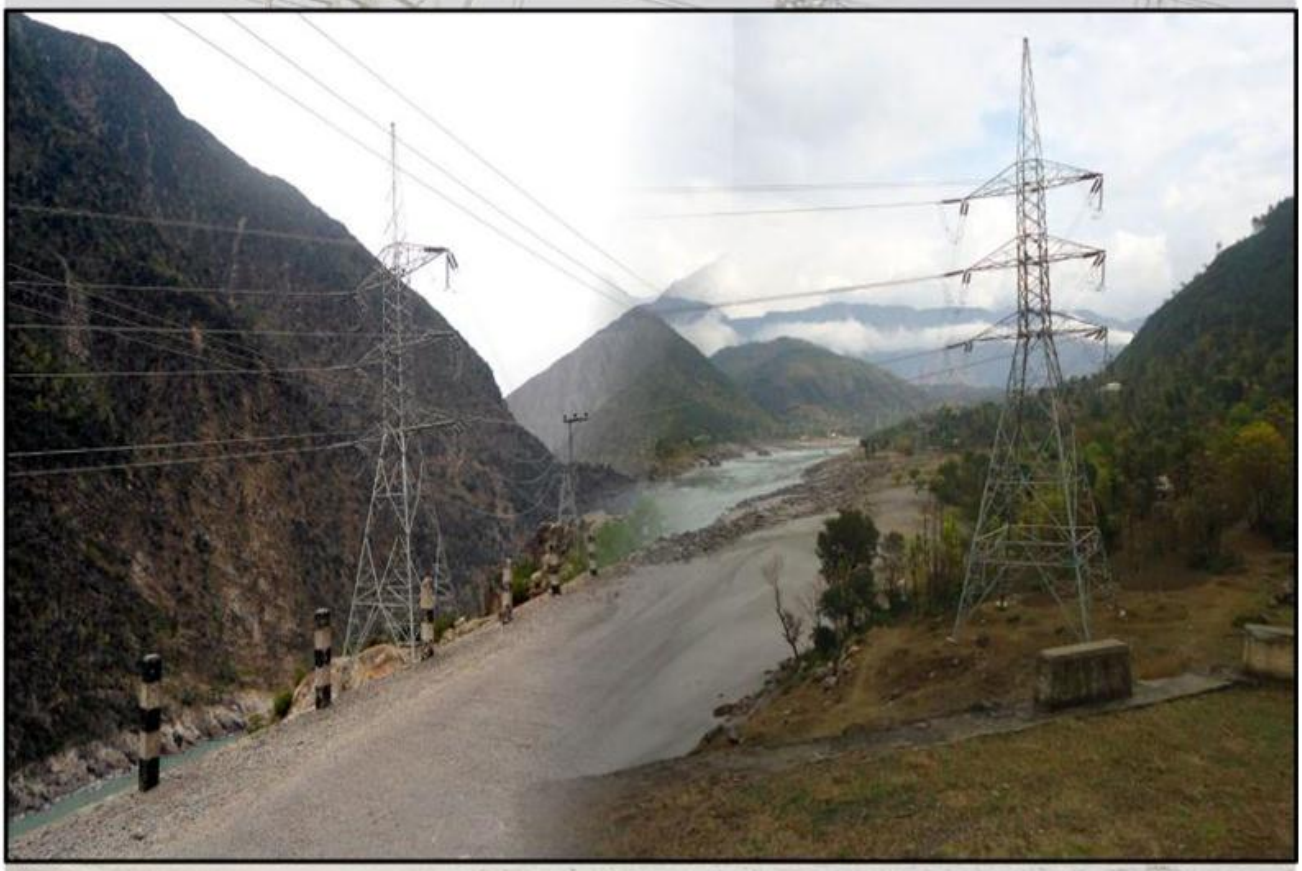
National Transmission & Despatch Company Limited (NTDC) Pakistan

Vol: III

ENVIRONMENTAL ASSESSMENT AND REVIEW FRAMEWORK (EARF)
500 KV DASU ISLAMABAD TRANSMISSION LINE PROJECT



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REVIEWED DRAFT FOR DISCUSSION

SUBMITTED BY:
ENVIRONMENT AND SOCIAL IMPACT CELL (E&SIC) - NTDC

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LIST OF ABBREVIATIONS

COI	Corridor of Impact
EAP	Environmental Action Plan
EARF	Environmental Assessment and Review Framework
EHV	Extra High Voltage
EIA	Environmental impact assessment
EMF	Electro Magnetic Field
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESA	Environmental and Social Assessment
E&SIC	Environment and Social Impact Cell
ESM	Environmental and Social Monitor
EUAD	Environment and Urban Affairs Division
GoP	Government of Pakistan
GRM	Grievance Redressal Mechanism
GS	Grid Station
GSP	Geological Survey of Pakistan
HDI	Human Development Index
HPP	Hydro Power Project
IMD	Index of Multiple Deprivations
IEE	Initial environmental examinations
IESCO	Islamabad Electric Supply Company
IPPs	Independent Power Producers
IUCN	International Union for Conservation of Nature
kV	kilo Volt
Km	Kilo meter
KPK	Khyber Pakhtunkhwa
LAA	Land Acquisition Act
MKT	Main Karakoram Thrust
mm	millimeter
MW	Mega Watt
NCS	National Conservation Strategy
NEQS	National Environment Quality Standards

NGOs	Not Governmental Organizations
NTDC	National Transmission and Despatch Company
NOC	No Objection Certificate
O&M	Operation and Maintenance
OP	Operational Policy
PAI	Project Area of Influence
PAPs	Project Affected Persons
Pak-EPA	Pakistan Environmental Protection Agency
PATA	Provincial Administrated Tribal Area
PESCO	Peshawar Electric Supply Company
PEPC	Pakistan Environmental Protection Council
Provincial EPAs	Provincial Environmental Protection Agencies
PCDP	Palas Conservation and Development Project
PPTA	Project Preparation and Technical Assistance
PCR	Project Completion Report
PMU	Project Management Unit
PS	Power Station
QPR	Quarterly Progress Report
RP	Resettlement Plan
RPF	Resettlement Policy Framework
RNR	Renewable Natural Resources
RoW	Right of Way
TL	Transmission Line
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAPDA	Water and Power Development Authority
WB	World Bank
WHO	World Health Organization

EXECUTIVE SUMMARY

1. INTRODUCTION

The Power Generation Capacity of Pakistan is 19,855 MW including all resources like hydal, thermal and IPPs. The contribution of power generation through hydel, thermal and IPPs is 6461 MW, 4811 MW and 6365 MW respectively. The power generated from Thermal and IPPs sources is costly and the government as well as public cannot afford the high prices of electricity. Therefore, to generate cheap electricity, the WAPDA is endeavoring to explore the hydropower resources. In this regard, WAPDA is working on various hydropower projects including Diamer Bhasha Dam, Kurram Tangi Dam, Munda Dam, Kohala Dam, Golen-Gol Hydropower, Dasu Hydropower, Bunji Hydropower, Neelum Jhelum Hydropower, Palas Hydropower and Spatgah Hydropower projects. The National Grid for power transmission consists of a large network of High Voltage and Extra High Voltage (HV & EHV) transmission lines and grid stations. Power is supplied in an integrated manner by a network of hydropower and thermal power plants located up and down in the country. National Transmission and Despatch Company (NTDC) is responsible for the construction, maintenance and operation of transmission lines and grid stations of 220 kV and above.

The Dasu Hydropower Project (Dasu HPP) is designed to generate 4320 MW electricity. The World Bank has recently shown its interest to finance the Dasu HPP as well as dispersal of power from Dasu to national grid system of Pakistan. This power dispersal from Dasu HPP will be carried out by construction of two parallel running 500 kV Transmission Lines from Dasu Power Station to 500 kV Grid Station at Pathar Garh (Hassan Abdal, District Attock). The 500 kV Transmission Lines will extend over a distance of about 250 km and route will traverse five districts of KPK including Kohistan, Battagram, Mansehra, Abbottabad and Haripur before connecting the proposed Grid Station near Village Pathar Garh, in Attock district of Punjab Province.

As the design of the project component on transmission line is at initial stages of preparation, and no tower spotting or detailed engineering designs have so far been done therefore the project prepared an Environmental Assessment Review Framework (EARF), which highlights the potential environmental and social impacts and institutional arrangements to implement the project. More detailing of the environmental resources in relation to the exact alignment of the transmission line will be carried out in the follow-up environmental and social impact assessment study commensurate with the detailed design stage of this component. This study will also look into more details on the alternative of analysis particularly from the siting options, access roads, design of towers, construction technologies, etc. NTDC will also prepare environmental management and mitigation plan which will be embedded into the bidding documents for the construction of transmission line.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The project will comply with all the national legislation relating to the environment in Pakistan, all the applicable World Bank environment and social guidelines and other international protocols and obligations. The national legislation relating to the environment in Pakistan in order to obtain the required regulatory clearances is as under:

- The national environmental policy 2005 aims to protect, conserve and restore Pakistan's environment in order to improve quality of life of the citizens through sustainable development.
- Pakistan Environmental Protection Act 1997, which empowers the Pak-EPA to delegate powers to the Provincial EPAs, identifies categories of projects to which the IEE/EIA provisions will apply, develop guidelines for conducting IEE and EIAs and procedures for their submission, review and approval, develop environmental emission standards for parameters such as air, water and noise, etc.
- The National Environmental Quality Standards (NEQS), 2000 specify the maximum allowable concentrations of pollutants in municipal and liquid industrial effluents, maximum allowable concentration of pollutants in gaseous emissions from industrial sources, etc.
- The National Resettlement Policy and Ordinance, which handles the resettlement and compensation issues, related to the project implementation is still in Draft Form and not considered for the proposed project.
- The other provincial and departmental applicable laws and regulations include; the Telegraphy Act 1885, Provincial Wildlife (Protection, Preservation, Conservation and Management) Acts, Ordinances and Rules (Act, 1972), Electricity Act 1910, Antiquities Act 1975, Factories Act 1934, Pakistan Pena Code 1860, Provincial Local Government Ordinances, 2001, etc.

The Project has also to comply with the applicable World Bank Guidelines, which control the environmental and social issues related with the project implementation. The major operational policies and operational directives related to the Project include Operational Policies (OP) 4.01, which identify the general policy of the World Bank about the Environmental Assessment, Operational Policies (OP) 4.11, which deal with the Bank's policy on Physical CulturalResources, and OP/BP 4.12, which sets policies relating to the involuntary resettlement of population disrupted by the project.

3. DESCRIPTION OF THE PROJECT

The Dasu Hydropower Project (Dasu HPP) is designed to generate 4320 MW electricity. Dasu HPP complex including Power Station will be constructed and owned by the Water Wing of WAPDA. The NTDC will be responsible for dispersal of power from Dasu Power Station to 500 kV Grid Station by constructing two 500 kV transmission lines. Hence, this EARF (including baseline and impact assessment) has been prepared only for Transmission Lines and Grid Station. A detailed Environmental and Social Assessment for the dam and ancillary works and KKH has been prepared separately by WAPDA.

The Dasu Hydropower Project will be constructed on the Indus River in Kohistan District of Khyber Pakhtunkhwa Province. It is a run-off-the river Project with the dam axis about 7 km upstream of Dasu Town, the administrative headquarter of Kohistan District. There will be 242 m high concrete gravity dam and 73 km long reservoir behind the dam. The reservoir will have average width of 365 m and at full supply level elevation 950m, an area of about 23.85 km^2. The catchment area will be 158,800km^2. The average discharge at dam site is 2,068 m^3/sec. The

project will have an underground powerhouse housing 12 turbines, each of which will produce 360 MW power, and a total maximum capacity to produce 4320 MW.

This power dispersal from Dasu HPP will be carried out by construction of two parallel running 500 kV Transmission Lines from Dasu Power Station to 500 kV Grid Station at Pathar Garh (Hassan Abdal, District Attock). The 500 kV Transmission Lines will extend over a distance of about 250 km and route will traverse five districts of KPK including Kohistan, Battagram, Mansehra, Abbottabad and Haripur before connecting the proposed Grid Station near Village Pathar Garh, in Attock district of Punjab Province.

The analysis of alternatives systematically compares feasible alternatives to the proposed project site, technology, design, and operation including, the "without project" situation in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. The ESIA would include the analysis of alternatives based on considerations; (a) No Project Alternatives (b) Siting Alternatives (c) Technical Alternatives (d) Environmental and Social Considerations and (e) Construction methodology options

4. ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS AND THEIR ANALYSIS

The physical, biological and social environment was observed within a strip of 500 m wide and 250 km long. The physical, biological and social environments of the project area are as under:

Physical Environment

Land resources and Topography: The area for transmission line comprises Guzara forests, Protected Forests, privately owned barani and irrigated agriculture land and barren mountains. The general configuration of land is mountainous with precipitous to gentle slopes. The individual geomorphic forms of the region include natural rock slopes, scree, debris covered slopes, debris-flow fans, alluvial fans and river terraces and some plain areas.

Geology: The geology of project area varies considerably, as the transmission line passes through various geological regions. The rocks of Dasu, Pattan, and Allai are of Cretaceous age. The rocks of the palas valley belong to Ultra mafic Patan complex of Metaplutonic origin and garnet granulite of jijal complex. The geology of the Bhattagram and Chhapargram area mainly comprises granitic gneiss, schist and alluvium (unconsolidated material). The geological features of Oogi, Sherwan and Haripur may be described as a section of Earth's Crust coming well within the area of Himalayan disturbance.

Seismology: In general, the project area lies in seismically active area. The active faults in the vicinity of project area include; Main Mantle Thrust (MMT), Kohistan Fault, Kamila Strike Strip Fault and Jamila Shear Fault.

Climate: The Project area falls in very cold, humid climatic zone of Pakistan and is characterized by large seasonal variation. The climate in this region is mainly determined by the altitude and precipitation in the form of rain and snowfall in some areas. The project area is influenced by two rainy seasons: (i) south-eastern monsoon during summer: and (ii) western winds during winter. The lower altitudes generally experience humid to sub-humid sub-tropical conditions, the

higher altitudes experience temperate conditions.

Water Resources: The major surface water sources in the Project area include River Indus (Dasu to Pattan), Tarbella Lake (near Khalabatt Township, Haripur) and River Siran. The other resources are nullahs or Khawars and fresh water springs/ waterfalls.

The ground water is almost unavailable from Dasu to Bhattagram. While in lower areas viz., Abbottabad, Mansehra, Harripur and Hassanabdal, the ground water is available at the depth varying from 100 ft to 140 ft.

Biological Environment

The whole project area (i.e. from Dasu to Hassan Abdal) is rich in all types of vegetation including wood trees, fruit trees, herbs and shrubs. From Dasu to Pattan, the mountain tops are almost empty, while the vegetation is present in valleys along the river. In Pallas Valley, Allai, Bhattagram, Abbottabad and Mansehra regions, the mountains tops and valleys are lush green. The hills are covered with forests of broad leaf and pine trees in accordance with the altitude. Fruit trees are also present and generally found in the courtyards of the farming communities. Major wood tree species existing along the Project corridor include; Chir (*Pinus roxburghii*), Kail (*Pinus wallichiana*), Deodar (*Cedrus deodara*), Oak (*Quercus baloot*), Olive (*Olea cuspidate*), Phulai (*Acacia modesta*), Gurgura (*Monotheca buxifolia*), Kahu (*Olea cuspidate*), Sufaida (*Eucalyptus spp*.), Kikar (*Acacia nilotica*), Phulai (*Acacia modesta*), Poplar (*Populus ciliata*), Batangi (*Pyrus pachia),* Willow (*Salix spp*.), Ailanthus (*Ailanthus altissima*), Shisham (*Dalbergia sisso*), Beri (*Zyziphus jajuba*), Bakain (*Melea azedarie*) and Toot (*Morus alba*). Among fruit trees; Walnut (*Juglans regia*), Amlok (*Diospyros lotus*), Bird Cherry (*Prunus padus*), Pomegranate (*Punica granatum*), Apple (*Malus domestica*), Pear (*Mangifera indica*), Peach (*Prunus persica*) and Citrus fruits can be seen along the project corridor.

The whole tract inhabits a variety of wildlife and fauna; mammals, reptiles and birds make the area rich and colorful in natural fauna.

There is no protected area in the project corridor. But, Palas Valley and International Migratory Bird Route Number 7 (Indus Flyway) exist in the COI of the project and are identified as Environmental Hotspots. The other major sites requiring special consideration are wetlands, Indus River and Tarbella Lake, falling in the vicinity of project corridor. Some specific details on the Palas valley and Indus Flyway are given below.

Palas Valley

The Palas valley supports about 1,000 Western Tragopan (Tragopan melanocepahalus - IUCN vulnerable), important pheasant in the Himalayan region. The Palas Valley also supports populations of at least 7 other species of rare bird species, including Phylloscopus tytleri is classed as near vulnerable and the remaining are restricted range. The Palas Valley It is listed by Birdlife International as the most important site for bird conservation in this bio-geographical zone.

Populations of most of the mammals found in the Western Himalayas are also found in Palas. These include Brown and Black Bears, Himalayan Ibex, Markhor, Snow Leopards, Wolves etc.

Inventories now being undertaken of smaller mammals and especially bats. These are revealing the presence of significant populations of other scarce species. One unique feature of the Palas Valley is that its isolation with the rest of the world made in to a relatively pristine condition. Total area of the Palas valley is 1,400 km2 with elevations ranging 700 m to 5,200 m. Both the winter and summer ranges of much of the wildlife are included within the valley.

The ESIA studies will analyze possibility of TL avoiding Palas valley to the extent possible or use the corridor through the valley, which has relatively poor environmental resources.

Indus Flyway:
The Indus flyway is a famous route for migratory birds from Siberia to various destinations in Pakistan over Karakorum, Hindu Kush, and Suleiman Ranges along Indus River down to the delta. This flyway of waterfowl and migratory birds constitutes a famous corridor of international importance, the so-called “Indus Flyway” or “International Green Route” or “International Migratory Bird Route Number 7”. According to some estimates, 700,000 to 1,200,000 birds arrive in Pakistan through Indus Flyway every year. The southward migration begins in November, and the northward migration starts in March.

These periods may vary depending upon weather conditions in Siberia and/or Pakistan. The route offers plenty of food and a mild and hospitable climate to the birds. The Indus valley and more particularly the wetlands of southern Sindh are the major wintering grounds of migratory waterfowl. Key species using the flyway include cranes, teals, pintails, mallards, gadwalls, White-headed Duck, Houbara Bustard and Siberian Crane. The 100 km long Tarbela Reservoir is known as a staging ground for migrating birds; the creation of the large and permanent Dasu reservoir will further enhance the habitat availability for wintering and for resting of migratory birds. Some species will favor the deep areas while some will refuge on the new shoreline of the reservoir as noticed in other dam projects and reservoirs of Pakistan and elsewhere in Asia. However, due to the absence of feeding grounds in the vicinity of the Dasu project there will be hardly any winter migrants resting longer than one day in the project area. It is also recommended that in parallel to ESIA study, the project also undertakes Avian Risk Assessment study.

Socioeconomic Environment

Around 95 percent of the entire transmission line will be constructed in the 5 districts of Hazara division of KPK province of Pakistan. The total area of the division is over 17084 square kilometer houses a total of 3.53 million population of which only 8.8% is urban (in 3 districts - Haripur, Abbottabad and Mansehra) while in the remaining 91.2 percent is rural. District Battagram and Kohistan with 52% of the total area (8794 sq.km) have not a single settlement to be called as urban. The overall population density in the entire region is 271 persons per sq.km ranging from the highest 448 persons in Abbottabad to the lowest 66 persons in Kohistan. The average household size in the entire division is around 6.5 persons.

The estimated Human Development Index (HDI) of Hazara division is 0.564 which is ranked between medium to low. The overall level of multiple deprivations against 18 indicators in Hazara division is 42.6 percent.

The overall literacy in 5 districts of Hazara division is (35.2%) is far lower than the national average 57%. The literacy ratio is highest in Abbottabad and Haripur districts 56.6% and 53.7%

respectively. The literacy ratio in other three districts presents a dismal picture with 36.3% in Mansehra, 18.3 % in Battagram and only 11.2% in Kohistan District.

Although the number of health related public and private sector infrastructure significantly increased in the post-earthquake reconstruction phase (2006--2008), that helped in improving the IMD at around 44%. But the services level in the entire region is still devoid of health care staff and medicines.

Poverty is prevalent in the entire COI districts and assuming menacing proportions with the passage of time. Poverty in this context perpetuates due to ongoing political instability, uneven distribution of resources, poor human resource development and polarization of power and resources in the hands of a small percentage of population.

5. STAKEHOLDERS AND PUBLIC CONSULTATIONS

In accordance with EPA and World Bank guidelines, the consultation process was carried out to share the information with the stakeholders/public on the proposed works and the expected impacts on the physical, biological and especially socio-economic conditions of the project corridor.

Major stakeholders included EPA department, forest department, wildlife department, NGOs, PAPs, general residents of the project corridor, farmers, and national and international agencies working on environment. At 21 locations, stakeholders/public consultations were conducted throughout the project corridor. The major concerns/issues raised by the stakeholders were regarding loss of agriculture land, crops, trees, etc. and their compensation process; to ensure accessibility of the field activities by community especially women; conflicts due to the uses of common resources by the contractor during the construction activities and during compensation for losses. All the concerns/issues have been taken care of and addressed accordingly in the respective chapters of the report.

6. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

Due to absence of final design and tower markings at site, project corridor of impact has been taken as 500 m wide, 250 km long strip for Transmission Lines, and an area of about 100 acres for 500 kV Grid Station, which have been used for the environmental/social baseline information and impacts assessment. From this corridor, two parallel running 500 kV transmission lines will pass and there could be direct impact on the environment like relocation of physical infrastructure (if any), clearing of vegetation, loss of crops, etc. and indirect impacts of the project activities are envisaged like existence of forests, wildlife habitats, wetlands, etc. The major impacts on physical, biological and social environments are described as under:

Land Resources: No permanent acquisition of land will be involved for transmission lines, while for grid station, it will be acquired. The temporary acquisition of land for the construction activities including the establishment of the contractor facilities will be involved. The other impacts on the land resources will include crop losses, soil erosion and contamination during the construction activities.

Infrastructure: the field investigations reveal that existing infrastructure like highways (N-35, N-5), motorway (M-1), Indus River, Peshawar – Islamabad Railway Track, existing transmission lines, etc., will have to be crossed for construction of transmission lines. But not impact on these infrastructures is envisaged.

Water Resources: The major impacts envisaged on the water resources include use of local water supplies, contamination of surface and groundwater and siltation of streams/nullahs.

Ambient air quality and noise Levels: During construction stage, the ambient air quality will be impaired and noise levels will be high.

Biological Resources: No protected area exists in the COI but environmentally sensitive sites like Palas Valley (The only Un-Touch Forests of Pakistan) and Bird Flyway Number 7 are present along the Project area. Besides these, the wetlands (Indus River and Tarbella Lake) also exist in COI, all these sites required special considerations in the Environmental and Social Impact Assessment Study.

Social and Cultural Environment: The major social impacts will include accessibility to farm fields, restriction on women's field activities, disturbance to the privacy of local community particularly women, security of public as well as workers. Further relocation of structures (if any) will be required. No cultural and historical site exists in the whole project corridor.

Environmental and Social Risk Assessment: An effort has also been made to assess the environmental and social risks during the construction as well as operation stages. In this context, the team has proposed a study on Avian Risk Assessment which will be undertaken in parallel to ESIA for the transmission lines.

Environmental and Social Benefits of the Project: Along with negative impacts of the Project, some major expected positive impacts have also been identified including availability of electricity as per demand, better life quality of the residents of project corridor, earning resources, installation of industry and other linked benefits.

7. ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE MITIGATION OF PROJECT (IMPACTS)

The Environmental Management Framework provides generic guidelines to be followed while implementing various project activities, in order to keep the project environmentally and socially sound. The existing Project Management Unit (PMU) will assume primary responsibility for the environmental assessment as well as implementation of EMPs for their respective components by PIUs. The environmental and social impact cell (E&SIC), NTDC will take care of environment, resettlement, and any other environmental and social development obligations and issues established at the PMU.

The internal monitoring will be done by the supervisory consultants and supervised by E&SIC, while external monitoring will be carried out by hiring an external monitor. The monitoring reports will be submitted to the World Bank on quarterly basis. The World Bank will conduct review missions and will assess the environmental compliance.

The guidelines for environmental management are integral part of environmental management framework. These are briefly described in the pertinent chapter of the report.

8. CONCLUSIONS AND RECOMMENDATIONS

Based on the available preliminary plans, field surveys and assessment of the impacts, it may be concluded that the Project has insignificant negative environmental and social impacts on the existingenvironmental resource base in the project corridor, except the existing of environmentally sensitive sites like Palas Valley Forests, Indus Birds Flyway Number 7 and Wetlands (Indus River and Tarbella Lake) in the COI Area. These sites require special considerations in the Environmental and Social Impact Assessment Study of the Project.

However, as the project is at planning stage and the detailed survey and design have yet to be carried out by NTDC and the assessment of losses is based on a preliminary design. So it is imperative that the assessment of losses should be done when the demarcation of the towers at site is made available. For this purpose, as per requirements of IFIs and Government of Pakistan, a Land Acquisition Resettlement Framework has also been prepared.

CHAPTER 1

INTRODUCTION

1.1 RATIONALE

The Power Generation Capacity of Pakistan is 19,855 MW including all resources like hydal, thermal and IPPs. The contribution of power generation through hydel, thermal and IPPs is 6461 MW, 4811 MW and 6365 MW respectively. The power generated from Thermal and IPPs sources is costly and the government as well as public cannot afford the high prices of electricity. Therefore, to generate cheap electricity, the WAPDA is endeavoring to explore the hydropower resources. In this regard, WAPDA is working on various hydropower projects including Diamer Bhasha Dam, Kurram Tangi Dam, Munda Dam, Kohala Dam, Golen-Gol Hydropower, Dasu Hydropower, Bunji Hydropower, Neelum Jhelum Hydropower, Palas Hydropower and Spatgah Hydropower projects. For dispersal of power from these hydropower projects, which are mostly located in northern part of the country, large and extensive power transmission network consisting of 500 kV, 220 kV transmission lines and grid stations will be required. All the power plants in WAPDA's power system are operated in an integrated manner to supply power to the National Grid consisting of a large network of High Voltage and Extra High Voltage (HV & EHV) transmission lines and grid stations. National Transmission and Despatch Company (NTDC) is responsible for construction, maintenance and operation of transmission lines and grid stations of 220 kV and above.

1.2 AN OVERVIEW OF THE PROJECT

The Dasu Hydropower Project (Dasu HPP) is designed to generate 4320 MW electricity. The World Bank has recently shown its interest to finance the Dasu HPP as well as dispersal of power from Dasu to national grid system of Pakistan. This power dispersal from Dasu HPP will be carried out by construction of two parallel running 500 kV Transmission Lines from Dasu Power Station to 500 kV Grid Station at Pathar Garh (Tehsil Hassan Abdal, District Attock). The 500 kV Transmission Lines will extend over a distance of about 250 km and route will traverse five districts of KPK including Kohistan, Battagram, Mansehra, Abbottabad and Haripur before connecting the proposed Grid Station near Village Pathar Garh, in Attock district of Punjab Province.

The Ministry of Water & Power, Government of Pakistan will be the implementation agency for this project. The Ministry of Water & Power, Government of Pakistan in order to ensure the compliance of environmental and social safeguards, is undertaking series of measures at various levels including this initial assessment of environmental and social impacts and compilation of environmental and social impact assessment frameworks.

Due to the absence of final design and tower markings at site, project corridor of impact has been taken as 500 m, which have been used for the environmental/social baseline information and impacts assessment. From this corridor, two parallel running 500 kv transmission lines will pass and there could be direct impact on the environment like relocation of physical infrastructure (if any), clearing of vegetation, loss of crops, etc. and indirect impacts of the project activities are envisaged like existence of forests, wildlife habitats, wetlands, etc. While, for 500 kV grid station, an area of about 100 acres barren land privately owned by the residents of Village Pathar Garh, Tehsil Hassan Abdal, District Attock.

1.3 NEED FOR PREPARATION OF ENVIRONEMNTAL ASSESSMENT AND REVIEW FRAMEWORK (EARF) DOCUMENT

The development projects bring about changes, both positive and negative, in the environmental and social settings of the project area. The intensity and level of change, however, depends upon the nature of the project and the baseline environmental conditions of the area. For the last four decades this aspect has gained a momentum both at official and public level. As a result of this, official regulations and laws have been promulgated for the protection and conservation of the physical, biological and social environment. The law makes it mandatory to carry out environmental assessment studies before commencement of construction activities of any project.

As the design of the project component on transmission line is at initial stages, and no tower spotting or detailed engineering designs have so far been done therefore the project prepared an Environmental Assessment Review Framework (EARF), which highlights the potential environmental and social impacts and institutional arrangements to implement the project. More detailing of the environmental assets in relation to the exact alignment of the transmission line will be carried out in the follow-up environmental and social impact assessment study commensurate with the detailed design stage of this component. This study will also look into more details on the alternative of analysis particularly from the siting options, access roads, design of towers, construction technologies, etc. NTDC will also prepare environmental management and mitigation plan which will be embedded into the bidding documents for the construction of transmission line.

1.4 SCOPE OF SERVICES AND APPROACH TO CARRY OUT THE STUDY

The Terms of references stipulated following major objectives of this study i.e.

a. Identify adverse environmental and social impacts associated with various project components viz., power station, grid station and transmission lines.
b. Describe baseline environmental and social conditions of the whole project corridor.
c. Describe the governing national laws & regulatory framework on environment and World Bank's relevant safeguard's policies as well as institutional arrangements.

1.4.1 Specific Tasks for the Study Team

To achieve the above mentioned objectives the NTDC Team carried out the following activities:

a. Review the Project Details

i. Review the proposed project and its geographic, ecological, environmental, social, and temporal context, including any offsite investments that may be required.
ii. Identify need for detailed environmental assessment studies.
iii. Define the Impact Area and the "Corridor of Influence" of the project on the basis of the project scope and extent.

b. Review of the Legislative and Regulatory Framework

a) Review the policy, legal, and administrative framework within which this study and future studies will be carried out.
b) Review the national and World Bank/IFIs environmental and social safeguard requirements of the project.
c) Indicate relevant international environmental and social safeguards related agreements to which the country is a party.
d) Specifically review the World Bank OPs and their triggering status for the Project.

c. Scoping

Scoping is the first step of the environmental and social assessment studies and is essentially the process of identifying the significant issues relating to the proposed action and of determining the scope of the issues to be addressed in the report. The key tasks include:

a. Carry out reconnaissance field visit(s);
b. Hold initial stakeholder consultations;
c. Prepare work plan for the subsequent tasks; and
d. Prepare the Scoping Statement compiling the process and outcome of the scoping tasks described above.

e. Review the definition of Area of Impact and the Corridor of Influence and revise (if necessary).

d. Baselines Studies

All the available literature and secondary resources were explored. Various site visits were conducted and consulted all the line departments to establish the baseline conditions in terms of physical, biological environment and socio-economic conditions in the project area.

e. Public/Stakeholders' Consultations

Public consultations at certain intervals of the project corridor to;

- Identify project stakeholders and hold consultations with them to delineate the appropriate boundaries of the environmental and social assessment
- Screen potential adverse environmental and social issues.
- Receive feedback on the expected environmental and social issues related to the project impact.
- The stakeholders included the primary stakeholder (those directly affected by the intervention) and secondary stakeholders (those indirectly affected and those who have an interest in the project).

f. Identification of Environmental and Social Impacts of the Project

The major objective of the study was to identify the potential environmental and social impacts of the proposed project.

- These impacts may relate to the project design stage, construction stage and/or the project operation and decommissioning stage.
- Based on impact prediction methods and result of public consultations, the screening of adverse environmental and social impacts for inclusion in mitigation measures and environmental management plan.
- Identification of existence of any environmentally sensitive site (Protected areas, archaeological site, etc.) in the project corridor.

1.5 THE STUDY TEAM

The following team members participated in the preparation of the document.

Name	Designation / Position
Environmental and Social Team	

Rana Muhammad Sarwar	Safeguards Specialist, PMC Consultant (Team Leader)
Mahr Khalid Mehmood	Manager Environment and Social Impact Cell, NTDC
Engr. Muhammad Tariq	Deputy Manager Environment (E&SIC-NTDC)
Muhammad Shahid Saleem	Assistant Manager Environment (E&SIC-NTDC)
Samina Bilal	Assistant Manager Social Safeguards (E&SIC-NTDC)
Mir Ghazanfar Afzal	Senior Environmental Engineer, PMC Consultant
Technical Team	
Manzoor Ahmad	Additional Manager (EHV-1), Islamabad
Abdul Razzaq	Surveyor

1.6 STRUCTURE OF THE REPORT

The Environmental Assessment Framework comprises of eight chapters and an executive summary.

Chapter 1, Introduction; gives an introduction of the Project, scope of work for Environmental Assessment Framework, Approach and methodology, the study team etc.

Chapter 2, Policy, Legal and Administrative Framework; provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national/provincial legislation relating to environment in Pakistan, and to obtain all the required regulatory clearances. It also deals with the requirements of international donor agencies and other international protocols for protection of biodiversity for which Pakistan has firm commitment.

Chapter 3, Description of the Project; gives a rather detailed account of the Project particularly emphasizing those project components which are of importance in relation with environmental and social aspects.

Chapter 4, Environmental and Social Baseline Conditions and their Analysis; provides information about the environmental and social settings of the project area, geology, climate, flora, fauna, water resources, socioeconomic conditions etc. and analysis of alterations on baseline conditions to be made by the implementation of project.

Chapter 5, Stakeholders and Public Consultations; deals with the outcome of the consultation carried out with the local communities, knowledgeable people, public representatives, etc. It discusses the concern of various tires of the people and provides an outline how these have been addressed within the framework of the project.

Chapter 6, Potential Environmental and Social Impacts; identifies the potential impacts due to the implementation of two parallel running 500 kV transmission lines, as well as grid station on the physical, biological and social environment of the Project Area.

Chapter 7, Environmental Management Framework for the Mitigation of Project (Impacts); outlines the environmental management framework (EMF). The EMF provides generic guidelines to be followed while implementing various project activities, in order to keep the project environmentally and socially sound.

Chapter 8, Conclusions and Recommendations; sums up the report and conclusions and recommendations resulting from the study.

CHAPTER 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

This chapter provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national/provincial legislation relating to environment in Pakistan, and to obtain all the required regulatory clearances. It also deals with the requirements of international donor agencies and other international protocols for protection of biodiversity for which Pakistan has firm commitment.

2.2 NATIONAL POLICY AND ADMINISTRATIVE FRAMEWORK

2.2.1 Overview

The Pakistan National Conservation Strategy (NCS) that was approved by the federal cabinet in March 1992 is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992). The NCS outlines the country‘s primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan‘s natural and physical environment. The core areas that are relevant in the context of the proposed project are pollution prevention and abatement, restoration of rangelands, increasing energy efficiency, conserving biodiversity, supporting forestry and plantations, and the preservation of cultural heritage.

Two organizations, the Pakistan Environmental Protection Council (PEPC) and the Pakistan Environmental Protection Agency (Pak-EPA), are primarily responsible for administering the provisions of the Pakistan Environmental Protection Act, promulgated by the Government of Pakistan in 1997. The PEPC oversees the functioning of the Pak-EPA. Its members include representatives of the government, non-governmental organizations, and the private sector, particularly industrial sector. The Pak-EPA is required to ensure compliance with the NEQS and establish monitoring and evaluation systems. As the primary implementing agency in the hierarchy, it is responsible for identifying the need for, as well as initiating legislation whenever necessary. The Pak-EPA is also authorized to delegate powers to its provincial counterparts, the provincial EPAs (environmental protection agencies). One of the functions delegated by the Pak-EPA to provincial EPAs is the review and approval of environmental assessment reports of projects undertaken in their respective jurisdictions.

2.2.2 National Environment Policy, 2005

The national environmental policy 2005 aims to protect, conserve and restore Pakistan's environment in order to improve quality of life of the citizens through sustainable development. The main objectives of the policy are:

- Conservation, restoration and efficient management of the environmental resources;
- Integration of the environmental considerations in policy making and planning process;
- Capacity building of government agencies and other stakeholders at all levels for the better environmental management;
- Meeting international obligations effectively in line with the national aspirations; and
- Creation of a demand for environment through mass awareness and community mobilization.

2.2.3 National Forest Policy Pakistan, 2001

This policy covers the Renewable Natural Resources (RNR) of Pakistan i.e. forests, watersheds, rangelands, wildlife, biodiversity and their habitats. The policy seeks to launch a process for eliminating the fundamental causes of the depletion of RNR through the active participation of all the concerned agencies and stakeholders, to realize the sustainable development of the resources. It is an umbrella level policy providing guidelines to the Federal Government, Provincial Governments and territories for the management of their RNR. In consonance with it, the Provincial and District Governments may devise their own policies in accordance with their circumstances.

The goal of this policy is to foster the sustainable development of RNR of Pakistan, for the maintenance and rehabilitation of its environment and the enhancement of the sustainable livelihoods of its rural masses especially women, children and other vulnerable groups.

The elements of the policy are as follows:

- Reducing the impact of socio-economic causes;
- Population planning in critical ecosystems;
- Providing substitutes to firewood in the wooded mountains;
- Reducing poverty, poverty of opportunity and Powerlessness;
- Reducing political interference in the Forestry and Wildlife Departments;

- Renovating and invigorating the institutions of RNR;
- Supporting Local Governments in the sustainable development of their RNR;
- Policies for fragile ecosystems;
- Riveraing forests;
- Irrigated plantations;
- Preservation of relict and unique forests;
- Wildlife;
- Rangelands and desert ecosystems; and
- Planting of trees and fodders on farmlands.

2.2.4 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 empowers the Pak-EPA to:

- Delegate powers, including those of environmental assessment, to the provincial EPAs Identify categories of projects to which the IEE/EIA provisions will apply. Develop guidelines for conducting initial environmental examinations (IEE) and environmental impact assessment (EIA) and procedures for the submission, review and approval of the same.
- Develop environmental emission standards for parameters such as air, water and noise.
- Enforce the provisions of the Act through environmental protection orders and environmental tribunals headed by magistrates with wide-ranging powers, including the right to fine violators of the Act.

Under the provisions of the 1997 Act, the Pak-EPA has empowered four provincial EPAs to manage the environmental concerns of their respective provinces. The provincial EPAs can frame environmental regulations tailored to the requirements of their province, provided these regulations meet or exceed the minimum standards set by the Pak-EPA. They are also required to review and approve EIA of all development projects undertaken in their respective provinces, including those projects implemented by federal agencies.

2.2.5 Regulations for Environmental Assessment

Under GoP regulations, the Pakistan Environmental Protection Agency (Pak-EPA) Review of Initial Environmental Examination and Environmental Impact Assessment

Regulations (2000) categorizes development projects into two schedules according to their potential environmental impact. The proponents of projects that have reasonably foreseeable impacts are required to submit an IEE for their respective projects (Schedule-I). Projects that have more adverse environmental impact (Schedule-II) are required to submit an environmental impact assessment (EIA) to the respective provincial Environmental Protection Agency (EPA). Distribution lines and sub-stations are included under energy projects and IEE is required for *Transmission lines less than 11Kv, and large distribution projects* (Schedule-I). EIA is required by GoP for all projects involving *Transmission Lines (11Kv and above) and grid stations* (Schedule-II).

2.2.6 Pakistan Environmental Protection Agency Review of IEE/EIA Regulations 2000

The Pakistan Environmental Protection Act, 1997 provides for two types of environmental assessments: Environmental Impact Assessments (EIA) and Initial Environmental Examinations (IEE). EIAs are carried out for projects that have a potentially "significant" environmental impact, whereas IEEs are conducted for relatively smaller projects 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 concerned EPA. 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.

2.2.718th Constitutional Amendment

Amendment XVIII (the Eighteenth Amendment) of the Constitution of Pakistan was passed by the National Assembly of Pakistan on April 8, 2010. According to this amendment, the Ministry of Environment has been dissolved and the provinces have been authorized to make the laws and regulations regarding environment. The powers of Pak-EPA have now become the powers of Provincial EPAs. Every province is making its own environment protection act.

Since the major part (about 90%) of the project falls in the jurisdiction of KPK-EPA, therefore, it is considered as major stakeholder for environmental clearance. The KPK

EPA was consulted during the preparation process of this document, and it was informed that draft KPK Environmental Protection Act (KEPA) is under process and the pattern will be almost same as adopted by Punjab EPA (given in subsequent paragraphs). After preparation of draft act, the approval will be sorted from provincial assembly and then it will become act. For environmental clearance, the copies of EIA will be submitted to both EPAs i.e. KPK EPA and Punjab EPA.

The Punjab Province on the other hand has made environment protection act namely; "THE PUNJAB ENVIRONMENTAL PROTECTION (AMENDMENT) ACT 2012 (XXXV OF 2012)". The whole text of PEPA, 1997 will remain almost same with following amendments:

- 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;
- for the word "National", wherever occurs, the word "Punjab" shall be substituted.
- for the word "Pakistan" wherever occurs, the word "Punjab" shall be substituted.
- The Government shall, by notification in the official Gazette, establish a Council to be known as the Punjab Environmental Protection Council consisting of Chief Minister, Provincial Environment Minister and members.

2.3 GUIDELINES FOR ENVIRONMENTAL ASSESSMENT

The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects (Pak-EPA, 2000, Procedures for Environmental Assessment). The guidelines that are relevant to the proposed project are listed below, followed by commentary on their relevance to the proposed project.

2.3.1 Guidelines for the Preparation and Review of Environmental Reports

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

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

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

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

2.3.2 Guidelines for Public Consultation

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 ensures that their concerns are incorporated in any impact assessment study.

2.4 NATIONAL ENVIRONMENTAL QUALITY STANDARDS, 2000 Revised in 2010 (NEQS, 2010)

The 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 (02) parameters) in gaseous emissions from vehicle exhaust; and
- Maximum allowable noise levels from vehicles;

The NEQS for motor vehicle exhaust and noise was approved in 2009. These NEQS specify the exhaust and noise standards for in use vehicles and new vehicles (Petrol and Diesel vehicles).

The NEQS for ambient air quality, drinking water quality and noise has been approved in 2010. These NEQS specify the following:

- Maximum allowable concentration of pollutants (nine (09) parameters) for ambient air;
- Maximum allowable concentration of pollutants (35 parameters) in drinking water; and

- Maximum allowable noise levels during day and night time for residential area, commercial area, and industrial area and silence zones.

These standards also apply to the gaseous emissions and liquid effluents generated by batching plants, camp sites and construction machinery.

2.5 NATIONAL RESETTLEMENT POLICY AND ORDINANCE

At this point, the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. The LAA is limited to a cash compensation policy for the acquisition of land and built-up property, and damage to other assets, such as crops, trees, and infrastructure. The LAA does not consider the rehabilitation and resettlement of disrupted populations and the restoration of their livelihoods. Experience with large-scale infrastructure development projects implemented by institutions such as the Pakistan Water and Power Development Authority (WAPDA) has demonstrated the need for a cohesive national policy for resettlement. In spite of the fact that a National Resettlement Policy and related legislation have been drafted, these have not been officially notified. In the absence of such notification the safeguard policy of the World Bank as spelled out in OP/BP 4.12 (Involuntary Resettlement) will form the basis for managing the resettlement needs arising from the project.

2.6 OTHER ENVIRONMENTAL - RELATED STATUTES

This section outlines statutes aside from the Pakistan Environmental Protection Act, 1997, which are relevant to the project.

2.6.1 The Land Acquisition Act 1894

At this point, the only legislation relating to land acquisition and compensation is the LAA of 1894. The LAA is, however, is limited to a cash compensation policy for the acquisition of land and built-up property and damage to other assets, such as crops, trees and infrastructure. The LAA does not consider the rehabilitation and resettlement of disrupted populations and the restoration of their livelihoods.

2.6.2 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.

2.6.3 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.

2.6.4 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.

2.6.5 The West Pakistan Water and Power Act, 1958

This Act authorizes WAPDA to construct and operate electrical Transmission Lines 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.

2.6.6 The Forest Act, 1927; (and Provincial Acts and Rules)

The Act, inter alia, deals with the matters related with protection and conservation of natural vegetation/habitats. In that matter it empowers the concerned agency to declare protected and reserved forest areas and maintaining these. In spite of the fact that it recognizes the right of people for access to the natural resources for their household use, it prohibits unlawful cutting of trees and other vegetation. Therefore, for cutting trees for the construction purposes or otherwise, prior permission is required from the Forest Department of the concerned province.

2.6.7 NWFP Hazara Forest Act, 1936

In general this act bears similar laws and regulations for the Reserved and Protected Forests as that in the Forest Act of 1927. However, in addition to the above it regulates the privately/community owned forests, *viz*., Guzara Forest, which account for 53% of the total forested area in NWFP as against 7% Reserved Forest and 40% Protected Forest.

2.6.8 Provincial Wildlife Protection Acts

Provincial Wildlife (Protection, Preservation, Conservation and Management) Acts, Ordinances and Rules (NWFP 1975). In addition to empowering provincial wildlife

departments to establish game reserves, parks, and wildlife sanctuaries, the acts and rules regulate the hunting and disturbance of wildlife.

2.6.9 Antiquities Act, 1975

The Antiquities Act relates to the protection, preservation and conservation of archaeological/ historical sites and monuments. It prohibits construction (or any other damaging) activity within 200ft of such sites unless prior permission is obtained from the Federal Department of Archaeology and Museums. The Antiquities Act also binds the project proponent to notify the department should anything of archaeological value be excavated during project construction.

2.6.10 Provincial Local Government Ordinance, 2001

These ordinances, issued following the devolution process, establish regulations for land use, the 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.

2.6.11 Regulation of Mines and Oil Fields and Mineral Development Act, 1948

This legislation provides regulatory procedures for the quarrying and mining of construction material on state-owned as well as private land.

2.6.12 Factories Act, 1934

The sections of the act relevant to the project are those that concern 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. Given that construction activity is classified as “industry”, these regulations will be applicable to the project contractor.

2.6.13 Pakistan Penal Code, 1860

The Pakistan Penal Code deals with offences where public or private property and/or human lives are affected due to the intentional or accidental misconduct of an individual or body of people. In the context of environment, the Penal Code empowers the local authorities to control noise, noxious emissions and disposal of effluents. The NEQS enforced by the EPAs supersede the application of this legislation on industries and municipalities. The Penal Code, however, can provide a basis for the NTDC to

coordinate its activities with the local authorities to ensure that its construction activities do not become a cause of public nuisance or inconvenience.

2.6.14 Explosives Act, 1884

Under the Explosives Act, the project contractor is bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.

2.7 INTERACTION WITH OTHER AGENCIES

The NTDC is responsible for ensuring that the project complies with the laws and regulations controlling the environmental concerns arising during construction and operation of the Project. Moreover, it desirable pre-construction requisites are met. These include obtaining necessary permits and clearances from various government agencies. This section describes the nature of the relationship between the proponent and the line departments concerned.

2.7.1 Provincial EPAs

NTDC will be responsible for providing the complete environmental documentation required by the EPA Khyber Pakhtunkhwa and EPA Punjab and remain committed to the approved project design. No deviation is permitted in design once it is finalized and incorporated in the environmental documents. Should there be any modification during project implementation stage, this is not allowed without the prior and explicit permission of the EPA concerned.

2.7.2 Forests and Wildlife Departments, Khyber Pakhtunkhwa and Punjab

The project is expected to involve tree cutting and other vegetation clearing for construction purposes. The project contractor will, however, be responsible for acquiring a “No-Objection Certificate” (NOC) from the Khyber Pakhtunkhwa and Punjab Forest Departments. The application for an NOC will need to be endorsed by the NTDC. NTDC will carry out tree plantation to compensate the cutting of the trees. This will be implemented either through a contractor or as a deposit work assigned to the Khyber Pakhtunkhwa and Punjab Forest Departments. NTDC will also be responsible for liaising with the provincial forest department on the types of trees to be planted and other matters particularly concerning the substitute plantation areas if enough space is not available in the vicinity of the project area. Should there be a need of mobilization of communities for accommodating compensatory plantation on their lands, NTDC will seek assistance from the Forest Departments. Where construction is to be carried out in close proximity of protected forests and wildlife areas, the NTDC is required to

coordinate with these departments to ensure that impacts on vegetation and wildlife are minimized.

The project will be located in a difficult valley which has limited access due to non-availability of road. Therefore, there is insignificant human intervention. The local communities are used to rather primitive life style, where the needs are limited to food production for livelihood through agriculture and rearing livestock. As such, the natural environment more or less remained unexploited. There is an apprehension that provision of an improved access for the development of the Project will result in enhanced exploitation of natural resources, particularly timber logging and hunting of rare wildlife species. Therefore, coordination/consultation with concerned quarters is of utmost importance for the protection and conservation of the valley.

2.7.3 Provincial Revenue Departments

According to law, land is provincial subject. Thus the matters relating to land fall under jurisdiction of the Provincial Revenue Department that keeps the record of land use and ownership and collection of land revenue. On enquiry from the Revenue Department and local population it has been learnt that land record has yet not been generated by Revenue Department. This is because a few years back the Kohistan territory formed the part of Provincial Administrated Tribal Area (PATA) with the consequence the matters relating to land were handled according to tribal traditions. With allocation of district level status to the area, the Revenue Department is in process of preparing revenue record. Under the law, the acquisition of land and other assets thereon, like built-up properties, trees and crops for development projects for any federal or provincial agency or otherwise is carried out by the Provincial Revenue Department. For the purpose of this Project, the Revenue Department of Khyber Pakhtunkhwa and of Punjab are the concerning agencies. As such, the proponent is required to lodge an application with the Khyber Pakhtunkhwa and Punjab government to depute a land acquisition collector (LAC) and other revenue staff who will be responsible for handling matters related to acquisition and the disbursement of compensation. NTDC will provide logistical support and assist in preparing the documents necessary for notifications. It will also need to liaise with the provincial departments of agriculture, horticulture, and forestry in order to evaluate affected vegetation resources, such as trees and crops, etc., for compensation purposes. Where public buildings/infrastructure is involved, NTDC will approach the concerned departments that own the affected building or infrastructure before removing or relocating the facilities.

2.7.4 Local Government & Local Administration

NTDC and its contractor must ensure that the project meets the criteria of the Khyber Pakhtunkhwa and Punjab government for the establishment of construction camps and plants, use of water resources and safe disposal of wastewater, solid waste and toxic materials. These matters lie in the jurisdiction of the Local Government. Therefore, the contractor should liaise closely with the concerned body. In that matter, NTDC will however assist the contractor for developing the contacts. NTDC will also be responsible for monitoring the environment-related issues.

2.8 WORLD BANK' SAFEGUARD POLICIES AND GUIDELINES

The World Bank requires governments seeking financial assistance for development projects to carry out environmental impact assessment and prepare environmental management and resettlement plans. It is also required that the environmental and resettlement related planning should meet the requirements of the World Bank's safeguard policies and regulations.

The following World Bank's Safeguards Policies are triggered based on the environmental and social assessment field investigations. The justification for each policy's triggering has also been incorporated in subsequent paragraphs.

2.8.1 Environmental Assessment (OP 4.01)

The World Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The OP defines the EA process and various types of the EA instruments.

The proposed project consists of activities which are likely to have environmental and social consequences, such as:

- Damage to assets (such as crops),
- Deterioration of air quality
- Water contamination and consumption
- Damage to top soil, land erosion
- Safety hazard.

Since, as a part of Dasu hydropower development, this project has also been categorized as Category A project. Therefore, to identify the extent and consequences of these impacts, and to develop an EMP for their mitigation, an ESA will have to be carried out, in accordance with this Operational Policy.

2.8.2 Involuntary Resettlement (OP 4.12)

This policy deals with the issues and concerns related to land acquisition and involuntary relocation of project affected people. It not only addresses compensatory actions for loss of property but also deals with other type of losses including the followings:

- *Loss of shelter and re-location*
- *Loss of income source or livelihood (with or without re-location)*
- *Loss of natural resources*
- *Loss of access to natural resources*
- *Loss of communication among communities*
- *Loss of utilities and social amenities*

The main objectives of Bank's policies are that:

- Involuntary resettlement should be avoided or minimized as far as possible by exploring other viable alternatives;
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development program, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits;
- Displaced persons should be assisted in their efforts to improve their livelihood and standards of living or at least restore to the extent of pre-displacement levels.
- Displaced persons should be properly consulted and should have opportunities to participate in planning and implementing resettlement programs.

The Policy defines the requirement of preparing a resettlement plan or a resettlement policy framework, in order to address the involuntary resettlement.

For the proposed project during the site/route selection, settlements are generally avoided, however at some places acquisition of cultivable land – though temporary - cannot be ruled out.

Similarly, crops along the proposed transmission lines may be damaged during the construction and operation phases of the proposed project.

The transmission lines will be constructed over a distance of 250 km, therefore, some structures (residential or commercial) would possibly be relocated near towns and settlements. In view of the above, the OP 4.12 is likely to be triggered. Based upon the findings of the ESA a resettlement policy framework (RPF) or a resettlement plan (RP) will be developed, in accordance with this OP.

2.8.3 Natural Habitat (OP 4.04)

The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions. As the project will be located in the proximity of natural habitat (Palas Valley Forests), it is required to adopt the guidelines laid down in this policy to avoid/minimize the impacts on the natural habitat and propose mitigation measures for the adverse impacts, if any.

2.8.4 Forestry (OP 4.36)

The objective of this Policy is to assist the World Bank borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.

Since the elaborated project details, such as the transmission line routes and tower locations, are not known at this stage, but it is clear that it will cross the Palas Valley forests, which are the only “Un touch Forests” in Pakistan. Therefore, this OP will be triggered and respective measures and guidelines would be adopted during project preparation and construction stages.

2.8.6 Projects on International Waterways (OP 7.50)

This OP defines the procedure to be followed for projects the World Bank finances that are located on any water body that forms a boundary between, or flows through two or more states.

The proposed project route is planned on both banks of Indus River from Dasu to Pattan. The Indus River flows throughout Pakistan and originating in the Tibetan plateau in the vicinity of Lake Mansarovar. Indus River runs a course through the Ladakh region

of Jammu and Kashmir, Gilgit, Baltistan and flows through Pakistan in a southerly direction along the entire length of Pakistan to merge into the Arabian Sea near the port city of Karachi in Sindh. However, the proposed projects is Transmission Line and does not have any direct contact with ground like other linear projects such as highways, railway lines etc. So, it will not affect the riparians of the Indus River.

2.8.7 Physical Cultural Resources (OP 4.11)

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, palaeontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements.

During field survey no cultural/historical/archaeological property was identified within the COI. However, should any such property/chance find/artifact get identified during implementation, the Contractor will stop work, protect the cultural property, contact the relevant government department/ agency responsible and handover the artifact/chance find, etc.

2.8.8 Access to Information: This policy sets out the Bank's requirements for disclosing and sharing information. The policy reaffirms the Bank's commitment to transparency and accountability in its activities for promoting development effectiveness and poverty reduction.

2.9 OTHER PERTINENT INTERNATIONAL REGULATIONS

At an international level, Pakistan is a signatory to a number of agreements, protocols and understandings. Some of those relevant to the project are as follows:

2.9.1 The Convention on Conservation of Migratory Species of Wild Animals, 1979

The Convention requires the countries to take action to avoid endangering migratory species. Species covered in the Convention should be given special attention during EA and monitoring, and any impacts identified should be mitigated to acceptable levels.

2.9.2 The Rio Declaration, 1992

The Rio Declaration comprises twenty seven principles which address such important issues as; sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption.

2.9.3 Convention on Wetlands (Ramsar Convention), 1971

The broad aim of the Convention on Wetlands (Ramsar, Iran, 1971) is to halt the worldwide loss of wetlands and to conserve those that remain through wise use and technology transfer. Contracting Parties have made commitments to:

- Designate at least one site that meets the Ramsar criteria for inclusion in the list of Wetlands of International Importance.
- Protect the ecological character of listed sites.
- Include wetlands conservation within their national land-use planning.
- Establish nature reserves on wetlands and promote wetland training.

2.9.4 Convention on Biological Diversity

According to its Article 1, the convention has the following aims: "The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding." The Convention entered into force on 29 December 1993.

2.10 NTDC's SAFETY CONSIDERATIONS

NTDC Design Directorate has issued safety considerations which must be borne in mind during selection of route for a Transmission Line. The main points of the guidelines are:

- Operation in environmentally sensitive areas with special respect for fragile ecosystems and their inherent biodiversity are to be avoided to the extent possible;
- Similarly, ROW for a Transmission Line through natural features like mountains, hilly terrain susceptible to landslides, large lakes, reservoirs, marshes, human habitations and reserved forests or national parks are to be avoided to the extent possible;
- ROW is selected after due consideration for location of telecommunication lines and railway circuits to avoid electrical interference due to mutual induction;
- Residential structures are kept a minimum of 12m out from the plumb line of the outer conductor in the ROW. However, in the absence of an alternative alignment, an exception can be made for farm buildings and single floor factory buildings, provided neither is used for purposes of residence;
- Innovative technologies and latest equipment must be adopted or used to abate pollution in construction activities and operations;
- Routes of Transmission Lines are avoided to the maximum extent through areas of cultural or historical importance and religious places;
- Tubewells and open wells using a surface pump are not permitted under high voltage conductors as piping and cranes used to recondition such wells could make contact with high voltage conductors;
- Existing orchards can remain within the ROW although Towers are kept out of orchards wherever possible. Orchards are to be over-sailed by a clearance of 6m above the height of a mature orchard whereas all other trees are to be removed;
- Brick kilns should be kept at 30m outside the center line of ROW;
- Alternative route alignments should be used if any school, rural dispensary, mosque or local shrine (ziarat) falls within 200m of the centerline of a planned route;
- Existing open wells and hand pumps can remain under high voltage conductors, provided open wells are capped;
- Selection of sites for Tower foundation and Tower erection is made consciously on stable surfaces and by rejecting sites susceptible to erosion, slips and landslides;
- Alignment of the Transmission Line is made by NTDC after discussions with key persons of the area and by avoiding properties and infrastructure to the extent feasible;

- Spacing between Towers/poles may not be uniform and ranges could vary for physical and other considerations, such as crossing of main roads, residential areas, streams and canals and trees and for avoiding graveyards and big ditches in between Towers/poles;
- The route alignment of the Transmission Line, location of the Towers/poles and the corridors are identified by NTDC;
- The main consideration relating to public safety is a safe horizontal and vertical distance of conductor from ground level to prevent electrocution of people or animals under the Transmission Line. A corridor having a minimum width of 30m, clear of all obstructions, is provided for extra high voltage (500KV and 220KV) Transmission Lines (half on either side from the centerline). However, general farming within this corridor is allowed and tree plantations that do not exceed a height of 1.5m are also allowed to remain under the lines. Similarly, open wells, including Persian wheels, can remain under Transmission Lines. Tubewells and pumps are not permitted under high voltage conductors, because piping and cranes used to refurbish such wells may come into contact with the lines; and
- No residential or other public buildings such as factory, school, hospital and mosque, except for graves/graveyards, are permitted within the corridor. However, farm buildings which are used for residential purposes may remain under extra high voltage lines, provided vertical clearance of at least 8m is maintained. The height of Towers can be increased to accommodate such buildings.

CHAPTER 3

PROJECT DESCRIPTION

3.1 GENERAL

This Chapter provides an overview of the project including the proposed Transmission Lines route, 500 kV grid station and Dasu power house, and their design construction aspects. The chapter provides details of project location, project components, design considerations, construction aspects, construction procedures, and operation and maintenance activities. Analysis of Alternatives has also been made the part of this chapter. The project description chapter has some limitations due to the unavailability of in-depth technical and design details for Transmission Lines and Grid Station. The pre-qualification of the Consultants for the detailed engineering design and tower spotting is in process. It is envisaged that the Consultants will be on board in 6 to 8 months.

Dasu Hydropower Project complex including Dasu Power Station will be constructed and owned by the Water Wing of WAPDA. The NTDC will be responsible for dispersal of power from Power Station to 500 kV Grid Station by constructing two 500 kV transmission lines. Hence, this EARF (including baseline and impact assessment) has been prepared only for Transmission Lines and Grid Station and NTDC is not the proponent for Dasu Power Station. But for better understanding, an introduction to Dasu Hydropower Project has also been made the part of this chapter besides the transmission lines and grid station.

3.1.1 Location of Dasu Hydropower Project

The Dasu Hydropower Project will be constructed on the Indus River in Kohistan District of Khyber Pakhtunkhwa Province. It is a run-off-the river Project with the dam axis about 7 km upstream of Dasu Town, the administrative headquarter of Kohistan District. It is about 350 km north of Islamabad, the Capital City. The Dasu Hydropower Project will be comprised of a 242 m high concrete gravity dam and 73 km long reservoir behind the dam. The reservoir will have average width of 365 m and at full supply level elevation 950m, an area of about 23.85 km^2. The catchment area will be 158,800km^2. The average discharge at dam site is 2,068 m^3/sec. The project will have an underground powerhouse housing 12 turbines, each of which will produce 360 MW power, and a total maximum capacity to produce 4320 MW. The Project inundation upstream will require relocation of 46 km of the existing Karakorum Highway on the Left bank of the Indus. The access road to the dam site will follow the current route from Karakoram Highway at Komila along the Seo road and contractor's facilities will be on the Right bank near village Kaigah.

3.1.2 Location of 500 kV Dasu-Islamabad Transmission Lines

The proposed two parallel running 500 kV Dasu – Islamabad Transmission Lines route begins at Village Seo some 10 km upstream of river Indus at Dasu Hydropower Plant in Kohistan District of Khyber Pakhtunkhwa and extends along downstream of Indu s River till Pattan. From there, the corridor proceeds through the lower Palas valley to Battagram district via Shrakot to Tailos and Banna in Allai Tehsil of District Battagram. From Banna, the line will pass through Karkat Nullah and will take 2045 masl altitude till Village Chil near Battagram. From there, with a slight southwest turn towards Oogi in Mansehra District in the vicinity of Settlement Chaprian (District Mansehra) and then to Sherwan in District Abbotabad and gradually turning south east will enter into Haripur District on the eastern flanks of Tarbela Dam near Village Darwaza (District Haripur). Out of total 250 km, the 200 km line route from Dasu to Darwaza is mountainous, hard rocks, forests and falls in swear winter zone. The next 50 km from Darwaza to Village Pathar Garh Tehsil Hasan Abdal, District Attock is plain with rugged land with some agriculture fields.

3.2 PROJECT COMPONENTS

As discussed earlier, the NTDC will be the proponent for two parallel running about 250 km long 500 kV transmission lines and 500 kV grid station. But to develop a linkage between Dasu hydropower project, the transmission lines and grid station, a brief introduction on Dasu power station has also been incorporated.

3.2.1 Power House Complex

Dasu powerhouse will be located near Village Seo, about 15 km upstream to the Dasu Komila as shown in **Fig 3.1**. The powerhouse complex comprises three major underground caverns, the powerhouse cavern (PH cavern), transformer/GIS cavern (TR cavern) and tailrace surge chambers. The PH cavern accommodates twelve 360 MW generating units. The TR cavern houses main step-up transformers and gas-insulated switchgears (GISs) for all units. The surge chambers are four large cylindrical caverns, one surge chamber serves for three turbine units.

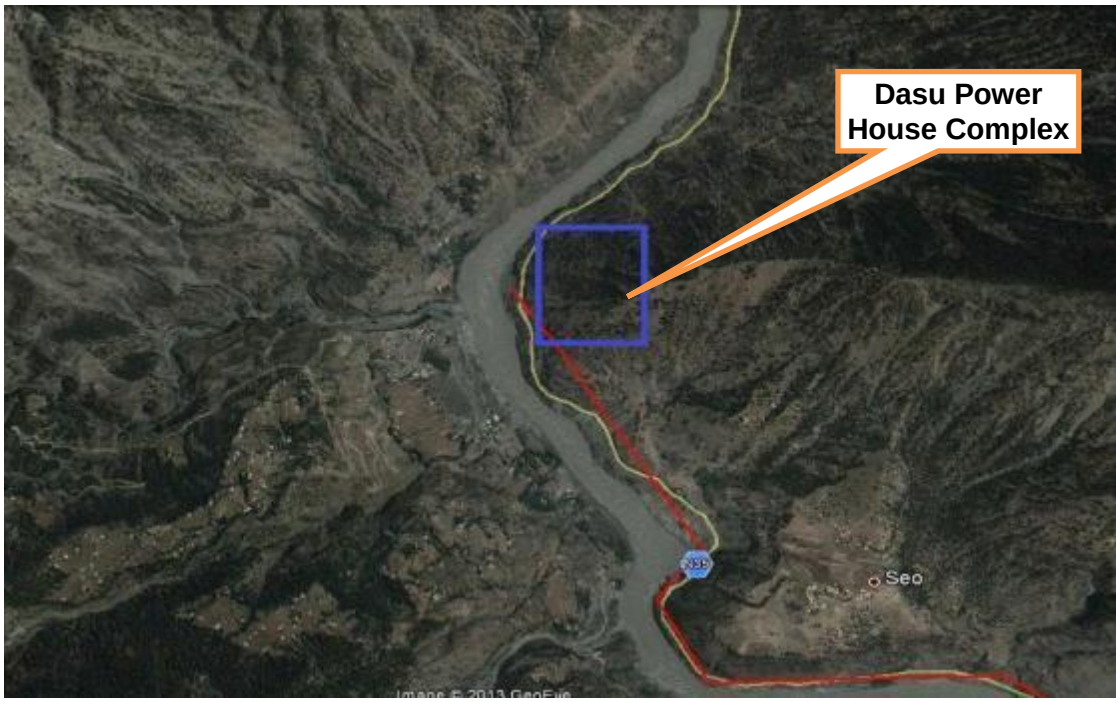


Fig. 3.1: Location of Dasu Power House Complex

The underground powerhouse complex will be constructed on left bank abutment of the main dam. The adopted alignment of the powerhouse complex is shown in **Fi 3.2**. In deciding the detailed alignment (position, orientation, etc.) of the powerhouse complex, the following considerations were taken into account:

1. Upstream waterway system between intake and powerhouse receives higher internal pressure than tailrace waterway. Provisions of the shortest possible length of the upstream waterway are advantageous to reduce costly high pressure waterways.
2. Major parts of caverns should be located within sound rock mass not containing inappropriate weak or fractured rock zones.
3. The axis of the PH cavern should be oriented in the direction perpendicular to major discontinuity planes in rock mass so as to minimize rock instability caused by cavern excavation.
4. The PH cavern should be located as close from the river bank as practical to minimize length of access tunnel and bus (cable) tunnel as well.

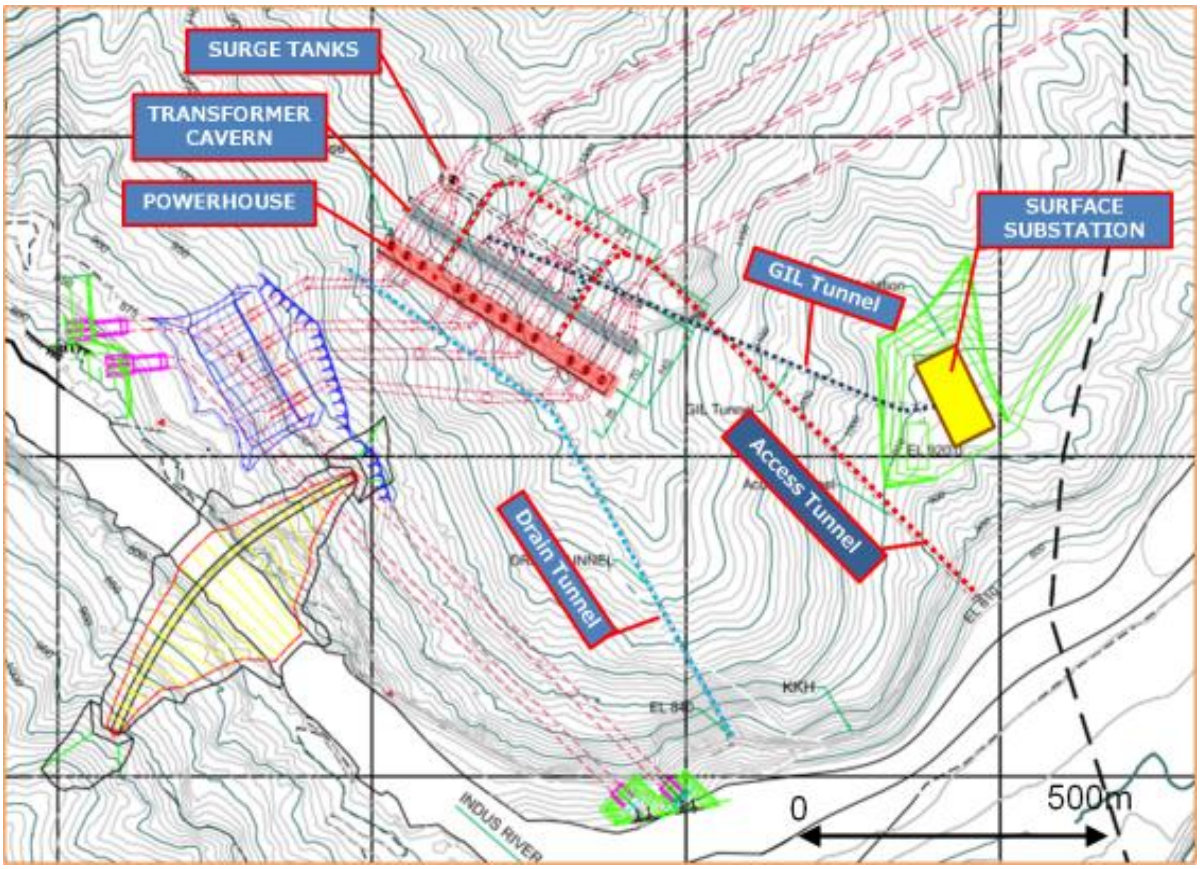


Fig 3.2: Alignment of Power House Complex

a. Generation Equipment

Twelve (12) No. 360 MW generating equipment units will be installed. Three (3) units will be connected to each power tunnel. Vertical shaft Francis turbine is selected for the rated output of 360 MW and the rated head (design head) of 179.51m.

b. Power Take-off yard and Transmission Lines

A take-off yard will be constructed and the power will be taken from the underground substation through underground tunnels up to the take-off yard where gantries are to be installed and then it will be connected to the Dasu - Pathar Garh Transmission Lines for power dispersal. The 500 kV Transmission Lines with two double circuit towers and four bundle conductors will be constructed from Dasu to Pathar Garh, Tehsil Hassan Abdal, District Attock.

3.2.2 Transmission Lines

The power dispersal from Dasu to Pathar Garh (Tehsil Hassan Abdal, District Attock) will be carried out by two parallel 500 kV Transmission Lines to connect 500 KV Grid Station near Pathar Garh Tehsil Hassan Abdal, District Attock. The 500KV Transmission Lines will extend over a distance of about 250km, the 200 km route will traverse five districts of Khyber Pakhtunkhwa including Kohistan, Battagram, Mansehra, Abbottabad and Haripur. The 40 km route will pass through Darwaza Tehsil & District Haripur before connecting the proposed Grid Station near village Pathar Garh Tehsil, Hassan Abdal, District Attock of Punjab Province (10 km). The transmission line route is shown in **Fig 3.3**.

The total estimated towers for both the proposed Transmission Lines will be 175 (if taken @ 285 m /tower) from Dasu to Pathar Garh. The spacing between the towers shall not be uniform because of the physical and other considerations like high altitudes, difficult terrain, crossing of rivers, main roads, railway lines, avoiding houses, infrastructure and cultural properties. However, average distance between towers can vary from 275 to 300m considering the topography and land use of the areas.

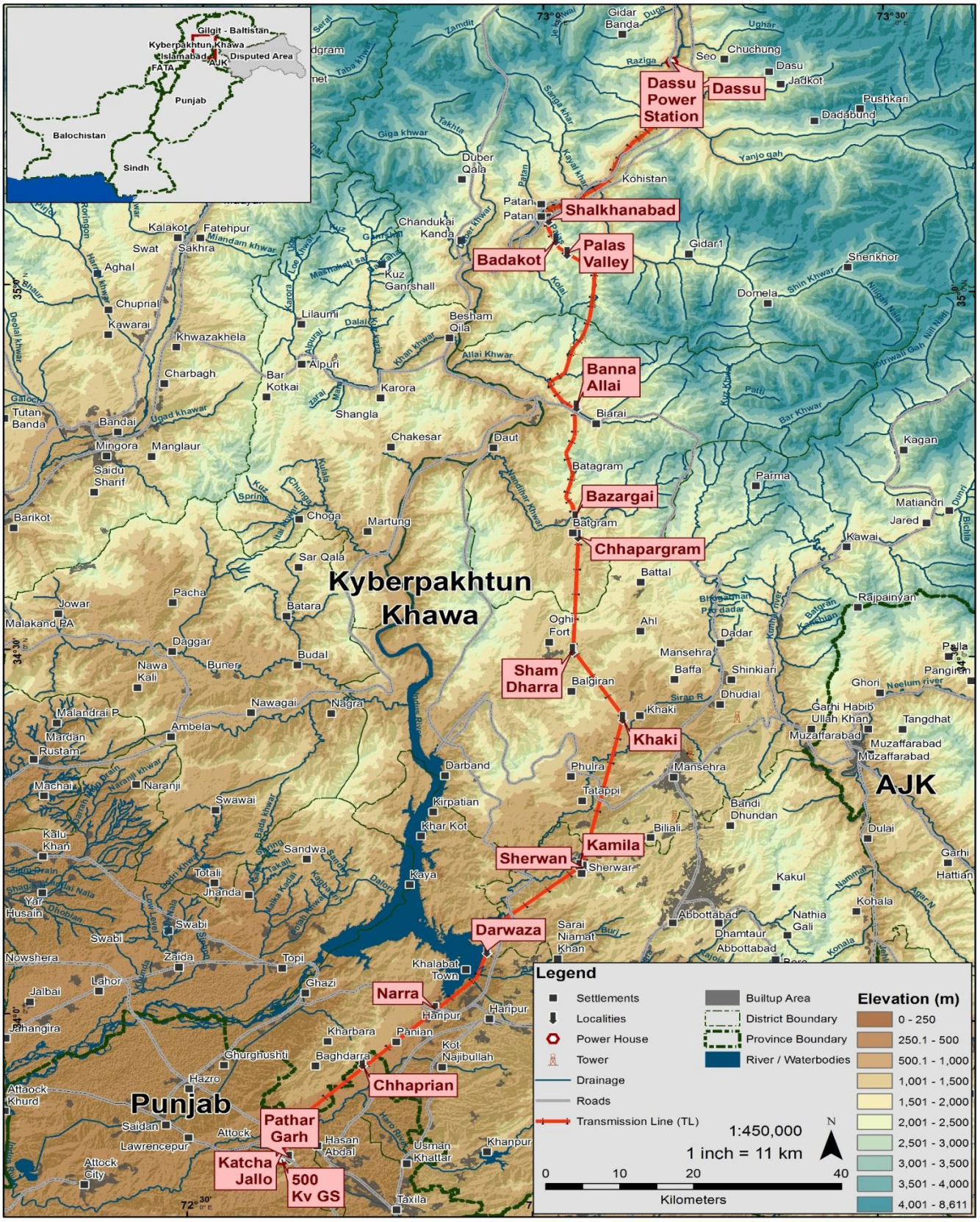


Fig.3.3: The Transmission Lines Route

a. Altitude of Transmission Lines Route

Almost 3/4th of the Transmission Lines from Dasu to Islamabad traverses through the mountainous areas of Kohistan, Battagram, Mansehra and Abbotabad districts from point 1 to 17 (as shown in **Fig. 3.4**). The red line in Fig. 3.1 shows the variation in the elevation of proposed Transmission Lines route.

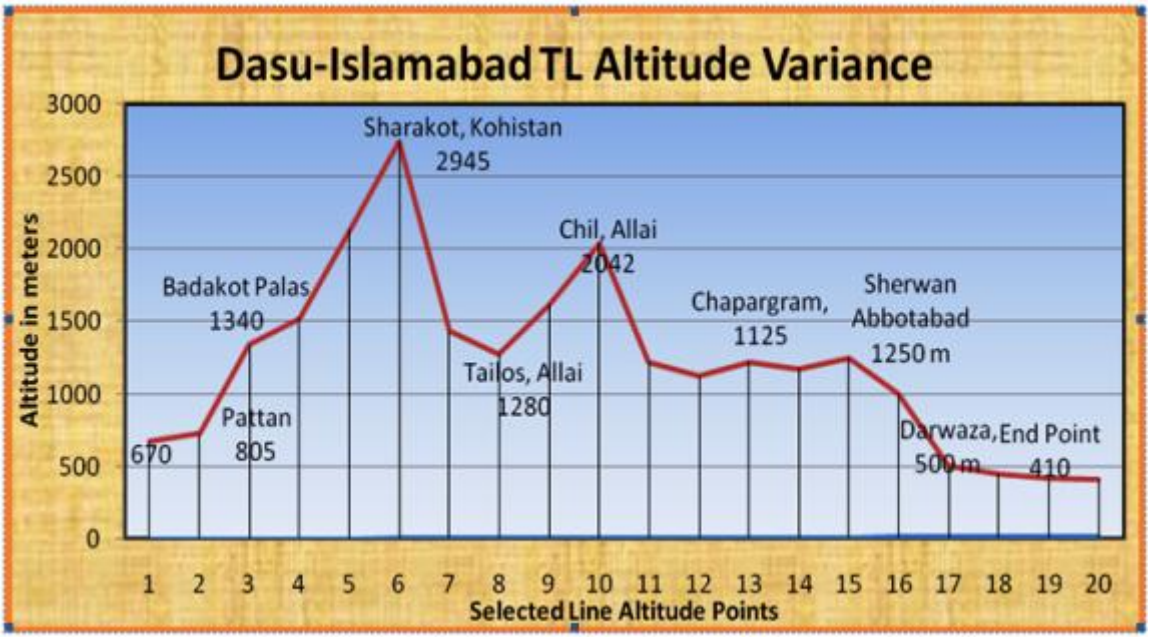


Fig.3.4: Dasu-Islamabad Transmission Lines Altitude Variance

The Transmission Lines in this area will be constructed on a wide range of altitude from about 670 to 2745 masl in Kohistan district (1 to 5), 1219 to 2042 masl in Battagram district (6 to 11), relatively even altitude between 1100 to 1200 masl in Mansehra district, followed by slightly higher altitude (1250-1000 masl) in Abbotabad district. The last 1/3rd section of the Transmission Lines will traverse through plain areas of Haripur and Attock districts where the altitude ranges between 500 to 410 masl.

b. Access to Existing Road Network

The overall access to the proposed transmission lines route is difficult, climatically hard, financially very expensive and technically a challenge for the engineers to design and implement. There is an acute problem of accessibility to road infrastructure in the entire tract. On an average for one square kilometer of the area, the access to road is only 0.30 km in Abbotabad, 0.25km in Haripur, 0.20 km in Mansehra and Battagram and 0.10 km in Kohistan district.

Table 3.1: Transmission Lines Access to Existing Road Network

	Area	Length of TL Km	Road Access Along or 2-3 km nearby	No of Rural Road Crossings
1	Dasu to Pattan –Palas	32	32	Both sides of the Indus. KKH
2	Palas to Palas Valley	10	12	
3	Palas Valley to Tailos	30	0	Only one jeep able
4	Tailos-Banna	10	6	Both side of Allai Khwar
5	Banna –Chill-Battagram	35	2	One jeep track one road
6	Battagram-Shamdara /Khaki	30	0	Two rural roads
7	Khaki –Darwaza	30	0	Two rural roads
8	Darwaza-Hasan Abdal	50	15	KKH and other link roads
	Total	250	65	

The proposed line direction of the transmission line is from north to south. Even then, less than 1/3rd of the route may have access from any main road, rural connecting road or jeep able roads. The remaining more than 2/3rd is entirely inaccessible mountains, forests or fellow lands. The most difficult mountainous and unexplored area (75 km) is between Palas Valley and Battagram.

3.2.3 Grid Station

The 500 kV Grid Station is proposed in the east west direction of Islamabad – Peshawar Motorway (M-1), near Village Pathar Garh, Tehsil Hassan Abdal and District Attock as shown in **Fig 3.5**. The Grid Station is initially proposed due to the following justifications:

- No Population and land availability.
- A 500 kV Grid Station will require 3 to 4 in and out circuits which require sufficient vacant area (about 100 acres).

- Close to National Transmission Lines Ring System, i.e. connection to all the distribution systems is easy.
- Land is barren and privately owned by the resident of village Pathar Garh.

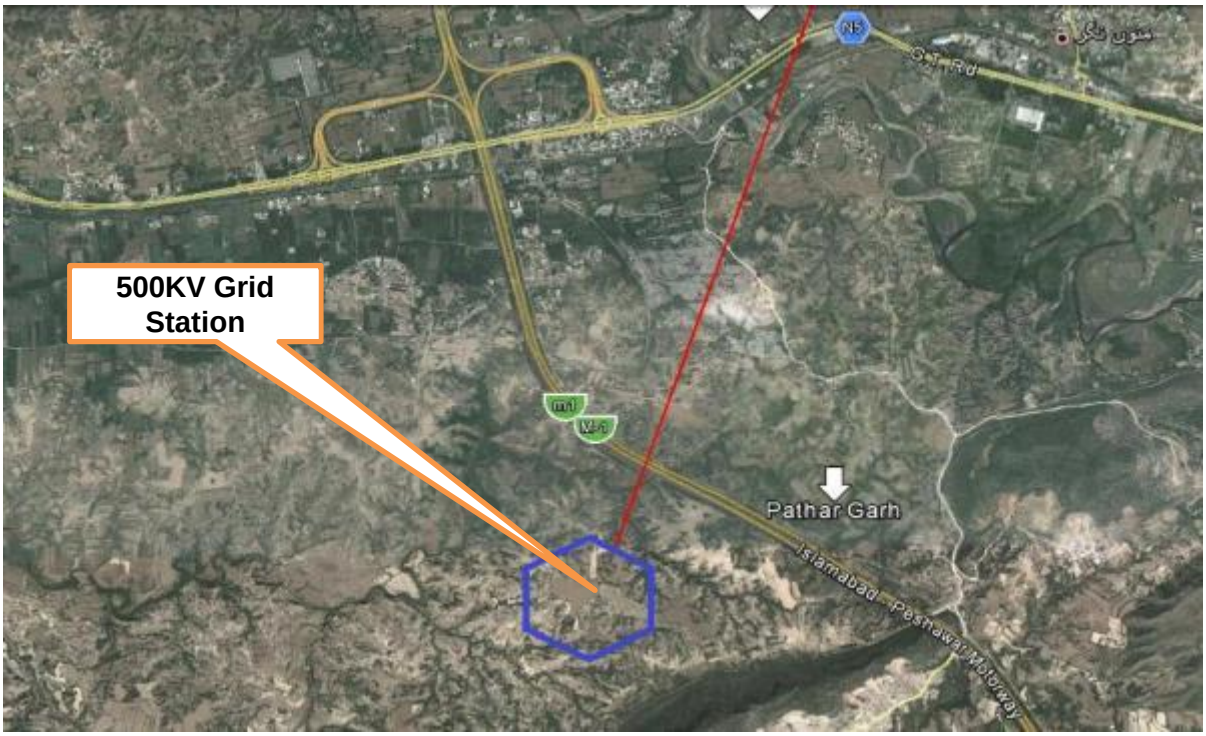


Fig. 3.5: Proposed 500KV Grid Station at Pathat Garh, Hassan Abdal

3.3 DESIGN ASPECT

Following is the brief description of the design aspects of the proposed Transmission Lines, Towers and Grid Station.

3.3.1 Transmission Lines

Electric-Power transmission is the bulk transfer of electrical energy, from generating powerhouse to electrical substations located near demand centers. This is distinct from the local wiring between high-voltage substations and customers, which is typically referred to as electric power distribution. Transmission Lines, when interconnected with each other, become transmission networks.

Electricity is transmitted at high voltages (110KV or above) to reduce the energy lost in long-distance transmission. Power is usually transmitted through overhead power lines. Underground Power transmission has a significantly higher cost and greater operational limitations but is sometimes used in urban areas or sensitive locations.

A key limitation in the distribution of electric power is that, with minor exceptions, electrical energy cannot be stored, and therefore must be generated as needed. A sophisticated control system is required to ensure electric generation very closely matches the demand. If the demand for Power exceeds the supply, generation plants and transmission equipment can shut down which, in the worst cases, can lead to a major regional blackout. To reduce the risk of such failures, electric transmission networks are interconnected into regional, national or continental wide networks thereby providing multiple redundant alternative routes for Power to flow should (weather or equipment) failures occur. Much analysis is done by transmission companies to determine the maximum reliable capacity of each line (ordinarily less than its physical or thermal limit) to ensure spare capacity is available should there be any such failure in another part of the network.

Taking into account the possibility of higher export of power through the line in future two 500 kV quad bundle Transmission lines from Dasu to Pathar Garh (District Attock) will be constructed. It may be added that detailed project specific information of the Transmission Lines will be available after the final design by the Consultants, while various parameters to be considered for the system and human safety are described below in detail.

a) Climatic Consideration

Local climatic conditions, i.e. the temperature, wind velocity, thunder storm levels, relative humidity etc., control the selection of materials to be used for Transmission Lines. The following climate parameters will be considered in the design criteria.

- Maximum Conductor Temperature $80^{o}C$
- Minimum Conductor Temperature $-5.0^{o}C$
- Every day temperature $25^{o}C$ to $27^{o}C$
- Maximum Wind Velocity 160 km/h (44.4 m/s)
- Isokeraunic Level 77-120 thunder storm day/year
- Maximum Relative Humidity 90%
- Ice Coating of Conductor 5 mm (for high altitudes)
- Current Rating of Conductor 1673A

b) Conductors and Line Configuration

The selection of conductor is based on electrical, mechanical and atmospheric pollution considerations. The size of conductor is determined such that the corona and radio interference levels are within the internationally acceptable limits. In the prequalification process for hiring of Consultants, the ACSR Martin conductor has been proposed for Transmission Lines that need further studies before final selection of the conductor. The ultimate tensile strength (UTS) limits for conductor tension should be as follows:

- 17% of UTS under no wind conditions, every day stress at every day temperature, final conditions;
- 50% of UTS under full wind load (44.7 m/sec) at every day temperature, final condition;
- 30% of UTS under no wind load condition at minimum temperature, initial condition; and
- Maximum wind pressure of 175kg/m² on conductors, 190 kg/m² for Optical Fibber Ground Wire (OPGW) and Overhead Shield Wire (OHSW) and 240kg/m² for insulators need to be adopted.

c) Insulation

Transmission Lines have been provided with appropriate insulator assemblies. These have been determined based on the degree of contamination in air, power frequency, operative voltage, switching and lighting surge voltage under the particular service conditions of the line. The type of insulators, creepage distance and shed diameter will be selected in accordance with the existing international standards for similar voltage level.

- ANSI C29.1: American national standards for electric power insulators;
- IEC Publication 383: Insulators of overhead lines with a normal voltage above 1000 V;
- IEC 575: Thermal-Mechanical performance test on string-insulator units; and
- Other relevant ANSI, ASTM and IEC Standards.

3.3.2 Towers

a) Tower Structures

All the Towers shall be self-supporting type, lattice steel structures, fabricated from galvanized structural steel shapes. The steel employed will be in accordance with the latest edition of the following standards:

- EN 10025: EURONORM Standard Specifications for Structural Steel; Rolled Steel, Steel Sheets and Plates etc.;
- ASTM A36: Standard Specifications for Structural Steel; and
- ASTM A572: Grade 50/60/65 Standard Specifications for High Strength Low-alloy Columbium-Vanadium Steels of Structural Quality.

The following types of towers are proposed for the proposed transmission lines at the planning stage:

i. Double Circuit Suspension Type Tower for line angles up to 2°. The tower shall consist of a basic body, body extension of 6.0 m and leg extensions of 2.0 m, 4.0 m, 6.0m &8.0 m.

ii. Double Circuit Light Angle Strain Type Tower for line angles up to 20° The tower shall consist of a basic body, body extension of 6.0 m and leg extensions of 2.0 m, 4.0 m, 6.0m &8.0 m.

iii. Double Circuit Medium Angle Strain Type Tower for line angles up to 40° The tower shall consist of a basic body, body extension of 6.0 m and leg extensions of 2.0 m, 4.0 m,6.0m &8.0 m.

iv. Double Circuit Heavy Angle/Terminal/deadend Strain type Tower for line angles up to 60° The tower shall consist of a basic body, body extension of 6.0 m and leg extensions of 2.0 m, 4.0 m,6.0 &8.0 m.

Double Circuit Strain Type Tower for line angle 60° shall be modified for use as transposition tower. The tower shall consist of a basic body, body extension of 6.0 m and leg extension of 6.0 m.

Notes

a. Special towers for long spans, river crossings, multi circuit towers; if required by site conditions; shall be designed as well.

b. It is proposed to use different families of towers at elevations up to 1000 masl, at elevations between 1000 and 2000 masl, at elevations between 2000 and 3000 masl and at elevations above 3000 masl. The necessary studies, investigations and techno-economic analysis to optimize the families and types of towers including body/leg/uneven leg extensions shall carry out at the detailed design stage.

c. All towers will be designed with reference to the environmental data and design characteristic to be agreed by the NTDC.

d. The number of tower types and height of towers shall be optimized to provide the most cost-effective line design considering reliability, materials, construction and maintenance solutions.

e. Normal ruling span and the tower height shall be determined for the most economical line construction according to the prudent engineering practices.

b) Tower Spotting

Tower spotting will be done considering the following factors:

- Selection of proper Tower type and positioning at optimum location;
- Achievement of economical Tower heights with safe clearance from ground and nearby objects;
- Assurance of compliance with design load criteria;
- Location of Towers to minimize risk of foundations being damaged by flood, erosion, shifting of material etc.;
- Providing a minimum clearance of 20 m from the outer conductor to the nearest conductor of another power line, existing or planned;
- Avoiding interference with or obstruction to any roadway or track being regularly used by wheeled vehicles, animals or pedestrians;
- In areas of high altitudes, extra ground clearance will be needed to ensure that tree/vegetation growth will not reduce conductor ground clearance below the minimum safe value; and
- The requirements of the relevant authorities regarding distance of Towers from the forests, roadways and railways.

c) Tower Foundations

All the Tower foundations should be designed as individual leg footings, with 4 legs per Tower. The following foundation types will be considered depending upon the results of the soil investigations.

- Shallow Foundation (Square);
- Dry;
- Semi-submerged;
- Submerged;

- Deep Foundation; and
- Piles.

Depending on the engineering parameters of the soils under various conditions referred above, different types of foundations will be recommended. Final choice will be made after the Contractor has carried out soil investigations at the time of construction.

The foundations will be about 2.5 to 4m below the natural surface level with only Tower footings protruding up to 0.45m above the ground. The general steel structure of the Tower will have a clearance of 4 to 8 m from the natural ground. This will allow the farmers to utilize the ground underneath the Tower.

Pile foundation is considered for Tower locations at nullah/stagnant/flash flood area at places where the soil condition do not permit the use of shallow foundations. The exact number of pile foundations will depend on subsurface investigations at the Tower locations at the time of construction.

3.3.3 Safety Parameters

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. It is for this reason that NTDC has adopted a 30 m wide (15 m either side from the centerline) corridor as the ROW for the proposed Transmission Lines. The aspects to be considered in this regard are as under:

(a) 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 6.4m should be adopted 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.

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, two (02) earth

electrodes of copper-clad steel rods are sunk vertically into the ground to a minimum depth of 3m and at the locations where the required resistance is not achieved crow footing will be done.

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.

(b) Public Safety

General Aspects**:** In view of public safety, NTDC has adopted a policy of keeping a 30 m wide corridor clear of all obstructions for 500KV Transmission Lines (15 m on either side from the centerline). However, NTDC allows general farm practices within this corridor, but tree plantation that exceeds a height of 2.5m is not allowed. As such, the existing orchards having fruit trees with a height of not exceeding 2.5m are allowed to remain under the lines. Similarly, open wells, including Persian wheels, are allowed to remain under the Transmission Lines. However, tube wells and peter pumps are not permitted under the high voltage conductors. This is for the reason that piping and cranes used to refurbish such wells could come in contact with the lines.

No residential or other public buildings like 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, provided a 10.2 m minimum clearance is maintained. The height of the Towers can be increased to accommodate such buildings.

Conductor to Ground Clearance: The conductor to ground clearance is desirable to be worked out based on over voltage due to switching surge. In this consideration, safe clearance is required to be provided for moving objects under the line with a height of 6.0m, withstanding switching surge of 3-sigma margin with 99.7% probability under adverse atmospheric conditions. This should keep the maximum voltage gradient at ground level and maximum current induced in a person less than the internationally allowable values. As such, the total conductor to ground clearance shall in no way be less than 10.2m.

The specific standard accepted is that of the NESC, currently applicable in the United States. The permissible conductor clearances (at a maximum temperature of 75^{o}C) are given in Table 3.2.

Table 3.2: Permissible Conductor Clearances

Sr. No.	Description	Clearance (m)
1	Cultivated land traversed by vehicles	11.5
2	Road and Streets	13.0
3	Highways	15.0
4	Railroads	14.0
5	Electrified Railroads Trolley Wire	6.0
6	River at High Flood Level	9.5
7	Places Accessible to Pedestrians only	12.0
8	Buildings Roofs not accessible to people	10.0
9	Tops of Trees (Orchards)	6.0
10	Canals	11.0

3.3.4 Grid Station Site Selection Guidelines

Since, the Project is at an initial stage and the detailed topographic survey and design of the Grid Station is yet to be carried out, the following points will be taken care of at a later stage:

- To minimize the resettlement, relocation of the existing infrastructure like roads, railways, cultural and religious sites etc. and alignment will be adjusted during the detailed survey;
- To avoid the cutting of fruit trees like apple and peach, alignment might be adjusted. However, an alternative for provision of Towers with maximum height to achieve the minimum required clearance will also be considered especially at sites where change of alignment is not possible;
- Adjustment of Towers to provide the minimum required vertical clearance at crossing points of roads; and
- Based on the site conditions, Towers with adequate height will be used to provide the required clearance.

3.4 CONSTRUCTION ASPECTS

3.4.1 Construction Schedule

Proposed construction schedule of the Transmission Lines will be developed at the detailed design stage and will attach in the ESIA report. The total duration of the Transmission Lines construction should take about 3 to 5 years. It is anticipated that construction work will be awarded to more than one contractor and work will be done at various locations simultaneously. The grid station will also be constructed at the same pattern and will take up to 3 years.

3.4.2 Construction Camps

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. A construction camp area will depend upon topography and site conditions. It is estimated to establish a worker camp every 50 km in average along the line, depending upon the land conditions. While, for grid station the camp will be located inside the boundary wall.

3.4.3 Work Force

The Transmission Lines construction involves many construction activities. For the purpose of ease, these are lumped into three main groups of activities, namely foundation laying, Tower erection, and conductor stringing crew including fixing of hardware and accessories. Accordingly, three types of construction crews are deployed for the work. The estimated work force required for each group of activities for one (01) Construction Camp is shown in Table 3.3 below.

Table 1.3: Estimated Work Force Requirement for Proposed 500KV T/L Project

Sr. No.	Staff	Foundation Crew	Tower Erection Crew	Conductor Stringing Crew
1	Site In-charge	1	1	1
2	Site Engineer	1	1	2
3	Supervisor	1	-	4
4	Foreman	1	1	2
5	Assistant Foreman	1	1	2

Sr. No.	Staff	Foundation Crew	Tower Erection Crew	Conductor Stringing Crew
6	Surveyors	1	-	1
7	Skilled Workers	12	8	14
8	Semi-skilled Workers	-	8	14
9	Unskilled / Helpers	22	21	49
10	Drivers	2	3	4
	Total	**42**	**44**	**93**

The total number of crew, skilled and unskilled labor to be employed will depend on the Contractor's activity schedule at the time when the contract is awarded. The Contractor will be advised to hire unskilled labor from the local communities. A training program will be recommended for unskilled workers at the detailed design stage. For grid station the construction work is also divided into two major categories i.e. civil works (construction of office buildings, staff residences etc.) and electrical works (fitting of transformers and other electrical appliances). The construction labor is expected to be at the same pattern shown in Table 3.3.

3.4.4 Construction Procedures

This section describe all the stages of the Transmission Lines construction that may cause a potential impact on the bio-physical and social environments, i.e. preparatory works that include access roads and the clearance of the ROW, construction of foundations and erection of Towers. It is also worth mention that the topography of the area and difficult terrain will involve number of construction procedures may be transportation of material through donkeys, horse or hand carts or may be in very high altitudes particularly in areas of Palas Valley, Tailos, Allai etc. will require helicopter services as well.

a. Access to the Construction Sites

The first section of the proposed Transmission Lines is approachable through Karakoram Highway up to Pattan. However, in other section of proposed Transmission Lines route from village Bada Kot Tehsil Palas District Kohistan onwards Sherwan Tehsil Sherwan District Abbottabad are different hilly areas and difficult terrain where the Contractor has to develop access tracks.

The access to proposed grid station site is comparatively easy and approachable from Jang Bahatar Interchange near Hassan Abdal, District Attock. From that interchange, the local access routes are present but the development of new access road to reach the site would also be required.

According to usual terms and conditions, laid down by NTDC, the Contractor will be bound not to cause 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 bounds 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 his pending works.

b. Clearing of ROW

To minimize the environmental impacts, NTDC normally imposes restrictions on the clearing of natural vegetation from ROW. 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. Trees more than 2.5m high, which may obstruct stringing or create hazard/danger to the Transmission Lines, will be removed. On the other hand, the clearing of dense 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 protected forests, orchards or other areas having fruit bearing trees, except as specifically approved by the Engineer in the case of having no other alternative. 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 Government of Pakistan. The clearance of ROW from the vegetation is normally done by mechanical means.

c. Tower Foundations and Erection

Since the Project is at the planning stage and detailed survey and design will be carried out at the later stage, the spotting of Tower locations has not been indicated at this stage of the Project. However, the general procedures for tower foundation and erection will be as follows.

In order to lay foundation the ditch is excavated by any mechanical and manual procedure. After fixing steel re-bars and concreting, the ditch is refilled with excavated material and the site is brought to the original ground level. As such, only four Tower

pedestals protrude above the ground level by about 0.45 m for normal foundations and about 1.8 m for pile foundations.

The Tower will be erected in panels of 2 m to 3 m 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.

3.5 OPERATION AND MAINTENANCE (O&M)

The 500 kV double Transmission Lines are vital link in the transmission grid system of Pakistan. Any outage on the line would seriously disrupt the power supply to major load centers, 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 Transmission Lines every three (3) months, while a comprehensive inspection will be carried out every 3 years.

3.6 ANALYSIS OF PROJECT ALTERNATIVES

The analysis of alternatives systematically compares feasible alternatives to the proposed project site, technology, design, and operation including, the "without project" situation in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, the environmental impacts are quantified to the possible extent and economic values are also incorporated where feasible. A comprehensive analysis would also include the basis for selecting the particular project design proposed and justify recommended emission levels and approaches to pollution prevention and abatement.

The ESIA would include the analysis of alternatives based on following considerations:

a. No-Project Alternative

The ESIA will evaluate the 'no-project' situation and report the justification for rejecting this alternative.

b. Siting Alternatives

The siting alternatives for the grid station and transmission line routes will be analyzed. The environmental and social aspects of these alternatives will be particularly described. The description will also include the siting process, selection criteria and

justification for the selected options. While considering various alternatives sites for grid station and routes for transmission lines, efforts will be made to minimize the environmental as well as socioeconomic impacts of the selected options. For this task, close coordination with the NTDC staff, particularly the route survey teams, will be essentially required.

c. Technical Alternatives

The ESIA will analyze the environmental and socioeconomic aspects of various technical options available for the Project including the construction techniques, design options. For this task as well, close liaison with the NTDC technical staff (Planning and Design departments) will be required.

d. Environmental and Social Considerations

The following criteria would be adopted for the selection of Transmission Lines route and alternate site for grid station considering the physical, ecological and socio-economic environments:

- Avoid densely populated areas/towns;
- Avoid indigenous or tribal settlements;
- Avoid cultural, religious and historical buildings;
- Minimize disturbance to the natural habitats of flora and fauna;
- Avoid major birds migratory routes;
- Avoid Wildlife sanctuaries, national parks and game reserves;
- Avoid potentially security vulnerable areas;
- Appropriate distance from the sensitive receptors (for instance, minimum 500 m);
- Avoid crossing large water bodies like lakes, rivers or streams; and
- Avoid crossing major roads, railway tracks and other similar structures and facilities.

CHAPTER – 4

ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS AND THEIR ANALYSIS

4.1 INTRODUCTION

The Project Area is composed of Alignment Route of two parallel running 500 kV transmission lines over a length of about 250 km and strip of 500 meter and 500 kV Grid Station at Village Pathar Garh (Tehsil Hassan Abdal, District Attock). For environmental and social assessment Corridor of Impact has been taken for a width of 500 m. In addition to this offsite impacts, wherever required, have been assessed.

This Chapter gives an overview of the environmental and social baseline information of Project Area, with special reference to impacts on Project Corridor. The information has been compiled from secondary and primary resources. Major environmental components are:

- Physical Environment
- Biological Environment
- Socioeconomic Environment

4.2 PHYSICAL ENVIRONMENT

Baseline studies on the physical parameters including land resources, topography, geology, seismicity, climate, water resources etc. are indicative of the following information.

4.2.1 Land Resources

The area for transmission line comprises Guzara forests, State forests, Protected Forests and privately owned barani and irrigated agriculture land and barren mountains. So far as the power station area is concerned, it will be constructed underground in the barren mountains of Village Seo (Dasu), while 500 Kv Grid Station is located on privately owned semi-barren land near Village Pathar Garh (Hassan Abdal).

Due to construction of two high voltage transmission lines in already limited usable land resources will definitely cause negative effects. Most of the project components fall in hilly area and the land available for agriculture use is in the form of terraces and very limited. Such terraces exist from Dasu to Pattan, on both banks of Indus River, in Palas valley, Allai (District Bhattagram), Abbotabad, Mansehra and Haripur. Therefore, the trend on land resources can be categorized as decreasing.

4.2.2 Topography

The general configuration of land is mountainous with precipitous to gentle slopes. The individual geomorphic forms of the region include natural rock slopes, scree, debris covered slopes, debris-flow fans, alluvial fans and river terraces and some plain areas.

The terrain varies from the high mountains and steep slopes of Dasu, Pattan, Pallas Valley, and Bhattagram to relatively gentle slopes of Abbotabad, Mansehra and Haripur districts. At places, level ground exists along the route of transmission line, but in the territory of Hassan Abdal, the flat land is available and agriculture farming is practiced by the farmers.

Like any other developmental activity, the transmission line construction will be causing land erosion coupled with removal of vegetation at places within the project corridor. The overall aesthetic effect of proposed transmission lines is likely to be negative, because mostly the lines will cross natural landscapes and private properties.

Fig. 4.1: High Mountains of Kohistan District

Fig. 4.2: Plain Areas near Khalabutt (Haripur)

4.2.3 Geology

The geology of project area varies considerably, as the transmission line passes through various geological regions. The rocks of Dasu, Pattan, and Allai are of Cretaceous age. Drosh formation to the south of Main Karakorat Thrust (MKT), thickly bedded porphyritic andesite with phenycrysts of plagioclase, pyroxene and hornblende, thin interbeds of red shales are common within the volcanoes.

The rocks of the palas valley belong to Ultra mafic Patan complex of Metaplutonic origin and garnet granulite of jijal complex. Geological units belonging to the Patan complex in the project area are diorite / granodiorite and gabbro.

The geology of the Battagram and Chhapargram area mainly comprises granitic gneiss, schist and alluvium (unconsolidated material). The rocks of this section belong to Hazara granitic complex. Gneisses are the product of high grade regional metamorphism. Schists are mainly composed of quartz as granular aggregates, muscovite (appearing) as colorless to light green and where associated with biotite tone produce schistose texture. The alluvial deposits of Bhattal are composed of slightly reworked and weathered material derived from the Mansehra granite along with silt clay/clayey silt, gravels and boulders occur at some places.

The geological features of Oogi, Sherwan (District Mansehra) and Haripur may be described as a section of Earth's Crust coming well within the area of Himalayan disturbance. This area is a part of land formations developed at the foothills of Himalayan Range through tectonic events subsequent to those that caused building of Himalaya. The rock formations include extremely folded beds of various types of sandstones, clay-stones and silt stones. The overall geological features and rock types of the whole project corridor are depicted in Fig. 4.3.

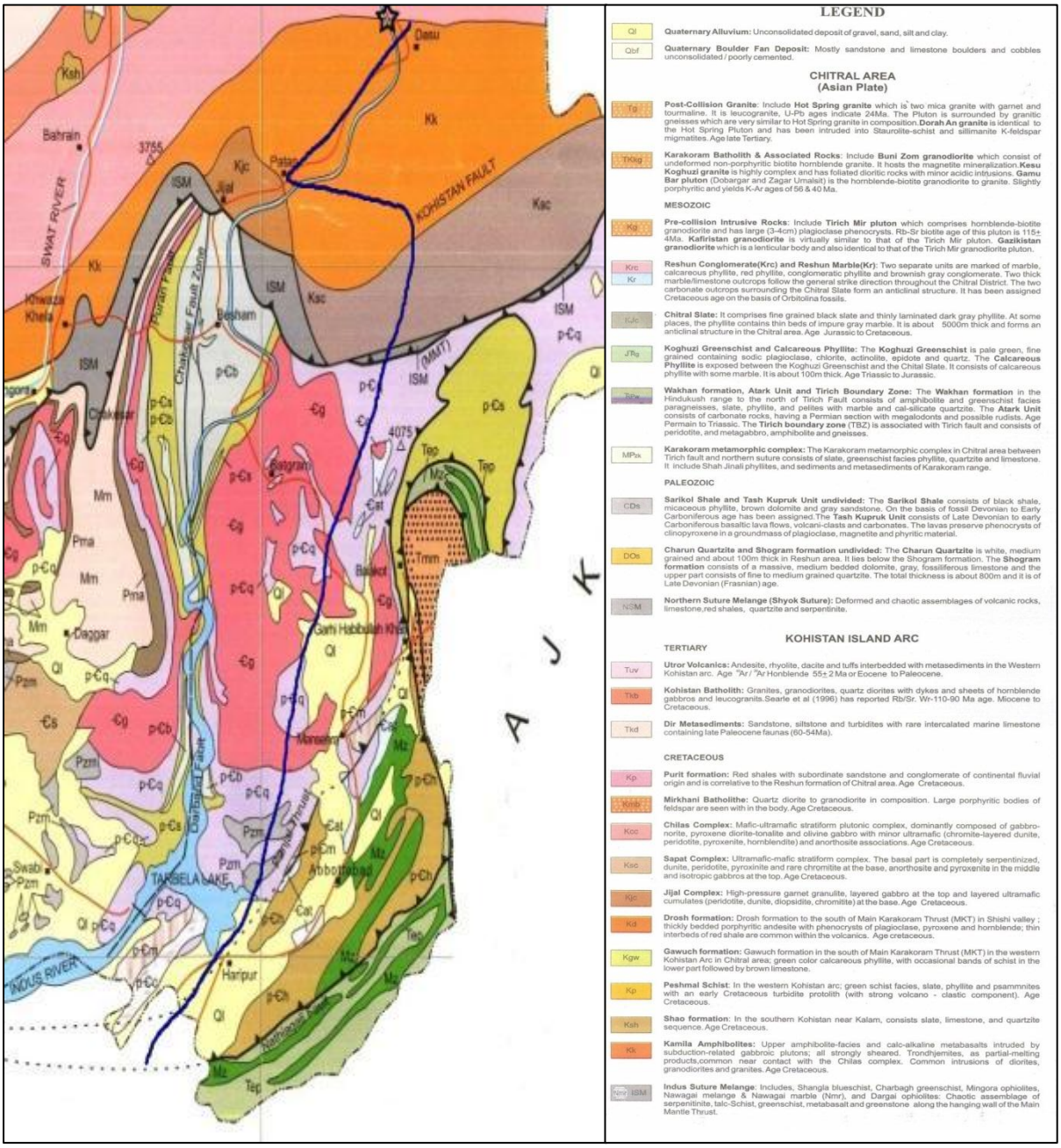


Fig. 4.3: Geological Map of Project Area (Source: Geological Map of KPK, Pakistan 2006, by GSP**)**

4.2.4 Soils

Soils in the region of Dasu, Pattan and Palas are derived from mixed source of alluvial deposits of Indus River, Kohistan River and Nullahs and colluviums from weathered rock material from side slopes of the valleys. The soils are gravely/gritty silt loam, loam to sandy loam. The lands at the valley floor and low-level terraces at the side slopes of the mountains are used for agriculture purposes, while at upper level the slopes are barren in Dasu and Pattan, while in Palas Valley, these are covered with grasses and shrubs with occasional trees. Here the lands are used for grazing.

Because of very steep slopes of the mountains in Dasu and Pattan, the soil material rarely get chance to remain intact along the slopes. Consequently, the area is not of any economic use from agriculture or grazing point of view and even for establishing settlements.

The alluvial deposits of Battagram and Mansehra area are composed of slightly reworked and weathered material derived from the Mansehra granite along with silt clay/clayey silt, gravels and boulders occur at some places and are covered with vegetation.

In Abbottabad and Haripur Districts, the loess plain (Rash Plain) consists of deep deposits of wind laid material (loess). These aeolian deposits are probably of Pleistocene age. The surface of the plain is mainly level to nearly level or gently undulating. In view of the age of the deposits, any relief has to be attributed to erosion rather than to deposition. In most of the area, recognized as loess plain, there is no serious gully erosion. Soil texture in the landform is very uniform locally but ranges from silt loam to silt clay over greater distances.

The soils of Haripur, Abbottabad and Mansehra districts are very fertile and used for agriculture purposes. The whole area is covered with vegetation.

4.2.5 Seismology

In general, the project area lies in seismically active area. The active faults in the vicinity of project area include; Main Mantle Thrust (MMT), Kohistan Fault, Kamila Strike Strip Fault and Jamila Shear Fault. A brief history of earthquakes occurred in and around the vicinity of project corridor is described in forthcoming paragraphs.

Before the establishment of seismological observatories, which began at the beginning of 20th century, intensity data collected from the historical records was the only source of earthquake information. Historical Earthquake data is a general account of damage/ loss to life (human & animal) and property. The historical pre-instrument earthquake data has been collected from the description of the earthquakes given in the memoirs or records of travelers, historians and writers. Such earthquakes catalogues have been compiled by Oldham, 1893, Heukroth and Karim, 1970, Ambraseys et al. 1975 and Quittmeyer and Jacob, 1979, from this data it reflects that northern Pakistan as a whole has remained a house of prominent

earthquakes. Taxila (25 A.D.) event is probably the most conspicuous one that changed style of building-construction out rightly. An important value of intensity data is that it establishes some understanding of the level of the damage that can be expected to occur in a given region. The catalogue of historical earthquakes for this region is rather sparse and probably highly incomplete. Since 1700's, the historical earthquake data for the northern areas of Pakistan are few and mainly concentrated on the centres of colonial administration. The important tremors for which damage data is available are as follows:

- Aristobulus of Cassandreia described that the first known historical account of seismicity of northern part of Pakistan in the fourth century B.C. He accompanied Alexander on his expedition to India, who pointed out that the country above the river Jhelum was subjected to earthquakes, which caused the ground to open up so much, that even the river beds were changed (Ambraseys et al., 1975).
- An important historical earthquake occurring in northern Pakistan was the destructive earthquake of 25 A.D., which ruined the city of Taxila, to which the intensity of IX-X has been assigned (Ambraseys et al., 1975). The effect of this earthquake still can be seen in the excavated remains of Jandail, Sirkap, and Dharmarajika. The building methods after this earthquake changed, including reduction in the height of buildings, improvements in masonry bracing density, and making the foundations more secure.
- On March 25, 1869, a large earthquake occurred in the Hindukush region, strongly felt at Kohat, Peshawar, Lahore, and at Khodjend and Tashkent, the shaking lasting 20 seconds;
- On January 20, 1902, a large earthquake caused damage in the Chitral area and was felt widely in the Punjab and up to Shimla;
- On July 8, 1909 an earthquake caused destruction in the region of Mankial and Kalam in the Swat valley where Lady Minot's Hospital was damaged and many houses collapsed, killing 10 people and cattle. Damage area extends to Dir, Karori and Alipurai and was felt in Gilgit, Besham, and to the north up to Tashkent; and
- The epicentral intensity of all these earthquakes is estimated to be not greater than VIII on the Modified Mercalli (MM) intensity scale.

The instrumental recording of earthquakes started in 1904 but very few seismic stations were established in the South Asian region until the 1960's. However subsequent installation of high quality seismographs by international agencies has resulted in improvement of the quality of earthquake recording in this region improved and has resulted in a better understanding of the seismicity of Pakistan.

The epicenters of three well-studied earthquakes of magnitude 5.9 or above have been recorded near the project area (Ambraseys, et al., 1975; Jackson & Yielding, 1982). These earthquakes are:

- Patan earthquake (28 December 1974); magnitude (Mb) 5.9; close to the surface expression of MMT;
- Hamran earthquake (3 September 1972); magnitude (Mb) 6.3; within the Kohistan Island Arc;

- Darel earthquake (12 September 1981); magnitude (Mb) 6.1; within the Kohistan Island Arc; and

The Kashmir earthquake of magnitude 7.6 struck the northern part of Pakistan on October 08, 2005, causing widespread damage and casualties in Azad Kashmir and adjoining areas of KPK. The earthquake was followed by a series of more than thousand aftershocks. Location of epicenter of this earthquake and affected area is shown in Fig. 4.4.

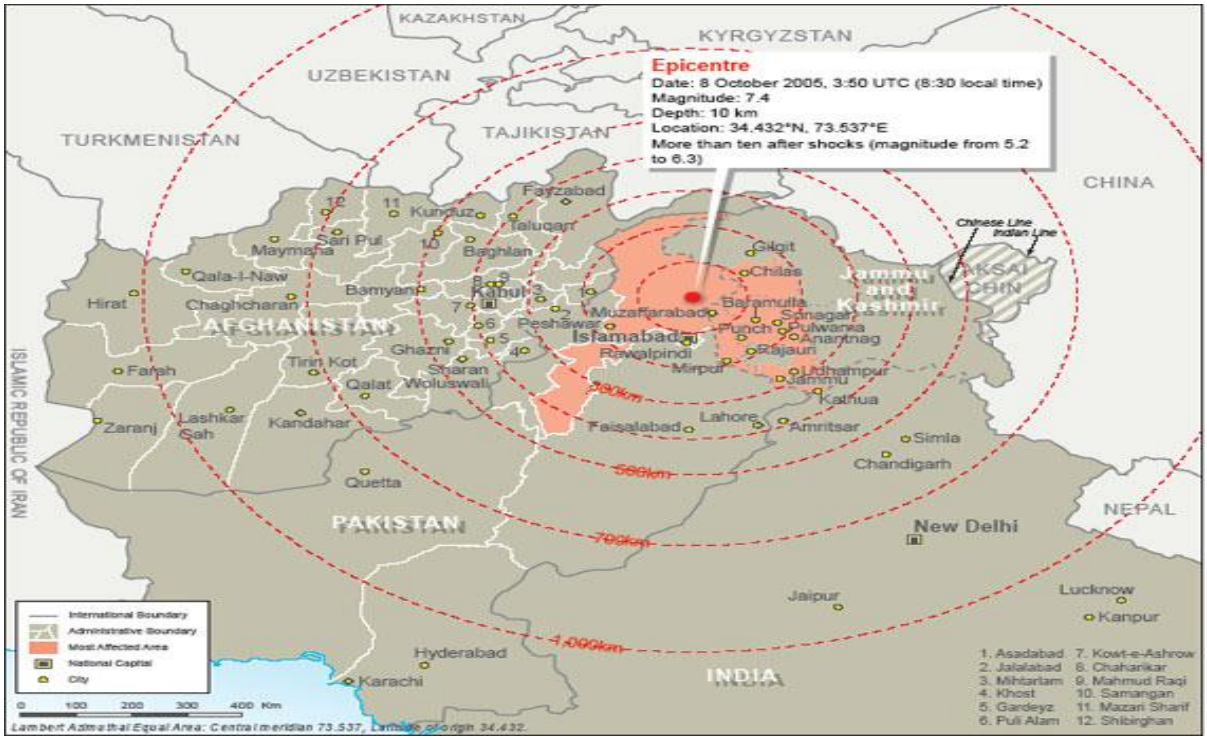


Fig. 4.4: Geological Map of Project Area (Source: United Nations Office for the Coordination of Humanitarian Affairs – Relief Web.)

4.2.6 Climate

The Project area falls in very cold, humid climatic zone of Pakistan and is characterized by large seasonal variation. The climate in this region is mainly determined by the altitude and precipitation in the form of rain and snowfall in some areas. The project area is influenced by two rainy seasons: (i) south-eastern monsoon during summer: and (ii) western winds during winter. The lower altitudes generally experience humid to sub-humid sub-tropical conditions, the higher altitudes experience temperate conditions.

For the purpose of the Project, the climatic data of two meteorological stations has been obtained from meteorological department which included; Pattan (730 m asl) and Kamra (303 m asl). The climatic data for Pattan is available for last 7 years (i.e. 2005-2011) and for Kamra the data is available for last 11 years (i.e.2001-2011) and presented below on mean monthly basis. Various parameters to establish the climatic baseline of the project area are discussed in the subsequent paragraphs and

complete climatic record of Pattan and Kamra Stations is attached as **Appendices 4.1** and **4.2** respectively.

a) Temperature

Fig. 4.5 and 4.6 depict average monthly maximum and minimum temperatures of two stations, viz., Pattan and Kamra respectively. It may be seen from the graphs that in Pattan the temperature rises rapidly until June. With advent of monsoon in July the temperature drops. The months of December and January experience a severe drop in temperature, and in areas above 1‘800 m asl the temperature falls below the freezing point. Severe frost occurs during these months, often damaging budding plants such as apple, pear and cherry. Summer is also marked with monsoon rains, which occur usually in July/August.

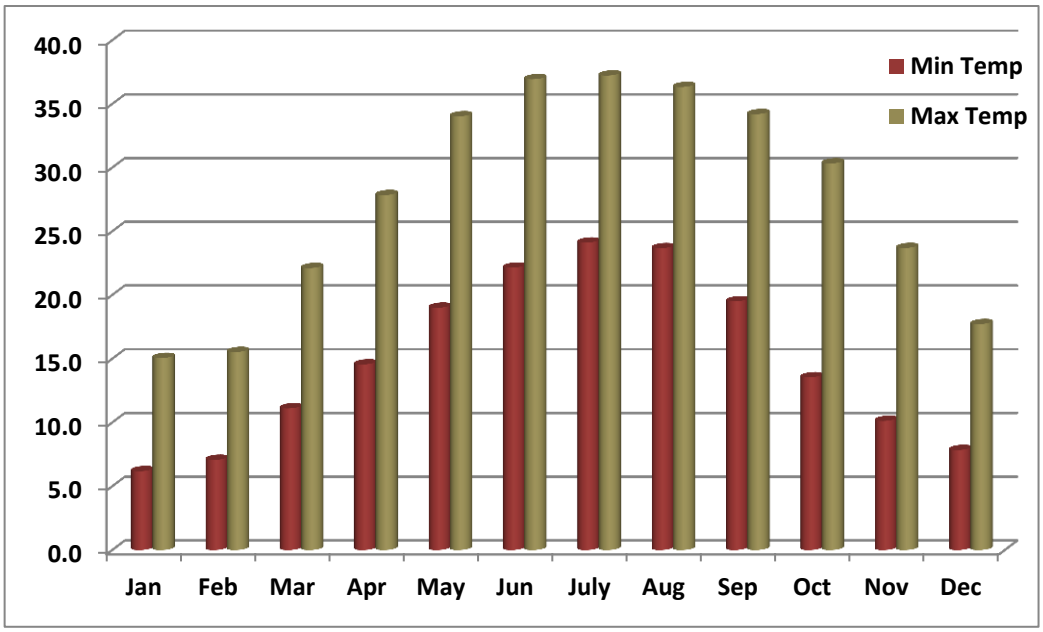


Fig. 4.5: Mean Maximum and Minimum Temperature (^{o}C) throughout the year (Pattan Station)

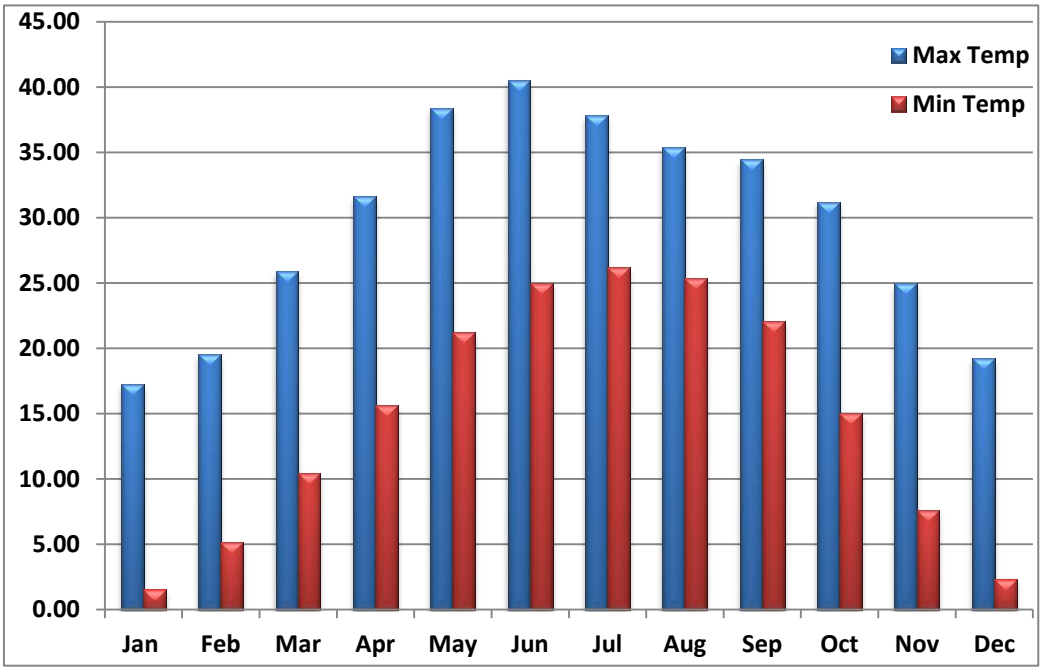


Fig. 4.6: Mean Maximum and Minimum Temperature (^{o}C) throughout the year (Kamra Station)

b) Humidity

Mean monthly humidity levels (%age) for both the stations are shown in Fig. 4.7 and 4.8. For Pattan station, the highest humidity is observed in February and lowest in June. With the advent of monsoon the humidity increases during July and August and declines from October onwards. In case of Kamra, the humidity is highest in December and Lowest in July. As seen from graph, the humidity shows fluctuations throughout the year.

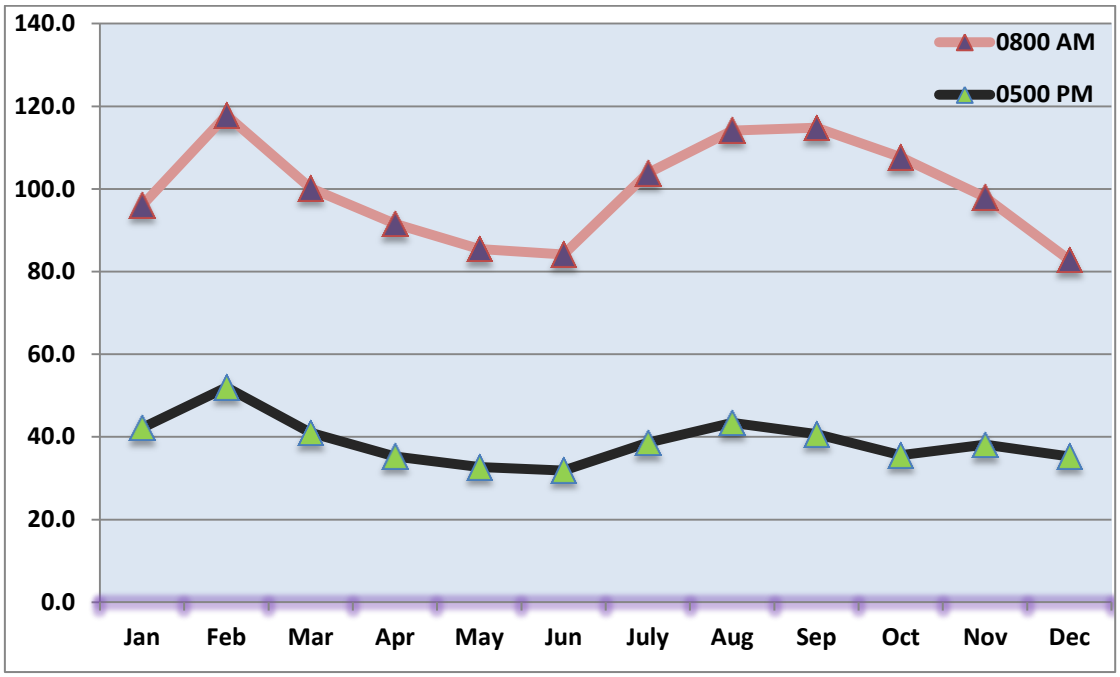


Fig 4.7: Mean Monthly Humidity Levels (% age) at 08:00 AM and 05:00PM (Pattan Station)

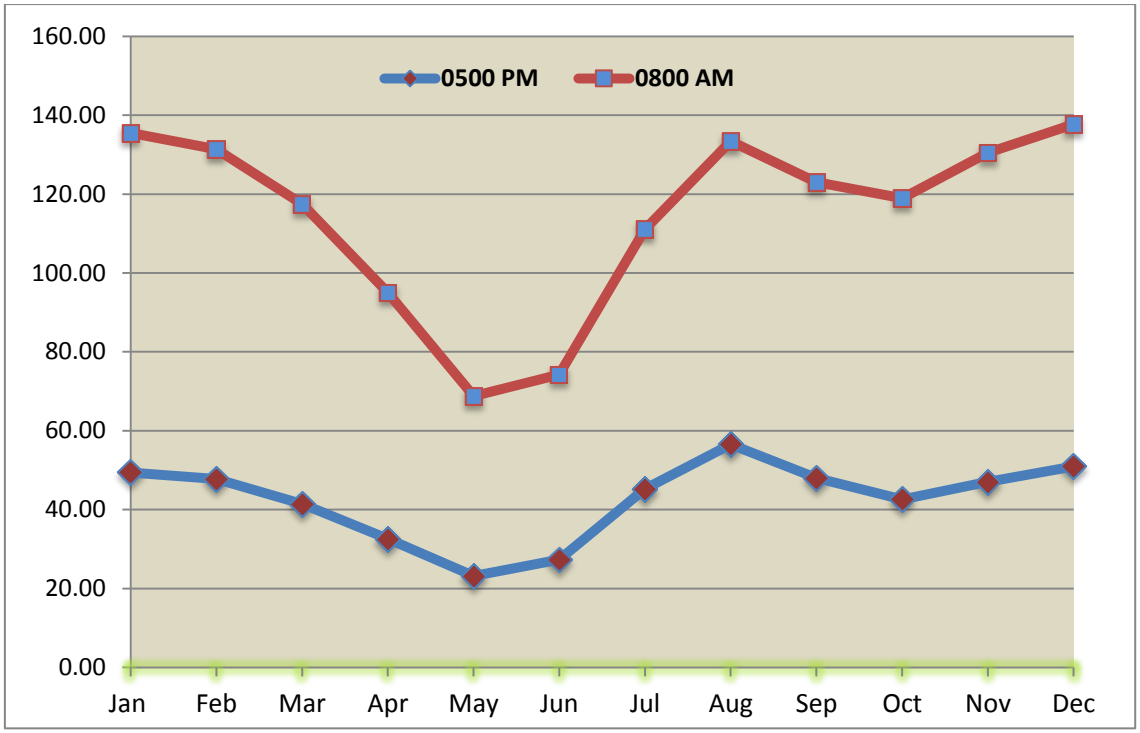


Fig 4.8: Mean Monthly Humidity Levels (% age) at 08:00 AM and 05:00PM (Kamra Station)

c) Rainfall

As shown in graphs, the rainfall varies considerably both in volume and distribution throughout the year. In Pattan, the maximum average rainfall occurs in month of February while for Kamra, the rainfall reaches the peak in August. In upper regions like Dasu, Pattan, Palas Valley, Allai etc. the winter rainfall is more significant than summer precipitation. In lower regions like Hasanabdal, Mansehra and Abbottabad, the situation becomes vice versa.

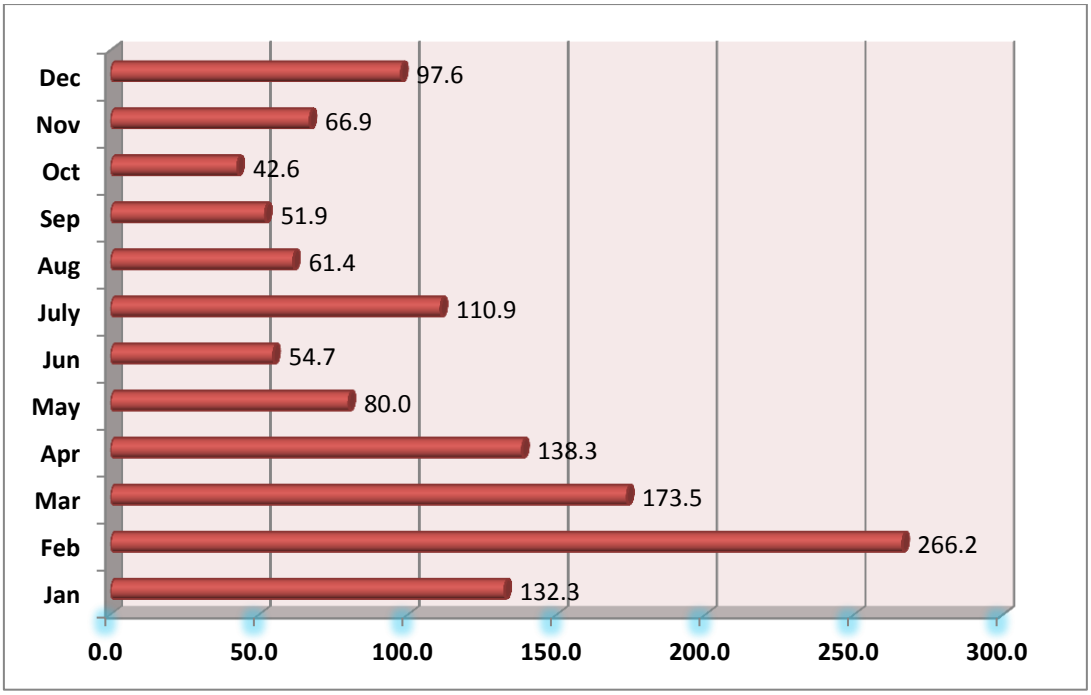


Fig 4.9: Mean Annual Rainfall Pattern (Pattan Station)

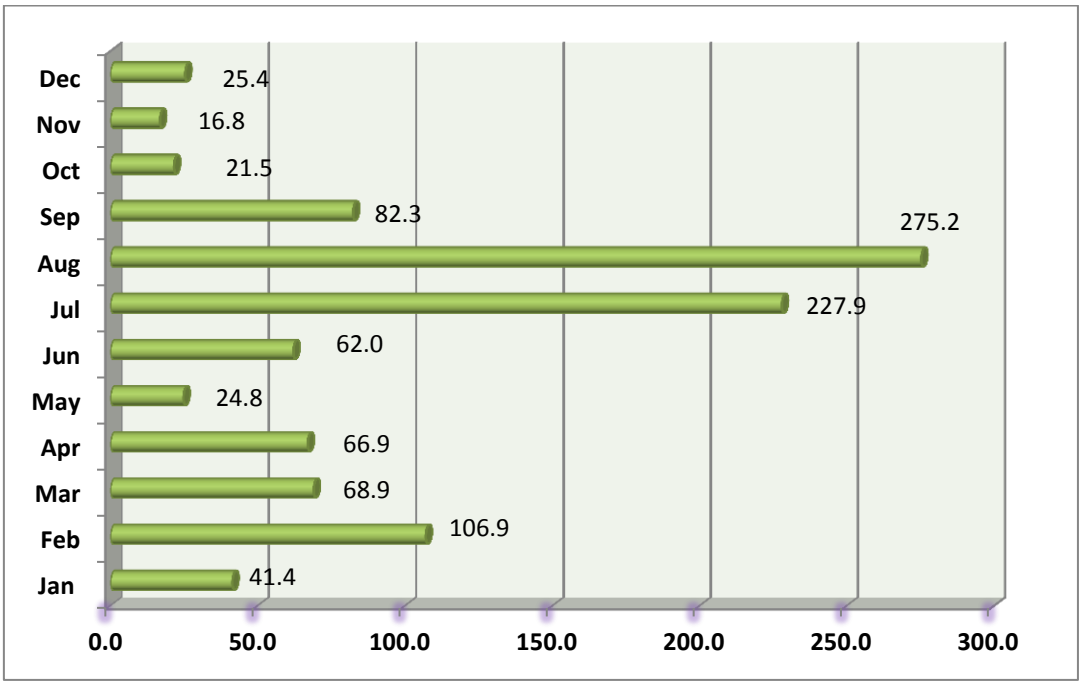


Fig 4.10: Mean Annual Rainfall Pattern (Kamra Station)

d) Winds

In Pattan Area, the winds normally blow from northeast morning time (at 0800 am) and southwest at evening (at 0500 pm). At Kamra Station, the predominant winds are normally blowing from northeast in winter and southeast in summer at morning time (at 0800 am) and northwest in winter and southeast in summer at evening (at 0500 pm).

Fig. 4.11 and 4.12 show the trend of wind speed (knots) during the year.

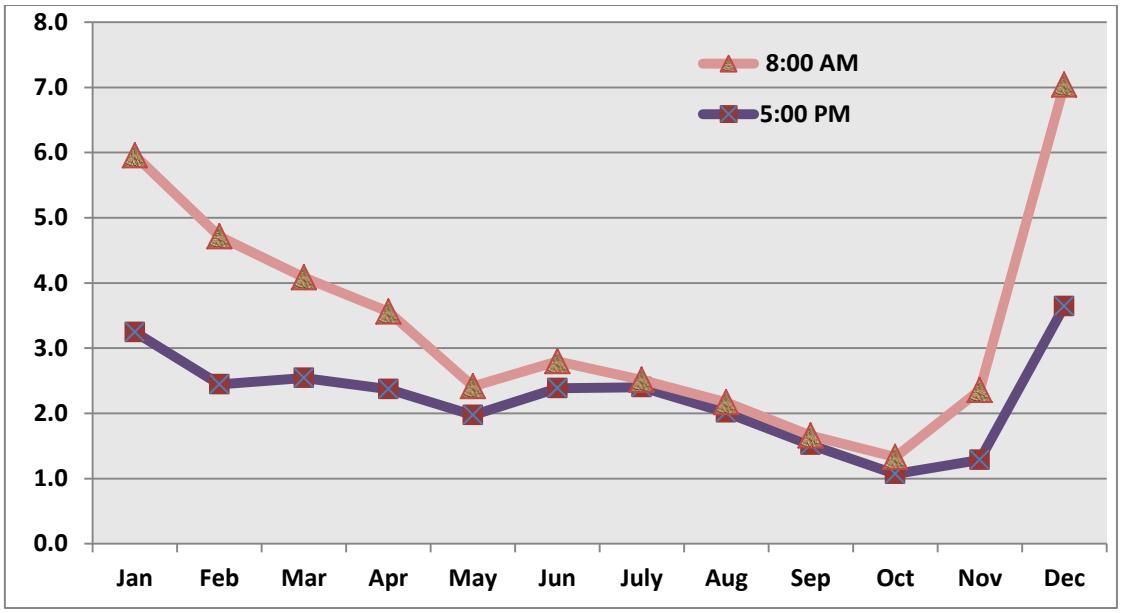


Fig 4.11: Wind Speed (knots) in Morning and Evening times, over the Year (Pattan Station)

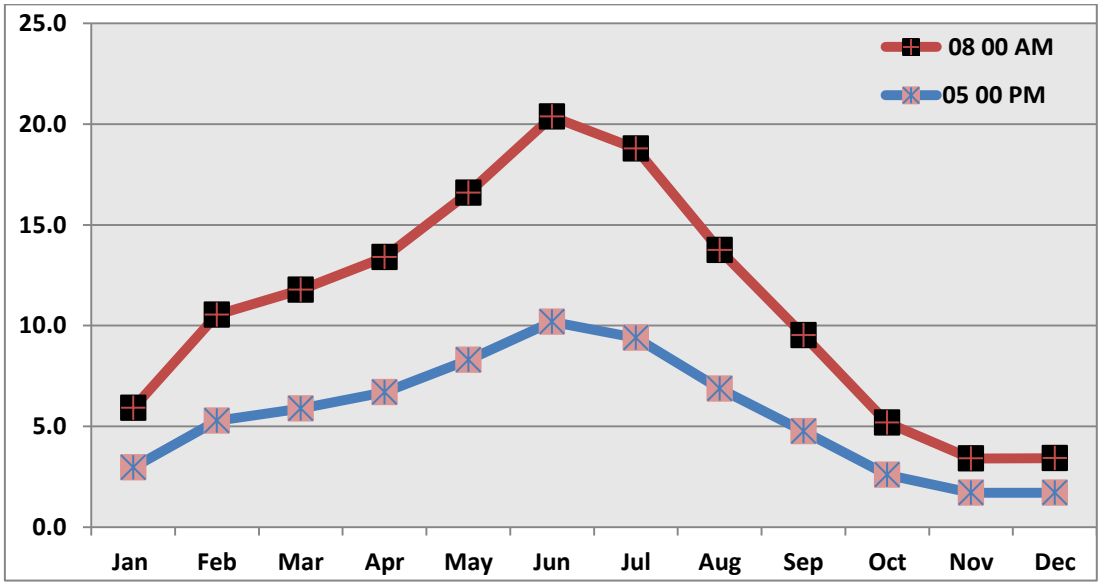


Fig 4.12: Wind Speed (knots) in Morning and Evening times, over the Year (Pattan Station)

e) Thunder Storms

Fig.4.13 and 4.14 indicate the frequency of thunder storms throughout the year which has been the highest in August i.e. average 4.9 nos. in Pattan and highest in July i.e. average 15.7 nos. in Kamra. However there is an abrupt decrease in number of storms from September to December at both stations. In winter months, the incidence of thunder storms is negligible.

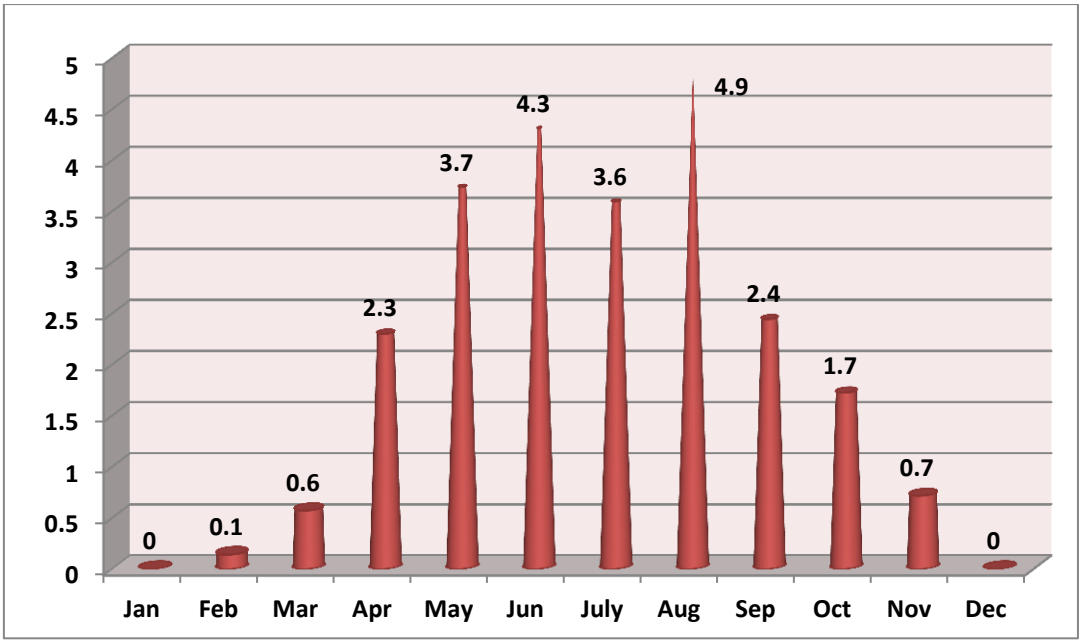


Fig 4.13: Frequency of Thunder Storms throughout the Year (Pattan Station)

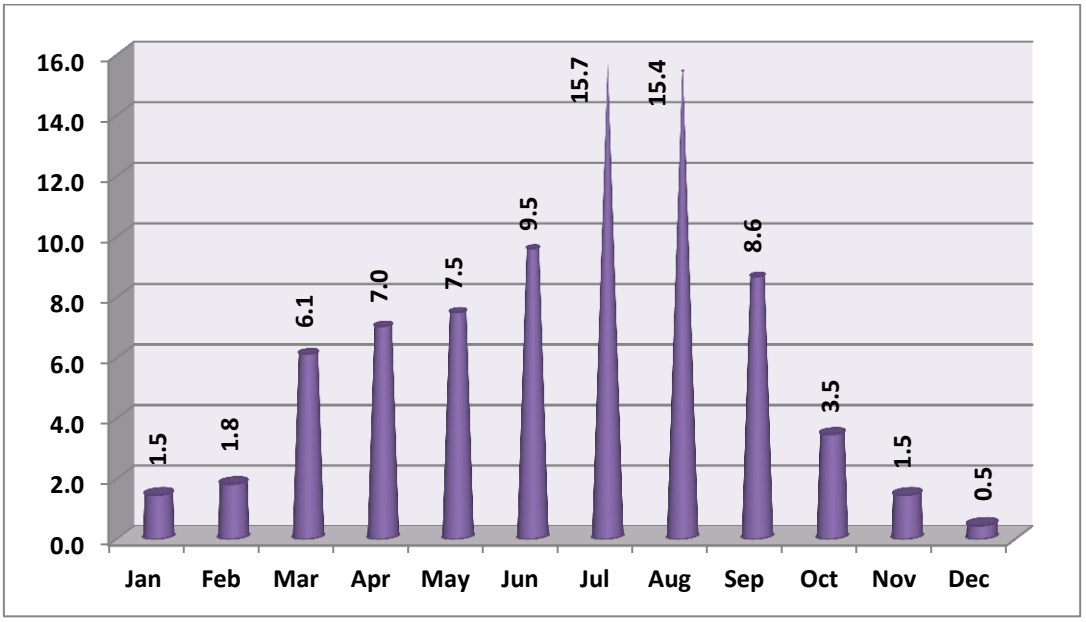


Fig 4.14: Frequency of Thunder Storms throughout the Year (Kamra Station)

4.2.7 Ambient Air Quality and Noise Levels

In the Study Area, major sources of air pollution are mobile vehicles. No industrial pollution was observed. Other sources of ambient air pollution are the exhausts from kitchens residences and due to combustion of wood for heating purposes in winter season. As such the monitoring of air quality with any equipment was not recorded and would be done when full fledge EIA will be prepared by the consultants.

There is no significant industrial unit in the Study Area. Main noise sources are traffic and commercial activities in towns. During site visits, noise levels at various locations in the Project area were measured with Digital Sound Level Meter Model AR-824. The results are tabulated below:

Table 4.1: Noise Levels at selected Locations in the Project Corridor

Reference Point	Date	Time	dB(A)										Average
Tunnel Boring Site near Proposed Power House Dasu	27-11-12	1:04 PM	70.0	69.6	68.3	71.2	73.2	71.0	70.8	71.0	72.6	73.0	70.9
Komila Bazar (Dasu)	27-11-12	1:30 PM	73.1	74.0	72.8	72.0	73.2	73.1	72.8	73.6	74.0	73.9	73.2
Pattan	27-11-12	2:40 PM	67.1	69.3	68.3	66.4	67.5	65.0	64.9	63.8	65.0	66.8	67.1
Shalkhandabad (Palas)	28-11-12	12:30 PM	67.1	69.3	68.3	66.4	67.5	65.0	64.9	63.8	65.0	66.8	67.1
Banna Allai	29-11-12	11:00 AM	46.1	48.9	47.8	48.8	48.6	46.7	52.0	53.1	50.6	51.6	49.2
Darwaza Village near Tarbella Lake	13-12-12	1:30 PM	46.1	47.0	45.6	47.3	44.2	43.6	44.5	45.0	46.2	47.0	46.1

Table 4.2: WHO Guideline Values for Community Noise in Specific Environments

Specific Environment	Laeq (dB)	LAmax, fast (dB)
Outdoor living area	55	-
School class rooms and pre-schools (indoors)	35	-
School, playground (outdoors)	55	-
Hospital, ward rooms (indoors)	30	40
Hospital, treatment rooms (indoors)	1	-
Industrial, commercial, shopping and traffic areas (indoors and outdoors)	70	110

Accordingly, the noise levels in the Project area are generally lower than the permissible limits of 85 dBA as fixed by Pak-EPA and also adopted by Provincial EPAs. However, while comparing with the WHO noise guidelines that prescribes a limit of 55 dBA with respect to receptors in outdoor areas (Refer: Table 4.2), the noise levels at various places in Project area exceed this limit.

Due to movement of machinery during construction of transmission lines and grid station, the ambient air quality and noise levels will be disturbed. But the impact will be temporary and local i.e. in the project corridor and its close proximity.

4.2.9 Water Resources

The major surface water sources in the Project area include River Indus (Dasu to Pattan), Tarbella Lake (near Khalabatt Township, Haripur) and River Siran. The other resources are nullahs or Khawars and fresh water springs/ waterfalls. From Dasu to Pattan, there are about 17 nos. of freshwater springs/waterfalls and River Kohistan falling in the Indus. Some are perennial and others are seasonal. The discharge of these springs depends upon the intensity of annual rainfall and snowfall and extent of the respective catchments. Therefore, the discharges of these springs increase in summer due to heavy rainfall and snow melts and reduces in winter.

The main Nullahs/Khawars in the remaining strip of project corridor are; Allai Khawar and Karkat Nullah (Banna Allai, District Bhattagram), Shamdharra Kati Nullah (Village Shamdharra, Oogi District Mansehra), Katha Nullah (Village Khaki, District Mansehra), Dour River (Near Village Darwaza, District Haripur), Harro River (near Chhaprian Village, Hassanabdal District Attock), Chablat Nullah (Katcha Jallo, Hassanabdal, District Attock). At higher elevation (i.e. Dasu, Pattan, Palas, Allai, and Bhattagram), normally the water tanks are constructed at spring locations to regulate the water supply and to improve accessibility to the water flow.

The ground water is almost unavailable from Dasu to Battagram. While in lower areas viz., Abbottabad, Mansehra, Harripur and Hassanabdal, the ground water is available at the depth varying from 100ft to 140 ft. The water is of good quality and used for drinking purposes, while in upper areas, spring is considered to be of good quality and used for drinking. In Hassanabdal, the tube wells have been installed and water is used for irrigation purposes.

Due to access routes/pathways for transmission lines construction, the route of surface water bodies like springs and *nullahs* may be altered. Water quality can be impacted not only by work within a stream/nullah or Indus River but also by nearby clearing and construction activities. It can also increase erosion of adjacent soils causing sediment to be deposited into the water body, especially during rain events. Construction often requires the building of temporary bridges across small channels, which if improperly installed may damage banks and cause erosion. These water

bodies are designated as special resources, which have local and regional importance. These impacts would create problematic situations for the population benefitted from these water resources. Hence, the overall trend is expected to be decreasing.

Fig. 4.15: A Nullah/Khawar falling in Indus River - about 15km Upstream of Pattan Town

Fig. 4.16: A view of Indus River near proposed Power Station at Dasu

4.3 BIOLOGICAL ENVIRONMENT

Various topics to be discussed under the heading “Biological Environment” include: Flora, Wildlife and Fauna, Protected Areas, Wetlands, Bird Flyway Number 7 and Palas as Natural Heritage Site or a Biosphere Reserve or a Protected Area.

4.3.1 Flora

The whole project area (i.e. from Dasu to Hassan Abdal) is rich in all types of vegetation including wood trees, fruit trees, herbs and shrubs. From Dasu to Pattan, the mountain tops are almost empty, while the vegetation is present in valleys along the river. In Pallas Valley, Allai, Bhattagram, Abbottabad and Mansehra regions, the mountains tops and valleys are lush green. The hills are covered with forests of broad leaf and pine trees in accordance with the altitude. Fruit trees are also present and generally found in the courtyards of the farming communities.

Major wood tree species existing along the Project corridor include; Chir (*Pinus roxburghii*), Kail (*Pinus wallichiana*), Deodar (*Cedrus deodara*), Oak (*Quercus baloot*), Olive (*Olea cuspidate*), Phulai (*Acacia modesta*), Gurgura (*Monotheca buxifolia*), Kahu (*Olea cuspidate*), Sufaida (*Eucalyptus spp.),* Kikar (*Acacia nilotica*), Phulai *(Acacia modesta),* Poplar (*Populus ciliata*), Batangi (*Pyrus pachia*), Willow (*Salix spp*.), Ailanthus (*Ailanthus altissima*), Shisham (*Dalbergia sisso*), Beri (*Zyziphus jajuba*), Bakain (*Melea azedarie*) and Toot (*Morus alba*).

Among fruit trees; Walnut (*Juglans regia*), Amlok (*Diospyros lotus*), Bird Cherry (*Prunus padus*), Pomegranate (*Punica granatum*), Apple (*Malus domestica),* Pear (*Mangifera indica*), Peach (*Prunus persica*) and Citrus fruits can be seen along the project corridor.

Fig. 4.17: Thickly Vegetated (Pine Trees) Hills near Allai District Bhattagram

Fig. 4.18: Natural Vegetation in the Project Corridor near Sherwan Town, District Abbottabad

The construction of two high voltage transmission lines will involve tree cutting under the TL within the corridor. The cutting will be done due to clearance for access routes, tower foundations and at the stage of stringing. The strip of about 10 to 12 meter under one 500 kV transmission line is kept clear forever to avoid the Electromagnetic incidences. **4.3.2Wildlife and Fauna**

The whole tract inhabits a variety of wildlife and fauna and following mammals, reptiles and birds make the area rich and colorful in natural fauna.

a. Mammals

Common mammals found in the Project area include: Wild Boar (*Sus scrofa*), Asiatic Jackal (*Canis aureus*), Kashmir Fox (*Vulpes vulpes*), Yellow-throated Marten (*Martes flavigula*), Stone Marten (*Martes foina*), Mongoose (*Herpestes edwardsii*), Jungle Cat (*Felis chaus*), Asiatic or Himalayan Black Bear (*Ursus thibetanus*), Brown Bear (*Ursus arctos*), Himalayan Musk Deer (Moschus chrysogaster), Himalayan or Grey Goral (*Naemorhedus goral*), Snow Leopard (*Uncia uncial)*, Leopard Cat (*Prionailurus bengalensis*), Hare (*Lepus Capensis*), Markhor (*Capra falconeri*), Porcupine (*Hystrix indica*) and monkeys. Domestic animals include goats, sheep, buffaloes, cows, donkeys, moles etc.

b. Reptiles

As the terrain is hilly, reptiles are also common in the tract. Various types of snakes are found such as Cobra, Phissi and rat eaters. In addition to snakes, lizards are also present in the area. Common reptiles of the project area include snakes, krait,

frog, lizards, etc. Scorpions and spiders are other poisonous creatures of the area. A list of main reptilian species is given as under:

Table 4.3: Reptiles in the Project Area

Common Name	Scientific Name
Garden Lizard	*Calotes versicolor*
Monitor Lizard	*Varanus bengalensis*
Krait	*Bungraus caeruleus*
Russel's Viper	*Vipera russel*
Cobra	*Naja naja*
Saw Scaled Viper	*Echis carinatus*

c. Birds

Avifauna of the Study Area is rich, colorful and diverse. Important resident bird species are Shikra, Myna, Ducks, Pigeons, Crows, Sparrows, Partridges, etc. and ome fowls like Chir & Kaleej Pheasants are found. Mountain crows and dove are found in large number. Some of the most attractive birds like Western Tragopan (*Tragopan melanocephalus*), Koklass Pheasant (*Pucrasia macrolopha biddulphi*) and Himalayan Monal Pheasant (*Lophophorus impejanu*s) are present in Palas Valley. However, these have been now reduced to a few in numbers due to the excessive hunting and netting. Other birds frequently sighted in the project tract are given below:

Table 4.4: Bird Species in the Project Area

Common Name	Scientific Name
Tawny Eagle	*Aquila rapax*
Greater Spotted Eagle	*Aquila clanga*
Merlin	*Falco columbarius*
Common Kestrel	*Falco tinnunculus*
Himalayan Griffon vulture	*Gyps himalayaensis*
Chukar	*Alectoris chukar*
Slaty-headed Parakeet	*Psittacula himalayana*
Black–rumped flameback	*Dinopium benghalense*
Crested Lark	*Galerida cristata*
Plain Martin	*Riparia paludicola*
Grey Wagtail	*Motacilla cinerea*
White Wagtail	*Motacilla alba*
White-browed Wagtail	*Motacilla maderaspatensis*
White-eared Bulbul	*Pycnonotus leucogenys*
Brown Dipper	*Cinclus pallasii*
Plumbeous Water Redstart	*Rhyacornis fuliginosus*
Common Stonechat	*Saxicola torquata*
Pied Bushchat	*Saxicola caprata*
Isabelline Wheatear	*Oenanthe deserti*
Blue Whistling Thrush	*Myiophonus caeruleus*

Blyth‘s Reed Warbler	*Acrocephalus dumetorum*
Lesser White-throat	*Sylvia curruca*
Brook‘s Leaf Warbler	*Phylloscopus subviridis*
Blyth‘s Leaf Warbler	*Phylloscopus regulaides*
Rook	*Corvus frugilegus*
House sparrow	*Passer domesticus*
Russet sparrow	*Passer hispaniolensis*
Indian Silverbill	*Lonchura malabarica*
Large billed crow	*Corvus macrorhynchus*
Himalayan Woodpecker	*Dendropus himalayansis*
Black Kite	*Milvus migrans*

d. Aquatic Fauna/Fish

The major surface water bodies of the project area include; Indus River, Tarbella Lake, Kohistan River, Siran River and a number of nullahs/khawars. The prominent aquatic life of these water bodies are; fish, phytoplankton’s (e.g. spirogyra) and zooplanktons (e.g. paramecium) benthic insects, larvae of mayfly, caddis fly mosquito larvae, dragon fly, stone fly and water mite. Common fish species found in Indus River and Tarbella Lake are given in **Table 4.5.**

Table 4.5: Fish Species in River Indus and Tarbella Lake

Common Name	**Scientific Name**
Cold water cat fish	*Glyptosternum reticulatum*
Snow carp	*Schizothorax plagiostomus*
-	*Schizothorax plagiostomus*
-	*Racoma labiate*
-	*Schizopyge esocinus*
-	*Triplophysa choprai*
-	*Schistura naseeri*
-	*Glyptosternum reticulatum*
Seenghara	*Mystus seenghala*
Masher	*Tor tor, Tor putitora*
Mullah	*Schizothorax spp.*
Goonch	*Bagarius bagarius*
Sunnee	*Cirrhinus reba*
Daula	*Channa punctatus*
Saul	*Channa marulius*
Mullee	*Wallago attu*
Talapia	*Oreochromis mosombica*
Bam	*Mastacembelus armatus*
Pari	*Notopterus notopterus*
Sareeha	*Labeo gonius*
Kharni	*Puntius sarana*
Rahu	*Labeo rohita*
Thaila	*Catla catla*

4.3.3 Protected Areas

In Pakistan, the protected areas are classified into three main categories viz., Wildlife Sanctuaries, National Parks and Game Reserves. In the project corridor, there is no Government notified protected area.

4.3.4 Wetlands

Wetlands cover approximately 9.7% or 7,800,000 ha of the total area of Pakistan. Wetlands in the country are mainly found along the Indus River and some other rivers and in the floodplains. The wetlands are characterized by a large biodiversity. Their significance is attributable to the wide diversity of species that they support. In all, eighteen threatened species of wetlands dependent mammals are found in the country, twenty threatened bird species are supported by Pakistan's wetlands in addition to twelve reptiles and two endemic species of amphibians. Pakistan's wetlands also support between 191-198 indigenous freshwater fish species, including fifteen endemics and a total of 788 marine and estuarine fish species.

The Indus valley forms the main wetland artery in the country. The major wetlands falling in the vicinity of project corridor are Indus River and Tarbela Lake. The transmission lines run on both sides of River Indus from Dasu to Pattan/Palas (about 32 km) and might be some towers located in or very close the River Bank. The other wetland near project corridor is Tarbella Lake. The Lines pass at Eastern side of Tarbella Lake near the Villages Darwaza, Khalabat Township and Narra, District Haripur. The confirmation of tower foundations in or near these wetlands will come from final design of the project. The tentative locations of Indus River and Tarbella Lake along the Transmission Lines route are represented Figs. 4.19 and 4.20 respectively.

Fig. 4.19: Indus River along the Transmission Lines Route from Dasu to Pattan (about 32km)

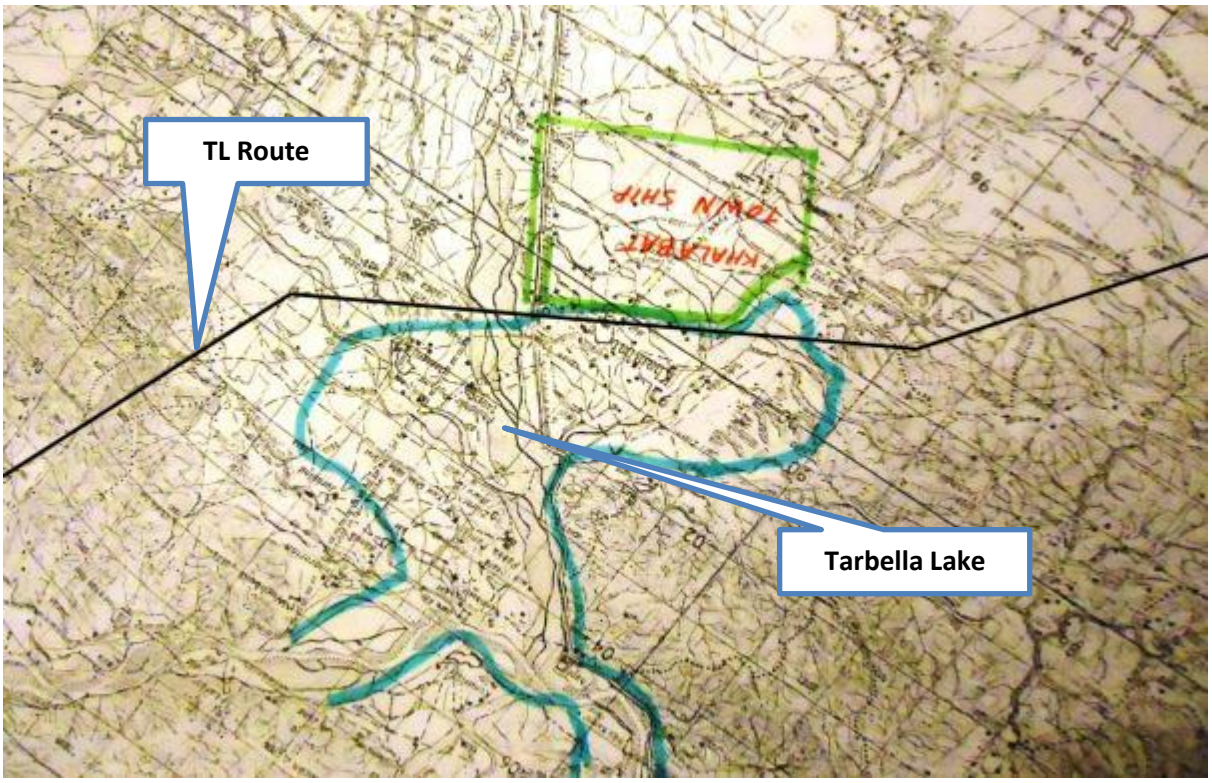


Fig. 4.20: Tarbella Lake near Transmission Lines Route (Khalabatt Township, District Haripur)

4.3.5 Birds Migratory Route Number 7 (Environmental Hotspot)

The famous route for migratory birds from Siberia to various destinations in Pakistan over Karakorum, Hindu Kush, and Suleiman Ranges along Indus River down to the delta is known as International Migratory Bird Route Number 7; it is known as the Indus Flyway and is one of the busiest routes in the world. According to estimates based on regular counts between 700,000 and 1,200,000 birds arrive in Pakistan through Indus Flyway every year. This route is also called “The Green Route”. The birds start migration on this route in November; February is the peak time and by March they start to fly back home. These periods may vary depending upon weather conditions in Siberia and/or Pakistan. Some extinguishing species like white headed duck, houbara, bustard and Siberian crane also travel on this route. The other migrating birds include; pelicans, cormorants, herons, egrets, bitterns, cranes, flamingo, teals, mallards, gadwalls and pigeons.

The TL corridor from Dasu to Pattan along the Indus River may pass through this bird flyway route. Due to construction of Dasu Reservoir, it is likely that the migratory birds come on the lake and the overhead transmission lines across the Indus Rivers may have a potential collision hazards for waterfowl and other large birds. Some of

the expected impacts on migratory birds have been discussed in Chapter 6, but detailed investigations are required during the Environmental and Social Impact Assessment (ESIA) study of this project. It is also recommended that in parallel to ESIA study, the project also undertakes Avian Risk Assessment study.

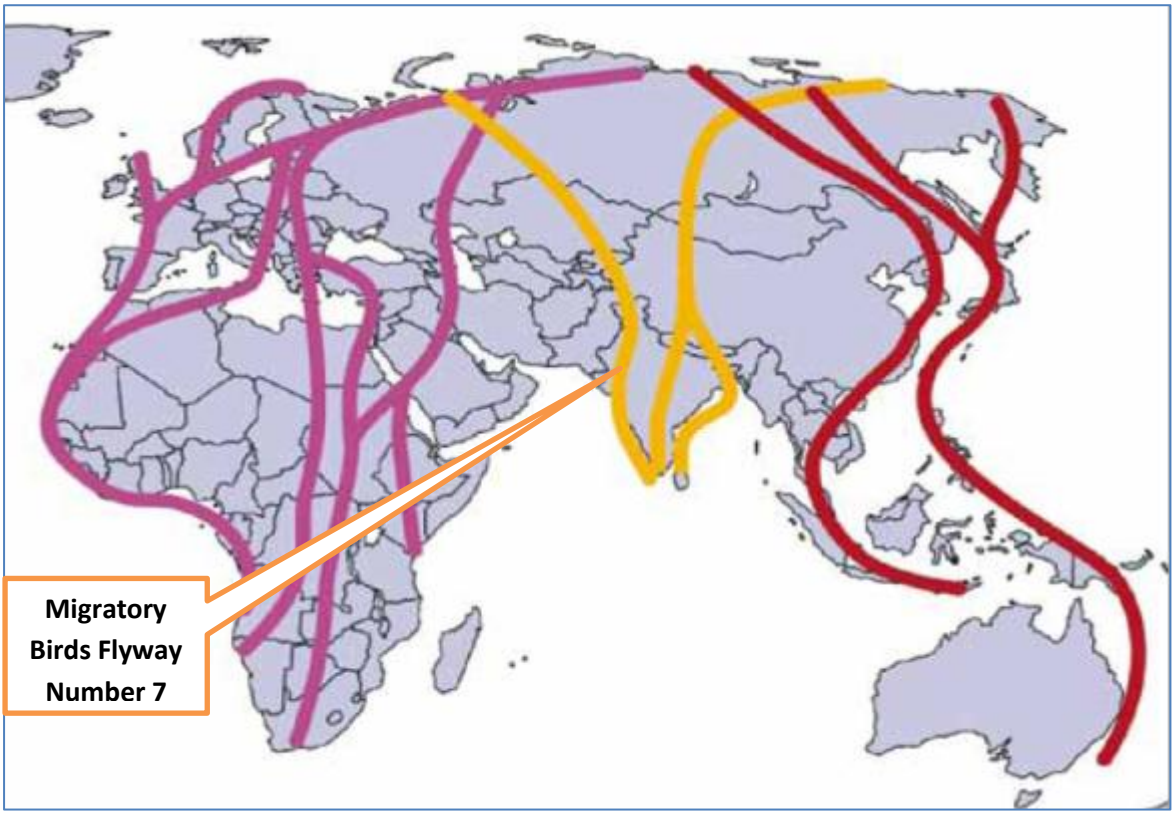


Fig. 4.21: Migratory Birds Flyway Number 7 and Adjacent Flyways

4.3.6 Palas Valley (Environmental Hotspot)

a. Natural Values of Palas Valley

The Palas Valley contains the most extensive natural forest in the Western Himalayas and Hindu-Kush Mountains. Other areas of similar forests exist elsewhere in Pakistan, in India and in the disputed territories of Kashmir. There are also fragments of forest in Eastern Afghanistan that share some of the values of the Palas Valley forests. However, none of the other areas is as large as Palas. The Greater Himalayan National Park in Himachal Pradesh in India shares some of the features of Palas but it is somewhat smaller and published accounts suggest that it is suffering from greater disturbance .

The Palas valley supports endangered pheasant, the Western Tragopan (Tragopan melanocepahalus - IUCN vulnerable). The population of around 1000 birds is almost certainly larger than any other population of the species. The second largest population of this species occurs in the Greater Himalayan National Park in India. Other small isolated populations of this species exist but they are all in areas under

severe threat from logging and land use change. Unlike other rare Pheasant species there are no viable captive populations of the Western Tragopan.

The Palas Valley supports populations of at least 7 other species of rare bird species. Of these *Phylloscopus tytleri* is classed as near vulnerable, the remaining are restricted range. It is likely that the populations are amongst the largest and best protected of these species. The Palas Valley also supports the most viable populations of the bird species typical of the forests of the western Himalayas. It is listed by Birdlife International as the IBA.

Populations of mammals found in the Western Himalayas are also found in Palas. These include Brown and Black Bears, Himalayan Ibex, Markhor, Snow Leopards, Wolves etc. Inventories now being undertaken of smaller mammals and especially bats. These are revealing the presence of significant populations of other scarce species.

A number of plant species are known only from the valley and other species have been recorded that are scarce or endangered elsewhere in their ranges. Rafiq (1996) provides the best account of the flora of the Palas Valley although further studies will almost certainly reveal the presence of many more species of plants. The best statement of the outstanding value of the flora of the valley is found in Akbar, 2003.

One unique feature of the Palas Valley that has not received much attention in previous accounts is that it is a complete ecological unit. The isolation of the areas has resulted in the entire valley being maintained in a relatively pristine condition. Thus an area of 1400 km^2 ranging in elevation from 700 m to 5200 m retains a great deal of its natural characteristic. Both the winter and summer ranges of much of the wildlife are included within the valley. This is particularly true of the Western Tragopan whose population moves seasonally between the North facing slopes in the summer and the South facing slopes in the winter. The valley is sufficiently large to support viable populations of all of the larger mammals and to enable them to make their normal seasonal movements.

b. Forests and Pastures of Palas Valley

Broadleaved Forests: These forests occur in scattered patches from 1‘100 to 1‘800 m elevation. The canopy is broken by cultivated fields on moderate slopes and nullahs. On northern aspects these forests occupy an altitudinal range up to 1‘500 m merging into dry sub-tropical forests below and coniferous forests in the upper reaches. The principal species are *xerophytic* evergreen Oak (*Quercus baloot*), associated by

Deodar (*Cedrus deodara*), Olive (*Olea cuspidate*), Phulai (*Acacia modesta*), Gurgura (*Monotheca buxifolia*), Pomegranate (*Punica granatum*), Adhatoda vassica, Beri *(Zizyphus nummularia*) and Amlok (*Diospyros lotus*) Undergrowth is generally by *Daphne oleoides*, *Berberis lycium*, *Dodonea viscosa* and various types of grasses. Regeneration of oak is unsatisfactory due to unrestricted felling, loping and browsing of trees.

Blue Pine Forests Blue Pine is the dominant species on North-Western aspects of Kolai and Batera forests at an altitude ranging from 1‘700 to 2‘700 m. Pine forests are subjected to heavy felling and encroachment for cultivation. The slopes are generally moderate with deep soil. On cooler aspects at higher altitudes, Fir and Spruce get mixed with Pine. The crop is mostly middle-aged although all age classes are found. The broadleaved associates are *Aesculus indica*, *Quercus ilex*, *Acer caesium*, *Juglans regia* and *Prunus padus*. Undergrowth consists of *Viburnum nervosum*, *Berberis lycium*, *Indigofera spp*., *Cotoneaster bacillaris*, *Lonicera spp*, *Rosa spp*. and *Parrotia jacquemontiana*. Regeneration of Blue Pine in remote areas is satisfactory while in areas adjoining to habitations it is scanty or absent due to illicit cuttings and heavy grazing pressure.

Fir/Spruce Forests The forests occupy few compartments in Bela/Kolai and most of the area in Musha‘ga at an altitude varying from 2‘100 to 3‘200 m. Fir is the dominant species and tends to purity on Northern aspects at higher altitudes. Scattered Blue Pine trees are found at higher altitudes. The crop is generally mature to over-mature lacking young age classes. The forests are in the form of patches separated by nullahs. Considerable damage to crop is caused due to snow creeping and avalanches. Dry standing trees are not uncommon. Regeneration of fir is inadequate, which may be attributed to the thick layer of litter and non-manipulation of the crop canopy. Many fir saplings die due to constant overhead shade. Spruce regeneration comes vigorously on favourable sites. The major associates are Birch *(Betula utilis*), Walnut (*Juglans regia*), Oak (*Quercus spp*.), Maple (*Acer caesium*), Horse Chestnut (*Aesculus indica*), Bird Cherry (*Prunus padus*), Amlok (*Diospryus lotus*) and Popular (*Populus cilata*). Undergrowth consists of *Viburnum spp., Parrotopsis spp*. *Rosa spp*. and *Prunus spp*.

Mixed Coniferous Forests: The forests are composed of varying mixture of some or all the four major species depending upon aspect and altitude. These forests occur mostly in Sheryal and Musha‘ga valleys. The exposed southern aspects contain a mixture of Blue Pine/Deodar in lower reaches and Blue Pine/Spruce on higher altitudes. Northern aspects are covered by Fir and Spruce with Deodar at lower elevations due to local variation of aspect and Pine at higher altitudes. The canopy is broken by *nullahs* and large patches of broadleaves. Fir and Spruce trees

are mostly mature to over-mature. Blue Pine in upper and reaches is in stunted form and over-mature. The forests occupy an elevation zone ranging from 1‘800 to 2‘900 meters. Regeneration of Fir and Spruce is hampered either due to thick humus layer and profuse growth of shrubs or heavy grazing pressure. Blue Pine regeneration is profuse on favorable sites and is the *coloniser* species on sites where Fir and Spruce have been removed. Deodar regeneration is inadequate and found on southern aspects in lower reaches only. Walnut (*Juglans regia*), Oak (*Quercus spp*.), Maple (*Acer caesium*), Horse Chestnut (*Aesculus indica*), Bird Cherry (*Prunus padus*), Amlok (*Diospryus lotus*), Popular (*Populus ciliata*), Birch (*Betula utilis*), Parrotia (*Parratopsis iacouemontiana*) and Yew (*Taxus baccata*) are major associates. Predominantly undergrowth, according to order of occurrence, comprises of *Viburnum nervosum, Indigofera sp., Rosa sp., Berberis lycium, Artemisia maritima,* and *Cotoneaster bacillaris*.

Deciduous Forests: Sub-tropical broad-leaved deciduous forest is found at lower elevation along the Indus River and lower reaches of Palas valley. The main species includes *Acacia modesta, Olea ferruginea, Zizyphus sativa,* and *Quercus baloot*. Scattered trees of *Fraxinus* can also been seen at bottom of the valley.

Sub-Alpine Scrub: This type of forest is found above mixed forests of Fir/Spruce and Blue Pine in Musha‘ga, Kolai and Kunsher Sub Valleys from 3‘300 to 4‘300 meters elevation. The main species is Birch (*Betula utilis*). The associate shrubs are Salix spp., *Juniperus spp*., *Rosa webbiana*, *Prunus spp., Rhamnus spp., Ephedra geradiana* and *Rhododendron spp*. The plants utilize water from glaciated peaks. Growth is slow and plants in stunted form due to high altitude, severe cold and short growth season. The bushy trees are hacked by nomads in summer for firewood.

Alpine Pastures: Alpine pastures occupy an elevation zone from 3‘350 to 4‘300 m. The pastures extend over large areas and make watershed ridge with Kaghan and Allai valleys in the east and south, respectively. The dominant Alpine Pastures in Palas Valley are Chour, Moru, Ganja Sar, Ledi, Gedar, Tiko Sar, Shaddad, and Maidan. The biggest alpine pasture is that of Chour, which is best known for its luxuriant grass growth. These pastures are depicted in Fig. 4.22.

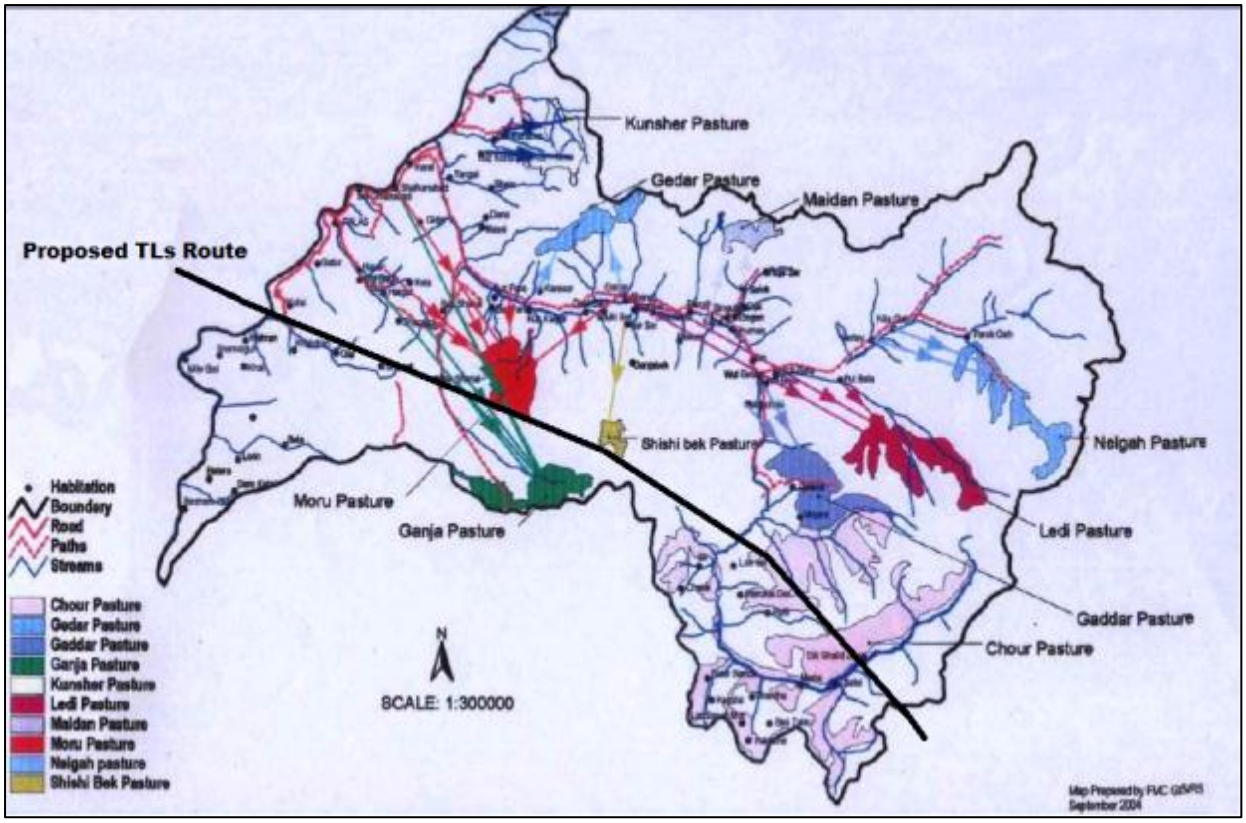


Fig.4.22: Pastures of Palas Valley

Graziers occupy these pastures during summer (June-September) along with their cattle, small ruminants and families. Alpine Pastures contain rich herbaceous and shrubby flora such as *Juniperus squamata, J. Communis spp., saxatilis* and *dwarf spp*. of Salix with abundant herbaceous flora. These include *Delphinium uncinatum, Dracocephalum nutens, Pumex dentalus, Chenopodium album, Polygonum barbatum, Polygonatum alfins, Digitalis spp., Conzya spp., Achillea millefolium, Caltha palustris, Nipeta alipteca, Microsisybrum spp., Ranunculus lactus* and grasses like *Setaria viridis, Panicum anulatum* and *Festuca spp*.

c. Biodiversity Status of Forests of Palas Valley

During forest inventory, KPK Forest Department assessed biodiversity status of individual forest compartments. Accordingly, the forest compartments have been classified into 3 categories, viz., with Rich, Fair and Poor biodiversity. There are total 235 compartments in the Palas Valley constituting 32 Rich, 98 Fair and 105 Poor compartments. The spread of different types of compartments are depicted in Fig. 4.23.

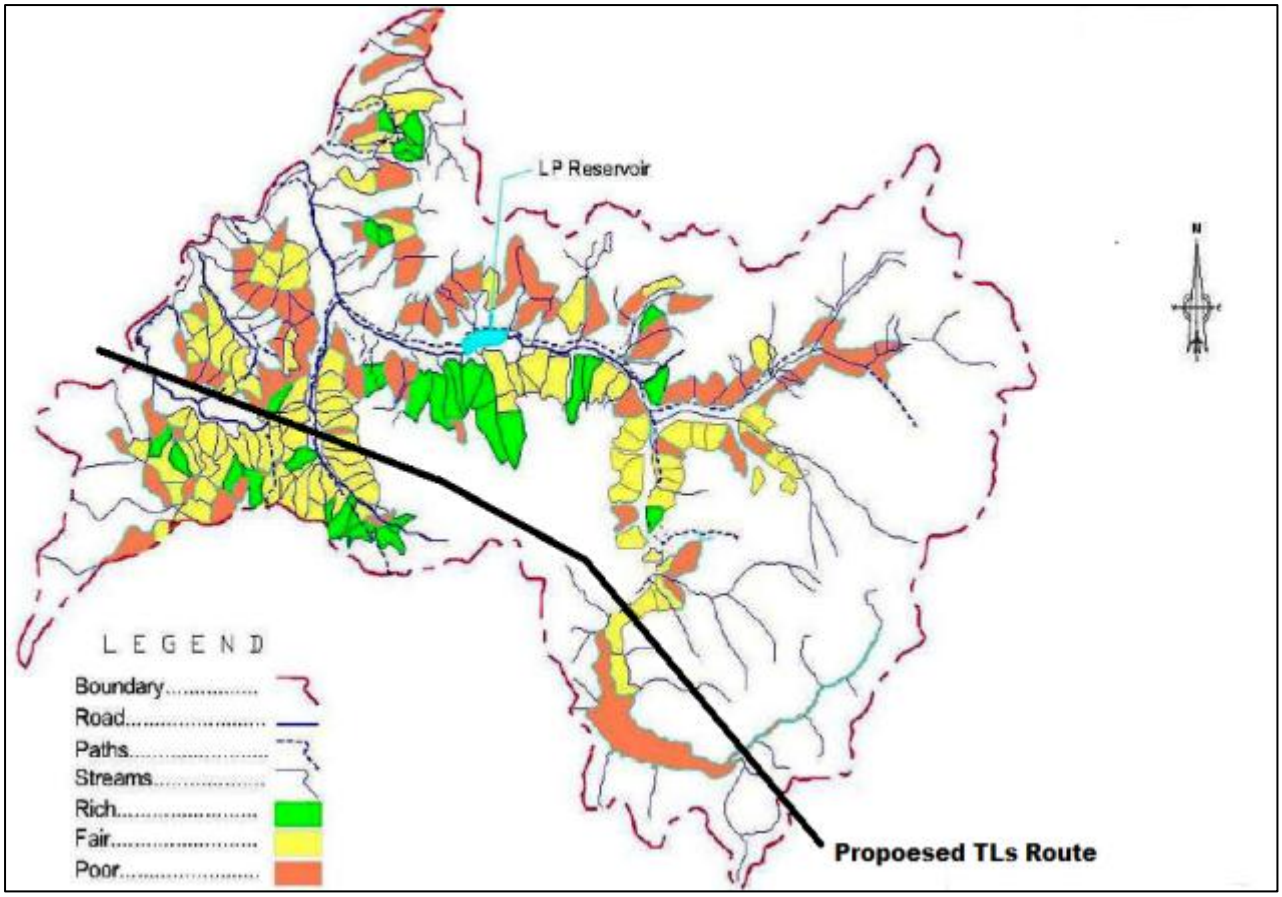


Fig. 4.23: Biodiversity Status of Forests of Palas Valley

d. Palas as "Natural Heritage Site or a Biosphere Reserve or a Protected Area"

The Palas Valley could qualify as "natural heritage" in accordance with the first two bullet points of article 2 of the World Heritage Convention (WHC).

The Himalayan Jungle Project and subsequently the Palas Conservation and Development Project (PCDP) have been trying to get the Palas Valley recognized as a Natural World Heritage Site by UNESCO or declared as a Biosphere Reserve under the Man & Biosphere Program of UNESCO. For this reference is made Consultancy Report # 12 of PCDP Consultant. The Executive Summary of the same is placed at **Appendix-4.3.** Even though there has been the full support of the Government of Pakistan, the efforts have so far not been fruitful. PCDP in this connection also arranged a consultant to present the case; even this did not prove fruitful. As Palas valley is owned by the local communities who have a very strong writ, the KPK Wildlife Department could not bring this area under the umbrella of Protected Area System thus failing to award the status of any of the three Protected Area categories viz., Wildlife Sanctuary, National Park or even a Game Reserve.

The efforts to designate Palas Valley and award some sort of protected status are still continuing.

The Palas valley forests are considered the only “Un Touch Forest” in Pakistan, hence it is identified as the major environmental hotspot of the project area. Therefore, it requires much detailed studies/investigations at the time for ESIA study and final design stage. The ESIA studies will analyze possibility of TL avoiding Palas valley to the extent possible or use the corridor through the valley, which has relatively poor environmental resources.

4.4 SOCIO ECONOMIC ENVIRONMENT

This section provides a generalized glimpse of socioeconomic settings and profile of the project corridor. Various parameters to be included are population, educational and health facilities, public infrastructure, poverty levels etc.

4.4.1 Population

Around 95 percent of the entire transmission line will be constructed in the 5 districts of Hazara division of KPK province of Pakistan. The total area of the Hazara division is over 17084 square kilometer houses a total of 3.53 million population of which only 8.8% is urban (in 3 districts -Haripur, Abbottabad and Mansehra) while in the remaining 91.2 percent is rural. District Battagram and Kohistan with 52% of the total area (8794 sq.km) have not a single settlement to be called as urban. The overall population density in the entire region is 271 persons per sq.km ranging from the highest 448 persons in Abbottabad to the lowest 66 persons in Kohistan. The average household size in the entire Hazara division is around 6.5 persons. The female to 100 male ratio widely varies between 98 in Mansehra to 100 in Abbottabad and Haripur and 107 in Battagram and 81 in Kohistan. The higher ratio of women is in Battagram and Kohistan districts is due to Polygamy.

The proposed line ends up in the vicinity of village pathar Garh in District Attock, some 6-7 Km from district boundary of Haripur. The village is included in the list of villages where consultations were held.

Table 4.6: Area and Demographic Indicators for Districts enroute TL

No	District	Area (Sq.km)	Population (000)	Density of Population (sq.km)	Average HH Size (persons)
1	Attock[1]	1518	1,518	221	5.8
2	Haripur	1725	0,692	400	6.6
3	Abbot Abad	1967	0,880	448	6.4

[1] District Attock is included in this table because village Pathar Garh may face two types of impacts – one from the transmission line and other from purchase of land for Grid station.

4	Mansehra	4570	1,152	252	6.7
5	Battagram	1302	0,307	204	6.6
6	Kohistan	7492	0,500	066	6.7
Total		**18574**	**5,049**	**271**	**6.5**

The 250 km long 130 m wide COI of the transmission line will traverse through only 0.15 percent of the total area. Based on the overall density of population for the entire region only 0.14 percent (7182 persons or 1100 households) are expected to face some impact during the construction of this transmission line.

4.4.2 The HDI Index of Hazara Division

The estimated Human Development Index (HDI) of Hazara division is 0.564[2] which is ranked between medium to low. The medium level human development is defined as the estimated HDI value of more than 0.5. The table 4.7 and Fig. 4.24 below show that the districts with more than 0.5 HDI value are Abbottabad (0.625), Haripur (0.616) and Mansehra (0.569) respectively. The remaining two districts i.e. Battagram (0.432) and Kohistan (0.388) with HDI value less than 0.5 and thus come in the category of "low level human development". The human development index for health (0.614) is in the medium category as against education (0.491) and income (0.468) in the lower level of human development.

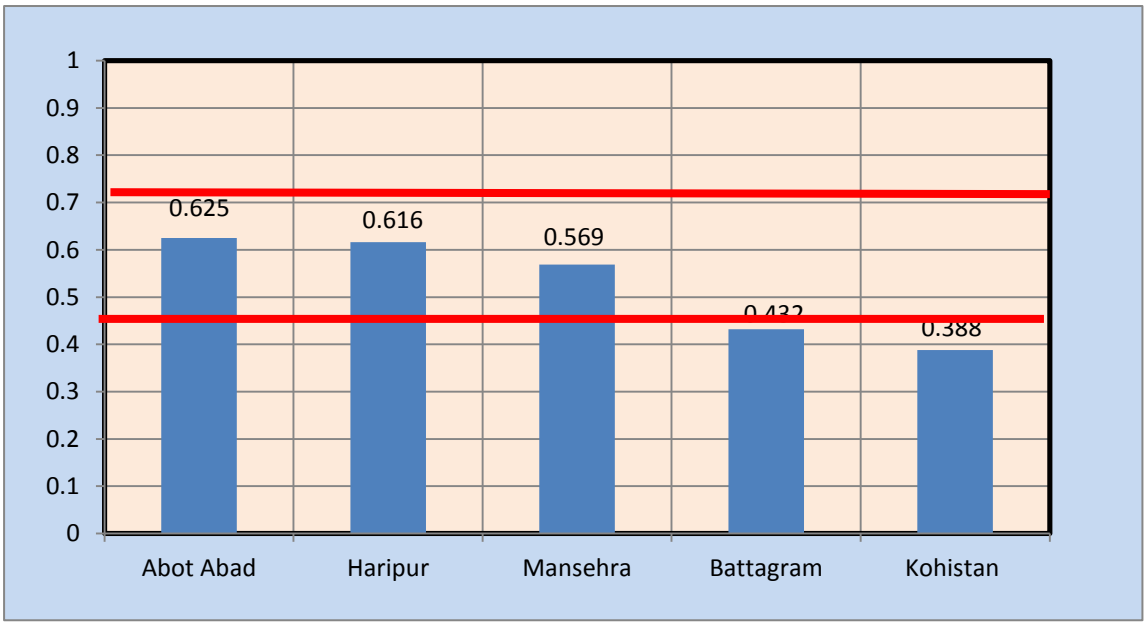


Fig. 4.24: HDI Indices of COI Districts (2008)

Table 4.7: HDI Indices of COI Districts (2008)

[2] Indices of Multiple Deprivations and Human Development in Khyber Pakhtunkhwa Province, 2011.

District	Overall HDI Value	HDI Value Against Indicators		
		Education	Health	Income
Abbot Abad	0.625	0.654	0.628	0.592
Haripur	0.616	0.580	0.631	0.635
Mansehra	0.569	0.595	0.659	0.453
Battagram	0.432	0.388	0.571	0.339
Kohistan	0.388	0.239	0.604	0.321
Overall	0.564	0.491	0.614	0.468

Source: Indices of Multiple Deprivations and Human Development KPK, UNDP-SPRSM Project, table A.9.1, page 41.

4.4.3 Poverty and Multiple Deprivations Indices

The overall level of multiple deprivations against 18 indicators in Hazara division is 42.6 percent. IMD broadly addresses publicly provided services and infrastructure besides income, education and health components The estimated magnitude of index of multiple deprivations (IMD) suggests that about the it is highest in Kohistan (67.2 percent) and Battagram ((55.3%) and relatively low in Abbottabad (33.9%), Haripur (35.1%) and Mansehra (39.7%) respectively. Highest deprivation is estimated in housing sector where about 48.7 percent population of Hazara division is deprived. The ratio of deprived population in housing is highest in Kohistan (69.08%) as against only 36.22% in Haripur. Health is the second highest deprived sector with 34.9% of the total population is without health facilities. District Kohistan again is the highest deprived district with 62.3%. Education sector follow health sector where around 38% of the total population is deprived of health facilities. The corresponding ratio is highest in Kohistan (66.7%) and Battagram (49.1%) districts. On economic indices the situation is somewhat better with 35.9% of the total population is deprived of the economic opportunities.

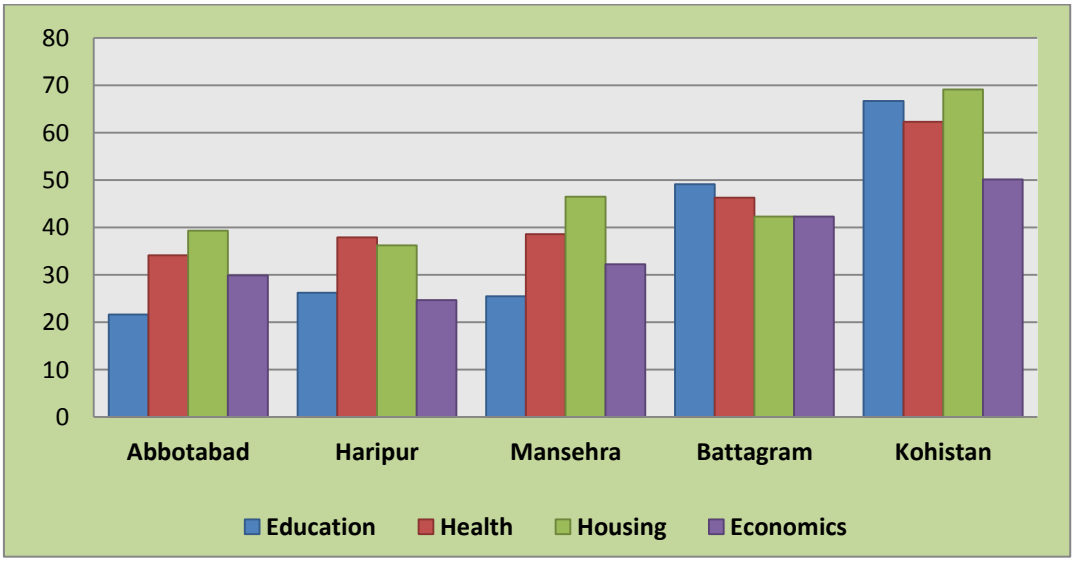


Fig. 4.25: Hazara Division Indices of Multiple Deprivations (with 18 Deprivation Indices in Percentages)

The above indicators of multiple deprivations clearly identified sectoral priorities (education, health and housing) as well as the priority districts within the COI zone of Dasu-Islamabad Transmission line.

Another important finding the above IMD reveals that Kohistan district is most deprived in overall IMD value and its components. The proposed project is also entirely dependent on the exploitation of the natural resources (power generation from Dasu HPP) from district Kohistan in this respect required special attention to reduce the deprivation level from the current 62.8% to at least 32% to stand at par with Abbottabad within the same region.

4.4.4 Literacy and Education

The extent of deprivation in education is discussed in the above sections. The overall literacy in 5 districts of Hazara division is (35.2%) is far lower than the national average 57%. The literacy ratio is highest in Abbotabad and Haripur districts 56.6% and 53.7% respectively. The literacy ratio in other three districts presents a dismal picture with 36.3% in Mansehra, 18.3 % in Battagram and only 11.2% in Kohistan District.

There also exit a huge gender gap in literacy in the entire region. The ratio of literate male population (48.5%) is more than double the female population both in overall and in the context of individual districts. The district –wise male and female literacy ratio follows the trend in overall literacy ratio.

Table 4.8: District-wise Male and Female Literacy Ratio

District	Population (000)	Literacy (10 year and Above)		
		Male	Female	Ratio in Total Population
Abbot Abad	0,880	74.5	39.1	**56.6**
Haripur	0,692	70.5	37.4	**53.7**
Mansehra	1,152	50.9	22.7	**36.3**
Battagram	0,307	29.4	6.5	**18.3**
Kohistan	0,500	17.2	2.9	**11.1**
Overall Literacy		**48.5**	**21.7**	**35.2**

4.4.5 Health Coverage

Although the number of health related public and private sector infrastructure significantly increased in the post-earthquake reconstruction phase (2006--2008), that helped in improving the IMD at around 44%. But the services level in the entire region is still devoid of health care staff and medicines. The current data shows the significant number of health institutions but there is a complete silence on the number of doctors and paramedic staff in Hazara division. Available estimates reveal that for every 25,000 people there is one doctor and the ratio of population to a nurse is 50,000. During the ESIC consultations in 20 villages only two village communities (10%) villages informed working basic health facility in or near to their settlement. Interestingly both health facilities are being operated by NGO[3]s. The EPI coverage is below 60% in the entire region where as it is even worse in both Battagram and Kohistan.

4.4.6 Access to Road

There is an acute problem of accessibility to road infrastructure in the entire Hazara division. On an average for one square kilometer of the area the access to road is only 0.30 km in Abbottabad, 0.25 km in Haripur, 0.20 km in Mansehra and Battagram and 0.10 km in Kohistan district.

4.4.7 Electricity and Cooking /Heating Fuel

Being in the long and swear winter region the access to electricity is to 76% of the households in Haripur, 75% in Abbotabad, 49% in Mansehra, 42%in Battagram and less than 20% in Kohistan. The natural gas is only available in main towns of Haripur, Abbotabad and Mansehra. Around 79% of the population in Haripur uses wood as a source of cooking and heating fuel. The corresponding ratio in Abbotabad and Mansehra is 78% and 95% respectively. The entire population of Battagram and Kohistan are dependent on wood for cooking and heating.

4.4.8 Poverty and Vulnerability

Poverty is prevalent in the entire COI districts and assuming menacing proportions with the passage of time. Poverty in this context perpetuates due to ongoing political instability, uneven distribution of resources, poor human resource development and polarization of power and resources in the hands of a small percentage of population. The unemployment ration in the COI districts ranges from 28.5% in Mansehra to 30 % in Haripur, 31% in Abbotabad[4] and 41% in Battagram.

[3] SDF – a Pakistan Poverty Alleviation Fund (PPAF) partner and Mission Society funded by some German Philanthropy.

[4] SUNGI Development Foundation, Situation Analysis of District Haripur, Abbotabad, Mansehra and Battagram.

The SUNGI district profiles estimated that poverty line goes higher and higher with the altitude of Indus river from Haripur to Kohistan. The ratio of population below poverty line and middle income groups for each district is given below.

- **Haripur:** Population below poverty line is 42% and 31 percent population belongs to middle income group.
- **Abbotabad:** More than 51 percent population lies below poverty line and 30 percent belong to middle-income group.
- **Mansehra:** More than 56 percent population lies below poverty line and 35 percent belong to middle-income group.
- **Battagram:** More than 65 percent population lies below poverty line and 30 percent belong to middle-income group.
- **Kohistan:** More than 70 percent population lies below poverty line and 20 percent belong to middle-income group.

4.4.9 Gender Equity and Equality

The district's overall performance on gender empowerment is dismal. A low investment in (female) human capital, negative social biases and prejudices, controversial and discriminatory policies and laws, restriction on female mobility and the internalization of patriarchy by women themselves, has become the basis for gender discrimination and disparities in all spheres of life.

4.4.10 Rural Economy

Increasing environmental degradation in Pakistan is a constant threat to the biological diversity and natural resource base of the country and is unfavorably influencing the lives of the poorest sections of society. It is worth to mention that the last few decades have witnessed increasingly exploitative and disenfranchising practices including illegal timber harvesting, deforestation on mountains and hill sides, rangeland degradation, over-cultivation, uncontrolled grazing, low productivity in agriculture and livestock, poor water resource management and a host of socio-political factors contributing to the ecological degradation.

Area under Cultivation: Total area of the Hazara division is 1.705 million hectares. The ratio of area under cultivation to total area of the district varies from as high as 45.7% in Haripur to only 4.9% in Kohistan. The corresponding ratio in Abbot Abad, Mansehra and Battagram is 32.2%, 17.7% and 18.6% respectively.

Categories	Abbottabad	Haripur	Mansehra	Battagram	Kohistan
Area Under Cultivation (ha)	63424	77875	80747	24173	36749

Area under Forest	83201	57398	332252	37983	216699
Land Use	83.4%	73.6%	82.7%	47.5	75.5
Cropping Intensity	88.3%	109%	136.7%	125.2	125.2
Average per Hectare Yield					
Maize (kg)	1342	1346	1718	1305	1961
Wheat(Kg)	1402	1526	1554	1531	1624
Average Agriculture Land per Household (ha)	1.01	1.01	2.48	0.85	0.85
Animals per household					
Buffalo/cattle	1.80	1.80	5.01	3.58	4.08
Sheep/goats	1.85	1.52	16.51	3.28	11.20

Source: *Agriculture Statistics KPK 2006*

Agriculture: The average agriculture land per household for the entire Hazara division is only 1.25 hectares which is less than one hectare in Battagram and Kohistan and around one hectare for Haripur and Abbottabad. The consideration for any land use or cropping intensity becomes irrelevant with such a small land holding for agriculture.

The small agriculture landholding and availability of community grazing areas around the settlements and on top of the hills providing opportunities for livestock rearing in the entire Hazara division. Average household in the entire COI districts keeps over 10 animals to substitute their livelihood. The ratio is as high as 22 animals in Mansehra and 16 in Kohistan to 7 in Battagram and lowest 4 and 3 in Abbottabad and Haripur respectively.

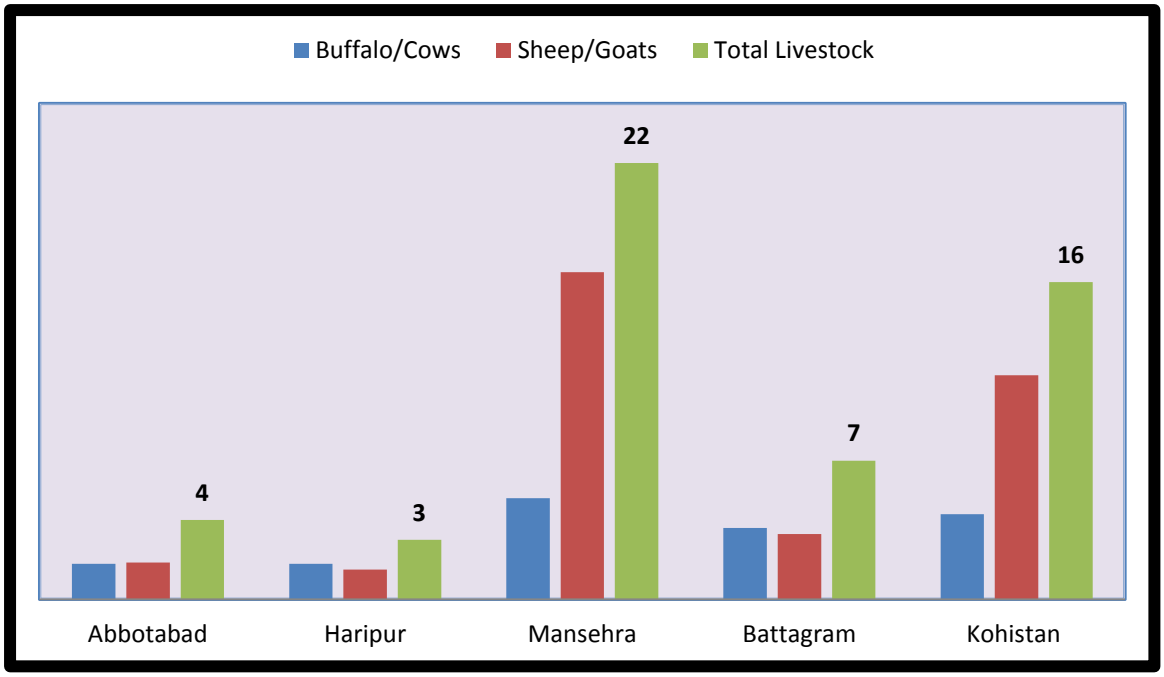


Fig.4.26 Average Household Livestock Index in COI Districts

The lowest per household livestock ration is due to highest (45.7%) area under cultivation as against the lowest (17% and 4.9%) area under cultivation in Mansehra and Kohistan with highest per household ratio of livestock 22 and 16 respectively.

CHAPTER 5

STAKEHOLDERS AND PUBLIC CONSULTATIONS

5.1 GENERAL

Stakeholders, especially the local population, involvement is an important feature of the environmental assessment and can lead to a better and more acceptable decision-making regarding the Project design and implementation. Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the Project design, will lead to better outcomes and lay the basis for on-going positive relationships between the stakeholders. Public involvement is necessary for smooth implementation of the Project. The local community support is also required for the success of the Project.

Given the dimension and nature of the Project, Transmission Lines Project management are committed for undertaking public consultation at local level as a part of Project planning/design, getting necessary environmental approval/NOCs, land acquisition, compensation for land and other assets and management of infrastructures.

Under the proposed Project of Transmission Lines, public consultation was carried out for all major accessible towns/villages of COI. These consultations were conducted during the preliminary environmental and social surveys. The major categories participated in public consultation were local population, community groups, landowners, businessmen, tenants, vulnerable groups and potential Project Affected Persons (PAPs) belonging to the COI. The feedbacks and issues raised during the consultation were recorded and documented for developing the strategy.

5.2 OBJECTIVES OF CONSULTATION

The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, those have been presumed to arise and to identify those which are not known or are unique to the Project. In fact, disclosure with many who have thoroughly observed the site conditions in the pre-developmental phase goes a long way in updating the knowledge and understanding. In accordance with World Bank and EPA Guidelines for public consultations, consultations were carried out keeping in view the following major objectives:

- Sharing of information with government authorities and local communities on the proposed Project activities and expected impacts on the physical, ecological and socio-economic conditions of the COI;

- Understanding the stakeholders concerns regarding various aspects of the Project, including the existing situation, route alignment, land acquisition, compensation and the potential impacts of the construction-related activities and operation of the Project; and
- Recording the feedback of public, in order to develop a mechanism to address their issues and other local level concerns and incorporation of the outcomes in final decision making.

5.3 IDENTIFICATION OF STAKEHOLDERS

Before proceeding Consultations with the stakeholders, an effort was made to identify the stakeholders. The major stakeholders related to the proposed Project are as under:

- NTDC (WAPDA)
- Water Wing WAPDA
- Dasu Wildlife Division Kohistan
- KPK EPA
- Divisional Forest Officer, Wildlife Kohistan
- NGOs
- Farmers
- PAPs
- General users of the Project area
- National and International agencies working on Environment.

5.4 MEETINGS WITH SELECTED STAKEHOLDERS

5.4.1 Institutional/Governmental/International and Individual

Meetings were held with the various stakeholders during site visits and report preparation. The participants included Govt. officials, representative of NGOs, representatives of forest and wildlife departments, EPA, Ministry of Climate Change and WWF. Mostly meetings were held in the offices of the concerned departments. The major findings of the consultations with their names, designation and objective of consultation are shown below:

Table 5.2: Selected Stakeholders Consultation Summary

Project Stakeholder	Name/Designation	Comments/Concerns
Wildlife Department	**Syed Mubarak Ali Shah** Chief Conservator of Wildlife **Muhammad Faiq** DFO Wildlife Abbottabad Formerly DFO Wildlife Kohistan	• *The Kohistan area is of utmost importance from biological aspects particularly Palas Valley. The various kinds of wildlife species are present in the area.* • *The Palas Valley is distributed in three distinct sections which are known as the biodiversity core zones. However, the proposed T/L routes crossed among the lower Palas Valley which may not crossed the three biodiversity core zones. It is recommended that the EIA Consultant will review the route alignment in detail particularly in Palas Valley to assess potential environmental and social impacts.* • *It is also informed by Wildlife Officials that is the only area Palas Valley which is untouched or protected. Therefore, it is requested to endeavor alternate route for the proposed T/Ls.* • *Horny pheasants (Tragopan) are endangered species of Palas Valley, which will require particular attention during environmental assessment in order to determine anticipated impacts from the proposed project.*
	Fazal Azeem Range Officer Dasu Kohistan Wildlife Division Khyber Pakhtoonkhwa	• *The district Kohistan is blessed with a variety of wildlife and hence known as "The Land of Wildlife".* • *More than 600 Markhors are present in District Kohistan and about 50 sq.km area is marked for protection of Markhor. This area is present about 20 km upstream to the proposed Power Station Dasu, therefore no impact is expected due to construction of Power station and high voltage transmission line.* • *This area is also the route of*

Project Stakeholder	Name/Designation	Comments/Concerns
		migratory birds and known as Flyway No. 7 (The Green Flyway). The number of migratory birds has increased due to Afghan War. As such no impact on this flyway is envisaged due to construction of proposed project, because the birds fly are at high elevations. • *It is advisable that all the protective measures would be adopted during project construction to eliminate the chances of disturbance to wildlife of the project area.*
Forest Department **KPK**	**Abdullah Khan** DFO Direction	• *The Kohistan area is rich of forestation particularly Palas Valley, which is protected forest. It is the only forest in the Kohistan area which is untouched or protected. It is suggested that the alternate route will be analyzed even the cost is higher than the proposed Palas Valley T/Ls route.* • *It is requested that official permission will be obtained prior to construction of T/Ls from Forest Department, Khyber Pakhtunkhwa. The proposed mechanism is to acquire permission via sending official letter to Secretary Environment, Khyber Pakhtunkhwa. The Secretary Environment will forward the letter to Chief Conservator Forest (CCF-II) for further processing.*
	Azhar Ali Khan DFO Upper Kohistan Forest Division **Essa Khan**	• *There cannot be two opinions on the possible benefits of the construction of two high voltage transmission lines, but the removal of trees from tower foundations and those lying below the transmission lines is obvious. This impact can be minimized by planting trees at least*

Project Stakeholder	Name/Designation	Comments/Concerns
	Assistant Forest Officer Lower Kohistan Forest Division	*three if one is cut. The forest department Khyber Pakhtunkhwa will extend its assistance in selecting the species for compensation plantation.* • *No dislocation of human population and infrastructure appears to result from the construction of the project. But, for smooth execution of the project, it is advisable that local community should be taken in complete confidence and thoroughly consulted before launching of the Project.* • *After completion of the project, all the construction sites would be restored to its original shape to avoid soil erosion.*
Ministry of Climate Change	**Muhammad Mansoor Khan** Deputy Project Manager National Impact Assessment Program Ministry of Climate Change Government of Pakistan **Dr. Mamoona Wali Muhammad** Deputy Director (Biodiversity)	• *It is a good step that all the projects are evaluated from environmental point of view before implementation. The Environmental Assessment as envisaged by the authorities concerned is a step in the right direction.* • *It will be appropriate to preserve all the vegetation, as far as possible, where inevitable, the compensation plantation should be done after consultation with the Forest Departments of Khyber Pakhtunkhwa and Punjab.* • *After 18th Constitutional Amendment, the environment department has been shifted to provinces. For NOC purpose, both the departments viz. EPA Khyber Pakhtunkhwa and EPD Punjab would be consulted.*
Water Wing WAPDA	**Haji Farooq** Project Director Dasu,	• *Land Acquisition and Resettlement cell and Environment Cell of Water Wing are responsible for compliance*

Project Stakeholder	Name/Designation	Comments/Concerns
	Water Wing **Ali Akbar** Deputy Director Environment LA&R Water Wing **Raheel Mustafa** Agronomist LA&R Water Wing **Riaz ul Haq** Consultant Environment Water Wing	*of environmental and social safeguards for all the hydropower projects including Dasu HPP.* • *All the safeguards documents for Dasu HPP has been prepared by the consultants and reviewed by Land Acquisition and Resettlement (LA&R) and Environment Cell of Water Wing.* • *The major impacts resulting from the implementation of Dasu HPP are the resettlement (relocation of about 767 households) and tree removal (about 21,000 nos. of various species).* • *It is proposed that LA&R and Environment Cell would be consulted in details at the time of ESIA preparation. The water wing would be available to provide any assistance/guidance to ESIC-NTDC in the preparation of environmental and social safeguards documents.*
Conservator	**Dr. Abdul Aleem Chaudhry** Ex-Chief Conservator of Forests Ex-DG Wildlife and Parks Department Punjab, Member IUCN World Commission on Protected Areas, Formerly Member WWF Board of Trustees, Member WWF Scientific	• *Importance of faunal resources of the area can hardly be overemphasized in view of their aesthetic, recreational and commercial value.* • *Similarly, vegetation of the area bears high significance because of its complementarity to fauna, in ecosystem.* • *The bird flyway no. 07 exists in the proposed project corridor, but no impact is envisaged, as the bird fly at height of 1000m to 2000m, while height of tower is low.* • *The district Kohistan in known as the "Land of Wildlife" therefore, special measure would be adopted during construction phase to minimize the disturbance to wildlife.* • *Although no protected area falls in*

Project Stakeholder	Name/Designation	Comments/Concerns
	Committee	*the whole project corridor, but extreme care is required to exercise full protection to the fauna/flora, during the construction and post construction phases of the Project.*

Fig. 5.1: Meeting with the officials of Forest Department at Pattan

Fig. 5.2: Eliciting the views of Range Officer Dasu, Kohistan Wildlife Division

5.5 PUBLIC CONSULTATIONS

Under the proposed Project, public consultation was carried out in the villages from Dasu to Pathar Garh (near Hasan Abdal, District Attock). Total 21 consultative meetings including 2 local NGOs were held with 273 participants and the major categories participated in these meeting were local population, community groups, landowners, businessmen, tenants and potential project affected persons. Majority of the people who participated in these consultations are mature/elderly persons because as per the local culture, elders have the right regarding any decision. Although, young people were also present during consultations, but their participation was negligible.

5.5.1 Scoping Sessions and Consultative Meetings

A series of scoping sessions and consultative meetings were carried out at various locations of the project corridor, i.e. Dasu – Palas Valley – Shamdarra (Tehsil Oogi, District Mansehra) – Chaprian (Tehsil Hasan Abdal, District Attock) etc. The purpose of the scoping sessions and consultative meetings was to share the information about the project activities with the grass route level i.e. with the actual direct or indirect affected persons and to get their feedback about the project. In this context, one consultation/ consultative meeting was done on about each 10 km distance in

COI. Thus, total 21 consultations/ consultative meetings were made with the PAPs/local community & general public. The various ways used to ensure the participation of the local community through the personal meetings with village elders, NGO representatives, numberdars, and school teachers. District-wise summary of scoping sessions/ consultative meetings is presented in Table 5.2 below, while the elaborated record of these consultations is given in Appendix – 5.1.

Table 5.2: Summary of Consultations/Consultative Meetings

Sr. No.	District	Tehsil	Union Councils	Locations/ Venues	No. of Participants
1	Attock	- Hasan Abdal	- Sontaki	- Pathargarh	19
			- Jallo	- Katcha Jallo	16
		- Ghazi	- Chaprian	- Chaprian	11
2	Haripur	- Haripur	- Dheldal	- Narra	8
			- Beer	- Darwaza	18
3	Abbotabad	- Abbotabad	- Sherwan	- Sherwan Kalan	10
4	Mansehra	- Ugi	- Icharrian	- Kotla Bala	13
			- Perhenna	- Khaki	10
			- Shamdara	- Shamdara	15
5	Battagram	- Battagram	- Ajmeeera	- Bazargai	9
			- Ajmera	- Chapargram	13
		- Allai	- Banna	- Banna	17
			- Tailoos	- Tailoos	8
			- Pashto	- Pashto	14
6	Kohistan	- Palas	- Haran	- Bada Kot	18
			- Shalkhan Abad	- Shalkhan Abad	17
		- Pattan	- Pattan Islahi Committee	- Pattan	12
			- Pak Mission Society (NGO)	- Shalkhan Abad	5
		- Dasu	- Seo	- Seo	11
			- Komila	- Komila	22
			- Salak Development Foundation (NGO)	- Komila - Pattan	7

Sr. No.	District	Tehsil	Union Councils	Locations/ Venues	No. of Participants
			Sub-Total	19+2	273
			Grand Total	**21**	**273**

5.5.2 Concerns/Feedback

Feedback received during public consultation includes both Project related concerns and other/general concerns are given below.

Project related concerns and suggestions are related to the willingness of people to accept project, livelihood, electricity and compensation/relocation/resettlement while other concerns include drinking water supply and sewerage, health facilities, public infrastructures and education.

A. Project Related Concerns/Feedback

i. People's willingness

The whole country is suffering from energy crisis. Continuous Power shutdown is badly affecting daily life of the people. People in the COI are quite happy with this Project. Most of the people ensure their cooperation and support for the proposed Project. According to respondents, such projects are important for the prosperity of people and country. People even demanded that this Project should be implemented as soon as possible. For the consulted communities this Project is more attractive than adverse impacts. Few respondents are even willing to bear minor losses due to this Project in the long term favor of the country.

Very few people have negative views about government Projects, as according to them land value would be reduced due to the construction of Transmission Line in the Project Area. Moreover, the proposed project will affect the already limited agriculture land resources.

Fig. 5.3: Recording the views of elders of Village Shalkhanabab, Palas

Fig. 5.4: Consultative Session at Village Badakot, Palas Valley

Fig. 5.6: Discussions with people of Village Shamdara, Mansehra District

Fig. 5.5: Eliciting the Concerns/Feedbacks of the Resident of Village Pathar Garh (Hassan Abdal)

ii. Livelihood

In the COI, farming, labor and small businesses are the main sources of livelihood. Majority of the respondents are poor and they told that there are very few employment opportunities. Therefore, economic conditions are not so good. Due to the hilly area, the people have small holdings of agriculture land, therefore it should be endeavored to save that and line would pass through barren land.

In the area of Katcha Jallo (Hasan Abdal, District Attock), people demonstrate against agriculture land shortage due to land acquisition for the construction of Motorway, GT Road and Railway Line projects. In addition to that three existing heavy transmission lines are crossing our lands and people of the area requested to change the route for proposed Transmission Lines. People of the Chhaprian village (Hasan Abdal, District Attock) demanded alternate land as the land will be lost forever and will not be properly utilized again to build houses and plant trees under the line.

As per respondents in the COI, they do not expect any direct benefit from this project, but for the development of the country, they are ready to cooperate to the possible extent. People in the COI said that employment opportunities during implementation phase of the Project should be given to them and government should provide jobs opportunities to poor people residing in the Project Area, on priority.

iii. Compensation/Relocation/Resettlement

In case, crops and trees are damaged due to Transmission Lines Project, proper compensation should be paid. If any community or private structures are affected, it should be relocated and compensated properly. Locals demanded that the

Transmission Lines should be kept away from agriculture lands, residential areas so that loss of assets will be minimized.

iv. Electricity

Electricity is not available in most of the villages of Kohistan section. It was suggested that electricity should be provided to all the villages in the route alignment of Transmission Lines. According to locals, provision of electricity will reduce many constraints of daily life. It will initiate development in the area and increase the living standard of locals.

B. Other Concerns/Feedback

Basic amenities of life are not available in most of the villages in COI of Kohistan section. Medical facilities, proper education system, road infrastructure, gas and electricity are not present in many areas along Project corridor.

i. Water Supply/Drinking Water/Irrigation Water

Drinking water is available in the area through natural streams in Kohistan section; people are fetching water through self-made network of pipes to their settlements. In plain areas of the COI people are used to fetch water through hand/pressure pumps.

People are using streams/rain water for hilly area agricultural lands in Kohistan section. However, in other areas of COI agriculture is being done through tube wells and canal water.

ii. Sewerage System

There is no proper sewerage system in most of the villages in the COI. Absence of proper sewerage system results in epidemic health problems. Locals demanded that sewerage system should be installed to improve sanitation condition of rural areas.

iii. Health/Medical Facilities

Water borne diseases are common in most of the villages along route alignment. Diseases such as jaundice, hepatitis, fever, tuberculosis and stomach disorders etc. are common in these areas. Hospitals are mostly far away while dispensaries are not fully equipped. Maternity homes are not available. Due to inadequate health facilities, majority of the patients could not get proper treatment. People have to travel long distances to get health facility. In Kohistan section more than 90 percent villages have no health facility. People demanded that health facility should be provided to the locals.

Livestock rearing is main source of income in many areas in the COI. There are no veterinary hospitals near settlement. Any disease outbreak among livestock directly affects the households. So veterinary centers should be provided in areas where livestock rearing is common.

iv. Public Infrastructures/ Roads

Transportation and road infrastructure is very poor in the COI. Most of the settlements have Katcha tracks. People have to travel longer distances by foot. During rainy season travelling on Katcha tracks become difficult. It was demanded that roads should be constructed and public transport should be provided to facilitate the local people.

v. Education

Education facilities are very poor in the COI. Schools are not present in villages and boys and girls have to travel long distances for education. Schools are devoid of proper infrastructure and learning aids. Many students could not join the college. It was suggested by locals that proper education system should be introduced along the COI especially for girls.

5.5.3 Menu of Benefit Sharing Options

The main focus of the consultation process has been the assessment and prioritization of needs of the communities situated close to the transmission lines route. Benefit sharing activities with the selected communities required a strategic focus on those challenges that affect the population most critically, and that the consultation participants themselves identify as key issues in their area. The process also ensured the voice of vulnerable is heard and their needs are assessed properly.

a. How the Menu Identified

The participatory need assessment process through the consultations with the community members a set of 5 different problems identified. The consultations qualified a menu of options from the wish list of priorities identified by the community members. The key informants on the other hand, not only crystallized the wish list but on the basis of their past experience, identified opportunities and constraints related to the implementation of each option.

b. Wish List of Options

At the end of each consultation the participants were asked one major question "*what are the development priorities of your area*?" This listing of development priorities

was followed by a supplementary question "*how they can be achieved?*". As expected the wish list starched from 7 to 10 problems including political, social and economic problems. The consultation coordinator than has to intervene to concentrate on "development priorities for the entire village and that are achievable".

The shortlist of menu of options includes sectors such as education, health, employment, skill development and access roads in the region. The priorities are presented below in a tabular form.

c. Ranking of Options

The ranking of options below is based on the number of times each priority is repeated.

Sector	Employment	Skill Development	Health Facilities	Education	Road Access
Count	21	20	19	18	17
% age	22%	21%	20%	19%	18%
Ranking	1st	2nd	3rd	4th	5th

The above ranking is an academic exercise that emerges from the data analysis. Some of the priorities for instance "availability of functional health facilities" and in the larger community context "employment" may be out of the context of this study or the resultant actions. In fact overall social development itself is a precondition and demand for implementation of this project. Rigid tribal traditions do not allow female education and local social environment discourages teachers and doctors from other districts. Government record shows all schools and health facilities functional with full staff strength. Whereas, over 50% schools and health facilities buildings are either closed or being used for other purposes by local influentials.

d. Need to Enhance Local Ownership of the Project.

There is a strong need to enhance local ownership of the project. Local ownership can only be enhanced through the participation of local communities in the inception, design, implementation and operation and maintenance of the project as well as investing in some resources in some social development projects which are visible functional and long term. Investing in charity or buying in of some influentials will not create local ownership of the project.

CHAPTER 6

POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS

6.1 GENERAL

This Chapter identifies the potential impacts due to the implementation of two parallel running 500 kV transmission lines and 500 kV grid station on the physical, biological and social environment of the Project Area.

6.2 DELINEATION OF PROJECT CORRIDOR OF IMPACT (COI)

Before proceeding to the environmental analysis of the Project, it is imperative to delineate the Project Area of Influence (PAI).

Due to absence of final design and tower markings at site, project corridor of impact has been taken as 500 m wide and 250 km long, which have been used for the environmental/social baseline information and impacts assessment. From this corridor, two parallel running 500 kV transmission lines will pass and there could be direct impact on the environment like relocation of physical infrastructure (if any), clearing of vegetation, loss of crops, etc. and indirect impacts of the project activities are envisaged like existence of forests, wildlife habitats, wetlands, etc. For 500 kV grid station, an area of 100 acres privately owned barren land has been selected.

6.2 IMPACT ASSESSMENT CHECKLISTS

A project impact checklist helps in identifying the potential areas of impact and screens the project for environmental and social soundness. Each project component/activity is screened separately with regard to its design, construction and operation phases, and according to the various physical, biological and social parameters.

The environmental and social impacts of power station as an integral part of Dasu Hydropower Project, has been identified and dealt by Dasu Hydro Consultants and Water wing of WAPDA will be the proponent of project and responsible for construction and implementation of proposed mitigation measures. The NTDC will be responsible for construction and operation of transmission lines and grid station. Therefore, the impacts for both these components have been assessed in the subsequent paragraphs.

Table 6.1 and 6.2 provide project impact checklists of the proposed two 500 kV Transmission Lines from Dasu Power Station to 500 kV Grid Station at Pathar Garh (Hassan Abdal, District Attock).

Table 6.1: Checklist for Identification of Environmental and Social Impacts by Power Transmission

Impact Assessment Questions	**Yes**	**No**	**Remarks**
Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
Cultural heritage site		√	
Wetland	√		River Indus and Tarbela Lake fall in the vicinity of project area, but no impact is expected.
Mangrove		√	
Estuarine		√	
Migratory Birds Flyway	√		Migratory Birds Flyway number 7 (The Green Flyway) exist along the project corridor. Detailed impacts will be analyzed during ESIA studies. Besides, Avian Risk Assessment study has also been recommended which will help identifying the extent of impact and recommend mitigation measures.,
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Will the Project cause;			
Encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?	√		Disfiguration of landscape and waste generation is expected during construction stage.
Encroachment on precious ecosystem (e.g. sensitive or protected areas)?		√	

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?	√		
Deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	√		During rainy season, such incidence would be more frequent.
Increased local air pollution due to rock crushing, cutting and filling?	√		
Chemical pollution resulting from chemical clearing of vegetation for construction site?		√	
Noise and vibration due to blasting and other civil works?	√		These would happen during tower foundation construction and transportation of material.
Dislocation or involuntary resettlement of people.	√		This impact will be minor and identified after final design of the project.
Social conflict relating to inconveniences in living conditions where construction interferes with pre-existing roads?	√		
Hazardous driving conditions where construction interferes with pre-existing roads?	√		
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	√		
Creation of temporary breeding habitats for mosquito vectors of disease?	√		
Environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	√		
Accident risks associated with maintenance of lines and related facilities?	√		The risks of accidents during maintenance of high voltage lines cannot be waved out.

Health hazards due to electromagnetic fields, land subsidence?	√		
Disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?	√		

Table 6.2: Checklist for Identification of Environmental and Social Impacts by Construction of Grid Station

Impact Assessment Questions	**Yes**	**No**	**Remarks**
Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
Cultural heritage site		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Will the Project cause;			
Disfiguration of landscape and increased waste generation?	√		By construction of grid station, residential colony and offices, the waste will be generated.
Encroachment on precious ecosystem (e.g. sensitive or protected areas)?		√	
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?		√	No water body exists in close proximity of proposed grid station site.
Increased local air pollution due to rock crushing, cutting and filling?	√		But the impact will be confined within the boundary of grid station.

Noise and vibration due to blasting and other civil works?	√		These would happen during construction stage and transportation of material.
Dislocation or involuntary resettlement of people.		√	There is no structure at proposed site.
Will the project involve the acquisition of private land?	√		About 100 acres of barren private land owned by the residents of Village Pathar Garh, Tehsil Hassan Abdal, District Attock, will be acquired.
Will the project cause disruption/dislocation of any public infrastructure (e.g. highway, railway line, public water supply, existing transmission lines, telephone poles)		√	None of such infrastructure exists in the proximity of proposed site.
Social conflict relating to inconveniences in living conditions where construction interferes with pre-existing roads?	√		
Will the project involve acquisition of agricultural land? Tree cutting?		√	The land identified for grid station is barren and almost free from vegetation.
Hazardous driving conditions where construction interferes with pre-existing roads?	√		
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	√		The impact will be minor, as the camps and work sites will be within the boundary of grid station.
Creation of temporary breeding habitats for mosquito vectors of disease?	√		
Environmental disturbances associated with the maintenance and repair of lines entering and transmitting power from grid station?	√		
Health hazards due to electromagnetic fields, land subsidence?	√		

6.3 LAND RESOURCES AND LAND USE

This section explains how the proposed project will affect the land use, soil erosion and contamination.

a. Permanent Land Acquisition

The proposed Project will not involve the acquisition of land on permanent basis for erection of towers as per NTDC (WAPDA) practice in the light of Telegraph Act, 1910. No payment is made for the land at the tower footing as the landowner is allowed the use of the area under the towers. However, the land may have to be acquired for relocation of houses or other structure (if involved). While, for 500 kV grid station, about 100 acres of barren land is privately owned by the residents of village Pathar Garh (Hassan Abdal, District Attock) and will be permanently acquired.

b. Temporary Acquisition of Land

The contractors will require temporary acquisition of land for:

- Contractors' camps and facilities, i.e. storage, workshop, equipment parking and washing areas,
- Aggregate quarries,
- Access roads for haulage, etc.

The contractor will be utilizing land for project activities, while, the subsequent operation of the project may induce temporary as well as permanent changes in the existing land use pattern.

c. Loss of Crops

The damages may occur to the existing crops during the construction stage of the project due to the following activities:

- ✓ During the detailed survey and soil investigation work for tower footings.
- ✓ Considerable vehicular movement for transportation of materials/water and steel formwork will be involved at the time of concreting of tower foundations. This movement and storage of materials will cause damages to the existing crops.
- ✓ The stringing of conductors involves the movement of equipment and vehicles along the corridor, which may involve the cutting of trees, and considerable damages to the existing crops in valleys.
- ✓ Due to project location in hilly areas, a number of new access routes will be required to approach each tower. Therefore, damage to the crops is obvious.

Magnitude of Impacts

Sr. No.	Item	Total
1	Total Length of two 500 kV Transmission Lines	250,000 m (250 km)
2	Width of COI	500 m (0.5 km)
3	Total COI Area	125000000 m^2 (12500 ha)
4	Estimated Total Towers of two lines (at @285 m /tower)	1754 nos.
5	Agriculture Land of COI Area	40 % (5000 ha)
6	Barren/Grazing Land of COI Area	40 % (5000 ha)
7	Forests Land of COI Area	20 % (2500 ha)

Since the Project is at planning stage and detailed survey is to be carried out along with the proposed tower positions by the NTDC. So in absence of availability of tower positions, it is very difficult to calculate the exact amount of the crop losses and to identify the owners. Therefore, the above calculations would be considered as just an estimate. Identification of owners will be carried out once the tower positions are finalized and NTDC will pay the compensation during the implementation stage of the project. It is estimated that the project activities will continue round the year at each tower from the start of survey to the stringing of conductors. So affectees will lose their crops for two seasons i.e. Winter and Summer. The crops and trees compensations are paid by NTDC at three stages viz., (i) tower foundation construction, (ii) erection and (ii) stringing works. The major crops which are being sown in the project area are wheat, rice, maize along with vegetables.

d. Soil Erosion

Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities at hilly areas and natural streams. Soil erosion may also occur at quarry areas, if unmanaged blasting is carried out.

e. Soil Contamination

Lands may get contaminated from the spillage of chemicals like fuels, solvents, oils, paints and other construction chemicals and concrete. This normally happens when these materials are transported in open or loosely capped containers.

The possible contamination of soil by oils and chemicals at camp sites, workshop areas, and equipment washing-yards may limit the future use of land for agricultural purposes.

6.4 PUBLIC INFRASTRUCTURE

Construction stage of the proposed project may affect the existing infrastructure falling in the proposed alignment of the transmission line. The effects due to the crossing of the transmission line route over the existing infrastructure/area are as under:

a. Roads and Railway Crossings

Field surveys revealed that the proposed lines will cross several roads including Islamabad-Peshawar Motorway, M-1 (once near Grid Station at Pathar Garh, Hassan Abdal, District Attock), Karakoram Highway, N-35 (at 2-3 locations), GT Road, N-5 (once near Katcha Jallo, Hassan Abdal, District Attock). Besides these national highways, the transmission lines will cross a number of local roads and access routes throughout the project corridor. At the time of stringing, interference to the traffic movement on these roads is expected. The transmission lines will also cross the railway line at one spot near village Katcha Jallo, Hassan Abdal, District Attock.

b. Power Lines

The selected route of 500 kV lines will involve the crossing of existing 220 kV line near Bhattagram. Besides this, some lines of PESCO and IESCO of 132 kV, 66 kV and 11 kV will also be crossed at various locations. Crossing may be dangerous during the stringing action and operation stage, if proper clearance is not provided at the design stage of the project.

6.5 WATER RESOURCES

This section explains how the Project will be affected in terms of water resources use and water body contamination; it also describes the mitigation measures to manage these impacts.

a. Use of Local Water Supplies

Local water supplies will need to be tapped to meet the campsite and construction requirements, bringing its use into competition with local use. This may cause conflicts between the locals and contractors.

b. Contamination of Water

Major surface water bodies of the project area include; Indus River, Kohistan River, Siran River, Dour River, Haro River, Tarbela Lake and a number of nullahs/khawars.

During construction, these water resources may be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites. Moreover, the routes of nullahs/khawars may be altered due to construction of access routes and hence leading to problem of water shortage for benefitting populations of these nullahs.

c. Siltation of Natural Streams/Nullahs

Natural streams may become silted by excavated material (earth) with the runoff from the construction area, workshops and equipment washing-yards. The natural streams running along the project corridor in the hilly areas may become silted, if unmanaged excavation is carried out for tower foundations.

6.6 AMBIENT AIR QUALITY AND NOISE LEVEL

This section discusses the impact of the construction and operation on the ambient air quality and noise levels in the proposed Project Area. It also describes the mitigation measures to manage these impacts.

a. Ambient Air Quality

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 wind speed and direction, the temperature of the surrounding air, and atmospheric stability.

The critical sources of air pollution during the construction phase are:

- Quarry areas that generate fugitive dust during the rock blasting and crushing.
- Earth haulage trucks that generate dust, particularly during loading and unloading processes.

b. Noise Level

Noise generated by the construction machinery during the project construction is likely to affect the project area particularly the sensitive receptors like schools, hospitals etc. Since, it has been endeavored to avoid the major towns and settlement, therefore the impact on sensitive receptor is not foreseen. High noise levels may also cause disturbance to the wildlife of project area.

6.7 BIOLOGICAL ENVIRONMENT

The impact on flora and fauna and corresponding mitigation measures are described in the following paragraphs:

a. Impact on Flora

In the areas of Kohistan District, from Dasu to Pattan, the trees are comparatively less and no major removal will be involved. While, from Palas Valley to Allai, Battagram, Abbottabad, Mansehra and Haripur regions of project corridor, the forests are available and valleys are lush green. The trees and shrubs will be removed for tower foundations, those lying under the transmission lines and for making access routes. Mainly, the trees are privately owned. The 500 kV Grid Station will be at barren land of village Pathar Garh (Tehsil Hasan Abdal, District Attock, only some bushes and shrubs will be removed. In the absence of final design and tower marking at the site, the exact number of trees to be removed cannot be counted at this stage. But it is envisaged that trees/shrubs, especially in Palas Valley Protected Forests will be removed during construction of transmission lines and will cause major negative impact on environment of the project area.

No major fruit orchid is present in the project area. The scattered fruit trees are present in valleys and along the terraced agriculture lands; therefore, no major environmental impact on fruit trees is foreseen.

b. Impacts on Fauna

During the construction phase, there will be negative impacts on the mammals and reptiles of the area, due to the activities involving construction of towers, access roads, stringing of conductors, movement of labor, carriage of goods and machinery to various sites, falling within the route of transmission line. Mammals, such as wild boar, jackal etc. will avoid these areas for fear of being hunted. Same will be the case with reptiles, some reptiles might be killed during the digging and dragging operations. Birds will try to find shelter and food somewhere else and will tend to move away from the route of transmission line due to the activities mentioned above for fear of being hunted/trapped.

c. Impact on Protected Areas

In Pakistan, the protected areas are classified into three main categories viz., Wildlife Sanctuaries, National Parks and Game Reserves. In the project corridor, no such site exists and therefore no impact on protected areas is envisaged due to construction of two parallel running 500 kV transmission lines and grid station.

d. Impacts on Migratory Birds Flyway Number 7

The famous route for migratory birds from Siberia to various destinations in Pakistan over Karakorum, Hindu Kush, and Suleiman Ranges along Indus River down to the delta is known as International Migratory Bird Route Number 7; it is known as the Indus Flyway and is one of the busiest routes in the world. According to estimates

based on regular counts between 700,000 and 1,200,000 birds arrive in Pakistan through Indus Flyway every year.

This route falls in the COI area of transmission lines from Dasu to Pattan along the Indus River. Due to construction of Dasu Reservoir, it is likely that the migratory birds come on the lake and the overhead transmission lines across the Indus Rivers may have a potential collision hazards for waterfowl and other large birds. Some of the expected impacts on migratory birds and facts and figures are given below, but detailed investigations are required during the Environmental and Social Impact Assessment (ESIA) study of this project.

- Depending on the type of construction used, power poles and power lines may cause fatal injuries to birds, because of both electrocution and collision. They affect especially large birds such as storks and raptors. There is a strong need to agree on standards in construction and design of electricity transmission facilities to minimize any such adverse effects, largely excluding the risk of bird deaths.

- Collisions with some types of aerial wire or cable, including power lines of all voltage ranges, can affect any flying bird. Migrating birds (bustards, rails, waders/shorebirds, cranes, waterfowl and sand grouses) flying at heights of 20m to 50m are at considerable risk of collision, especially at night, when flying in flocks, and for large and heavy birds of limited maneuverability.

- Bird collisions frequently involve the top (grounding) wire, which is typically the least visible. Particularly collision-prone species are relatively heavy-bodied birds with limited maneuverability during level flight; examples include pelicans, cormorants, herons, storks, ibises, flamingoes, waterfowl (ducks, geese, and swans), cranes, bustards, and coots. Power line collisions are usually most problematic over wetlands, since these habitats tend to have high bird concentrations in general, but particularly most of the species groups with high collision vulnerability. Unlike birds, bats do not normally collide with power lines. Bird electrocutions most typically involve raptors (hawks, owls, eagles, and vultures) or other medium-to-large birds that perch on the lines or poles and complete a circuit by simultaneously touching two live wires, or a live wire and grounding element. Some relatively long-lived, slowly-reproducing bird species have suffered significant population declines due to collisions or electrocutions at power transmission lines.

e. As discussed above in the report, in parallel to ESIA, project will also commission Avian Risk Assessment study to identify the risks associated with passing TL through Indus Flyway cooridor.**Encroachment to Wetlands**

Wetlands occur in many different forms and serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing

habitat for aquatic species and wildlife. In Pakistan, the Indus valley forms the main wetland artery in the country. The major wetlands falling in the vicinity of project corridor are Indus River and Tarbela Lake. The transmission lines run on both sides of River Indus from Dasu to Pattan/Palas (about 32 km) and might be some towers located in or very close the River Bank. The other wetland near project corridor is Tarbella Lake. The Lines pass at Eastern side of Tarbella Lake near the Villages Darwaza, Khalabat Township and Narra, District Haripur. The confirmation of tower foundations in or near these wetlands will come from final design of the project. The construction and maintenance of transmission lines can damage wetlands in the following ways:

- Heavy machinery can crush wetland vegetation and wetland soils.
- Wetland soils, especially very peaty soils can be easily compacted, increasing runoff, blocking flows, and greatly reducing the wetland's water holding capacity.
- The construction of access roads can change the quantity or direction of water flow, causing permanent damage to wetland soils and vegetation.
- Construction and maintenance equipment that crosses wetlands can stir up sediments, endangering fish and other aquatic life.
- Transmission lines can be collision obstacles for sandhill cranes, waterfowl and other large water birds.
- Vehicles and construction equipment can introduce exotic plant species such as purple loosestrife. With few natural controls, these species may out-compete high-quality native vegetation, destroying valuable wildlife habitat.

Any of these activities can impair or limit wetland functions. Organic soils consist of layers of decomposed plant material that formed very slowly. Disturbed wetland soils are not easily repaired. Severe soil disturbances may permanently alter wetland hydrology. A secondary effect of disturbance is the opportunistic spread of invasive weedy species. These invasive species provide little food and habitat for wildlife.

6.8 SOCIOECONOMIC AND CULTURAL ENVIRONMENT

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

a. Impacts on Local Communities/Workforce

The area's surrounding communities will be affected during the construction phase as follows:

- ✓ During the construction phase the general mobility of the local residents and their livestock in and around the project area is likely to be hindered.

- ✓ Unmonitored construction activities, e.g. blasting may create an accident risk for the local residents particularly their children.
- ✓ Usage of Community's common resources like potable water, fuel wood etc. by Contractor workforce may create conflicts between the community and the Contractor.
- ✓ Community will have to face the noise and dust problems during the construction activities.
- ✓ Induction of outside workers in the Contractor labor may cause cultural issues with the local community.
- ✓ Theft problems to the community by the Contractor workers and vice versa.

b. Loss of Income

- During the construction activities of tower foundations, erection, and conductor stringing people will lose their annual income due to the loss of crops, trees, etc.
- The land under the towers during the operation stage may restrict its current use for agriculture purposes.
- The restriction of plantation of trees above 2.5 m height during the operation stage may also cause the reduction of income of the farmers.
- Due to the erection of towers and passing the transmission line, the value of land may depreciate in the long term.

c. Gender Issues

- ❖ As the project route is passing through the rural areas and rural community, women activities in the field may become affected due to the construction activities.
- ❖ The rural women normally use the open field latrines and their privacy may suffer due to the project activities.
- ❖ The induction of outside labor may create social and gender issues due to the unawareness by them of local customs and norms. It will also cause hindrance to the mobility of local women.
- ❖ Disturbance to the privacy of the local women when workers will work on the erection of towers.

d. Indigenous, Vulnerable and Women Headed Households

- During the field survey of the project corridor, no indigenous group of people was identified, which comes under the definition of “Indigenous People” as per World Bank O.D. 4.20. So, no impact on the indigenous people is envisaged due to the implementation of the project.

- Income of vulnerable people may be affected due to the implementation of the Project, like relocation of their infrastructure, loss of land, crops, trees, etc. In case of loss of crop/trees due to the Project, the person who is going to lose over 50 % of his land will be considered as vulnerable people.

- The women headed household are need to be identified during the detailed social survey of the Project.

e. Public Health and Safety Hazards

- Construction of two 500 kV Transmission lines, a 500 kV grid station and power station will require hundreds of workers who will obviously be accommodated in congested temporary camps. This scenario will lead to spreading of diseases like Malaria, Cholera, Typhoid, Hepatitis A, B and C etc.

- Occurrence of accidents/incidents during the construction stage of high voltage lines is a common phenomenon.

- The existing infrastructure in the project area for solid waste management is not very satisfactory; the induction of more people in the project area may cause more problems.

- The Project area is very sensitive from the law and order point of view in Kohistan and Bhattagram districts, therefore, the security of Contractor and Consultant staff will be a major issue.

- During the operation stage, people believe that they will be prone to danger due to the current flows from towers, breaking of conductors, etc.

- Slippage of Contractor staff while working at steep hilly slopes in hilly area.

- Safety of general public at blasting sites and construction sites.

- During the operational stage electric current (induction) may travel into the towers and will become a hazard to the public/animals.

f. Relocation of Private/Public Infrastructure

- Removal of infrastructure like houses, animal sheds, etc. will cause the loss of community shelters and source of income. As per field observations, it is expected that few number of such structures will be affected due to

implementation of the Project. As project is at planning stage, during detailed design, any private infrastructure like may come within the COI.

- Although a number of public infrastructure will fall into the proposed transmission line route, but no relocation is expected as the Project has the flexibility to provide proper horizontal/vertical clearance for safe passage over the existing infrastructure.

g. Religious, Cultural and Historical Sites

Although the project will pass close to a number of religious sites like mosques and graveyards, but none of them is falling within the COI limits.

6.9 ENVIRONMENTAL AND SOCIAL RISK ASSESSMENT

The common environmental risks as assessed on the basis of consultations with the stakeholders are as under:

- The farmers believe that their movement will be restricted in the fields due to Electro Magnetic Field (EMF), and it may have adverse impacts on the health. EMF due to EHV can cause the risk of *leukemia,* which is a disease in which white blood cells mutate and become cancerous before maturity. These cells are important in fighting against infection in the body. Leukemia also slows down the production of red blood cells that are needed to carry oxygen in the second leading cause of death for children ages 2-15 years.
- Animal movement may be restricted due to EMF and current in the towers in rainy season.
- Collapse of the towers due to the high wind or earthquake may be dangerous for human as well as animal life.
- Breaking of conductors due to any mishap will cause a safety hazards due to the current flow at fields and crossing over roads, canals, streams etc.
- People have to bear an excessive noise due to the current flow in the conductors especially in rainy season.
- The electronic devices/equipment may fail to work passing under the EHV transmission lines.
- Special measures are required if transmission line passes over any existing transmission line.
- The transmission lines may become a danger to the movement of birds and fatalities may occur if someone sits on the conductor.

6.10 ENVIRONMENTAL AND SOCIAL BENEFITS OF THE PROJECT

Although there will be some insignificant and temporary negative effects of the Project during implementation and operation stage, but a large number of positive impacts on environment and social settings of the area are also expected. This project will have local to national level positive impacts. During construction phase, a lot of local labor will be hired and other services e.g. concrete materials will be purchased from local markets ultimately leading to the socio-economic uplift in the project area. During operation phase, the employees of the project will be provided with better facilities e.g. hospitals, schools, roads, electricity etc. and ultimately the local community will also be benefitted from these facilities. Beside these, the whole country is facing the shortage of electricity and lots of people have lost their livelihood sources due to this problem. Dispersal of 4320 MW power from Dasu Power Station by constructing 500 Kv transmission lines will help to meet the energy requirements in the country. The major positive impacts of the proposed Project on environment and social settings of the Project area particularly on rural communities are as under:

- The most outstanding benefit of the project will be the availability of resources and expertise for the protection and conservation of environmental resources in the Palas valley.
- Due to implementation of the Project availability of the electricity will be ensured as per demand of the area.
- Expansion of industries expected due to availability of electricity.
- Better quality of life will be available for the citizens.

CHAPTER 7

ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE MITIGATION OF PROJECT (IMPACTS)

7.1 GENERAL

This Chapter outlines the Environmental Management Framework (EMF). The EMF provides generic guidelines to be followed while implementing various project activities, in order to keep the project environmentally and socially sound. However, for more precise, site specific Environmental Management Plan (EMP), as a part of ESA has to be prepared.

7.2 INSTITUTIONAL ARRANGEMENT AND RESPONSIBILITIES

Project Preparation and Technical Assistance (PPTA) Consultants to be hired by NTDC will be responsible for preparation of full fledge ESA including site specific EMPs. The public consultation and information disclosure shall be conducted by the consultants during the process preparation ESA.

The Environment and Social Impact Cell (E&SIC) of NTDC, shall review and modify (if any) the already prepared EMPs as per the IFI's Guidelines.

The existing Project Management Unit (PMU) will assume primary responsibility for the environmental assessment as well as implementation of EMPs for their respective components by PIUs. The environmental and social impact cell (E&SIC), NTDC will take care of environment, resettlement, and any other environmental and social development obligations and issues established at the PMU. The Project Supervisory Consultants will assist the PMU in monitoring and management of environmental safeguards.

Organogram of environment and social impact cell of NTDC has been depicted in Fig.7.1. The E&SIC is headed by Manager, the other staff includes; Deputy Manager Environment, Assistant Manager Environment, Assistant Manager Social Safeguards, Social Surveyor and a Computer Operator. The only vacant position in the E&SIC is Computer Operator, which would be filled before execution of this project. The major role of E&SIC is to fulfill the environmental and social safeguards requirements of financing agencies and other responsibilities are described in subsequent paragraphs.

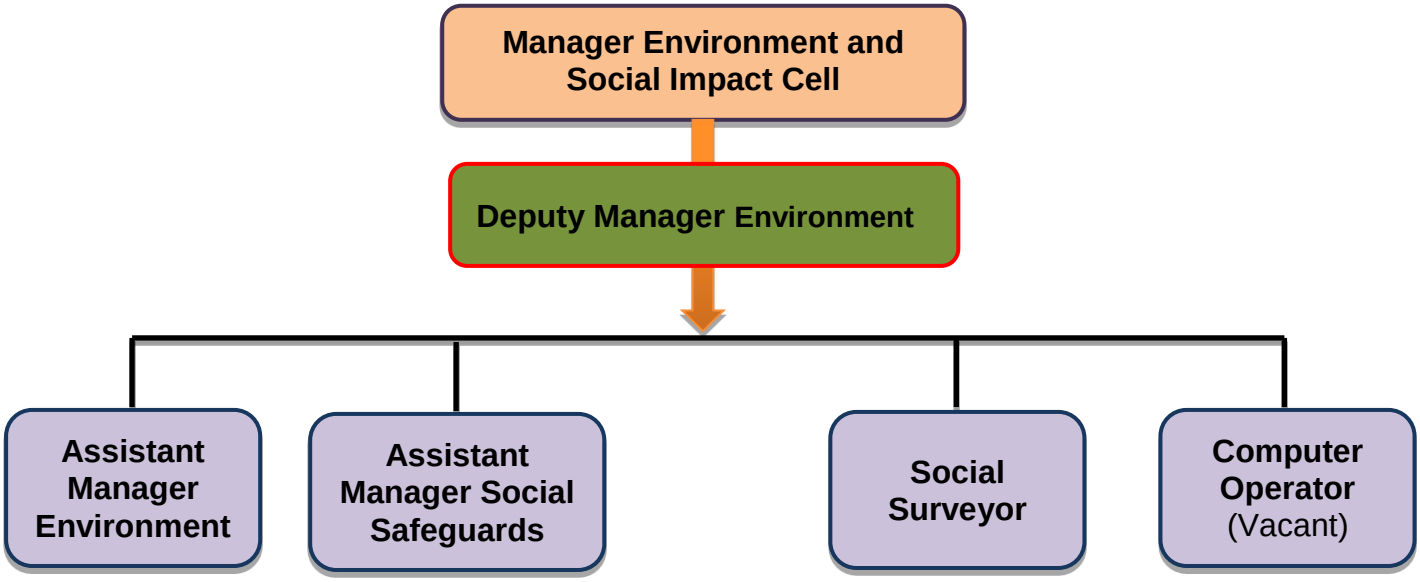


Fig. 7.1: Organogram of Environment and Social Impact Cell - NTDC

The duties of the E&SIC will include at minimum:

(i) 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.
(ii) supervise and scrutinize the PPTA consultants hiring process for environmental and social documents preparation;
(iii) oversight of construction contractors for monitoring and implementing mitigation measures;
(iv) preparing and implementing environment policy guidelines and environmental good practices;
(v) liaising with the PIUs and seeking their help to solve the environment related issues of project implementation;
(vi) providing awareness training workshop on environmental and social issues related to power transmission to PIU staff;
(vii) preparation of monthly/quarterly progress report on environmental and social safeguards for submission to financing agencies;
(viii) conduct seminars / local training workshop on environment safeguard matters with the help of NGOs / PIU / IFIs, etc. and
(ix) Seek environmental approvals from respective EPAs and share with World Bank.

The roles and responsibilities of various agencies responsible for project implementation are tabulated below:

E&SIC/PMU/PIU
Detailed Design and Pre-construction stage
• The Environment and Social Impact Cell will be involved with the project planning and design team in the site selection process. The E&SIC will also categorize the project for carrying out environmental assessment studies. • PIU, PMU and environmental consultants to conduct all the environmental studies in compliance with World Banks' operational policies on environment including detailed ESIA and Avian Risk Assessment study. • In case of changes in specific locations or alignments of any subproject facilities that EMP will be updated and that environmental assessment will be carried out if changes in location and alignment are located outside the project area of influence. • The E&SIC will review the ESA/EIA/IEE Reports and will submit to relevant EPA and World Bank for approvals and further necessary actions. • No Objection Certificate (NOC) will be obtained from respective EPAs and clearance from financing agency (World Bank) will also be sorted before commencement of the project construction activities. • The E&SIC will assure that the site specific EMPs have been prepared prior to award of contract. • The legal agreement to include clauses (viz., site specific EMPs) on obligation of the borrower/client to incorporate safeguards requirements in bidding documents and civil work contracts. After confirmation of clearance of IEEs/EIAs from EPAs, E&SIS and PMU final EARF, IEEs/EIAs with EMPs to the public as required by World Bank. All IEEs/EIAs should be available to the public upon request.
Construction stage
• Each contractor will appoint a dedicated Environmental and Social Monitor (ESM) at the project sites. The ESM will be responsible for the implementation of mitigation measures given in EMPs during construction works. He will also be responsible for communication with and the training of their respective construction and camp crews in all aspects environmental management. • The Project Supervisory Consultants will also have an Environmental Specialist and his responsibility would include the preparation of quarterly progress report (QPR) for E&SIC for onward submission to World Bank. • Project supervision consultant with the assistance of Contractor will conduct environmental quality monitoring during construction stage (ambient air and noise, soil and water quality, etc.).

The E&SIC will review the QPR and incorporate the necessary amendments (if any) before submission to World Bank for approval.
Project Completion
E&SIC/PMU to prepare a project completion report (PCR) that assesses whether the objective and desired outcomes of the environmental plans have been achieved, taking into account the baseline conditions and the results of monitoring.
Operation Stage
Executing agency to conduct monitoring, as specified in the environmental monitoring plan.

7.3 MONITORING AND REPORTING

7.3.1 Internal Monitoring

Implementation of the EMP during construction will be done by the supervisory consultants and supervised by E&SIC/PMU. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the monitoring plan prepared as part of the EMP. The supervisory consultants and contractors will report the results and conclusions of EMP implementation and environmental monitoring to the PMU quarterly. The PMU will review the quarterly progress report on EMP implementation and submit to World Bank. The budget for environmental monitoring shall be included as part of civil works contracts.

Environmental assessment will include environmental monitoring plans identifying environmental monitoring activities to ensure that negative environmental impacts are addressed properly. It will identify environmental parameters to be monitored, frequency of monitoring, applicable standards, agencies and institutions responsible for monitoring; and provide indicative monitoring costs.

7.3.2 External Monitoring

In addition to the internal monitoring discussed above, NTDC will engage consultants to carry out external monitoring on periodical basis. The objectives of this external monitoring will be to ensure that:

- the EMP as s part of the ESA is being adequately implemented,
- mitigation measures are being implemented,
- the compliance and effects monitoring are being conducted,
- environmental trainings are being conducted, and
- complete documentation is being maintained.

7.3.3

7.4 ENVIRONMENTAL GUIDELINES

The guidelines are the key component of the Environmental Management Framework (EMF). These guidelines enlist all the potential effects of each activity of the project and their associated generic mitigation measures. These guidelines should be followed during the design, construction and operation of project components. The guidelines are described in forthcoming paragraphs.

7.4.1 Guidelines for Design Phase

a. Site/Route Selection

- Areas prone to land sliding (such as river banks or mountain slopes having more than 30% gradient) should be avoided for the grid station sites.
- Slope stabilization measures should be incorporated in the design of Transmission line tower foundations.
- Areas having precious/sensitive natural vegetation and wildlife resources should be avoided for the grid station sites and transmission line routes.
- Protected areas (national parks, wildlife sanctuaries and game reserves) should be avoided while selecting the grid station sites and transmission line routes.
- Sites of archeological, cultural, historical or religious significance should be avoided when selecting the grid station sites and transmission line routes.
- The grid station should preferably be planned on the State land.
- In case the State land is not available, it should be ensured that the land is not disputed, and proper documents are available with the owners.
- Efforts should be made to select the transmission line routes on existing right of way (RoW) or State land. Cultivated areas should be avoided as far as possible.

b. Equipment Selection

PCB-free transformers should be selected for the proposed project. Appropriate Clauses will be included in the equipment specifications and tender documents.

c. Grid Station Design

- The grid stations and associated buildings should have appropriate sewage Disposal systems.
- Leaked oil collection arrangement (such as a channel and a drain pit below the transformers) should be incorporated in the design of the transformer foundations at the grid stations.
- Tree plantation will be carried inside and at the periphery of the grid stations, without compromising the safety aspects (ie, required clearances will be

maintained). For this purpose, provisions will be made in the site layout of the grid stations.

7.4.2 Guidelines for Contractor Mobilization / Demobilization

a. Soil Erosion and Contamination

- Vehicular traffic on unpaved roads should be avoided as far as possible.
- Operation of vehicles and machinery close to the water channels, water reservoir will be minimized.
- Vehicles and equipment should not be repaired in the field. If unavoidable, impervious sheathing should be used to avoid soil and water contamination.

b. Air Quality Deterioration

- Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate.
- Project vehicles will avoid passing through the communities, farms and orchards as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.

c. Noise

- Vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Night time traffic will be avoided near the communities. Local population will be taken in confidence if such work is unavoidable.
- Vehicular traffic through the communities will be avoided as far as possible.
- Vehicle speeds will be kept slow, and horns will not be used while passing through or near the communities and hospitals.

d. Safety Hazards

- Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.
- Project drivers will be trained on defensive driving.
- Vehicle speeds near / within the communities will be kept low, to avoid safety hazard and dust emissions.

e. Damage to Infrastructure

All damaged infrastructure will be restored to original or better condition.

7.4.3 Guidelines for Construction Camp Establishment and Operation

a. Soil Erosion / Contamination

- Photographs will be taken to record the site conditions prior to the establishment of the camp.
- Construction camp will be located in a stable and flat area, requiring minimal de-vegetation and leveling. E&SIC's approval will be obtained for camp location.
- Land clearing, leveling and grading will be minimized, and carried out in a manner to minimize soil erosion.
- Vehicular traffic on unpaved roads will be avoided as far as possible.
- Operation of vehicles close to the water channels, water reservoirs will be minimized.
- Contractors will prepare a waste disposal plan and submit to E&SIC for approval.
- For the domestic sewage, appropriate treatment and disposal system will be constructed having adequate capacity.
- Waste oils will be collected in drums and sold to the recycling contractors.
- The inert recyclable waste from the site (such as card board, drums, broken/used parts, etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste.
- Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination.
- The camp sites will be completely restored after the completion of the construction works. All temporary structures will be demolished, land leveled and re-contoured to the original condition or better. All debris and any other material will be removed from the site. The photographs taken prior to the camp establishment will be used to restore the area.

b. Air Quality Deterioration

- ✓ Construction camp will be established about 500 m away from the communities.
- ✓ Generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- ✓ Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. Waste water from kitchen and washing area of the construction camp may be used for water spraying.

- ✓ Project vehicles will avoid passing through communities, farms and orchards. If unavoidable, max speed of 15 km/h will be observed to avoid excessive dust emissions.

c. Surface Water Contamination

- For the domestic sewage, appropriate treatment and disposal system will be constructed having adequate capacity. Waste oils will be collected in drums and sold to the recycling contractors.
- The inert recyclable waste from the site (such as card board, drums, broken/used parts, etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste.
- Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination.

d. Water Consumption

- Water will be obtained from the source approved by the E&SIC.
- Astute planning will be employed to conserve water at the construction sites and camp. Water will be procured in a manner that least affects the local communities.
- Waste water recycling will be carried out for sprinkling and gardening purposes.

e. Loss of Vegetation

- Clearing natural vegetation will be avoided as far as possible.
- The camp will be established in a natural clearing, outside forested areas.
- Complete record will be maintained for any tree cutting.
- The construction crew will be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood will not be allowed.

f. Noise

Generators and vehicles will have exhaust mufflers (silencers) to minimize noise generation.

g. Safety Hazards

- Protective fencing to be installed around the Camp to avoid any accidents.
- Firefighting equipment will be made available at the camps.
- The camp staff will be provided fire-fighting training.
- All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.

h. Public Health

- Camps will be at least 500 m from any groundwater wells used by the community.
- The construction camps and site offices will have first-aid kits.
- The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C).

i. Social and Gender Issues

- Construction crew will avoid entering the villages and settlements.
- No child labor will be employed at the camp sites.

7.4.4 Guidelines for Transportation of Equipment and Construction Materials

a. Soil Erosion and Contamination

- Vehicular traffic on unpaved roads will be avoided as far as possible.
- Operation of vehicles and machinery close to the water channels, water reservoir will be minimized.
- Vehicles and equipment will not be repaired in the field. If unavoidable, imperious sheathing will be used to avoid soil and water contamination.

b. Air Quality Deterioration

- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate.
- Project vehicles will avoid passing through the communities and cultivation fields as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.

c. Noise

- Vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Nighttime traffic will be avoided near the communities. Local population will be taken in confidence if such work is unavoidable.
- Vehicular traffic through the communities will be avoided as far as possible.
- Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities.

d. Safety Hazards

- Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.
- Project drivers will be trained on defensive driving.

- Vehicle speeds near / within the communities will be kept low, to avoid safety hazard and dust emission.

e. Damage to Infrastructure

All damaged infrastructure will be restored to original or better condition.

7.4.5 Guidelines for Grid Station Construction

a. Land Acquisition

- Land for the grid station will be purchased directly from the owners, on the basis of *willing seller – willing buyer*, at mutually acceptable price (based on market price). The seller will have the right of refusal.
- The agreement between NTDC and the sellers will be properly documented.
- Grievance redressal mechanism will be put in place to address the community complaints.

b. Loss of Agriculture

- ➢ The land price will include any existing crops/trees at the time of the agreement.
- ➢ Compensation will also be paid for damaged crops/trees, if any, outside the acquired land.
- ➢ Complete record will be maintained for the compensation determination and payment.

c. Blocked Access

In case of the blockage of the existing routes, alternate routes will be identified in consultation with affected communities.

d. Noise and Vibration

Working hours for construction activities within the communities will be limited to between 8 am and 6 pm.

e. Safety Hazards

- ✓ The construction sites will have protective fencing to avoid any unauthorized entry.
- ✓ Before commencing the testing commissioning of the system, the nearby communities will be informed.
- ✓ Protective fencing will be used where appropriate/possible.

f. Damage to Infrastructure

All damaged infrastructure will be restored to original or better condition.

g. Gender and Social Issues

- Bypass routes to be provided to communities, if required, especially along routes frequented by women, such as route to the local well or water source.
- Construction crew will avoid in entering villages and settlements.
- Local social norms and practices will be respected.
- No child labor will be employed at the project sites.

h. Sites of Historical, Cultural, Archeological or Religious Significance

- Grid station sites will avoid the known sites of historical, archeological, cultural or religious significance.
- In case of discovery of any sites or artifacts of historical, cultural, archeological or religious significance, the work will be stopped at that site.
- The provincial and federal archeological departments will be notified immediately, and their advice will be sought before resumption of the construction activities at such sites.

i. Soil Erosion

- Cut and fill at the proposed grid station site will be carefully designed, and ideally should balance each other. The surplus soil, if any, will be disposed at places approved by E&SIC. Such sites will be selected after surveying the area and ensuring that soil deposition will not have any significant impacts, such as loss of productive land, blocked access, natural vegetation and disturbance to drainage.
- If necessary, fill material for grid station sites will be obtained from appropriate locations approved by E&SIC. Such locations will be selected after surveying the area and ensuring that soil extraction will not have any significant impacts, such as soil erosion, loss of natural vegetation and disturbance to drainage.
- The fill material will not be obtained from any cultivation fields, unless allowed by the landowner/cultivator. Where the use of cultivated land is unavoidable for obtaining the fill material, the top 30 cm soil layer will be removed and stockpiled for redressing the land after removal of the borrow material. The excavation in such areas will be limited to 50 cm depth.
- Areas from where the fill material is obtained or surplus soil deposited will be landscaped to minimize erosion and hazard for people and livestock.
- Embankments and excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken as per the design (e.g., stone pitching).
- After the completion of the construction works, campsites and other construction sites will be completely restored. No debris, surplus construction material or any garbage will be left behind.

- Photographic record will be maintained for pre-project, during-construction and post-construction condition of the sites.

j. Soil Contamination

- Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.
- For the domestic sewage, appropriate treatment and disposal system, such as septic tanks and soaking pits, will be constructed having adequate capacity. The contractor(s) will submit to E&SIC the plans for the camp layout and waste disposal system, and obtain approval.
- Waste oils will be collected in drums and sold to the recycling contractors.
- The inert recyclable waste from the site (such as card board, drums, broken/used parts, etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste.
- Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination. The waste disposal plan submitted by the contractor(s) will also address the solid waste.
- PCB-free transformers will be selected for the proposed project. Appropriate clauses will be included in the equipment specifications and tender documents.
- Leaked oil collection arrangement (such as a channel and a drain pit below the transformers) will be incorporated in the design of the transformer foundations at the grid stations.

k. Air Quality Deterioration

- Construction machinery, generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. Since water availability is an issue in some of the areas, it is recommended that the waste water from kitchen and washing area of the construction camp may be used for water spraying.
- While working within the communities for works such as transmission line laying, coordination with the communities will be maintained to minimize any detrimental impacts on the crops and settlements.

7.4.6 Guidelines for Transmission Line Construction

a. Loss of Agriculture

- Temporary RoW will be acquired along the proposed transmission lines, and for access routes to the transmission line corridor.
- Compensation will be paid for the crops damaged during the construction activities. The compensation will be paid to the cultivator, and absence of the land title will not be a bar to receiving the compensation. Based upon the findings of the ESA, an RP or LARP will be prepared to address the involuntary resettlement issues.
- Complete record will be maintained for the determination and payment of the compensation.
- It will be ensured that the land under the 500 kV transmission lines tower remains available for cultivation.
- In case the above is not possible, the land under the tower will be acquired in accordance with the LAA procedures (Section 17.4 of the LAA will not be used). Operation of project vehicles and construction machinery outside the RoW will be avoided. Attempts will be made to use existing tracks/roads to access the transmission line corridor/tower locations. In case new access routes are necessary, the cultivated land will be avoided as far as possible. Damage to crops will be compensated.
- Grievance redressal mechanism will be put in place to address the community complaints

  .

b. Blocked Access

In case of the blockage of the existing routes, alternate routes will be identified in consultation with affected communities.

c. Noise and Vibration

- Vehicular traffic through the communities will be avoided as far as possible.
- Project routes will be authorized by E&SIC.
- Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities.
- Vehicles will have exhaust silencers to minimize noise generation.
- Night time traffic will be avoided near the communities.
- Movement of all project vehicles and personnel will be restricted to within work areas, to avoid noise disturbance.
- Working hours for construction activities within the communities will be limited to between 8 am and 6 pm.

d. Safety Hazards

- The construction sites will have protective fencing to avoid any unauthorized entry.
- Before commencing the testing commissioning of the system, the nearby communities will be informed. Protective fencing will be used where appropriate/possible.

e. Damage to Infrastructure

All damaged infrastructure will be restored to original or better condition.

f. Gender and Social Issues

- Bypass routes to be provided to communities, if required, especially along routes frequented by women, such as route to the local well or water source.
- Construction crew will avoid in entering villages and settlements.
- Local social norms and practices will be respected.
- No child labor will be employed at the project sites.

g. Sites of Historical, Cultural, Archeological or Religious Significance

- The known sites of historical, archeological, cultural or religious significance will be avoided for routing the transmission lines.
- In case of discovery of any sites or artifacts of historical, cultural, archeological or religious significance, the work will be stopped at that site.
- The provincial and federal archeological departments will be notified immediately, and their advice will be sought before resumption of the construction activities at such sites.

h. Soil Erosion

- Embankments and excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (e.g., stone pitching).
- Vehicular traffic on unpaved roads will be avoided as far as possible.
- Operation of vehicles and machinery close to the water channels, water reservoir will be minimized.
- Construction works at mountain slopes will be carefully planned. Off-track vehicular traffic will not be allowed.
- Appropriate measures will be taken to avoid soil erosion during the excavation of transmission line tower foundations. These include temporary embankments to protect excavated soil and placing gabions. The surplus soil will be disposed as stated above.

- After the completion of tower foundations particularly on slopes, additional stone pitching around the foundation will be carried out, where required, to avoid any subsequent soil erosion/land sliding.

i. Soil Contamination

Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.

j. Air Quality Deterioration

- Construction machinery, generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. Since water availability is an issue in some of the areas, it is recommended that the waste water from kitchen and washing area of the construction camp may be used for water spraying.
- Project vehicles will avoid passing through the communities and cultivation fields as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.
- While working within the communities for works such as transmission line laying, coordination with the communities will be maintained to minimize any detrimental impacts on the crops and settlements.

k. Loss of Natural Vegetation

- Clearing of natural vegetation will be minimized as far as possible during the transmission line works.
- No new tracks will be developed to reach the transmission line route inside the forested areas; the existing routes will be used to transport equipment, material and personnel. Vehicles will not be operated off-track in such areas.
- For each transmission line route, a tree cutting plan will be prepared and submitted to E&SIC / NTDC for approval. A complete record will be maintained for any tree cutting or trimming. The record will include: the number, species, type, size, age, condition and photograph of the trees to be cut/trimmed. The compensation will be determined on the basis of these factors.
- Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations).
- A program will be developed for the tree plantation particularly along the transmission line routes in the forested areas, in order to compensate removal of the trees during the transmission line laying. The trees thus planted will be

at least 5 times the ones which would be removed for the transmission line works.

- E&SIC/NTDC will coordinate with the relevant Forest Department for the development and implementation of this program.
- Indigenous tree species will be selected for plantation; in particular, Eucalyptus trees will not be used in any case.
- Consultations will be held with the forest department on the possibility of using the transmission line route in the forested areas as the fire line. The forest fires are a frequent problem in our mountainous areas, and if the de-vegetated strip under the transmission lines can effectively be used as the fire line, the transmission lines can provide a useful value to the forest.
- The construction crew will be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood will not be allowed.
- No fires will be allowed inside the forest.
- Construction camps will not be established inside the forested area.

I. Damage to Wildlife

- Blasting will not be carried out while working in the forested areas for new transmission line routes. No nighttime activities will be carried out in such areas.
- The works in such forested areas will be carried out in coordination with the Forest and Wildlife departments.
- Vehicle movement will be limited to the existing tracks in the above area.
- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Garbage will not be left in the open.
- The project staff will not be allowed to indulge in any hunting or trapping activities.

7.4.7 Occupational Health and Safety Guidelines

Occupational safety and health (OSH) is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. The goals of occupational safety and health programs include to foster a safe and healthy work environment. OSH may also protect co-workers, employers, and many others who might be affected by the workplace environment. In this project, the construction of two high voltage transmission lines, power station and grid station will require special attention to protect the workers' health. Relevant provisions of

IFC/World Bank EHS Guidelines, 2007, have been attached to this report as Annex – 7.1.

7.4.8 Guidelines for Operation and Maintenance (O&M) Activities

a. Soil and Water Contamination

- The grid station will have appropriate solid waste collection and disposal arrangements.
- The grid station will have appropriate sewage handling system. The grid stations' sewage collection system will be connected to the Municipality operated sewerage system, if available. Otherwise, grid stations will have their own septic tanks and soakage pits.
- Waste oils and chemicals will be disposed in accordance with their respective Material Safety Data Sheet (MSDS).
- Non-toxic recyclable waste (such as cardboard) will be given away for recycling.
- Toxic waste will be stored separately, and incinerated at an appropriate double chamber incinerator.
- Grid stations will have channels and drainage pits to collect any leaked oil from the transformers in the grid stations.
- E&SIC / NTDC will develop a comprehensive plan for PCB testing and its complete elimination from all the transformers and circuit breakers from the entire network.

b. Impacts on Biological Resource

- E&SIC / NTDC will maintain coordination with the Forest and Wildlife departments for trimming the tall trees under the forested segments of the transmission lines.
- E&SIC / NTDC will implement and monitor the forestation initiative, with collaboration of the Forest Department.
- Maintenance works on the forested segment of transmission lines will be carried out in consultation with the Wildlife Department.
- No new tracks will be developed inside the forested areas. The vehicular movement will be restricted to the existing tracks.
- No night time maintenance works will be carried out in the forested areas.

c. Safety Hazards

- Trees under the transmission lines will be regularly trimmed to maintain the minimum clearance required.
- NTDC's O&M staff will be provided essential protective gears and equipment.

- NTDC's O&M staff will be provided safety training. Refresher courses will be arranged on regular basis.
- The communities near the grid stations and transmission lines will be educated on the risk of electrocution, and how to avoid accidents.

d. Loss of Agriculture

- Damage to the crops will be avoided during the transmission line patrolling.
- Any damage during the repair and maintenance activities will be compensated.
- Liaison with the nearby communities will be maintained in this regard.
- The Grievance Redressal Mechanism (GRM) will be maintained on continuous basis.

7.5 TENTATIVE SCHEDULE AND BUDGETARY REQUIREMENTS FOR ESIA STUDY

e. Staff Requirements and Manning Schedule

The Environmental and Social Impacts Study will be carried out in about 06 months' period. The details of staff requirements and man-months input for the proposed study is tabulated as below;

Table 7.1: Staff Requirements and Manning Schedule

Sr. No.	*Position*	*No. of Positions*	*M.M./ Position*	*Total M.M.*
1	Team leader	1	6	6
2	Chief Environmentalist	1	6	6
3	Principle Resettlement Specialist	1	6	6
4	Senior Environmentalist	1	3	3
5	Senior Resettlement Specialist	1	3	3
6	Junior Sociologist	2	6	12
7	Junior Environmentalist	2	6	12
8	Senior Ecologist	1	4	4
9	Geologist	1	1	1
10	Surveyors	4	4	16 (4x4)
11	Enumerators	4	4	16 (4x4)
12	Admin Officer	1	6	6
13	Data Entry Clerks/ Computer Operator	2	6	12 (6x2)
14	Cashier/ Account Officer	1	6	6
15	Photocopier Operator	1	6	6
16	Service Man/ Chowkidar/ Cook	4	6	24 (6x4)
17	Part time staff Sweeper, Electrician	4	4	24 (6x4)
18	Receptionist	1	6	6
Total Man-Months				**169**

f. Budgetary Requirements

The tentative total budget required to carry out the environmental and social impact assessment study comes up **Rs. 17,610,000,** out of which Rs. 14,910,000 are salary costs and Rs. 2,700,000 are direct costs. The details are given in Tables 7.2 and 7.3 respectively. The Avian Risk Assessment study will cost around Rs 5 million.

Table 7.2: Salary Costs

Sr. No.	Position	No. of Positions	Total M.M.	Rate / Month	Total Amount
1	Team leader	1	6	400,000	2,400,000
2	Chief Environmentalist	1	6	350,000	2,100,000
3	Principle Resettlement Specialist	1	6	350,000	2,100,000
4	Senior Environmentalist	1	3	300,000	900,000
5	Senior Resettlement Specialist	1	3	300,000	900,000
6	Junior Sociologist	2	12	100,000	1,200,000
7	Junior Environmentalist	2	12	100,000	1,200,000
8	Senior Ecologist	1	4	300,000	1,200,000
9	Geologist	1	1	300,000	300,000
10	Surveyors	4	16	30,000	480,000
11	Enumerators	4	16	30,000	480,000
12	Admin Officer	1	6	40,000	240,000
13	Data Entry Clerks/ Computer Operator	2	12	30,000	360,000
14	Cashier/ Account Officer	1	6	40,000	240,000
15	Photocopier Operator	1	6	15,000	90,000
16	Service Man/ Chowkidar/ Cook	4	24	15,000	360,000
17	Part time staff Sweeper, Electrician	4	24	10,000	240,000
18	Receptionist	1	6	20,000	120,000
Total			**169**	-	**14,910,000**

Table 7.3: Direct Costs

No.	Description	Rate/ month	Quantity	Cost Rs.
1	Per diem allowances (including accommodation at site)	100000	6	600,000
2	Office Rent	100000	6	600,000

3	Communication Costs Telephone, Fax & Mobiles	50000	6	300,000
4	Drafting, Reproduction of Reports	LS	LS	200,000
5	Use of Computers' accessories/ toner, Stationary	LS	LS	200,000
6	Environmental Monitoring	LS	LS	200,000
7	Transportation Cost, Hiring of Vehicle etc.	100000	6	600,000
Total				**2,700,000**

Table 7.4: Total Budgetary Requirements for developing ESIA Study

Salary Costs	Rs. 14,910,000
Direct Cost	Rs. 2,700,000
Avian Risk Assessment study	Rs, 5,000,000
Total Cost	**Rs. 22,610,000**

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

Based on the preliminary plans, environmental and social field surveys, and identification of environmental impacts of proposed two parallel running 500 kV transmission lines from Dasu to Pathar Garh (Hassan Abdal) and 500 kV Grid Station at Pathar Garh (Hassan Abdal), it may be concluded that there are insignificant, short term and reversible impacts of the Project. The major impacts of the Project are summarized as under:

- No acquisition of permanent land will be involved for erection of towers for transmission lines as per Telegraphy Act, 1910, while the land for 500 kV Grid Station at Pathar Garh (Hassan Abdal) will be acquired. This is almost barren land and privately owned by residents of village Pathar Garh (Tehsil Hassan Abdal, District Attock). However, where relocation of houses/structures is involved (if any), payment for land will be based on current market rates.
- Acquisition of temporary land for establishment of Contractor's camp facilities will be required.
- The transmission lines will not pass through any protected areas (Wildlife Sanctuary, National Park, and Game Reserve), archaeological or religious site etc. Hence no impact on such sites is expected.
- Two major environmentally sensitive sites viz., Palas Valley Forests and Indus Bird Migratory Route Number 7 fall in the COI of project and these are identified as Environmental Hotspots. The disturbance to both these sites is expected.
- Two major wetlands viz., River Indus and Tarbela Lake fall in the close vicinity of the project. The erection of towers in these wetlands will be decided at the time of final design.
- All the other impacts like soil erosion, soil contamination, water contamination, air pollution, high noise level, etc. are of temporary nature.
- The terraced agriculture area in valleys will be affected during construction stage due to erection of towers and access routes. The standing crops will be damaged for which compensation will be paid by NTDC.
- Tree removal will also be involved due to construction of transmission lines and grid station. This impact will be compensated by planting at least five trees if one is cut.
- No indigenous peoples have been found in the project area.

- Women headed households could be found. This will be identified during detailed environmental and social assessment studies.
- The other social issues like safety of general public and workers, security problems, community accessibility issue, women accessibility to fields for their daily routine life etc. are of temporary nature.
- Most of the above impacts are of temporary nature and manageable through good engineering practices and none of these are irreversible.

In the light of the above discussions, it may be concluded that the proposed preliminary Project route is environment friendly and will cause the least effects on the area's existing environmental settings.

8.2 RECOMMENDATIONS

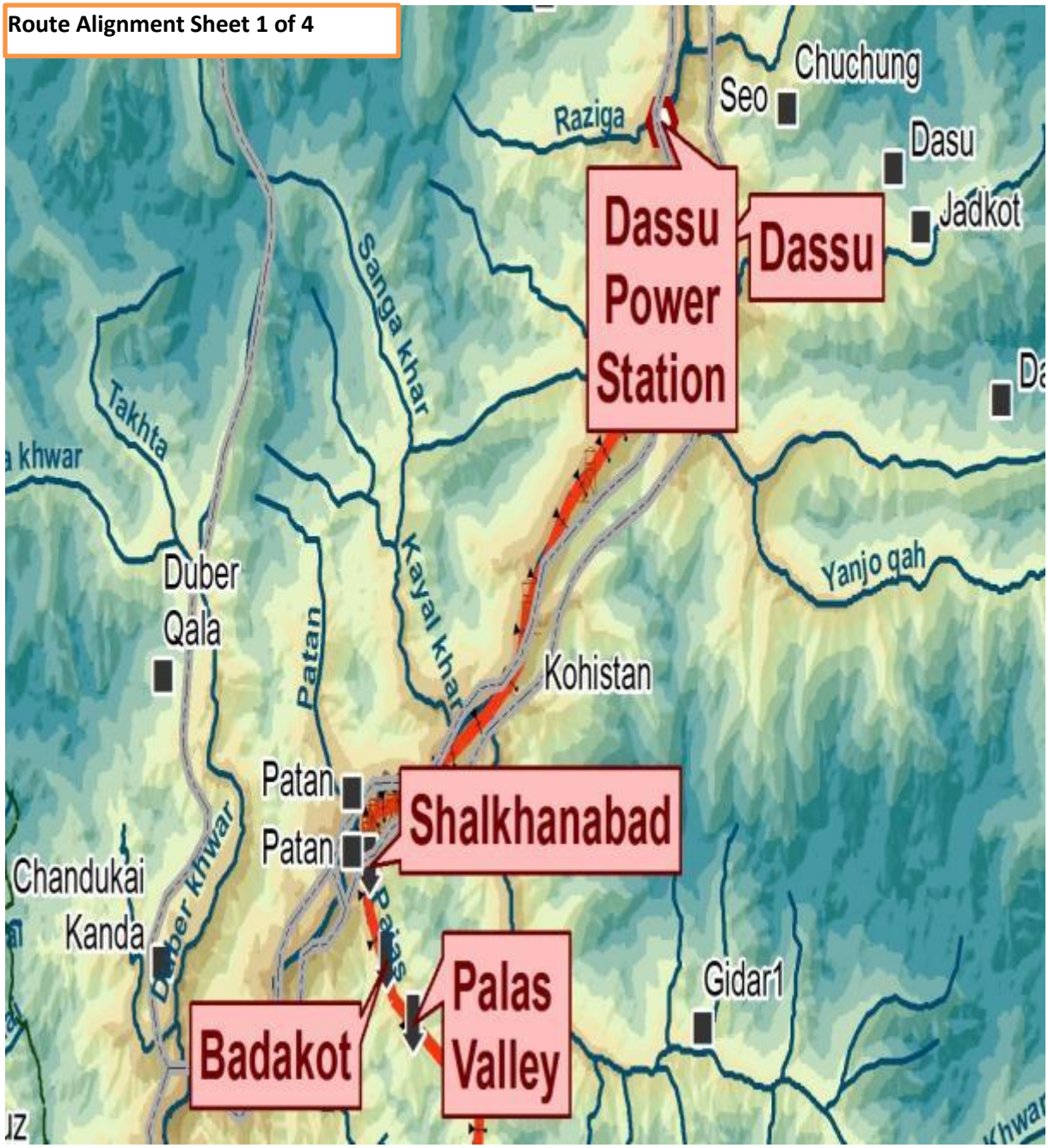
To minimize the negative impacts and to enhance the positive impacts of the Project, the some recommendations are given below:

- Detailed Environmental and Social Impact Assessment studies including environmental management plans and resettlement plans should be carried out before start of works. It would help in smooth execution of the project.
- Special investigations should be carried out to identify and mitigate the impacts of transmission lines on environmental hotspots (Palas Valley and Indus Bird Flyway Number 7). A separate Avian Risk Assessment study is therefore recommended in parallel to ESIA studies. It is also recommended that special considerations should be given to the impacts on wetlands (Indus River and Tarbella Lake) falling in the COI of project.
- Project facilities should be located at a minimum distance of 500 m from the existing settlements and built-up areas.
- As far as possible, waste/barren land i.e. areas not under agricultural or residential use and natural areas with a high elevation should be used for setting up the project facilities.
- Soil erosion, water contamination, air pollution and high noise levels should be controlled with the use of good engineering practices.
- Fair and negotiated compensation in accordance with the prevailing market prices should be made for loss of crops and trees during the construction activities of the Project.
- In case of relocation of buildings and infrastructure like houses, the payment should be made on replacement cost basis.

- The Contractors will have to adopt some suitable timing for the construction activities like tower footings, erection and stringing of conductors so as to cause the least disturbance to the local community particularly women considering their peak movement hours.
- Contractors should take due care of the local community and its sensitivity towards local customs and traditions.

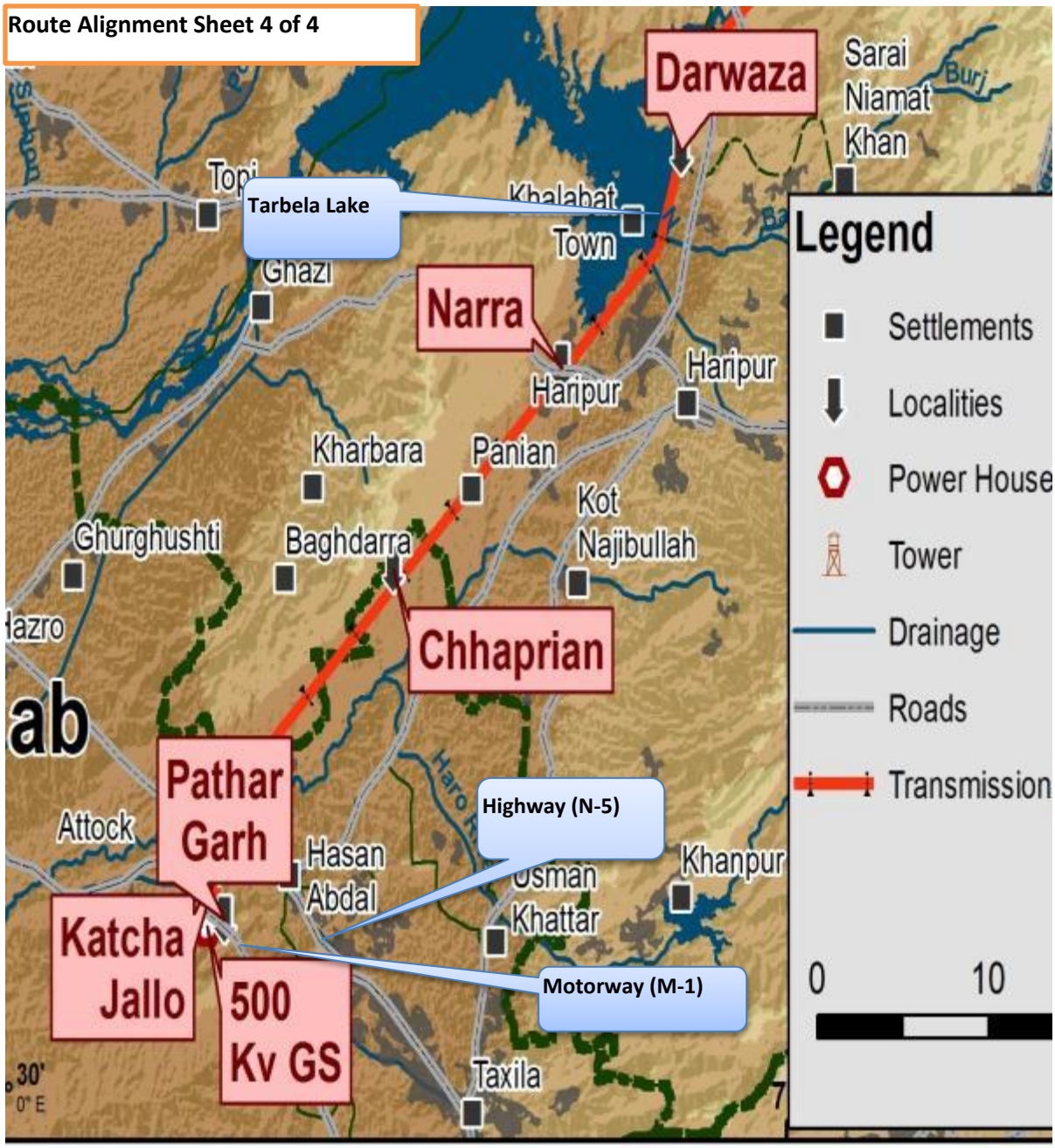
APPENDICES

Appendix – 3.1: Elaborated Sections of Transmission Lines Route




Route Alignment Sheet 2 of 4
Shalkhanabad
Patan
Chandukai
Kanda
Palas
Badakot
Palas Valley
Gidar1
Kuz Ganrshall
Kolai
Domela
Besham Qila
Khan khwar
Allai Khwar
Banna Allai
Karora
Biarai
Patti
Chakesar
Daut
Batagram
Parma
Bazargai
Martung
Batgram
Chhapargram
Battal


Route Alignment Sheet 3 of 4
Chhapargram
Kyberpakhtun
Khawa
Battal
Oghi
Fort
Ahl
Dadar
Mansehra
Sham
Dharra
Baffa
Shinkiari
Balgiran
Siran R
Dhudial
Nagra
Khaki
Khaki
Darband
Phulra
Mansehra
Tatappi
Kirpatian
Bandi
Dhundan
Khar Kot
Biliali
Kamila
Sherwan
Sherwan
Kaya
Abbottabad


Route Alignment Sheet 4 of 4
Darwaza
Sarai Niamat Khan
Burj
Topi
Tarbela Lake
Khalabat Town
Ghazi
Narra
Haripur
Haripur
Kharbara
Panian
Kot Najibullah
Ghurghushti
Baghdarra
Chhaprian
Pathar Garh
Attock
Hasan Abdal
Highway (N-5)
Khanpur
Usman Khattar
Katcha Jallo
500 Kv GS
Motorway (M-1)
Taxila
Legend
Settlements
Localities
Power House
Tower
Drainage
Roads
Transmission
0
10

APPENDIX- 4.1

CLIMATIC DATA OF PATTAN STATION FROM 2005 TO 2011

Monthly Mean Minimum Temperature Pattan							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	6.7	5	7.3	3.3	7.6	8.3	5.1
Feb	4.9	10.9	8.5	6.3	6.8	6.5	5.6
Mar	11.5	10.8	9.5	12.5	10.5	13.4	9.6
Apr	14.2	14.4	17	13.8	13.1	16.1	13.3
May	16.1	20.9	19	19.9	18.5	18.1	20.5
Jun	21.3	22.8	23	24.3	21.3	19.6	22.7
July	24.4	25.3	23.6	24.5	23.3	22.7	25
Aug	22.3	23.2	23.6	23.9	25.1	23.1	24.5
Sep	20.9	19	20.4	19.1	18.2	18.7	20.2
Oct	13.5	14	12.6	14.4	13	13.6	13.7
Nov	9.2	10	10.1	11.5	10.2	9.5	10.4
Dec	9.1	7.8	6.3	9.4	9.1	5.1	8.1

Monthly Mean Maximum Temperature Pattan							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	13.9	12	17.2	11.2	14.6	19.2	17.3
Feb	11.8	19.3	18	15.8	15.6	13.6	14.6
Mar	20.9	21.8	19.8	25.1	20.4	24.8	22
Apr	25.9	29.3	33	26.8	25.1	27.9	26.9
May	29	37.6	34.9	35.3	33.9	31.4	36.1
Jun	37.6	37.3	37.5	37.1	36.4	34.7	38
July	37.5	37.9	36.2	37.2	38.5	36.3	37
Aug	36.5	35	36.8	36.5	38	34	37.5
Sep	35.2	34.3	34.4	34.4	35.1	33.2	32.8
Oct	29.9	30.9	31.2	30.2	31	30.6	28.5
Nov	21.4	21.7	27	24.1	23.1	26.1	22.4
Dec	18.2	15.7	16.5	17.2	17.5	20.2	18.7

HUMIDITY AT 0500 PM (%) PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	47	56	30	54	48	32	28
Feb	61	51	49	34	53	59	57
Mar	50	44	39	34	48	32	40
Apr	35	32	25	36	47	37	35
May	41	26	31	27	26	46	32
Jun	30	26	28	39	27	37	36
July	38	40	42	40	33	39	38
Aug	40	48	44	38	39	55	40
Sep	40	42	40	32	38	44	49
Oct	39	40	22	39	28	37	44
Nov	46	52	26	32	33	32	46
Dec	29	41	42	39	35	25	36

HUMIDITY AT 0800 AM (%) PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	55	63	41	63	58	45	52
Feb	78	61	67	50	69	67	69
Mar	65	65	56	58	60	51	59
Apr	47	49	49	66	62	58	63
May	59	44	55	53	47	61	50
Jun	51	45	52	65	44	55	54
July	65	65	71	71	56	67	62
Aug	69	76	73	70	64	78	65
Sep	76	78	73	70	69	76	77
Oct	63	81	66	79	66	74	76
Nov	60	80	49	53	49	60	68
Dec	36	50	59	46	44	48	50

MONTHLY TOTAL RAIN (mm) PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	145.8	243.6	7.6	268.5	173.3	49.6	38
Feb	337.5	171.9	137.4	76.9	265.2	483	391.5
Mar	250.6	91.3	286	69.4	196	121.5	200
Apr	130.1	102.6	71.2	134.4	263.1	83.2	183.5
May	88.2	25.6	84.7	58.4	85	171.4	46.6
Jun	43.5	10.3	103.9	114.7	24.5	68.4	17.5
July	28.5	95.2	158.4	42	37.8	322.8	91.7
Aug	74.6	69.7	101	32	56.4	71.2	25
Sep	46.2	11.7	48.9	19	58.8	96	83
Oct	85.2	35.1	4	41.2	5	29.3	98.5
Nov	110.2	139.9	5	84.9	46.5	0	82.1
Dec	2	247.5	55.7	241.8	93.3	18	25.1

THUNDER STORMS (DAYS) PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	0	0	0	0	0	0	0
Feb	1	0	0	0	0	0	0
Mar	1	0	1	0	0	1	1
Apr	2	1	3	5	4	1	0
May	5	2	9	6	2	0	2
Jun	6	5	5	5	3	5	1
July	4	6	6	1	4	3	1
Aug	7	4	8	8	4	1	2
Sep	3	3	4	3	3	0	1
Oct	5	4	1	0	1	1	0
Nov	1	0	0	4	0	0	0
Dec	0	0	0	0	0	0	0

Wind Speed At 5: 00pm PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	3.3	3.2	5	2.1	4.6	2.6	1.9
Feb	1.5	3	1.4	4.1	2.9	2.1	2.1
Mar	1.9	2.3	3.5	2.5	3.1	2	2.5
Apr	4.6	1.9	2.3	2.2	2.5	1.3	1.8
May	1.8	2.5	2.5	2.6	2.4	1.1	0.9
Jun	2.3	2.9	2.5	2.5	2.2	2.2	2.1
July	2.4	2.7	2.1	2.5	2.4	2.2	2.5
Aug	1.9	1.9	1.7	2.3	3	0.3	3
Sep	1.6	2.2	1.9	2.7	1.2	0.3	0.7
Oct	1.5	1.4	1.5	0.9	1.3	0.4	0.5
Nov	1.7	0.3	0.8	2	2.4	0.7	1.1
Dec	6.2	3.4	1.7	4.8	5.1	1.3	3

Wind Speed At 8 : 00 am PATTAN							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	2.6	2.8	3.6	2.1	4.5	1.9	1.5
Feb	0.7	2.2	1.3	5.6	2.7	1.5	1.9
Mar	2	0.7	1.4	1.1	2.9	1	1.7
Apr	2.9	1	0.6	0.7	1.8	0.8	0.5
May	0.7	0.3	0.2	0.2	0.5	0.6	0.6
Jun	0.3	1.3	0.2	0.1	0.8	0.2	0
July	0.2	0.1	0.1	0.1	0.3	0	0
Aug	0.5	0.1	0	0.2	0.1	0.2	0
Sep	0.1	0.1	0	0.2	0.1	0.2	0.3
Oct	1.1	0	0.1	0.1	0.2	0	0.3
Nov	1.7	0.1	0.3	1.7	2.7	0	1
Dec	5.6	2.7	2.8	5.1	3.9	1.1	2.6

APPENDIX – 4.2

CLIMATIC DATA OF KAMRA STATION FROM 2001 TO 2011

MONTHLY MEAN MAXIMUM TEMPERATURE (^{o}C) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	18.3	18.6	18	16.4	15.2	16.5	18.2	14.6	17.5	20.0	16.3
Feb	22.8	19.5	18.5	21	15.3	23.7	18.7	19	19.9	18.5	17.9
Mar	27.8	26.2	23.2	29.9	23.3	24.5	22.7	29.1	24.5	28.2	25.6
Apr	32.1	32.7	30.3	33.9	30.6	32.7	34.1	29.3	29.0	33.5	29.5
May	41	39.5	35.8	38.4	34	41.7	37.6	38.4	37.8	37.5	40.1
Jun	39.9	40.8	41.2	40.5	42.4	40.4	40.4	38.1	40.3	40.0	41.5
Jul	36.1	41.4	37.1	40.4	36.6	37.3	36.6	36	40.4	38.2	36.1
Aug	35.6	34.9	35	36	36.1	34.4	36.3	34.7	37.4	33.6	35.1
Sep	35.8	32.4	33.4	36.1	35.5	34.3	34.4	33.8	35.8	34.0	33.6
Oct	33	31.3	30.6	28.3	31.3	31.4	31.4	31.9	32.0	31.8	30.2
Nov	25.6	25.6	24	25.1	24.7	23.8	25.2	25.1	24.5	25.9	25.1
Dec	20.5	19.2	19	19.2	19.6	17.4	18.4	19.9	19.8	18.5	19.8

MONTHLY MEAN MINIMUM TEMPERATURE (oC) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	-0.5	0.1	1.6	4	2.2	2.6	0.1	0.1	4.3	1.1	1.2
Feb	3.2	4.4	5.2	5.1	5.2	7.7	6.6	2	6.0	6.2	5.6
Mar	9.4	9.6	9.7	11.4	11.3	10.9	9.2	11	9.1	12.7	10.8
Apr	16.1	16.3	15.5	17.5	13.6	14.7	15.7	15.5	14.5	17.2	15.0
May	23.8	21.8	19	20.4	18.8	23.6	20.9	21.4	20.1	21.3	22.6
Jun	27.2	25.6	24.6	24.5	24.8	24.5	25.2	25.5	23.1	23.6	26.5
Jul	26.1	26.6	26	26.5	25.9	27.3	25.5	25.7	26.5	26.6	25.3
Aug	25.6	25.4	24.7	24.8	25.2	25.1	25.5	24.8	26.8	25.2	25.4
Sep	21.3	20.7	23.2	21.9	23.4	21.7	22.4	20.8	22.3	22.0	22.7
Oct	15.4	15.8	13.8	13.9	14.8	16.6	12.7	16.5	13.7	16.6	15.7
Nov	7.4	8.2	6.6	7.6	6	10.4	6.8	7.2	6.0	7.3	9.7
Dec	3.2	3.8	3.2	4.3	-0.8	3.5	2.6	3.8	1.7	0.2	0.3

HUMIDITY AT 0500 PM (%) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	39.0	43.0	51.0	60.0	59.0	49.0	40.0	47.0	58.3	43.9	53.3
Feb	23.0	44.0	48.0	43.0	64.0	45.0	58.0	36.0	51.3	54.4	59.4
Mar	24.0	38.0	44.0	30.0	57.0	46.0	48.0	33.0	48.4	44.0	43.5
Apr	30.0	24.0	39.0	26.0	31.0	25.0	30.0	38.0	44.3	31.5	39.5
May	19.0	17.0	26.0	17.0	29.0	21.0	27.0	26.0	26.0	24.6	23.0
Jun	32.0	26.0	22.0	26.0	20.0	25.0	31.0	42.0	22.8	24.5	29.2
Jul	53.0	29.0	47.0	35.0	51.0	47.0	48.0	57.0	34.6	42.4	53.5
Aug	57.0	53.0	58.0	51.0	52.0	62.0	54.0	58.0	50.2	67.7	58.9
Sep	40.0	49.0	55.0	42.0	47.0	50.0	51.0	47.0	44.5	48.8	54.3
Oct	39.0	44.0	45.0	46.0	41.0	47.0	36.0	46.0	34.3	42.4	47.6
Nov	46.0	47.0	43.0	48.0	39.0	57.0	52.0	45.0	41.1	46.8	52.6
Dec	52.0	47.0	53.0	60.0	40.0	55.0	52.0	54.0	46.4	54.0	47.0

HUMIDITY AT 0800 AM (%) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	84	82	87	89	90	87	83	85	88	85	87
Feb	70	80	82	87	87	85	88	82	86	86	87
Mar	60	78	76	69	81	82	83	72	80	77	78
Apr	57	53	67	58	63	57	64	66	70	62	70
May	41	35	47	45	51	42	51	48	48	48	45
Jun	48	46	42	47	38	47	50	63	44	45	46
Jul	77	49	68	56	72	68	71	75	53	62	73
Aug	79	75	77	74	73	78	77	81	71	84	77
Sep	70	75	75	68	76	76	78	77	72	78	79
Oct	69	75	78	74	78	81	77	79	72	77	80
Nov	81	77	81	83	82	86	88	87	81	85	86
Dec	82	83	84	91	86	87	90	91	84	88	88

MONTHLY TOTAL RAIN (mm) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	0	4	11.5	124.5	128	55	-1	54	56.0	14.0	9.0
Feb	1	60.5	270	36	205.5	10	286	39	75.0	143.0	50.0
Mar	37.4	69	150	-1	123	39	189	-1	63.0	52.0	38.0
Apr	17	5	112	72	40	17	52	263	85.0	7.0	66.0
May	16.5	20	18	22	20	92	52	3	9.0	15.0	5.0
Jun	13.5	114	25	47	4	32	157	199	5.0	48.0	38.0
Jul	210	6	229	79	324	126.5	185	436	89.0	517.0	305.0
Aug	454	516.5	282	242	130	207	259	267	169.0	364.0	137.0
Sep	11	147	207	64	88	78	69	88	44.0	32.0	77.0
Oct	0	15	12	70	36	44	0	12	4.0	1.0	43.0
Nov	43	-1	19	30	5	26	17	16	11.0	0.0	19.0
Dec	-1	62	36	25	0	88	3	59	0.0	7.0	0.0

THUNDERSTORMS (DAYS) KAMRA											
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Jan	0	3	2	0	1	2	3	1	3	0	1
Feb	2	2	0	3	2	3	3	3	0	1	1
Mar	1	8	6	7	7	5	2	12	8	7	4
Apr	12	4	7	6	7	9	10	5	4	4	9
May	8	6	6	6	8	6	8	10	6	10	8
Jun	8	6	10	9	13	6	9	5	13	7	19
Jul	20	12	15	15	11	21	11	21	13	18	16
Aug	15	16	15	15	21	13	15	14	12	16	17
Sep	11	12	11	9	9	8	4	7	9	9	6
Oct	4	2	3	2	3	1	8	3	6	0	6
Nov	0	4	0	3	0	1	1	2	3	1	1
Dec	0	0	0	0	0	2	2	0	0	0	1

WIND SPEED AT 0500 PM (knots) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	1.3	0.8	1.2	2.1	3.2	4.8	4.4	4.8	3.8	2.5	3.6
Feb	5.3	6.3	3.4	0.9	4.5	5.1	5.6	5.9	7.9	6.5	6.6
Mar	4.8	4.1	4.6	4.1	6.4	7.7	7.3	6.8	6.7	6.4	5.9
Apr	3.4	6.1	4.3	6.5	7.2	7.9	6.1	7	7.8	9.3	8.1
May	5.8	8.6	7.2	7	8.1	6.8	9.7	11.6	8.5	11.1	6.9
Jun	9.2	8.9	8.5	9.5	9.9	8.9	9.7	12.2	10.6	13.3	11.4
Jul	6.4	8.7	5.9	11.5	9.4	11	7.4	10.2	12.1	11.9	8.8
Aug	4.5	6	4.1	7.2	8.6	7.4	6.6	7.4	9.1	6.5	8.3
Sep	3.2	3.6	2.4	5.5	5	5.5	6.5	3.9	4.5	6.3	6.1
Oct	1.2	0.5	1.4	4.8	3.4	1.7	1.7	2.3	3.7	2.6	5.2
Nov	0.9	1.9	0.9	0.4	2.1	2.3	0.8	1.2	2.9	2.1	3.1
Dec	0.8	1.6	1	1.9	1	3.8	2.1	1.7	2.6	1.4	0.9

WIND SPEED AT 08: 00 AM (knots) KAMRA											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Jan	0.4	0.4	0.4	0.9	1	2.1	0.5	0.9	0.6	1.0	0.5
Feb	0.1	1.1	1	3.7	2.1	0.1	1.9	0.6	2.4	2.1	1.9
Mar	0.4	1.2	1.5	0.5	1.4	2.3	1.7	1.4	1.9	0.6	1.7
Apr	0.6	2.5	1.7	2.1	2.4	4.1	1.8	3.1	3.3	3.9	2.3
May	3.5	5	3	3.8	9.4	3	4.5	5.7	4.5	4.5	4.2
Jun	6.7	4.1	3.5	5.9	7.1	6.7	7.9	7.8	4.0	4.1	8.5
Jul	4.7	3.4	5.6	6.3	5.9	6.4	6.2	6.3	9.3	8.9	5.5
Aug	3	5.1	2.6	4.4	3.2	4.3	4.6	3	8.4	5.5	6.1
Sep	1.3	2.1	2.2	2.7	4	3.5	4.5	4.3	1.7	3.9	3.2
Oct	0.9	0.1	0.1	2.9	1.2	0.1	0	0.5	0.3	1.6	1.2
Nov	0.5	0.2	0.5	0	0.3	0.8	0.1	0.5	0.6	0.5	0.8
Dec	0	0.5	0.5	0.7	0	2	0.2	0.7	0.2	0.4	0.0

APPENDIX – 4.3

PALAS CONSERVATION AND DEVELOPMENT PROJECT

Prospects and implications of promoting Palas Valley, Kohistan as a UNESCO World Heritage Site/Man and Biosphere Reserve

EXECUTIVE SUMMARY

This is the report of a mission to Pakistan in August-September 2003 to review the potential for World Heritage or Biosphere Reserve listing for the Palas Valley in the Northwest Frontier District of Pakistan.

The Palas Valley is a large well-preserved "ecological unit" with global importance for rare and endemic birds and flowering plants. It supports populations of the full range of mammal species of the western Himalayan. Hindu Kush region. On these grounds it should qualify for listing as a natural site under section 44 (a) (iv) of the operational guidelines for the WHC.

A number of issues would have to be addressed in order to meet the criteria for integrity for listing under the WHC. Potential threats from over-stocking with domestic animals and from commercial logging must be anticipated, as both of these activities will threaten the World Heritage values of the site. A management plan will need to be prepared. A legal, institutional and regulatory status will need to be established that will guarantee the maintenance of World Heritage values.

Additional and more in-depth studies of the fauna and flora are needed to add weight to the nomination - the flora still needs greater study as it is potentially rich in endemic or limited-range species. Biosphere reserve designation could provide the framework for increased intensity of research effort. Research should be closely linked to management and should draw on local traditional knowledge.

Efforts to fully engage the Palasi people in the decision making about the future of the Valley need to be reinforced. These should be both formal mechanisms - through Jirgas etc. and informal mechanisms through greater involvement of local people in project field activities. This will require greater and more sustained field presence of PCDP staff.

Field facilities should be constructed to enable project staff and other legitimate visitors to have better working conditions in the Valley. These facilities should initially

be constructed close to areas of prime Tragopan habitat. Local materials and methods of construction should be used.

As well as negotiating conservation agreements at the level of the entire Valley or with the Khels - sub-tribes - it may be worth working with individual families living adjacent to prime forest areas in order to ensure the conservation of these areas as a *sanctus-sanctorum.* These areas might either be subject to a management agreement or might be purchased and held in trust.

The legal category of ***Community Managed Wildlife Reserve*** would appear to be the most appropriate designation to ensure the maintenance of the conservation values of the entire Valley under existing Government KPK legislation.

The PCDP should seek to identify development pathways for the Palasi people that do not require the construction of roads into the Valley. Project development interventions should promote income-generating activities that do not require roads. The PCDP should also review options for limiting the growth of livestock numbers in the Valley and develop a sector strategy.

Assuming that some progress is made on the institutional and legal issues a mission should be fielded in spring of 2004 to prepare a nomination for World Heritage listing. In the meantime the Pakistan authorities should be encouraged to designate the Palas Valley as a Biosphere Reserve and to expand research activities in the area accordingly.

APPENDIX – 5.1

RECORD OF PUBLIC CONSULTATIONS

Sr. No.	Date	Venue	Name of Participants	Concerns
1.	11-12-2012	**Village/Town** - Pathar Garh **Union Council** - Sontaki **Tehsil** - Hassan Abdal **District** - Attock	1. Irfan Afzal - Ex UC Nazim 2. Muhammad Aslam – Ex Wapda Employee 3. Haji Alla Dad 4. Muhammad Fayyaz 5. Asif Mehmood 6. Habibul Rehman 7. Muhammad Maskeen 8. Sarfraz Khan 9. Tariq Mehmood 10. Amad Ali 11. Muhammad Zareen 12. Razi Khan 13. Farman Elahi 14. Sher Ali Khan 15. Shafqat Ali Khan 16. Liaqat Ali Khan 17. Arshad Ali Khan 18. Rab Nawaz 19. Gulzar Ali	• *We are in the favor of the project but NTDC should satisfy the affected persons regarding the compensation of lost assets.* • *Agriculture area should be avoided and barren land will be utilized for construction of T/Ls.* • *Similarly, populated area should be avoided and vacant lands would be utilized for the installation of towers.* • *Land for Grid Station in Pathar Grah should be acquired according to prevailing market value of land.* • *Privacy of women regarded with due respect during construction and operational stages of the proposed project.* • *Local labor of the village should be hired during the construction of the project.* • *Before start of the work, the affected persons should be consulted and compensated for their losses.*
2.	11-12-2012	**Village/Town** - Katcha-Jallo **Union Council**	1. Malik Nasir 2. Malik Rab Nawaz 3. Syed Mubarik Shah	• *We are already facing land shortage, because due to construction of Motorway, GT Road and Railway Line, major part of agriculture land was utilized by*

Sr. No.	Date	Venue	Name of Participants	Concerns
		- Jallo **Tehsil** - Hassan Abdal **District** - Attock	4. HameedMubarik 5. Ishrat Ali 6. Shamsher Khan 7. Bilal Ahmdad 8. Malik Ahsan 9. Malik Nisar 10. Saadat Ali Khan 11. Muhammad Din 12. Mujahid Khan 13. Kareem Khan 14. Ahmad Ali Khan 15. Ashraf Ali Khan 16. Altaf Ahmad	*these projects.* • *Already three heavy T/Ls are crossing over our lands; therefore, you are requested to change the T/L routes.* • *There is also a housing society (Wah Model Town Phase III) nearby our village, which could also cause hindrance in this project.* • *The participants of the meeting suggested an alternate route of the T/Ls. NTDC plan to pass the line along the right side of the M-I from Khacha-Jallo to Phathar Garh and at Pather Garh the T/Ls will cross the M-1 and connect with proposed Grid Station. The said area is heavily populated and also includes a large residential society (Wah Model Town Phase-III), which is under planning and can be a hindrance for NTDC. The Participants suggested that if NTDC cross the T/Ls to M-1 straight on the west side of the village Kacha-Jallo and go to proposed site of Grid Station (Jang Bahtar) along the left side of the M-1 that will be more feasible. The ESIC team has visited the proposed route along the both sides of M-1 and observed the impacts that can be reduced to adopt the route along left side as compare the right side of the M-1.*
3.	12-12-2012	**Village/Town** - Chaprian **Union Council** - Chaprian **Tehsil**	1. Muhammad Daood 2. Muhammad Masood 3. Maqbool Ali 4. Muhammad Riasat 5. Tanvir Ali 6. Ali Jan	• *Agriculture land is in the form of small holdings, therefore it should be endeavored to save that the line would pass through barren land.* • *We provide two options for smooth execution of the project: (a) The line should pass along the base of the mountains, so that settlement and agriculture*

Sr. No.	Date	Venue	Name of Participants	Concerns
		- Ghazi **District** - Haripur	7. Ghulan Khan 8. Abid Ali 9. Sojat Ali 10. Sajawal Ali 11. Muhammad Ameer	*land will be saved; (b) The route of T/line should be along the Qay Nulla involving the settlements; Katcha-Jallo – Bafad – Niko – Sabz Peer - Goonga – Bharwal - Mohri – Kanwan – Palar Chugi – Bherian – Chamba – Khalabatt. This route will involve relatively less resettlement and other social impacts because along this the mostly land is barren and not being used for any productive activities.* • *A newly proposed road by NHA from Hassanabdal to Gilgit is also passing through the Chapprian village and most of the land is being acquired from the land owners of the Chapprian village for the purpose of this road construction.* • *We will not support this project, unless they are provided with alternate land. Because the land will be lost forever and they will not be able to construct house and plant trees under the line.*
4.	12-12-2012	**Village/Town** - Narra **Union Council** - Dheldal **Tehsil** - Haripur **District** - Haripur	1. Muhammad Usman 2. Zafar Ali 3. Shoukat Ali 4. Muhammad Javed 5. Misbah Khan 6. Khalid Nawaz 7. Rab Nawaz 8. Raheem Bux	• *It is good development to invest in power enhancement projects as we are facing acute power shortage.* • *Rights of the affected persons should be expedite and given due attention while implementing project.* • *Sufficient compensation should be given for the damages due to the installation of towers and stringing activities.* • *The area under T/Ls towers will be wasted and cannot be utilized appropriately, so handsome compensation should be given to affected persons.*
5.	13-12-2012	**Village/Town** - Darwaza	1. Haibat Khan 2. Azam Khan	• *We are in the favor of project but adequate compensation should be paid for the loss of trees*

Sr. No.	Date	Venue	Name of Participants	Concerns
		Union Council – Bher **Tehsil** – Haripur **District** – Haripur	3. Muhammad Altaf 4. Muhammad Sajjad 5. Tahir Iqbal 6. Asim Shehzad 7. Muhammad Iqbal 8. Amar Nawaz Khan 9. Abuzar Ghaffari 10. Mian Khan 11. Aureng Zaib 12. Kudadad Khan 13. Rajib Ali 14. Kazim Ali 15. Muhammad Tariq 16. Shahid Ali 17. Muhammad Khalid 18. Afzal Ali	*and crops and other losses.* • *The affectees of already constructed T/L by WAPDA have not yet been compensated. It is anticipated that the same would not be practiced for the proposed project.* • *Bab-e-Tanawal foundation comprising of 25-30 members which is actively working in the village and participating in all kind of the developmental activities of the area.* • *We do not expect any direct benefit from this project, but for the development of the country, we are ready to cooperate to the possible extent.* • *Project benefits will be shared for well-being of the affected persons.*
6.	14-12-2012	**Village/Town** – Sherwan Kalan **Union Council** – Sherwan **Tehsil** – Abbotabad **District** – Abbotabad	1. Fida Muhammad Khan 2. Haji Rahim Dad 3. Jan Muhammad 4. Kareem Tanoli 5. Iftikhar Hussain 6. Jahan Sher Khan 7. Muhammad Moosa 8. Ibrahim Tanoli 9. Tufail Mughal 10. Ilyas Ali	• *It is a good step that all the developmental activities are evaluated from social point of view and the residents of project area are being consulted before start of the project.* • *It is proposed that the T/Ls route should be along the road, so that the access would be available during construction, operation and maintenance of transmission line.* • *The people of the area are cooperative and will not pose any problem during the T/L construction provided they are satisfactorily compensated by the NTDC.* • *The residents of this area will be happy if new access routes are made by the contractors during*

Sr. No.	Date	Venue	Name of Participants	Concerns
				T/L construction. Because, there are many areas near villages; Rattian and Kamila, where access is not available. • *In the jurisdiction of Sherwan Police Station, a committee/Jirga has been formulated. This Jirga plays vital role in the resolution of all the disputes of area. During construction of T/L, if any such hindrance arises, that will be resolved by the Jirga.*
7.	15-12-2012	**Village/Town** – Kotla Bala **Union Council** – Icharrian **Tehsil** – Oogi **District** – Mansehra	1. Raees Azam 2. Dildar Khan 3. Shafi Khan 4. Haq Nawaz 5. Haji Muhammad Saleem 6. Sado Khan 7. Muhammad Riffique 8. Muhammad Tufail 9. Muhammad Sadiq 10. Rashid Iqbal 11. Muhammad Din 12. Amjad Ali 13. Sahib Khan	• *Good to see that the power infrastructure development is gradually improving in the country. We hope that investment in the power sector will help to reduce power shortage and minimize the frequent power outages.* • *We want that social issues will be given top priority while constructing Transmission lines and minimum loss policy will be adopted as far as possible.* • *However, we suggest that right of the affected persons will be restored to satisfactory level so that the developmental activities will be accepted and appreciated throughout the country.*
8.	15-12-2012	**Village/Town** – Khaki **Union Council** – Perhenna **Tehsil** – Ougi **District**	1. Asif Khan 2. Hakim Khan 3. Pir Muhammad 4. Roshan Khan 5. Khush Rang Khan 6. Feroz Din 7. Nazir Khan	• *Agriculture land is in small patches, therefore, the line should cross through barren mountains. If inevitable, the affected persons should be paid for the loss of crops and trees.* • *The proposed Transmission lines are of high voltage, therefore the populated areas should be avoided to the possible extent.*

Sr. No.	Date	Venue	Name of Participants	Concerns
		- Mansehra	8. Muhammad Iqbal 9. Javaid Ali 10. Qadir Bux	• *No direct benefit is expected from the line but, it is recommended that the labor for construction of T/L should be hired from local areas.* • *Local norms and customs would be practiced during project construction and operation. The privacy of underlying resident should not be impaired.*
9.	16-12-2012	**Village/Town** - Shamdarrah **Union Council** - Shamdarrah **Tehsil** - Ougi **District** - Mansehra	1. Haq Nawaz 2. Khan Bahadur 3. Muhammad Inayat 4. Khadim Hussain 5. Bashir Ahmad 6. Like Muhammad 7. Iftikhar Ahmad 8. Hussain Khan 9. Nazir Ahmad 10. Shahid Khan 11. Gulzar Khan 12. Jahangir Khan 13. Jahanzeb Khan 14. Rustam Khan 15. Tayyab Khan	• *Initially the Transmission lines will be constructed in open areas and on vacant lands, but later on, due to increasing population, the houses cannot be constructed under the lines.* • *No large trees can be grown under the transmission line, which is another obstruction.* • *If an affected person has only 10 marla area for growing crop and vegetables, which will be lost due to construction of tower in that land. The NTDC should compensate him by providing alternate land.* • *Construction of two towers does not mean only the loss of 6 marla land, rather whole canal is devalued. Nobody will be agreed to purchase that land after tower construction.* • *Before start of the work, the affected persons should be consulted and compensated for their losses.* • *In spite of all the afore-mentioned apprehensions, the residents of this area will cooperate in the construction of proposed transmission lines.*
10.	17-12-2012	**Village/Town** - Bazargai **Union Council** - Ajmera	1. Riaz Khan 2. Chan Zaib 3. Baz Khan 4. Shamroz Jan 5. Dukhtar Khan	• *Construction of T/L is very prospective development in our area but we cannot see any direct benefit from the proposed project. The main obsession is that the electricity will not be provided to us. Similarly, the labor will be hired by the Contractor from other areas*

Sr. No.	Date	Venue	Name of Participants	Concerns
		Tehsil – Battagram **District** – Battagram	6. Niaz Akhtar 7. Gul Khan 8. Taj Haider 9. Haji Ghulam Ishaque	*of the country and the overall situation of the area remains same.* • *The Government and NTDC should plan some social welfare projects along with such major projects for the well-being of the affected persons as well as other people along the T/L corridor.*
11.	17-12-2012	**Village/Town** – Chapargram **Union Council** – Ajmera **Tehsil** – Battagram **District** – Battagram	1. Haji Dalwar Khan 2. Zameen Khan 3. Shafiq Khan 4. Attaullah Khan 5. Noraz Khan 6. Muhammad Shah 7. Syed Waqar Shah 8. Gul Zaman 9. Muhammad Navid 10. Muhammd Khan 11. Zahid Khan 12. Usman Khan 13. Muhammad Hussain	• *Dassu Dam construction and hydro power generation is very good development to cater energy loss as well as for the prosperity of Kohistan. We will cooperate for the proposed project in national interest.* • *It is also worth mentioning that often development projects of such nature deprived from the project benefits for the local people. So, it is suggested that the project benefits will be shared with local people.* • *We will accept that minimum damage will be occurred during the installation of towers and for that adequate compensation will be paid to affected persons.*
12.	29-11-2012	**Village/Town** – Banna **Union Council** – Banna **Tehsil** – Allai **District** – Battagram	1. Jamal Nasir – Political Representative 2. Muhammad Kamal – WAPDA Employee 3. Gul Muhammad 4. Muhammad Sultan 5. Shah Faisal Khan 6. Qazi Rehman 7. Falak Khan 8. Sherin Rehman	• *We will cooperate with the proposed development to the possible extent. However, the generous demands of affected persons will be fulfilled for smooth work progress.* • *In the recently constructed T/L in our area, I was actively involved in the dialogue process between protestors and executing agencies for restoration of the terminated work at site.* • *Allai area is rich of vegetation being high an altitude. The rich biodiversity is recognition of this area. If possible alternate route will be analyzed or may*

Sr. No.	Date	Venue	Name of Participants	Concerns
			9. Anwar Rehman 10. Aslam Ali 11. Abdul Rehman 12. Bakhtiar Khan 13. Hasan Khan 14. Niaz Khan 15. Muhammad Javaid 16. Safdar Khan 17. Zameer Khan	*consider minimum disturbance to the biodiversity.*
13.	29-11-2012	**Village/Town** – Tailoos **Union Council** – Tailoos **Tehsil** – Allai **District** – Battagram	1. Mian Khan 2. Shams ul Haq 3. Arshad Ali 4. Arshad Iqbal 5. Khayyal Muhammad 6. Gul Rehman 7. Nizam Khan 8. Gul Zaman	• *Job opportunities will be provided to the locals on priority basis during the construction of the proposed project as people of our area will go to other areas for the labor and employment.* • *During construction local customs and norms will be followed particularly with respect to privacy of women.* • *Infrastructure facilities will be improved along with basic utilities in our village as we are lacking the basic services. Educational facilities will also be provided to educate and aware our children's.*
14.	29-11-2012	**Village/Town** – Pashto **Union Council** – Pashto **Tehsil** – Allai **District** – Battagram	1. Shahbaz Khan 2. Sarwar Khan 3. Noor Khan 4. Barkatullah 5. Ghulamullah 6. Jawad Khan 7. Gul Nawaz 8. Ghulam Khan 9. Bahroz Khan	• *During the construction of T/L project approach roads will be required for the construction purposes. It is an old practice that compensation will be only made for the land under T/L tower base and the compensation was not made for constructing approach roads. It is requested that compensation should be made for the damages that occur during the construction of approach roads.* • *It is also recommended that the Contractor will*

Sr. No.	Date	Venue	Name of Participants	Concerns
			10. Arshad Khan 11. Habib Ahmad 12. Ashfaque Khan 13. Muhammad Asif 14. Iqbal Khan	*inform locals prior to construction work at site. So, the crops, trees, assets etc. in ROW will be salvaged.*
15.	28-11-2012	**Village/Town** - Bada Kot **Union Council** - Haran **Tehsil** - Palas **District** - Kohistan	1. Moulana Asmatulla Khan 2. Muhammad Afzal 3. Younis Khan 4. Abdul Hannan 5. Mufti Khan 6. Ayub Khan 7. Nowsher Khan 8. Moulana Abdul Mustahan 9. GulRoh Khan 10. MalakWadan 11. Abdul Qadeer 12. Haji Rehman 13. Seqool Khan 14. Abdul Sajood 15. Sarwar Khan 16. Malik Sabir 17. Malik Mehbab 18. Malik Sehrab	• *Job opportunities should be provided to the locals for the proposed T/L.* • *Rights of the APs should be given due consideration and issues of APs should be addressed properly.* • *In our area young's are very determine to gain trainings, so training opportunities should be given to the Younger's of the area.* • *Most of the people migrated in other areas only to provide quality education to their children's. So education and health facilities should be provided for the welfare of the locals.* • *In our area electricity is not available, so the Pattan grid station should be upgraded for the dispersal of power to our area.* • *Houses and agriculture lands should be avoided as much as possible.* • *Maximum weightage should be given to the agriculture lands as compare to the easy approach for the installation of tower (plain areas).*
16.	28-11-2012	**Village/Town** - Shalkhan Abad **Union Council** - Shalkhan Abad	1. Haibut Khan-X Nazim UC Shalkan Abad 2. Mufti Mahmood 3. Jahnzeb Khan	• *We will welcome any kind of development in the best interest of our country. However, we will also demand that the electricity should be provided free of cost in our area.* • *The compensation should be provided sufficiently to*

Sr. No.	Date	Venue	Name of Participants	Concerns
		Tehsil – Palas **District** – Kohistan	4. Haji Abdul Qayum 5. Haji Gulzar 6. Haji Orangzeb 7. Noor Dad 8. Muhammad Ilyas 9. Ahmad Yousaf 10. Gulab Khan 11. Abdul Rahim 12. Anwar Badshah 13. MoulviQasim 14. Naseem Khan 15. Saiful Rehman 16. Abdul Rehman 17. Khalil Ullah	*cater the loss of our land and livelihood.* • *Installation of tower will cause disturbance to our crops, lands, trees etc. people of area have small land holdings for agriculture, so the compensation should be handsome to restore their livelihood.* • *No revenue record of land is available here.* • *Land is marked by the owner tribe* • *Major occupations in the area are livestock raring, wood cutting, agriculture, labour etc.* • *Govt. Middle School in the area is operational since 1995 by a local NGO.* • *Basic utilities are not available in the area i.e. electricity and natural gas* • *Disputes are solved by Jirga*
17.	18-12-2012	**Village/Town** – Pattan **Tehsil** – Pattan **District** – Kohistan	**Pattan Islahi Committee/Jirga Pattan,** 1. Jamal Khan 2. Haji Yar Dad 3. Dasham Khan 4. GulShehzad 5. Muhammad Saffa 6. Haji Abdul Kareem 7. Haji Abdul Majid 8. Haji Dost Muhammad 9. Haji Nawab 10. Qari Dost Muhammad 11. Mir Dad	• *Construction of T/Ls in the hilly area towards Palas valley will be a difficult task, therefore, it is proposed that the T/Line should run parallel to the Indus River.* • *The major hurdles in Palas valley route will include; protected forest, small patches of land used for agriculture, snow falling during winter, lack of access and difficulties for repair and maintenance activities.* • *The objective of this suggestion was that the community wanted the line should cross through their area of influence so that their own community would be benefited from the project.* • *Willingness to participate in the process of execution of the project.* • *The compensation should be assessed based on prevailing local market rates of the area and the*

Sr. No.	Date	Venue	Name of Participants	Concerns
			12. Malik Badshah	*nature of the land involved under the proposed T/Ls.*
18.	19-12-2012	**Pak Mission Society (NGO) Pattan, Tehsil** Pattan **District** Kohistan	1. Rajar Rofis – Project Manager 2. Abdul Sattar–Tehsil Coordinator 3. Ashfaq Maqbool – Assistant Project Manager 4. Dushnm Khan– Field Worker 5. Gul Shahzada– Field Worker	• *Pak Mission Society is a Para-Movement Church based relief and development organization, which cover business, development, financial, management, technical, pastoral, health and education expertise. Pak Mission Society is working in Kohistan area for the above mentioned expertise. The society is also running Middle School at Shelkhan Abad in the Govt. school building. We are engaged in the education and health sector improvement at Shelkhan Abad and other areas of Kohistan. Our objective is to provide quality education and better health facilities for the people of Kohistan.* • *The proposed development will be beneficial for the Kohistan area and bring prosperity along with better opportunities in the area.*
19.	20-12-2012	**Village/Town** – Seo **Union Council** – Seo **Tehsil** – Dassu **District** – Kohistan	1. Jan Muhammad 2. Gul Muhammad 3. Nawazish Ali 4. Akbar Ali 5. Yasir Khan 6. Naveed Jan 7. Noor Khan 8. Dilbar Khan 9. Dost Khan 10. Sohrab Khan 11. Kamal Khan	• *It is requested that tree cutting will be avoided in the ROW to the possible extent, as the trees are precious here and prevailing trend of the trees cutting in the area has significantly reduced dense forests.* • *The fair compensation will be made for the affected crops, trees, lands, and other assets prior to construction of the proposed project.* • *The land ownership in this area is not recorded but the local elders (Jirga members) knew who the genuine occupant and how the compensation will be divided in their tribe.* • *Local labor will be hired so that the locals will support*

Sr. No.	Date	Venue	Name of Participants	Concerns
				proposed development and will allow room in their areas for construction of T/L.
20.	28-11-2012	**Village/Town** – Komila **Union Council** – Komila **Tehsil** – Dassu **District** – Kohistan	**Chirag Abad Society** 1. Gulab Shah 2. Ahsanullah 3. Ahsan Ayoub 4. Salam Dar 5. Hibab Shah 6. Haji Sulmain Shah 7. Mannan Khan 8. Habibul Rehman 9. Zainul Rehman 10. Ziadad Khan 11. Jamroz 12. Mujeeb Rehman 13. Haji Shah 14. Ameer Khan 15. Akbar Shah 16. Syed Haroon 17. Muhammad 18. Noorul Haq 19. Nazar Rehman 20. Muhammad Feroze 21. Muhammad Ayoub 22. Sardar Ayoub	• *Three major tribes in Komila 1) Shamat Khel, 2) But Khel, and 3) Akhar (blacksmith)* • *In our area decision are usually made by jirga and Jirga is the highest decision making institution -elder persons / influentials are nominated to become Jirga member. For decision within the tribe –elders from different branches normally takes the role of Jirga members. Jirga decisions are always oral and announced in public and accepted by all.* • *In case one party disagree with Jirga decision, that case goes to Maulvi for Sharia decision- group of Mullahs (5-6) than decide the case through sharia laws.* • *The participants of consultations held in Komila and Pattan specially mentioned their experience with NTDC. A 220 KV Dubair-Khankhawar-Mansehra-Islamabad transmission line recently completed by NTDC where the implementation agency never holds consultation with the affected persons at design and implementation stages. Numbers of affected persons are not paid compensation even after the tower erection and stringing. Further even the direct affected persons were not consulted for the assessment of losses. The entire Pattan community decided to block the construction of two towers in protest. The consultations recommended for a fair and transparent process with the involvement of local representatives.*

Sr. No.	Date	Venue	Name of Participants	Concerns
				• *Avoid construction of towers or develop any road through the cultivation terrace as terrace cultivation is the lifeline of the household and cost months of labor and years to stabilize.* • *In case it is extremely unavoidable to save the terrace the project should be responsible to restore it in its original condition and pay proper compensation for at least three crops.*
21.	30-11-2012	**Salak Development Foundation (NGO) Komila, Pattan Tehsil** Dassu, Pattan **District** Kohistan	1. Fazal Subhan - Field Coordinator 2. Dr. Hafeez 3. Dr. Taj Muhammad 4. Jahnzeb Salik 5. Liaqiat Ali - Field Coordinator 6. Ahmad Khan - Field Coordinator 7. Jahnzeb Khan – Education Promoter	• *Salak Foundation is providing better health facilities in five health centers in district Kohistan. The Salik Foundation has also established fix center for polio campaign in their respective center on request of Health Department Kohistan* • *We will accept that with the implementation of proposed development the social life of the Kohistani people will improve. It is also accepted during construction activities health of local people will not be compromised.*

APPENDIX – 7.1

WORLD BANK'S ENVIRONMENTAL, HEALTH, AND SAFETY (EHS) GUIDELINES

2.0 OCCUPATIONAL HEALTH AND SAFETY

Applicability and Approach

Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers.

Preventive and protective measures should be introduced according to the following order of priority:

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

2.1 General Facility Design and Operation

Integrity of Workplace Structures

Permanent and recurrent places of work should be designed and equipped to protect OHS:

- Surfaces, structures and installations should be easy to clean and maintain, and not allow for accumulation of hazardous compounds.
- Buildings should be structurally safe, provide appropriate protection against the climate, and have acceptable light and noise conditions.
- Fire resistant, noise-absorbing materials should, to the extent feasible, be used for cladding on ceilings and walls.
- Floors should be level, even, and non-skid.
- Heavy oscillating, rotating or alternating equipment should be located in dedicated buildings or structurally isolated sections.

Severe Weather and Facility Shutdown

- Work place structures should be designed and constructed to withstand the expected elements for the region and have an area designated for safe refuge, if appropriate.

- Standard Operating Procedures (SOPs) should be developed for project or process shut-down, including an evacuation plan. Drills to practice the procedure and plan should also be undertaken annually.

Workspace and Exit

- The space provided for each worker, and in total, should be adequate for safe execution of all activities, including transport and interim storage of materials and products.
- Passages to emergency exits should be unobstructed at all times. Exits should be clearly marked to be visible in total darkness. The number and capacity of emergency exits should be sufficient for safe and orderly evacuation of the greatest number of people present at any time, and there should be a minimum two exits from any work area
- Facilities also should be designed and built taking into account the needs of disabled persons.

Lavatories and Showers

- Adequate lavatory facilities (toilets and washing areas) should be provided for the number of people expected to work in the facility and allowances made for segregated facilities, or for indicating whether the toilet facility is “In Use” or “Vacant”.
- Toilet facilities should also be provided with adequate supplies of hot and cold running water, soap, and hand drying devices Where workers may be exposed to substances poisonous by ingestion and skin contamination may occur, facilities for showering and changing into and out of street and work clothes should be provided.

Potable Water Supply

- Adequate supplies of potable drinking water should be provided from a fountain with an upward jet or with a sanitary means of collecting the water for the purposes of drinking.
- Water supplied to areas of food preparation or for the purpose of personal hygiene (washing or bathing) should meet drinking water quality standards.

First Aid

- The employer should ensure that qualified first-aid can be provided at all times. Appropriately equipped first-aid stations should be easily accessible throughout the place of work.
- Eye-wash stations and/or emergency showers should be provided close to all workstations where immediate flushing with water is the recommended first-aid response.
- Where the scale of work or the type of activity being carried out so requires, dedicated and appropriately equipped first aid room(s) should be provided.

First aid stations and rooms should be equipped with gloves, gowns, and masks for protection against direct contact with blood and other body fluids.

- Remote sites should have written emergency procedures in place for dealing with cases of trauma or serious illness up to the point at which patient care can be transferred to an appropriate medical facility.

2.2 Communication and Training

OHS Training

- Provisions should be made to provide OHS orientation training to all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees.
- Training should consist of basic hazard awareness, site specific Hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training.

New Task Employee and Contractor Training

The employer should ensure that workers and contractors, prior to commencement of new assignments, have received adequate training understands work hazards and to protect their health from hazardous ambient factors that may be present. The training should adequately cover:

- Knowledge of materials, equipment, and tools
- Known hazards in the operations and how they are
- controlled
- Potential risks to health
- Precautions to prevent exposure
- Hygiene requirements
- Wearing and use of protective equipment and clothing
- Appropriate response to operation extremes, incidents and accidents

2.3 Physical Hazards

Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or work activity. Single exposure to physical hazards may result in a wide range of injuries, from minor and medical aid only, to disabling, catastrophic, and/or fatal. Multiple exposures over prolonged periods can result in disabling injuries of comparable significance and consequence.

Noise

- No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C).

- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 dB(A).
- Although hearing protection is preferred for any period of noise exposure in excess of 85 dB(A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent.
- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.
- Periodic medical hearing checks should be performed on workers exposed to high noise levels.

Vibration

Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values, (i.e. the level of exposure at which remediation should be initiated) are provided by the ACGIH66. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers.

Welding / Hot Work

Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include:

- Provision of proper eye protection such as welder goggle sand/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required.
- Special hot work and fire prevention precautions and Standard Operating Procedures (SOPs) should be implemented if welding or hot cutting is undertaken outside established welding work stations, including 'Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated.

Special procedures are required for hot work on tanks or vessels that have contained flammable materials.

Working Environment Temperature

Exposure to hot or cold working conditions in indoor or outdoor environments can result temperature stress-related injury or death. Use of personal protective equipment (PPE) to protect against other occupational hazards can accentuate and aggravate heat-related illnesses. Extreme temperatures in permanent work environments should be avoided through implementation of engineering controls and ventilation. Where this is not possible, such as during short-term outdoor work, temperature-related stress management procedures should be implemented which include:

- Monitoring weather forecasts for outdoor work to provide advance warning of extreme weather and scheduling work accordingly.
- Adjustment of work and rest periods according to temperature stress management procedures provided by depending on the temperature and workloads.
- Providing temporary shelters to protect against the elements during working activities or for use as rest areas. Use of protective clothing.
- Providing easy access to adequate hydration such as drinking water or electrolyte drinks, and avoiding consumption of alcoholic beverages.

Ergonomics, Repetitive Motion, Manual Handling

Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems should be minimized or eliminated to maintain a productive workplace. Controls may include:

- Facility and workstation design with 5th to 95th percentile operational and maintenance workers in mind.
- Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds selecting and designing tools that reduce force requirements and holding times, and improve postures.
- Providing user adjustable work stations.
- Incorporating rest and stretch breaks into work processes, and conducting job rotation.
- Implementing quality control and maintenance programs that reduce unnecessary forces and exertions, taking into consideration additional special conditions such as left handed persons.

2.4 Chemical Hazards

Chemical hazards represent potential for illness or injury due to single acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing or oxidative

substances. They also represent a risk of uncontrolled reaction, including the risk of fire and explosion, if incompatible chemicals are inadvertently mixed. Chemical hazards can most effectively be prevented through a hierarchical approach that includes.

- Replacement of the hazardous substance with a less hazardous substitute Implementation of engineering and administrative control measures to avoid or minimize the release of hazardous substances into the work environment keeping the level of exposure below internationally established or recognized limits.
- Keeping the number of employees exposed, or likely to become exposed, to a minimum Communicating chemical hazards to workers through labeling and marking according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Any means of written communication should be in an easily understood language and be readily available to exposed workers and first-aid personnel.
- Training workers in the use of the available information (such as MSDSs), safe work practices, and appropriate use of PPE.

Fire and Explosions

Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers. Prevention and control strategies include:

- Storing flammables away from ignition sources and oxidizing materials. Further, flammables storage area should be:
    - Remote from entry and exit points into buildings
    - Away from facility ventilation intakes or vents
    - Have natural or passive floor and ceiling level ventilation and explosion venting
    - Use spark-proof fixtures
    - Be equipped with fire extinguishing devices and self-closing
    - doors, and constructed of materials made to
    - withstand flame impingement for a moderate period of time
- Providing bonding and grounding of, and between, containers and additional mechanical floor level ventilation if materials are being, or could be, dispensed in the storage area.
- Where the flammable material is mainly comprised of dust, providing electrical grounding, spark detection, and, if needed, quenching systems Defining and labeling fire hazards areas to warn of special rules (e.g. prohibition in use of smoking materials, cellular phones, or other potential spark generating equipment).
- Providing specific worker training in handling of flammable materials, and in fire prevention or suppression.

2.5 Biological Hazards

Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Biological hazards can be prevented most effectively by implementing the following measures:

- If the nature of the activity permits, use of any harmful biological agents should be avoided and replaced with an agent that, under normal conditions of use, is not dangerous or less dangerous to workers. If use of harmful agents cannot be avoided, precautions should be taken to keep the risk of exposure as low as possible and maintained below internationally established and recognized exposure limits.
- Work processes, engineering, and administrative controls should be designed, maintained, and operated to avoid or minimize release of biological agents into the working environment. The number of employees exposed or likely to become exposed should be kept at a minimum. The employer should review and assess known and suspected presence of biological agents at the place of work and implement appropriate safety measures, monitoring, training, and training verification programs.
- Measures to eliminate and control hazards from known and suspected biological agents at the place of work should be designed, implemented and maintained in close co-operation with the local health authorities and according to recognized international standards.

Biological agents should be classified into four groups.

- Group 1: Biological agents unlikely to cause human disease, and consequently only require controls similar to those required for hazardous or reactive chemical substances;
- Group 2: Biological agents that can cause human disease and are thereby likely to require additional controls, but are unlikely to spread to the community;
- Group 3: Biological agents that can cause severe human disease, present a serious hazard to workers, and may present a risk of spreading to the community, for which there usually is effective prophylaxis or treatment available and are thereby likely to require extensive additional controls;
- Group 4: Biological agents that can cause severe human disease, are a serious hazard to workers, and present a high risk of spreading to the community, for which there is usually no effective prophylaxis or treatment available and are thereby likely to require very extensive additional controls.

The employer should at all times encourage and enforce the highest level of hygiene and personal protection, especially for activities employing biological agents of Groups 3 and 4 above. Work involving agents in Groups 3 and 4 should be restricted only to those persons who have received specific verifiable training in working with and controlling such materials.

Areas used for the handling of Groups 3 and 4 biological agents should be designed to enable their full segregation and isolation in emergency circumstances, include independent ventilation systems, and be subject to SOPs requiring routine disinfection and sterilization of the work surfaces.

HVAC systems serving areas handling Groups 3 and 4 biological agents should be equipped with High Efficiency Particulate Air (HEPA) filtration systems. Equipment should readily enable their disinfection and sterilization, and maintained and operated so as to prevent growth and spreading of disease agents, amplification of the biological agents, or breeding of vectors e.g. mosquitoes and flies of public health concern.

2.7 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) provides additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems. PPE is considered to be a last resort that is above and beyond the other facility controls and provides the worker with an extra level of personal protection. Recommended measures for use of PPE in the workplace include:

- Active use of PPE if alternative technologies, work plans or procedures cannot eliminate, or sufficiently reduce, a hazard or exposure.
- Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual.
- Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. Proper use of PPE should be part of the recurrent training programs for employees.
- Selection of PPE should be based on the hazard and risk ranking described earlier in this section, and selected according to criteria on performance and testing established by recognized organizations.

2.8 Special Hazard Environments

Special hazard environments are work situations where all of the previously described hazards may exist under unique or especially hazardous circumstances. Accordingly, extra precautions or rigor in application of precautions is required.

Confined Space

A confined space is defined as a wholly or partially enclosed space not designed or intended for human occupancy and in which a hazardous atmosphere could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space. A “permit-required” confined space is one that also contains physical or atmospheric hazards that could trap or engulf the person. Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined

space or in attempting a rescue from a confined space. Recommended management approaches include:

- Engineering measures should be implemented to eliminate, to the degree feasible, the existence and adverse character of confined spaces.
- Permit-required confined spaces should be provided with permanent safety measures for venting, monitoring, and rescue operations, to the extent possible. The area adjoining an access to a confined space should provide ample room for emergency and rescue operations.
- Access hatches should accommodate 90% of the worker population with adjustments for tools and protective clothing. The most current ISO and EN standards should be consulted for design specifications.
- Prior to entry into a permit-required confined space:
    - Process or feed lines into the space should be disconnected or drained, and blanked and locked-out.
    - Mechanical equipment in the space should be disconnected, de-energized, locked-out, and braced, as Appropriate.
    - The atmosphere within the confined space should be tested to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL).
    - If the atmospheric conditions are not met, the confined space should be ventilated until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.
- Safety precautions should include Self Contained Breathing Apparatus (SCBA), life lines, and safety watch workers stationed outside the confined space, with rescue and first aid equipment readily available.
- Before workers are required to enter a permit-required confined space, adequate and appropriate training in confined space hazard control, atmospheric testing, use of the necessary PPE, as well as the serviceability and integrity of the PPE should be verified. Further, adequate and appropriate rescue and / or recovery plans and equipment should be in place before the worker enters the confined space.

Lone and Isolated Workers

A lone and isolated worker is a worker out of verbal and line of sight communication with a supervisor, other workers, or other persons capable of providing aid and assistance, for continuous periods exceeding one hour. The worker is therefore at increased risk should an accident or injury occur.

- Where workers may be required to perform work under lone or isolated circumstances, Standard Operating Procedures (SOPs) should be developed and implemented to ensure all PPE and safety measures are in place before the worker starts work. SOPs should establish, at a minimum, verbal contact

with the worker at least once every hour, and ensure the worker has a capability for summoning emergency aid.

- If the worker is potentially exposed to highly toxic or corrosive chemicals, emergency eye-wash and shower facilities should be equipped with audible and visible alarms to summon aid whenever the eye-wash or shower is activated by the worker and without intervention by the worker.

2.9 Monitoring

Occupational health and safety monitoring programs should verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards, and the implementation of prevention and control strategies. The occupational health and safety monitoring program should include:

- *Safety inspection, testing and calibration:* This should include regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used. The inspection should verify that issued PPE continues to provide adequate protection and is being worn as required. All instruments installed or used for monitoring and recording of working environment parameters should be regularly tested and calibrated, and the respective records maintained.
- *Surveillance of the working environment:* Employers should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards. Generally, monitoring should be performed during commissioning of facilities or equipment and at the end of the defect and liability period, and otherwise repeated according to the monitoring plan.
- *Surveillance of workers health:* When extraordinary protective measures are required (for example, against biological agents Groups 3 and 4, and/or hazardous compounds), workers should be provided appropriate and relevant health surveillance prior to first exposure, and at regular intervals thereafter. The surveillance should, if deemed necessary, be continued after termination of the employment.
- *Training:* Training activities for employees and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually required to submit to the employer adequate training documentation before start of their assignment.

Accidents and Diseases monitoring

- The employer should establish procedures and systems for reporting and recording:
    - Occupational accidents and diseases
    - Dangerous occurrences and incidents

These systems should enable workers to report immediately to their immediate supervisor any situation they believe presents a serious danger to life or health.

- The systems and the employer should further enable and encourage workers to report to management all:
    - Occupational injuries and near misses
    - Suspected cases of occupational disease
    - Dangerous occurrences and incidents
- All reported occupational accidents, occupational diseases dangerous occurrences, and incidents together with near misses should be investigated with the assistance of a person knowledgeable/competent in occupational safety. The investigation should:
    - Establish what happened
    - Determine the cause of what happened
    - Identify measures necessary to prevent a recurrence
- Occupational accidents and diseases should, at a minimum, be classified according to the below Table. Distinction is made between fatal and non-fatal injuries. The two main categories are divided into three sub-categories according to time of death or duration of the incapacity to work. The total work hours during the specified reporting period should be reported to the appropriate regulatory agency.

Table: Occupational Accident Reporting		
a. Fatalities (number)	**b. Non-fatal injuries (number)**	**c. Total time lost non-fatal injuries (days)**
a.1 Immediate	b.1 Less than one day	
a.2 Within a month	b.2 Up to 3 days	c.1 Category b.2
a.3 Within a year	b.3 More than 3 days	c.2 Category b.3

4.0 CONSTRUCTION AND DECOMMISSIONING

4.2 Occupational Health and Safety

Over-exertion

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries in construction and decommissioning sites. Recommendations for their prevention and control include:

- Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary.
- Planning work site layout to minimize the need for manual transfer of heavy loads.
- Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations.
- Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks.

Work in Heights

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard:

- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface.
- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 5000 pounds (also described in this section in Working at Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 5000 pounds.
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces.

Struck By Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities. Techniques for the prevention and control of these hazards include:

- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels.
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable.
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap.

- Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged.
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures.
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes.

Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving. Techniques for the prevention and control of these impacts include:

- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic.
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle.
- Ensuring moving equipment is outfitted with audible back-up alarms.
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

Confined Spaces and Excavations

Examples of confined spaces that may be present in construction or demolition sites include: silos, vats, hoppers, utility vaults, tanks, sewers, pipes, and access shafts. Ditches and trenches may also be considered a confined space when access or egress is limited. The occupational hazards associated with confined spaces and excavations in construction and decommissioning sites should be prevented according to the following recommendations:

- Controlling site-specific factors which may contribute to excavation slope instability including, for example, the use of excavation dewatering, side-walls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning.
- Providing safe means of access and egress from excavations, such as graded slopes, graded access route, or stairs and ladders.

- Avoiding the operation of combustion equipment for prolonged periods inside excavations areas where other workers are required to enter unless the area is actively ventilated.

Other Site Hazards

Construction and decommissioning sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms, which should be prevented through the implementation of project specific plans and other applicable management practices, including:

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition.
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements prior to dismantling or demolition including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury.
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection.

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