat		X		X					
87	*Saxicoloides fulicata*	Indian Robin		X	X						
88	*Sterna albifrons*	Little Tern	X					X			II
89	*Sterna aurantia*	Indian River Tern		X	X						
90	*Sterna caspia*	Caspian Tern	X		X						
91	*Sterna hirundo*	Common Tern	X							X	II
92	*Streptopelia decaocto*	Collared Dove		X		X					
93	*Streptopelia senegalensis*	Little Brown Dover		X		X					
94	*Streptopelia transquebarica*	Red Turtle Dove		X		X					
95	*Sylvia curruca*	Lesser Whitethroat	X			X					
96	*Sylvia nana*	Desert Warbler	X		X						

S#	Scientific Name	Common Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	SWPO	IUCN	CMS
97	*Tachybaptus ruficollis*	Little Greb		X	X						
98	*Tringa totanus*	Redshank	X		X						II
99	*Turdoides caudatus*	Common Babler		X		X					
100	*Turdoides striatus*	Jungle Babler		X		X					
101	*Upupa epops*	Hoopoe		X	X						
102	*Xenus cinereus*	Terek Sandpiper	X			X					

Source: *Direct observation, interview of local people and cross checking with the secondary information*

Note:

VU=Vulnerable. NT=Not Threatened

Table IV.4: List of Birds Observed during the Site Visits in Dera Allah Yar and Sibbi Districts of the Project Area

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
1	Bank Myna	*Acridotberes ginginianus*		X	X						
2	Bay-baked Shrike	*Lanius vittatus*		X	X						
3	Black crowned finch lark	*Eremopterix nigriceps*		X	X						
4	Black Drongo/King Crow	*Dicrurus macrocercus*		X	X						
5	Black kite	*Milvus migrans*		X		X			X		
6	Black redstart	*Phoenicurus ocbruros*		X	X						
7	Black winged Kite	*Elanus caruleus*		X	X				X		
8	Black winged stilt	*Himantopus bimantopus*	X		X						
9	Blue rock pigeon	*Columba livia*		X	X						
10	Bluethroat	*Luscinia svecica*	X			X					
11	Blyth's Reed Warbler	*Acrocepalus dumetorum*		X	X						
12	Cattle egret	*Bubulcus ibis*		X	X						
13	Chiffchaff	*Phylloscopus collybita*	X								
14	Common babbler	*Turdoides caudatus*	X			X					
15	Common Myna	*Acridotberes tristis*		X	X						
16	Common Pochard	*Aytbya farina*		X		X					

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
17	Common redstart	*Phoenicurus phoenicurus*	X				X				
18	Common Rosefinch	*Carpodacus erytbinus*		X	X						
19	Common Sandpipper	*Actitis bypoleucos*	X				X				
20	Common Teal	*Anus crecca*	X		X						
21	Crested Lark	*Galerida cristata*		X	X						
22	Snake Bird	*Anbinga melanogaster*	X				X				
23	Desert Lark	*Ammomanes deserti*		X	X						
24	Desert Wheatear	*Oenanthe deserti*	X		X						
25	Gadwal	*Anas strepera*	X		X						
26	Golden backed woodpecker	*Dinopium benghalense*		X	X						
27	Great cormorant	*Phalacorcorax carbo*	X			X					
28	Great Grey Shrike	*Lanius excubitor*		X			X				
29	Great Red Walbler	*Acrocephalus arunndinaceus*	X					X			
30	Greater Short-toed Lark	*Calandrella brachydactyla*	X				X				
31	Greater spotted Eagle	*Aquila clanga*	X		X				X		
32	Grey Heron	*Ardea cinerea*	X		X				X		

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
33	Hoopoe	*Upupa epops*		X	X						
34	House Crow	*Carvus splendens*		X	X						
35	House Sparrow	*Passer domestica*		X	X						
36	House Swift	*Apus affinis*			X	X					
37	Hume's Wheatear	*Oenanthe alboniger*		X				X			
38	Common moorhen	*Gallinula chloropus*		X			X				
39	Indian crow Pheasant	*Centropus sinensis*		X	X						
40	Indian Robin	*Saxicoloides fulicata*		X				X			
41	Indian Tree Pie	*Dendrocitta vagabunda*		X	X						
42	Intermediate Egret	*Egretta intermedia*	X			X					
43	Isabelline Shrike	*Lanius isabellinus*	X				X				
44	Large Pied Wagtail	*Motacilla maderaspatensis*		X	X						
45	Little cormorant	*Phalaccroccorax niger*		X	X				X		
46	Little Egret	*Egretta garzella*	X		X				X		
47	Little Green Bee-eater	*Merops orientalis*		X	X						
48	Little Stint	*Calidris minuta*	X				X				II

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
49	Long-eared Owl	*Asio otus*	X					X			
50	Long-legged Buzzard	*Buteo rufinus*	X		X				X		
51	Long-tailed Grass Warbler	*Primia aeruginous*		X		X					
52	Mallard	*Anas platyrbynchos*			X						II
53	Marsh Harrier	*Circus aeruginosus*	X		X				X		
54	Merlin	*Falco columbarius*						X	X		II
55	Northern Pintail	*Anas acuta*				X					II
56	Paddy Bird	*Ardeola grayii*		X	X				X		
57	Peregrine Falcon	*Falco peregrinus*						X	X		II
58	Pied Bushchat	*Saxicala caprata*		X				X			
59	Pied Kingfisher	*Ceryle rudis*				X					
60	Plain Prinia	*Prinia inornata*		X		X					
61	Purple Heron	*Ardea pupurea*	X		X				X		
62	Purple Sunbird	*Nectarinia asiatica*			X				X		II
63	Redshank	*Tringa tatanus*			X						II
64	Red Vented Bulbul	*Pycnonotus cafer*		X	X						

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
65	Red-wattled Lapwing	*Hoplopterus indicus*		X	X						
66	Ring Dove	*Streptopelia decaocto*		X	X						
67	Rufus fronted Prinia	*Prinia bucbanani*		X	X						
68	Rufous-toed Eagle	*Circaetus gallicus*	X					X			
69	Short-toed Eagle	*Circaetus gallicus*		X		X			X		
70	Shoveler	*Anas clypeata*	X		X						II
71	Sindh Jungle Sparrow	*Passer pyrrbonotus*		X			X				
72	Sindh Pied Woodpecker	*Dendropos assimilis*		X			X				
73	Spotted Little Owl	*Athene brama*		X	X						
74	Streaked Weaver	*Placeus manyar*		X		X					
75	Tawny Eagle	*Aquila rapax vindhiana*		X	X				X		
76	Tawny Pipit	*Anthus campestris*				X					
77	White Breasted Kingfisher	*Halcyon smyrnensis*		X	X						
78	White Breasted waterhen	*Amaurornis phoenicurus*		X	X						
79	White-browed Fantail Flycatcher	*Rhipidura aureala*		X	X						
80	White-cheeked Bulbul	*Pynonotus leucogenys*		X							

S#	Common Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	BWPA	IUCN	CMS
81	White eyed Pochard	*Aythya nyroca*	X				X		X	NT	
82	Pied Wagtail		X			X					
83	White throated Munia	*Eodice malabarica*		X	X						
84	Yellow bellied Prinia	*Prinia flaviventris*		X	X						
85	Yellow Wagtail	*Motacila flava*	X		X						

Note:

VU=Vu

Source: *Direct observation, interview of local people and cross checking with the secondary information*

VU: Vulnerable. NT=Not Threatened

Table IV.5: List of Mammals in the Project Area-Kashmore District of Sindh

S#	Common Name	Scientific Name	Occurrence				Listing		
			Common	Abundant	Less Common	Rare	SWPO	IUCN Red List	CITES APPENDIX
1	Asiatic Jackal	*Canis aureus*	X		X		X		Iii
2	Indus Dolphin	*Platanista minor*			X	X	X	EN	I
3	Fishing Cat	*Prionailurus viverrinus*			X			EN	Iii
4	Desert Cat	*Felis silverstris*							
5	Five stripped palm Squirrel	*Funambulus pennantii*	X			X	X		
6	Hog Deer	*Axis porinus*				X	X	EN	
7	Smooth coated Otter	*Lutrogale perspicillata*						VU	Ii
8	Long eared desert hedgehog	*Hemiecbimun collaris*	X						
9	Indian Porcupine	*Hystrix indica*	X						
10	Black naped harc	*Lepus nigriollis*	X						
11	Indian desert jird	*Merives hurrianae*	X						
12	Little Indian field mouse	*Mus booduga*	X						
13	Indian gerbil	*Tatera indica*	X						
14	Indian wild boar	*Sus scrofa*		X					
15	Indian grey Mongoose	*Herpestes edvards*	X						
16	Small Indian mongoose	*Herpestes Javanicus*		X			X		

Source: *Direct field observation, interview of local people and cross checking with the secondary information*

Table IV.6: List of Mammals in the Project Area-Dera Allah Yar and Sibbi Districts of Balochistan

No	Common Name	Scientific Name	Occurrence				Listing		
			Common	Abundant	Less Common	Rare	BWPA	IUCN Red	ESAPPEND
1	Asiatic Jackal	*Canis aureus*	X		X		X		iii
4	Desert Cat	*Felis silverstris*							
3	Red Fox	*Vulpes vulpes*	X						
4	Five stripped palm Squirrel	*Funambulus pennantii*	X			X	X		
5	Indian Crested Prcupine	*Hystrix indica*	X						
6	Cape Hare	*Lepus capensis*	X						
7	Indian Desert Jird	*Meriones burrionae*	X						
8	Balochistan Gebril	*Gerbilus nanus*	X						
9	House Mouse	*Mus musculus*	X						
10	House Rat	*Rattus rattus*	X						
11	Indian Fox	*Vulpes bengalensis*							
12	Long eared desert hedgehog	*Hemiecbimun collaris*	X						
13	Indian Porcupine	*Hystrix indica*	X						
14	Little Indian field mouse	*Mus booduga*	X						
15	Indian gerbil	*Tatera indica*	X						
16	Indian grey Mongoose	*Herpestes edvards*	X						
17	Small Indian mongoose	*Herpestes Javanicus*		X			X		

Source: *Direct field observation, interview of local people and cross checking with the secondary information*

Table IV.7: Fish Species of Commercial Value in Guddu Area

S#	Latin Name	Local Name	Herbivores	Carnivores	Exotic	Suitable for aquaculture	Commercial exploitation
1	Cirrhinus mrigala	Morakhi	✓			✓	✓✓✓
2	Cirrhinus reba	Suni	✓				✓
3	Ctenopharyngodon idella	Chinese Grass Carp	✓		✓	✓	✓✓
4	Cyprinus carpio	Gulfam	✓		✓	✓	✓✓
5	Gibelion catla	Thaili	✓			✓	✓✓✓
6	Hypophthalmichthys molitrix	Silver Carp	✓		✓	✓	✓✓✓
7	Labeo calbasu	Dahi	✓				✓
8	Labeo dyocheilus pakistanicus	Torki	✓				✓
9	Labeo gonius	Sereha	✓				✓
10	Labeo rohita	Rohu	✓			✓	✓✓✓
11	Bagarius bagarius	Fouji Khagga		✓		✓	✓✓
12	Channa morulius	Chakur/Mundi/Sowl		✓		✓	✓✓✓
13	Chitala chitala	Gundan		✓			✓
14	Clupisoma garua	Bachwa		✓			✓

S#	Latin Name	Local Name	Herbivores	Carnivores	Exotic	Suitable for aquaculture	Commercial exploitation
15	Eutropiichthys vacha	Jhalli		✓			✓
16	Rita rita	White Khagga		✓		✓	✓✓
17	Sperata sarwari	Singhari		✓			✓✓✓
18	Wallago attu	Malli		✓		✓	✓✓
19	Heteropneustes fossilis	Luhur		✓			✓
20	Notopterus spp	Phool/Chitti Mundi				✓	✓✓
21	Oreochromis mossambicus	Tilapia			✓	✓	✓✓
22	Puntius ticto	Popri					✓

Leg L

Source: *Direct observation, interview of local people and cross checking with the secondary information*

Legend

✓ Low Commercial Exploitation

✓✓ Medium Commercial Exploitation

✓✓✓High Commercial Exploitation