Initial Environmental Examination

December 2014

PAK: Pakistan Power Transmission Enhancement Program Tranche-IV (220 kV Chakdarra Grid Station and Allied Transmission Line)

Prepared by Environment and Social Impact Cell (ESIC), NTDC for the Asian Development Bank.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
COI	Corridor of Influence
CCMR	Community Complaints Management Register
CSP	Country Strategy Program
CSC	Construction Supervision Consultants
DO	District Officer
DDO	Deputy District Office
DoF	Department of Forests
DFO	Divisional Forest Officer
DIZ	Direct Impact Zone
EA	Environmental Assessment
EARF	Environment Assessment and Review Framework
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FESCO	Faisalabad Electric Supply Company
GDP	Gross Domestic Product
GOP	Government of Pakistan
IEE	Initial Environmental Examination
KPK	Khyber Pakhtunkhwa
LAO	Land Acquisition Officer
LARP	Land Acquisition and Resettlement Plan
Leq	equivalent sound pressure level
MC	Management Consultants
MMF	Multi-tranche Financing Facility
MPL	Maximum Permissible Level
NEQS	National Environmental Quality Standards

NGO	Non-Governmental Organization
NTDC	National Transmission Line and Despatch Company
PC	Public Consultation
PEPAct	Pakistan Environment Protection Act 1997
PPTA	Project Preparation and Technical Assistance
REA	Rapid Environmental Assessment
SDO	Sub Divisional Officer
SIA	Social Impact Assessment
SP	Subproject
SR	Sensitive Receiver
TOR	Terms of Reference
WAPDA	Water and Power Development Authority

EXECUTIVE SUMMARY

1. INTRODUCTION

2. National Transmission & Despatch Company (NTDC) Limited was incorporated on 6th November, 1998 and commenced commercial operation on 24th December, 1998. It was organized to take over all the properties, rights and assets obligations and liabilities of 220 kV and 500 kV Grid Stations and Transmission Lines/Network owned by Pakistan Water and Power Development Authority (WAPDA).

3. The NTDC has signed an agreement of Multi-tranche Financing Facility (MFF) with ADB extending over a period from 2006 to 2017. This document is the Initial Environmental Examination (IEE) for the construction of the new 220 kV Chakdara Grid Station and about 85 S/C transmission line for In/Out of 220 kV Shahi Bagh-Mardan under Tranche 4 of the Asian Development Bank (ADB) program, Power Transmission and Enhancement Multi-tranche Financing Facility (PTEMFF).

4. This report gives an overview of project description, impact identification, their assessment and mitigation measures through environmental and social assessment study process and methodology.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORKS

5. The National Environmental Policy had been announced by Government of Pakistan in the year 2005. Pakistan Environmental Protection Council is the apex decision making body of the country. Submission of the Environmental Impact Assessment report to the concerned Environmental Protection Agency is mandatory under the Pakistan Environmental Protection Act, 1997. This project falls in the jurisdiction of EPA KPK, therefore, environmental clearance will be obtained from EPA Khyber Pakhtunkhwa.

3. THE PROJECT

6. The subproject has two components the grid station and transmission line. The 220 kV grid station and transmission line (total 85 km) will be located in KPK Province. The grid station will have equipment including 220 kV substation with 3*250 MVA Transformers. There will be 85 km 220 kV D/C transmission line on twin bundle Rail conductor for In/Out of existing 220 kV Shahibagh-Mardan. This line will involve the installation of 238 towers, i.e. each tower at distance of 357 m as reported by Surveys & Investigation Department of NTDC.

7. Main objective of project is to enhance the transmission capacity of NTDC system by addition of new 220 kV Chakdarra Substation along with its allied transmission lines to meet the growing power demand of DISCOs, particularly PESCO.

- This improvement in system will help to bridge the demand supply gap to eliminate the severe load shedding of the country.
- Improvement and enhancement in overall power system efficiency, reliability and power supply position in PESCO area, particularly in the vicinity of Malakan, Mardan and Charsadda.
- Improvement in voltage profile of 132 kV Grid stations in PESCO area.

4. ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

8. The project area is almost mountainous and about 15 km South-West to Chakdara City along the N-45 Road. The transmission line route will pass through three districts of KPK province i.e. Malakand, Charsadda and Mardan.

9. Malakand district is surrounded by high mountains rich with mineral resources. Deposits of chromite iron, china clay and fuller earth have been found in Malakand. The soil of Malakand is loamy and moist, and is irrigated by the Swat River which flows from Swat, through Kohistan and joins the river Kabul near Peshawar.

10. Mardan district may broadly be divided into two parts, north eastern hilly area and south western plain. The entire northern side of the district is bounded by the hills in the district. The highest points in these hills are Pajja or Sakra, 2056 meters high and Garo or Pato, 1816 meters high. The south western half of the district is mostly composed of fertile plain with low hills strewn across it. This plain once formed the bed of a lake which was gradually filled up by the load of the river flowing into the area from the surrounding hills. From the foot hills the plain runs down at first with a steep slope which carried the rain water to the lower levels and ultimately to the Kabul river.

11. Charsadda district lies in the central plain of Peshawar Valley. The Kabul River enters at a point near the south west of the district. It flows along the southern boundary of the district, and crosses the district in the extreme south eastern corner. The Swat (Abazai) river is an important tributary of the Kabul river. It enters the district near Adazai village and flows in the south-eastern direction till it joins the Kabul river. The last section of Kabul river, below the point all its tributaries join it, is locally known as Landai river. The plain areas of the district include Doaba Plain, lying between Swat and Kabul rivers, Hashtnagar in the central and south-eastern parts, and Mohmand and Muhammadzai plains in the north and north-east.

12. Air quality in most of the project area appears good based on observation during the study period. Noise from vehicles and other powered mechanical equipment (electric generator etc.) is intermittent. There are also the occasional calls to prayer from loud speakers in the local mosques but there are no significant disturbances to the quiet rural setting.

13. The wildlife of three districts includes fox, pig, jackal and wild cat. Among common species of birds found in the district are pigeon, dove, tlliar, lalmena, bias, parrot, quail pechard, pintail, mallara, teal, and stark. Commercial capture fisheries do not operate in the area. No data were available for fish production from the rivers but recreational fishing for local home supply, and for selling takes place in the project area. Among the fish, Mahasher & Rahu are favorites due to their taste. There are abundant fish in Kabul River.

14. The present flora of the irrigated areas is exotic. The common trees are mesquite, ber, Poplar, Eucalyptus, Willow, Shisham, Kikar, Mulberry and different species of acacia. The most common shrubs are Tamarix articulata, spands, akk, small red poppy, spera, pueghambrigul, drab grass, spera, eamelthorl and phulai, and chaulai etc. Orchards and home gardens with fruit trees of citrus, apricot, peach, guava, water melon, musk melon, pear, persimmon, and loquat are common in the area. There are plenty of trees in the areas near the works but natural forest cover in the districts has been significantly reduced in the past.

15. No protected area, religious tree or environmentally sensitive site exists in the project corridor.

16. Majority of the population of the project area is linked with Agriculture, followed by fishery. The majority of the urban population is associated with construction industries, wholesale, shops and market sales, retail trade, restaurants and hotels industries etc.

17. Roads are the means of transportation for the movement of people and goods in all the three districts and connect this with other parts of the country. These districts are connected with Peshawar and Islamabad with main highways including N-45, GT Road (N-5) and Motorway (M-1). International and countrywide postal and telecommunication facilities are easily available in the city and project area.

18. The electricity supply is available to almost all the villages and settlements along the line route. PESCO is responsible for electricity distribution in project area.

19. According to census 1998, the Malakand District has a population of 452291 persons with a growth rate of 3.36%. Number of males for every 100 females was 106.8 percent recorded in 1998 Census in Malakand district. The rural population is 90.45% and urban population is 9.55%. The population of the district Malakand is predominantly Muslims. The total area of the District is 952 sq. km with a Population Density of 475.1 persons per sq. km. Average household size was 9.1 persons.

20. The Population of Mardan was 1460100, with an average household size of 8.4 persons in 1998 (Census Report 1998) with a growth rate of 3.01 %. The population of the Mardan district is almost entirely Muslim who constitutes 99.51 of the total population. The main minorities are Ahmadis and Christians who are 0.32 and 0.14 percent respectively. Other minority is Hindu, who are 0.02 percent of the total population. The total area of the District is 1632 sq. km with a Population Density of 894.7 persons per sq. km. Average household size was 8.4 persons. The rural population is 79.78% and urban population is 17.47 %. Number of males for every 100 females was 106.6 percent.

21. The Charsadda District has a population of 1022364 persons with average annual growth rate of 2.88% in year 1998. Number of males for every 100 females was 107.9 percent recorded in 1998 Census in Charsadda district. The rural population is 81.14% and urban population is 18.86%. The population of the district Charsadda is predominantly Muslims. The total area of the District is 996 sq. km with a Population Density of 1026.5 persons per sq. km. Average household size was 8.0 persons.

22. The principal tribes of these districts are Nipka Khel, Lali, Gujjar, Pathan, Mola Khel, Zaidsadri, Lohaar, Utman Khel, Molyan, Tarkhan, Miran, Kaka Khel, Khan Khel, Khanan, Khan, Kandi, Yousaf Zai, Daray Kando, Syed, Lohdi, Bajaur, Momand and Khatak.

5. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIONS

23. As a first step, the screening of the Project was done considering the Asian Development Bank's guidelines. The project falls in Environmental Category B under SPS,2009 and according to Pak EPA's IEE/EIA regulations 2000, the project involve carrying of environmental impact assessment, as the project falls in schedule – II. To ensure participation of local communities and Project stakeholders, consultative meetings, scoping sessions and group discussions were held with the local community and departments. The participants were of the view that Project should be implemented as early as possible. The main concerns of the participants were that the transmission line should not pass over the private houses, local people should be provided jobs during construction, load shedding should be minimized, electricity /voltage should be stabilized, and load shedding causes disruption in water supply and burning of electronic

appliances. Considering these difficulties, the participants were of the view that improvement of electricity supply through up-gradation of grid stations and construction of new transmission lines is the need of the day.

24. There are no major negative impacts of this project. Most of the negative impacts are localized and limited to project sites. Proper mitigation measures adopted as per provided EMP will surely reduce the negative impacts. Post mitigated impacts will be negligible.

25. The major positive impacts include improvement in power supply in old areas and provision of power supply to new areas, improved reliability and stability of electricity, improvement in voltage profile, control existing load shedding and creation of jobs during construction.

26. Mitigation measures for negative impacts include compensation to Project Affected Persons for the loss of standing crops / trees as per entitlements of Land Acquisition and Resettlement Plan (LARP). The noise can be mitigated by using silencers and earmuffs. The dust pollution can be mitigated by sprinkling water 2 to 3 times a day and controlling of speed of moving vehicles. Planting of compensatory trees, careful driving in work areas, avoidance of vehicle and machinery movements during peak hours, careful collection and disposal of oils and lubricants, proper waste disposal and safety precautions of workers etc. A comprehensive Environmental Management Plan (EMP) has been prepared to mitigate all the environmental impacts during construction and operational phase of the project.

6. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMMP)

27. A comprehensive EMMP has been prepared for the projects (Annex-I & Annex-II). It includes actions proposed for mitigation of negative impacts and effective monitoring of the implementation of proposed mitigation measures during pre-construction, construction and operation phases. This will be made part of the contract document for contractors. The contractors will be responsible for implementation of mitigation and monitoring measures through Bill of Quantities (BOQ) in the bidding documents. NTDC will also carry out its internal monitoring.

28. The total cost for environmental management of the proposed project is about 2858250 Pak. Rupees.

8. CONCLUSIONS AND RECOMMENDATIONS

29. The proposed project interventions will cause few environmental and social impacts mostly during construction phase and very limited during operational phase.

30. The construction stage will face negative impacts in the form of dust, smoke and noise on account of employment of vehicles, machinery and equipment. The generation of construction waste, solid waste and oil spills/seepage will have negative impacts on land and air resources. Further, the stringing process may involve traffic congestion. All such impacts are temporary and are of minor nature. The mitigation measures have been suggested in the EMMP.

31. The project operation phase may cause issues such as clearance of ROW, movement of vehicles for maintenance and repairing of transmission line etc. Accordingly mitigation measures have been given in the EMMP.

- No land acquisition is involved, because grid station land is already in the possession of NTDC, however, in case of transmission line, the project affectees will be compensated for the loss of their crops/assets and livelihood according to the provisions of the entitlement matrix.
- Private and forest owned trees will need removal for which three (03) times compensation tree plantation has been suggested.
- The impacts identified are mainly of temporary nature which will automatically vanish with the completion of construction phase.
- Most of the impacts could be prevented or mitigated by adopting the mitigation measures suggested in the EMMP.
- Major Positive Impacts are:
    i. Significant improvement in reliability and stability of electric supply system.
    ii. Improvement in voltage profile.
    iii. Control of existing load shedding.
    iv. There is insignificant environmental damage to local land, water and biological resources.

1. INTRODUCTION

1.1 Overview

1. This document is the Initial Environmental Examination (IEE) for the construction of the new 220 kV Chakdara Grid Station and about 85 km transmission line for in/out of 220 kV Shahi Bagh-Mardan under Tranche-IV of the Asian Development Bank (ADB) program, Power Transmission and Enhancement Multi-tranche Financing Facility (PTEMFF). This IEE presents the results and conclusions of environmental assessment for the proposed construction of transmission line and is submitted by the Government of the Pakistan (GoP), Ministry of Water and Power and National Transmission and Despatch Company (NTDC) to ADB. This IEE has been prepared to fulfill the ADB's Safeguards Requirement as stipulated in Safeguards Policy Statement, 2009 (SPS,2009).

2. The PTEMFF loan has been approved by ADB in year 2006 - 2007. The total cost of this subproject is estimated at US$ 13 million. ADB will finance the design, civil works and supply of equipment. A support component has also been provided to assist the NTDC with various aspects of project preparation and implementation.

3. The Project involves the construction of new 220 kV Chakdara Grid Station and about 85 km 220 kV transmission line. Surveys and Investigation (S&I) department of NTDC has conducted initial survey of the line route and tentative marking has been done on GT Sheets and Google Earth. The detailed designs of subproject will be prepared by Project Preparatory and Technical Assistance (PPTA) Consultants. Hiring process of these consultants has already been initiated by NTDC.

4. The environmental assessment requirements of the GoP for power transmission projects are different to those of ADB. The environmental regulations of the GoP categorize development projects into two schedules according to their anticipated potential environmental impact. For the projects that have more adverse environmental impacts (Schedule-II of PEPA, 1997), the proponents are required to submit an Environmental Impact Assessment (EIA). While, for the projects having less environmental impacts (Schedule-I of PEPA, 1997), the proponents have to submit Initial Environmental Examination (IEE) with respective Environmental Protection Agency (EPA). For power transmission projects of higher than 11 kV, GoP demands EIA while ADB requires IEE.

5. This IEE has been prepared by Individual Consultant hired by NTDC and ADB. The objective of IEE preparation at this stage is to fulfill the requirements of Project Financing Report (PFR) of Tranche-IV to be submitted to ADB by NTDC. The detailed EIA for EPA approvals and site specific EMPs will be prepared by PPTA consultants when detailed design and physical marking on site will be available.

1.2 Background

6. The conditions of the power transmission system in Pakistan are inadequate to meet rapidly growing demand for electrical power. This situation limits national development and economic growth. To cope with the constraints, the existing power transmission infrastructure has to be improved and upgraded. The overall contribution of power infrastructure also requires institutional arrangements and capacity building that support the strategic management of the sector and planning and management of investments. Overall, the proposed PTE-MFF facility has been designed to address the both investment and institutional aspects in the electrical power sector.

7. The Tranche IV subprojects can be broadly separated into two groups; (i) the subprojects involving improvement of facilities and equipment within existing grid station boundaries and should not require any land acquisition, (ii) construction of new transmission lines and new grid stations of 220 kV and 500 kV. Chakdara subproject falls in the group of projects that involve construction of new 220 kV grid station and allied transmission line. Environmental impacts from this grid station and transmission line are potentially significant, although not insurmountable, and no private land will need to be acquired permanently but the crops and tree removal could possibly be involved for transmission line component. While for grid station, the identified site falls in the land owned by NTDC.

8. The GoP has requested the Asian Development Bank (ADB) to provide finance for the Chakdarra subproject, to help fulfill the overall objective of the MFF to encourage economic growth and improve transmission efficiency by creating a series of national improvements. The improved transmission efficiency will contribute to expansion of economic opportunities by improving capacity and efficiency in Peshawar Electric Supply Company (PESCO) region of KPK Province.

1.3 Scope of the IEE Study and Personnel

9. This subproject will involve construction of New 220 kV Chakdara Grid Station and about 85 km 220 kV transmission line. This IEE study has included field reconnaissance of the whole transmission line route and grid station site.

10. The Study Area included the site of grid station and transmission line corridor within the RoW (15m either side of transmission line) and the whole area on both sides of the transmission line including all irrigation facilities, water supply, habitable structures, schools, health facilities, hospitals, religious places and sites of heritage or archaeological importance and critical areas (if any) within 100m of the transmission line alignment and grid station site.

11. The field studies were undertaken by a team with experience of environmental assessment for power projects in Pakistan. Mr. Shabir Ahmad Khan and Malik Muzaffar conducted the preliminary scoping, survey and assessment activities and coordinated the field sampling and analysis. Mr. Shabir was also responsible to supervise collection of information and co-ordinate the various public consultation activities. The Environment and Social Impact Cell (ESIC) provided all logistic arrangements and guidance with regards to the essential detailed assessments of design, construction, operational and decommissioning impacts, noise, air quality and waste disposal. The environmental team also benefited from technical support and other important information on the impacts of the proposed power works provided by S&I department of NTDC and from PC-I prepared by Planning Department of NTDC.

12. The study process began with scoping and field reconnaissance during which a Rapid Environmental Assessment was carried out to establish the potential impacts and categorization of project activities. The environmental impacts and concerns requiring further study in the environmental assessment were then identified. The methodology of the IEE study was then elaborated in order to address all interests. Subsequently, both primary and secondary baseline environmental data was collected from the proposed works and the intensity and likely location of impacts were identified with relation to the sensitive receivers; based on the work expected to be carried out. The significance of impacts from the power transmission work was then assessed and, for those impacts requiring mitigation, measures were proposed to reduce impacts to within acceptable limits.

13. Public consultation (PC) was carried out in January 2014 in line with ADB guidelines. Under ADB requirements the environmental assessment process must also include meaningful public consultation during the completion of the draft IEE. In this IEE, the PC process included verbal disclosure of the sub-project works as a vehicle for discussion. Interviews were conducted with local families and communities and line departments along the transmission line alignment. Written records of the responses have been passed to the Project Proponent, NTDC. The responses from respondents have been included in this IEE.

2. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

14. Direct legislation on environmental protection is contained in several statutes, namely the Pakistan Environmental Protection Act (1997) the Forest Act (1927) the Punjab Wildlife Act (1974). In addition the Land Acquisition Act (1894) also provides powers in respect of land acquisition for public purposes. There are also several other items of legislation and regulations which have an indirect bearing on the subproject or general environmental measures.

2.1 Statutory Framework

15. The Constitution of Pakistan distributes legislative powers between the federal and the provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal List covers the subjects over which the federal government has exclusive legislative power, while the Concurrent List contains subjects regarding which both the federal and provincial governments can enact laws. "Environmental pollution and ecology" is included in the concurrent list, hence both the federal and the provincial governments can enact laws on this subject. However, to date, after 18th Constitutional Amendment, federal ministry of Environment has been dissolved and the provincial governments are authorized to formulate environmental laws and regulations. The key environmental laws affecting this subproject are discussed below.

2.1.1 Pakistan Environmental Protection Act, 1997

16. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed subproject relate to the requirement for an Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for development subprojects. Section 12(1) requires that: "No proponent of a subproject shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination [IEE] or, where the subproject is likely to cause an adverse environmental effect, an Environmental Impact Assessment [EIA], and has obtained from the Federal Agency approval in respect thereof." The Pakistan Environmental Protection Agency has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies, in this case the KPK EPA.

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

17. The Pakistan Environmental Protection Act, 1997 (PEPA, 1997) provides for two types of environmental assessments: Initial Environmental Examinations (IEE) and Environment Impact Assessments (EIA). EIAs are carried out for subprojects that have potentially 'significant' environmental impacts, whereas IEEs are conducted for relatively smaller subprojects with a relatively less significant impact. The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (the 'Regulations'), prepared by the Pak-EPA under the powers conferred upon it by the PEPA, categorizes subprojects for IEE and EIA. Schedules I and II, attached to the Regulations, list the subprojects that require IEE and EIA, respectively.

18. The Regulations also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

(i) A subproject is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.

(ii) An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.

(iii) The EIA or IEE is submitted to the concerned provincial EPA if it is located in the provinces or the Pak-EPA if it is located in Islamabad and federally administrated areas. The Fee (depending on the cost of the subproject and the type of the report) is submitted along with the document.

(iv) The IEE/EIA is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.

(v) The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.

(vi) The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.

(vii) Then the EPA accords their approval subject to certain conditions:

(viii) Before commencing construction of the subproject, the proponent is required to submit an undertaking accepting the conditions.

(ix) Before commencing operation of the subproject, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.

(x) An EMP is to be submitted with a request for obtaining confirmation of compliance.

(xi) The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.

(xii) The IEE/EIA approval is valid for three years from the date of accord.

(xiii) A monitoring report is to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operation.

19. Distribution lines and grid substations of 11 kV and above are included under energy subprojects in Schedule II, under which rules EIA is required by GoP. Initial Environmental Examination (IEE) is required for distribution lines and grid stations less than 11 kV and large distribution subprojects (Schedule I). A review of the need for EIA/ IEE submission is therefore required by the relevant EPA, in this case the KPK Environmental Protection Agency (EPA) as the proposed subproject will be located in KPK.

20. There are no formal provisions for the environmental assessment of expanding existing distribution lines and grid substations but the KPK EPA has requested disclosure of the scope and extent of each subproject in order that their Director General can determine if additional land is required and the need for statutory environmental assessment. The details of this subproject will be forwarded to the KPK EPA, in order to commence the local statutory environmental assessment process.

2.1.3 National Environmental Quality Standards (NEQS)

21. The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in 1995 and 2000. The following standards that are specified in the NEQS may be relevant to the Tranche this subproject of Tranche-IV:

22. 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).

23. Maximum allowable concentration of pollutants (2 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.

2.1.4 Other Relevant Laws

24. There are a number of other federal and provincial laws that are important in the context of environmental management. The main laws potentially affecting subprojects in this MFF are listed below.

25. The Punjab Wildlife Protection Ordinance, 1972; empowers the government to declare certain areas reserved for the protection of wildlife and control activities within in these areas. It also provides protection to endangered species of wildlife. As no activities are planned in these areas, no provision of this law is applicable to the proposed subproject.

26. The Forestry Act, 1927; empowers the government to declare certain areas reserved forest. As no reserved forest exists in the vicinity of the proposed subproject, this law will not affect to the proposed subproject.

27. The Antiquities Act of 1975; ensures the protection of Pakistan's cultural resources. The Act defines 'antiquities' as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, Government of Pakistan, any archaeological discovery made during the course of the subproject.

28. Safety Regulations; mainly three laws and regulations viz. (i) PEPA Laws, 2000, (ii) Labor Laws, and (iii) Electricity Rules, 1937 directly or indirectly govern the occupational health and safety issues during the currently studied production activities.

2.2 Structure of Report

29. This IEE reviews information on existing environmental attributes of the Study Area. Geological, hydrological and ecological features, air quality, noise, water quality, soils, social and economic aspects and cultural resources are included. The report predicts the probable impacts on the environment due to the proposed subproject. This IEE also proposes various environmental management measures. Details of all background environmental quality, environmental impact/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided in this report. References are presented as footnotes throughout the text. Following this introduction the report follows ADB guidelines and includes:

- Executive Summary
- Policy, Legal and Administrative Framework
- Description of the Subproject
- Description of Environmental and Social Baseline Conditions
- Assessment of Environmental Impacts and Mitigation Measures
- Analysis of Alternatives
- Information Disclosure, Public Consultation and Participation
- Environmental Management and Monitoring Plan
- Conclusion and Recommendation

3. DESCRIPTION OF THE PROJECT

3.1 Type of Project

30. The subproject has two components the grid station and transmission line. The 220 kV grid station and transmission line (total 85 km) will be located in KPK Province. The grid station will have equipment including 220 kV substation with 3*250 MVA Transformers. There will be 85 km 220 kV D/C transmission line on twin bundle Rail conductor for In/Out of existing 220 kV Shahibagh-Mardan. This line will involve the installation of 238 towers, i.e. each tower at distance of 357 m as reported by Surveys & Investigation Department of NTDC.

3.2 Categorization of the Project

31. Categorization is based on the environmentally most sensitive component of a subproject. The aspects of the subproject with potential for significant environmental impacts need to be assessed in detail and this environmental assessment has therefore focused on the significant impacts possible from the construction activities of the subproject.

32. The grid station site is located on barren land owned by NTDC. It is situated about 15 km South-West to Chakdara City along the National Highway (N-45). In addition to the construction of new Grid station, installation of transmission line passes through 50 villages belonging to four Tehsils, fall in the jurisdiction of three districts named as Malakand, Mardan and Charsadda of the KPK province. There will be installation of 238 towers, i.e. each tower at distance of 357 m as reported by Survey & Investigation Section of NTDC. There will be no major environmentally significant impact. There is no water body in the vicinity of grid station and transmission line route. There will be no major disturbance to environmental settings of the area, if routine environmental management procedures and engineering controls are implemented thoroughly.

33. Categorization is based on the most environmentally sensitive component and the Chakdarra subproject is categorized as a Category “B” sub-project under ADB’s requirements and this IEE report is based on that assumption.

34. The aspects of the project with potential for significant environmental impacts need to be assessed in detail and environmental assessment has therefore focused on significant impacts from the construction aspects as well as consultation with the public all along the proposed alignment of the transmission line and grid station. This report has also surveyed the transmission line corridor and immediate hinterland that may be affected by knock on effects from impacts such as waste disposal.

3.3 Need for the Project

35. The conditions of the power distribution system in Pakistan are inadequate to meet rapidly growing demand for electrical power. This situation limits national development and economic growth. Electricity demand is expected to grow by 7.80% per annum during next 10 years over the period 2009-19. The existing power distribution infrastructure has to be improved and upgraded to ensure a reliable power supply to increasing number of industrial, agricultural, commercial, and domestic consumers. The overall contribution of power infrastructure also requires institutional arrangements and capacity that support strategic management of the sector, and planning and management of investments. Overall the proposed MFF facility has been designed to address both investment and institutional aspects in the electrical power sector.

36. As the result of this, enhancement in capacity of NTDC transmission system is required for power evacuation. The proposed project has therefore been prepared to meet the requirement which will also result in overall power efficiency and stability to deliver adequate & quality power to the consumers.

37. Main objective of project is to enhance the transmission capacity of NTDC system by addition of new 220 kV Chakdara Substation along with its allied transmission lines to meet the growing power demand of DISCOs, particularly PESCO.

- This improvement in system will help to bridge the demand supply gap to eliminate the sever load shedding of the country.

- Improvement and enhancement in overall power system efficiency, reliability and power supply position in PESCO area, particularly in the vicinity of Malakand, Charsadda and Mardan.

- Improvement in voltage profile of 132 kV Grid stations in PESCO area.

3.4 Location and Scale of Project

38. At present, sever load shedding is being faced in the country due to power shortage/demand supply gap. In this situation, the bulk Power generation is required to be added in the system to overcome the problem. In this regards, the power supply of national grid system of country will be improved by the proposed grid station and allied transmission line subproject of Tranche-IV.

39. The new 220 kV Chakdara grid station site is located on barren land owned by NTDC. It is situated about 15 km South-West to Chakdara City along the National Highway (N-45). In addition to the construction of new Grid station, the route of transmission line passes through 50 villages belonging to four Tehsils, fall in the jurisdiction of three districts named as Malakand, Mardan and Charsadda of the KPK province. The scope of work of this project includes;

i) A 220 kV substation with two 220/132 kV, 250 MVA transformers with allied equipment and accessories.
ii) 220 kV D/C transmission line on twin bundle Rail conductor for In/Out of existing 220 kV Shahibagh-Mardan S/C at 220 kV Chakdara (85 km) along with two 220 kV line bays at proposed 220 kV substation Chakdara for said in/out arrangement.

40. Depending upon the type of tower and subsoil condition, the tower footings have variable dimensions. However a minimum of 150 m^2 working area is required for the excavation of normal foundations and upwards of 250 m^2 for the larger angle towers. The depth of excavation for the normal foundation varies from about 3 to 4 m. The excavation for tower footing is carried out either manually or by mechanical excavator as per site requirements. In rocky areas, some controlled blasting can also be involved but there should be no rock encountered in the Chakdara subproject area.

41. After fixing steel reinforcements concreting the piles, the necessary excavation 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 0.15 m for normal foundations and about 1.8 m for pile foundations.

42. Tower erection is carried out on the concreted pile pad locations with the help of derrick poles or cranes. The required working area for this activity is about 500 m^2 for

each tower. The tower is erected in panels. The panels are 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.

43. In aligning the high-voltage transmission line the design aims to avoid cultivated fields and pass through the area as thinly populated as possible. As such, the accessibility will not be a problem. There are tracks and katcha ways and the contractor may have to develop a few tracks for transporting the materials. This should result in very little, if any, damage to the vegetation or disruption of the farmland in the vicinity of the route of transmission line. The grid station site is easily accessible by N-45. Since, the route of the proposed transmission line is along the roads, therefore, it is approachable through metalled road. Almost all the village tracks are linked to the metalled roads and are thus accessible though vehicles. The contractor is unlikely to need to transport the materials manually. In any event care will be taken that the disruption to the vegetation is kept to a minimum.

44. The environmental impacts are likely to be localized near the supporting tower construction at most places and impacts are reviewed in the environmental impact section of the report. The impacts will need to be reviewed and amended if necessary if the locations change and when the detailed designs are available.

45. As evident from **Fig.3.1**, the 220 kV Chakdara grid station is located on barren land along the N-45 Road, while the transmission lines route passes from private agriculture lands of three districts i.e. Malakand, Charsadda and Mardan of KPK.

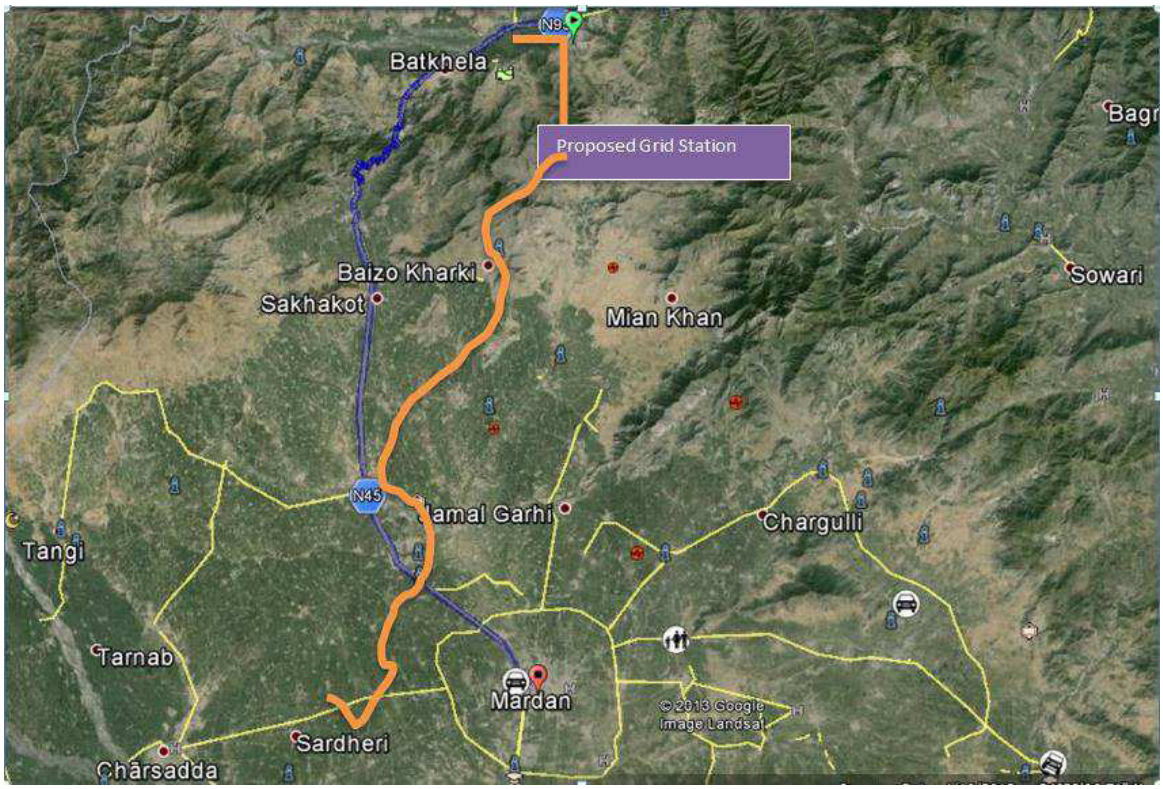

Fig 3.1: Google Image of 220 kV Chakdara Grid Station and 220 kV Allied Transmission Line, KPK Province

3.5 Analysis of Alternatives

46. The subprojects of Tranche-IV of MFF will contribute to the improvement of the overall performance of the power transmission sector, improving transmission efficiency, broadly widening access to power to drive economic opportunities. The beneficiaries of the subproject will be people, companies, and government and non-government agencies in Pakistan that use power transmission services. Power users will benefit in terms of secure power and improved power safety and potentially increased productivity.

3.5.1 Do Nothing Scenario

47. Based on the available information, the predictions have indicated that without the tranche-IV power transmission subprojects, the supply will not be reliable. This subproject is a part of an overall strategic improvement to the system.

48. In the absence of the subproject, the potential for interruptions to power supply will increase and socio-economic development of the province could be affected in the short to medium term. In an un-enhanced state, the wear and tear on existing facilities will rise. In the short term, the power supply would improve and more reliable access to secure power would be available.

3.5.2 Alternative Construction Methods

49. The feasibility and constructability of the transmission line towers is well established locally and installation of equipment is well practiced in the international context (even if some types of equipment are new to Pakistan). The process basically includes the transportation of equipment to site and the assembly of pre-fabricated units in-situ. Thus, the impacts from construction activities are very manageable from the environmental viewpoint.

3.5.3 Alternative Geometry

50. The grid station site is located on NTDC owned semi barren land. The design and route of transmission line is as short as it can be and avoids the local villages by erecting angle towers. This lines route is total 85 km and the settlements have been avoided by passing the line through private barren and agriculture land. Some further detailed surveys may be carried out for the detailed design to determine the exact construction methods and locations but no land acquisition is envisaged to be involved in this subproject from private peoples.

51. The present assumption is that the grid station site and transmission line will be completed as planned on the defined alignment and site. The detailed design and surveys are yet to be carried out.

3.6 Proposed Schedule for Implementation

52. The Project Proponent (NTDC) plans to have the tranche-IV completed by mid to late 2017. The details for the implementation of the 12 subprojects are in development. There will not be any significant land acquisition or compensation process except for the crop compensation of the transmission line towers. Designs, power transmission arrangements, access, review of environmental management and construction processes will need to be completed in say about three months. When the detailed designs are completed, tendering and award of contract will take place over about three to six months. The construction period will follow and best estimates indicate about eighteen months to two years.

3.7 Construction Material

53. The materials used for the construction of transmission line include cement, coarse aggregates, fine aggregates (sand) and steel. No borrow of earth material is expected in the Project. Tentative quantities of various materials required for each tower are provided in Table below.

Estimated Construction Materials for Single Tower

Sr. No.	Type of Material	Quantity/ Tower	Source
Local Materials			
1.	Cement	300 bags	From nearest local market
2.	Sand	20 cu.m	River beds
3.	Crush	30 cu.m	Nearest Crushing Plant
4.	Steel	1200 kg	-
Imported Materials			
1.	Steel Towers	12 tons	Imported and Shifted from Karachi Port to Site Stores. In case of domestic goods, shifted from the manufacturer's to work sites.
2.	Conductor and OPGW*	3800 kg	
3.	Hardware	200 kg	
4.	Insulator	750 kg	

** Optical Fiber Ground Wire.*

4. DESCRIPTION OF ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 Project Area

4.1.1 General Characteristics of Project Area

55. The grid station is located on barren land owned by NTDC along the N-45 Road about 15 km South-West to Chakdara City and transmission lines route (85 km) will pass through privately owned agriculture land of three districts named as Malakand, Mardan and Charsadda of the KPK province.

56. It has been endeavored by Surveys and Investigation (S&I) department of NTDC that the route should be selected in a way that no structure would require relocation or demolishing. Only tree removal and crop damages will occur during construction phase of project. The grid station site is on barren land and has only some tress. The transmission line will cross agriculture land and hence the impact on crops or trees is obvious. By using angle towers and by locating the line, as per alignment provided by NTDC, on the agriculture fields there are no locations where the line is immediately adjacent to any residential or school property (Sensitive Receptor).

57. Erection of each tower may require working room up to 500 m^2, however, there is plenty of room in the agriculture fields. The land acquisition will not be involved in this project, but the trees and crops will be affected. Access to the transmission line will be from the tracks and katcha roads adjacent to the site. There should be no need to disturb any existing roads and water courses, based on the current alignment subject to reconfirmation after detailed designs are complete.

4.1.2 Affected Administrative Units

58. The grid station site is located on barren land owned by NTDC. It is situated about 15 km South-West to Chakdara City along the National Highway (N-45), district Malakand. In addition to the construction of new Grid station, route of transmission line passes through 50 villages belonging to four Tehsils, fall in the jurisdiction of three districts named as Malakand, Mardan and Charsadda of the KPK province. The administrative units of these three districts are likely to be affected by implementation of this subproject of ADB Tranche-IV.

59. For the purpose of this study, the Chakdara subproject has been assumed to affect all the adjacent local authorities (irrigation department, C&W department. Forest department etc.) and interviews have been conducted with the public from all along the line corridor.

4.2 Physical Resources

4.2.1 Topography, Geography, Geology, and Soils

60. The project area is almost mountainous and about 15 km South-West to Chakdara City along the N-45 Road. The transmission line route will pass through three districts of KPK province i.e. Malakand, Charsadda and Mardan.

61. Malakand district is surrounded by high mountains rich with mineral resources. Deposits of chromite iron, china clay and fuller earth have been found in Malakand. The

soil of Malakand is loamy and moist, and is irrigated by the Swat River which flows from Swat, through Kohistan and joins the river Kabul near Peshawar.

62. Mardan district may broadly be divided into two parts, north eastern hilly area and south western plain. The entire northern side of the district is bounded by the hills in the district. The highest points in these hills are Pajja or Sakra, 2056 meters high and Garo or Pato, 1816 meters high. The south western half of the district is mostly composed of fertile plain with low hills strewn across it. This plain once formed the bed of a lake which was gradually filled up by the load of the river flowing into the area from the surrounding hills. From the foot hills the plain runs down at first with a steep slope which carried the rain water to the lower levels and ultimately to the Kabul river.

63. Charsadda district lies in the central plain of Peshawar Valley. The Kabul River enters at a point near the south west of the district. It flows along the southern boundary of the district, and crosses the district in the extreme south eastern corner. The Swat (Abazai) river is an important tributary of the Kabul river. It enters the district near Adazai village and flows in the south-eastern direction till it joins the Kabul river. The last section of Kabul river, below the point all its tributaries join it, is locally known as Landai river. The plain areas of the district include Doaba Plain, lying between Swat and Kabul rivers, Hashtnagar in the central and south-eastern parts, and Mohmand and Muhammadzai plains in the north and north-east. The Charsadda Plain itself consists of fine alluvial deposits, the composition and depth of which varies in different localities and different distances from the surface. In most parts of the plain, the soil is light and porous and contains more or less sand in depth of one to six meters. Below this lies the sandy mixture of clay, often combined with beds of nodular lime stone followed by gravel and sand. The plain of Charsadda district is very fertile.

64. The soils and subsoil conditions beneath the alignment have not been investigated in detail. However the proponent's previous experience of construction of foundation pads and piles for tower construction in the surrounding areas indicates that there should not be any constraints to construction due to poor or rocky soil conditions.

4.2.2 Climate, Temperature and Rainfall

65. The climate of Malakand is extreme to moderate. The temperature reaches its maximum up to 40^{o}C in June. The rainfall mostly occurs in July to August (186mm) and minimum rainfall occurs in November (8mm). The average rainfall is not enough, therefore the soil requires artificial irrigation.

66. The summer season in Mardan is extremely hot. A steep rise of temperature observed from May to June, August and September record quite high temperatures. During May and June dust storms are frequent. The temperature reaches its maximum in June (i.e. 41.5^{O}C). Due to intensive cultivation and artificial irrigation the tract is humid and the heat is oppressive. However, there is a rapid fall of temperature from October onwards. The coldest months are December and January. The mean minimum temperature recorded for January is 2.0^{o}C. Most of the rainfall occurs in the month of July, August, December and January. Maximum rainfall recorded for August (the rainiest month) is 125.85mm. Towards the end of cold weather there are occasional thunder storms and hail storms. The relative humidity is quite high throughout the year, the maximum recorded for December is 73.33 percent.

67. The climate of Charsadda is extreme. The summer season persists from May to September. June is extremely hot and dry when the temperature rises to over 40 degrees centigrade. July to September are the monsoon months. July and August are hot and humid. Humidity is maximum during August. After mid- November it is cool and

pleasant. From December to mid-February it is cold. The mean minimum temperature recorded for January is 4.7°C. There are two spells of rainy season in a year. The winter rainfall, due to western disturbances, is high during the months of March and April (the mean for March being 78.4mm). The highest summer rainfall is in the month of August, with a mean of 67.7mm. The average winter rainfall is higher than that of summer.

4.2.3 Groundwater and Water Supply

68. The strata near the Chakdara project are water bearing rocks and alluvial deposits, giving good groundwater potential throughout the project area and the water table is near the surface in plains. The depth to groundwater along the Kabul and Indus rivers and in canal irrigated areas in western part is generally less than 10 m while it is more than 30 m for areas at higher elevations. The water table in these districts rises during rainy season (July and August) and declines during dry season (October to December) when the groundwater abstraction is higher.

69. As per the 1998 Housing Census for Mardan, the facility of drinking water inside the house is available to about 79% of the housing units, while 21% use outside source as drinking water. In Charsadda, 15% of Housing Units are using piped water, majority of which have this facility within their house. The majority is using hand pumps for potable water, but their share is less than 18%. More than 62% households are using potable water taken from wells.

4.2.4 Surface Water

70. River Kabul and Swat are the major surface water source of project tract. These are perennial water bodies and flow throughout the year. These also cause floods in the monsoon season, when it receives excessive rainfall water from upstream.

71. Streams in Mardan flow from north to the south. Most of the streams drain into Kabul river. Kalpani, an important stream of the district rises in the Baizai and flowing southwards join Kabul river. Other important streams which join Kalapani are Baghiari Khawar on the west and Muqam Khawar, coming from Sudham valley and Naranji Khawar from the Naragi hills on the east.

72. Charsadda has an unusual feature of three main rivers flowing through its terrain. This is the reason that Charsadda was always very fertile even before the introduction of the irrigation system. Of the three main rivers, River Kabul forms the boundary between Peshawar and Charsadda. After entering the Peshawar valley near Warsak, the Kabul river divides into many branches all of which flow in Peshawar district, except its main tributary. All these tributaries (namely Budhanai, Shah Alam and then the main river Kabul) are crossed while coming from Peshawar to Charsadda by road.

73. The second major river in the area is the River Khiali. This is one of the branches of river Swat. The river Swat after traveling in the hills of swat and Mlakand Agency enters the plains near Munda. It enters Charsadda and after traveling for some distance bifurcates into river Khiali and Jindi. Both these rivers fall into river Kabul near Jungle and Chak Nisata respectively. After Nisata, there is one mighty river Kabul commonly known as Landai.

74. The main source of irrigation is canals. The Upper Swat canal irrigates most of Mardan district, and the lower Swat canal irrigates south-western part of the district. Besides, irrigation is done by tube-wells and lift irrigation. The other main canals include the Doaba canal, and the Sardar Garhi canal.

75. The Charsadda District has a very extensive irrigation system. Excavation at the present sites of the canal revealed an irrigation system as old as 2000 years. This indicates the fertile nature of the region. About eighty per cent of the area is canal fed.

4.2.5 Air Quality

76. Air quality in most of the project area appears good based on observation during the study period. Emissions should be controlled at source under the EMP. There will be a few items of powered mechanical equipment to be used in the construction of the transmission line works that may give rise to complaints of dust and other emissions; however, these should be minor and easily dissipated. Domestic sources of air pollution, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households, are minor.

77. The project area is distant from major sources of air pollution like industries or urban type traffic, domestic sources such as burning of wood and kerosene stoves, etc. or fugitive sources such as burning of solid wastes. Air quality in the project area appeared very good during the study period. The vehicular traffic is the primary source of air pollution in project corridor.

78. There should be no source of atmospheric pollution from the subproject. In the operational phase the industrial facilities with fuel powered mechanical equipment will be the main polluters. All such emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the project.

79. The other major source of air pollution is dust arising from construction and other ground or soil disturbance, during dry weather, and from movement of vehicles on poorly surfaced or damaged access roads. It has been observed that dust levels from vehicles may even be high enough to obscure vision significantly temporarily.

4.2.6 Noise

80. Noise from vehicles and other powered mechanical equipment (electric generator etc.) is intermittent. There are also the occasional calls to prayer from loud speakers in the local mosques but there are no significant disturbances to the quiet rural setting. However, the construction of proposed transmission line will use powered mechanical equipment, bulldozers, cranes etc. Digital Sound Level Meter Model AR-824 was used to monitor the noise levels. But the monitored values did not exceed 65 dB (A) during day time at various locations along the route.

4.3 Biological Resources

4.3.1 Wildlife, Fisheries and Aquatic Biology

81. The wildlife of these three districts (Malakand, Mardan and Charsadda) includes fox, pig, jackal and wild cat. Among common species of birds found in the district are pigeon, dove, tlliar, lalmena, bias, parrot, quail pechard, pintail, mallara, teal, and stark.

82. Commercial capture fisheries do not operate in the area. No data were available for fish production from the rivers but recreational fishing for local home supply, and for selling takes place in the project area. Among the fish, Mahasher & Rahu are favorites due to their taste. There are abundant fish in Kabul River.

83. The project tract has a variety of wild fauna, including Leopard, Leopard Cat, Black Bear, Brown Monkey, Jackal, and Pheasant.

84. Domestic livestock include buffalo, cattle, goats and sheep. Donkeys are kept to pull carts in the area. Livestock are mainly farm fed. Goats and sheep herds may be raised by feeding on wastelands in the districts.

4.3.2 Terrestrial Habitats, Forests and Protected Species

Vegetation cover and trees

85. The present flora of the irrigated areas is exotic. The common trees are mesquite, ber, Poplar, Eucalyptus, Willow, Shisham, Mulberry and different species of acacia. The most common shrubs are Tamarix articulata, spands, akk, small red poppy, spera, pueghambrigul, drab grass, spera, eamelthorl and phulai, and chaulai etc. Orchards and home gardens with fruit trees of citrus, guava, water melon, musk melon, pear, persimmon, and loquat are common in the area.

86. There are plenty of trees in the areas near the works but natural forest cover in the project area has been significantly reduced in the past.

Protected and Religious Trees

87. There is no protected forest near the areas of works. LARP for the sub project has been prepared which made provision for compensation for concerned departments and private owners if needed, after detailed study. Fruit and wood trees will be compensated according to entitlements as specified in the LARP. NTDC is responsible for re-plantation of these trees and 3:1 is recommended. The works must deal with trees that need to be lopped or removed for safety reasons with the necessary permissions.

4.3.3 Protected areas / National Sanctuaries

88. In Pakistan there are several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. There is no protected area or national sanctuary near the area of works and subproject area.

4.4 Economic Development

4.4.1 Agriculture, Livestock and Industries

89. Majority of the population of the district is linked with Agriculture, followed by fishery. The majority of the urban population is associated with construction industries, wholesale, shops and market sales, retail trade, restaurants and hotels industries etc.

90. Livestock breading is one of the main pursuits and means of livelihood of rural and urban population of the whole project area. The buffalo, sheep, goats and cows are common livestock animals and serve as an important source of income.

91. Roads are the means of transportation for the movement of people and goods in all the three districts and connect this area with other parts of the country. These districts are connected with Peshawar and Islamabad with main highways including N-45, GT Road (N-5) and Motorway (M-1). International and countrywide postal and telecommunication facilities are easily available in the city and project area.

92. Mardan is rich in sugar cane, tobacco, poplar and shisham wood. There is a lot of industrial activity for the production of sugar and manufacturing of cigarettes. In 1997-98 there are 77 industrial units of sugar, tobacco, match, furniture, marble, flour mills, steel industries, aluminum goods and handicrafts etc. A small industrial estate has been

established wherein a total of 66 factories were established out of which 36 are operating while the rest have been closed. In Mardan, commercial deposits of Marble, Limestone, Dolomite and Granite exist. Veins of a good quality of Topaz, being a valuable gemstone have been found in the hillocks of Shaheed Ghundai and Shamozai Katlang, Mardan. Nominal scattered deposits of Fuller Earth have also been prospected near the Indus river bank of Jehangira Swabi road. The different kinds of activities regarding prospecting mining and transportation of various major minerals are controlled in KPK, under the KPK Mining Concession Rules, 1976.

93. In Charsadda, despite its good communication system, and its vicinity to major towns like Peshawar and Mardan as well as to Tribal Areas, industry could not flourish here. The only industry present here is Charsadda Sugar and Paper Mill and a few flour mills. This phenomenon may be due to many facts. It could be the absence of an industrial zone, absence of industrial infrastructure, absence of markets for the finished goods, absence of capital and last but not the least the temperament of the people. Still the region can boost of certain cottage industries established on strong footings in the area. Beside sugar and paper, Charsadda has developed a good industry in chappal (foot wear) making and local made coarse cloth known as Khamta (Khadar). These items are very popular throughout the country. Traders of other cities purchase shoes/chappals and Khamta cloth from here.

4.4.2 Energy Sources

94. The electricity supply is available to almost all the villages and settlements in the vicinity of project area. PESCO is responsible for electricity distribution in project area. Gas supply is available in towns, while in settlements and villages, wood is used for cooking purposes. But a very small proportion in village also uses gas cylinders for household uses.

95. The biomass sourcing is concentrated on home garden production of fuel wood, the extraction of wood from forests, woodland, crop plantations and agricultural residues. The other significant energy sources in the area are kerosene and LPG.

4.5 Social and Cultural Resources

4.5.1 Population Communities and Employment

96. According to census 1998, the Malakand District has a population of 452291 persons with a growth rate of 3.36%. Number of males for every 100 females was 106.8 percent recorded in 1998 Census in Malakand district. The rural population is 90.45% and urban population is 9.55%. The population of the district Malakand is predominantly Muslims. The total area of the District is 952 sq. km with a Population Density of 475.1 persons per sq. km. Average household size was 9.1 persons.

97. The Population of Mardan was 1460100, with an average household size of 8.4 persons in 1998 (Census Report 1998) with a growth rate of 3.01 %. The population of the Mardan district is almost entirely Muslim who constitutes 99.51 of the total population. The main minorities are Ahmadis and Christians who are 0.32 and 0.14 percent respectively. Other minority is Hindu, who are 0.02 percent of the total population. The total area of the District is 1632 sq. km with a Population Density of 894.7 persons per sq. km. Average household size was 8.4 persons. The rural population is 79.78% and urban population is 17.47 %. Number of males for every 100 females was 106.6 percent.

98. The Charsadda District has a population of 1022364 persons with average annual growth rate of 2.88% in year 1998. Number of males for every 100 females was 107.9 percent recorded in 1998 Census in Charsadda district. The rural population is 81.14% and urban population is 18.86%. The population of the district Charsadda is predominantly Muslims. The total area of the District is 996 sq. km with a Population Density of 1026.5 persons per sq. km. Average household size was 8.0 persons.

99. The major proportion of total population is self-employed, others are private employees and government employees. The difference in proportions of employed population is significant between the genders and urban and rural residences. The major occupation in project area is agricultural farming, small businesses and service in public and private sectors.

100. The main occupation of women in rural areas is house-keeping which includes attending to the cattle, extracting butter and ghee from milk, weaving and sewing of family clothes. In addition they generally help their men-folk on farms with the lighter duties like transplanting of seedlings, threshing and winnowing of grains and sometimes they also help in harvesting. In city women are house-wives or work as professionals; such as doctors, nurses, teachers, private jobs etc.

4.5.2 Education and Literacy

101. The literacy rate of Malakand district is 39.50 % as per 1998 census report. The literacy rate for males is much higher (i.e. 55.21%) than the females (i.e. 22.74%).

102. Over the years, since independence, Mardan has had a high improvement in education and educational facilities, although the standards are fairly low in government funded schools, as compared with the rest of the country. The literacy rate of the district among the population aged 10 years and above is 49.95 percent. It has increased by 34% since 1981 when it was only 15.95 percent. The male literacy ratio is much higher at 60.50% compared to 35.38% for women. There are separate educational institutes for girls and boys, although there are many co-educational institutes for school going children.

103. The literacy ratio in Charsadda district has increased from 13.3 per cent in 1981, to 31.1 per cent in 1998. The literacy ratio for males is 46.9 per cent as against 14.1 per cent for females. The ratio is much higher in urban when compared with rural areas both for male and female. Of the educated persons 18.6 per cent were below primary, 27.4 per cent had passed primary, 19.1 per cent middle, 21.2 per cent matriculate, 7.7 per cent graduates, 1.8 per cent post graduates while 0.4 per cent were diploma/certificate holders. Regarding sex differential males were more educated and had higher education than females. In rural areas of the district there were around 7 thousand graduates while in urban areas hardly 3 to 4 thousand were found with graduate degree.

4.5.3 Cultural Heritage and Community Structure

104. There are no officially protected heritage sites or historic, religious or archaeologically important sites located in the subproject works areas. There are no major historic or archaeological features of note but there are a few places of worship within about 500 m of the works. It is expected that there will be no impact on such places.

105. Pushto is the most common language. Punjabi (in standard and Hindko dialect) and Gujri are also spoken by sizeable population of the project tract. Urdu being National language is also spoken and understood in all the three districts.

106. The principal tribes of these districts are Nipka Khel, Lali, Gujjar, Pathan, Mola Khel, Zaidsadri, Lohaar, Utman Khel, Molyan, Tarkhan, Miran, Kaka Khel, Khan Khel, Khanan, Khan, Kandi, Yousaf Zai, Daray Kando, Syed, Lohdi, Bajaur, Momand and Khatak.

5. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Subproject Location

5.1.1 Impact Assessment and Mitigation

107. This Tranche-IV subproject will involve the construction of 220 kV new Chakdarra grid station and about 85 km 220 kV transmission line for In/Out of 220 kV existing Shahi Bagh-Mardan. The grid station land is barren and almost clear from all type of structures and vegetation and is owned by NTDC. There are a few Sensitive Receivers (SR) including some houses, schools, Mudrassas, but are more than 500 m away from the line route. Various small water channels (Nullahs) and some access roads will need to be crossed by transmission line.

108. The location and scale of the works are very important in predicting the environmental impacts. Therefore, it is essential that a proper analysis is carried out during the subproject planning period. This process of impact prediction is the core of the IEE process and it is critical that the recommendations and mitigation measures are carried out according to, and with reference to the conditions on the ground in the affected areas in the spirit of the environmental assessments process. In this section the potential environmental impacts are reviewed. Where impacts are significant enough to exceed accepted environmental standards, mitigation is proposed in order to reduce residual impact to acceptable levels. In this regard, the impact prediction plays a vital role as these predictions are used for developing mitigation measures and any alternative options, if appropriate. When the detailed designs are completed, the impacts and mitigation measures will need to be further reviewed to take account of how the contracts are set up and in the light of any fine tuning of the subproject proposals.

109. The environmental management plan has been prepared based on the assessment and shall be reviewed in due course at subproject inception and through construction in order to provide a feedback on any significant unpredicted impacts. It is based on the analysis of impacts, primarily to document key environmental issues likely to arise from subproject implementation, to prescribe mitigation measures to be integrated in the subproject design, to design monitoring and evaluation schedules to be implemented during subproject construction and operation, and to estimate costs required for implementing subproject mitigation measures. The EMP must be reviewed in the subproject inception by the subproject management and approved before any construction activity is initiated, to take account of any subsequent changes and fine tuning of the proposals.

5.2 General Approach to Mitigation

110. Based on professional experience on heavy transmission line and grid station projects, contractors have put emphasis on the financial compensation for nuisances. This may be acceptable for some social impacts where evacuation is necessary or where structures have been accidentally damaged, however, it is not best international practice to accept payment for environmental impacts. An approach whereby the subproject contractor pays money for nuisances rather than control impacts at source will not be acceptable. This practice should not be allowed and financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance.

111. During the preparation for the subproject construction phase the future contractors must be notified and prepared to co-operate with the executing and

implementing agencies, subproject management, construction supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must be primed through bidding stages and the contract documentation to implement the EMP in full and be ready to engage or train staff in the management of environmental issues and to audit the effectiveness and review the mitigation measures as the subproject proceeds. The effective implementation of the EMP will be audited as part of the loan conditions and the executing agency (NTDC) must be prepared for this. In this regard, the NTDC must fulfill the requirements of the law and guidance prepared by Pak-EPA on the environmental aspects of power subprojects and the recommendations already made for subproject in this IEE and under Pakistan's PEPA 1997

112. The location of the residences, mosques, schools, hospitals and civic, cultural and other heritage sites has been reviewed. The line route and grid station site is clear from all type of permanent structures and hence no potential impacts in the construction stage from disturbance and significant noise and dust are envisaged. The line route was selected in way that minimum disturbance to human settlements occur and the alignment is along agriculture land and has no human settlements and structures in its ROW of 30 m.

113. The grid station construction activities will be within the boundary wall. Work on the tower sites could cause some generation of air borne dust, but any nuisance from this is likely to be very localized and temporary. Other project activities, e.g. movement of heavy vehicles on unpaved tracks during the works, could generate considerable dust. Water is available in the study area, although surplus water may not always be available to suppress dust at vulnerable locations in the dry season. Therefore, as a general approach it is recommended that where works are within 15m of any residential sensitive receivers, the contractor should install segregation between the works and the edge of the sensitive receivers. The segregation should be easily erectable 2.5 m high tarpaulin sheet and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base. These can be moved along from tower base to tower base as the work proceeds.

114. Noise from the construction of the towers should not be a major consideration unless very close to schools or hospitals where construction should be avoided at sensitive times. In addition to the physical effect of mitigating dust and noise with barriers installation of such measures should be discussed with the local population and serve as a vehicle for further public consultation at the implementation stage to assist in public relations.

5.2.1 Cultural Heritage, Mosques, Religious Sites, and Social Infrastructure

115. The location of mosques and other cultural and other heritage SR sites has been reviewed. There is no mosque, graveyard, tomb or any other religious/archaeological site in the ROW of transmission line, therefore, no impact on such site is expected.

116. The clinic / hospitals are all more than 100m from the edge of the Subproject and there will be sufficient buffer distance between the works and the SR such that no significant impact would be expected from the works.

117. The location of schools is more than 100m from the edge of the Subproject. There will be sufficient buffer distance between the works and all the SR such that no significant impacts can be expected. Public consultation should be undertaken at the implementation stage to ensure nuisances are not allowed to escalate.

5.3 Potential Environmental Impacts in Construction Phase

5.3.1 Encroachment, Landscape and Physical Disfiguration

118. Prior to the operation of Subproject, the transmission line towers will be constructed. The encroachment impacts of subproject will be confined to ROW and will be temporary. No significant additional landscape impacts can be expected from construction of the subproject. The grid station construction will not pose any encroachment, because it will be constructed in a boundary wall.

119. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction.

5.3.2 Cut and Fill and Waste Disposal

120. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. The Subproject work should not involve any significant cutting and filling but the excavations (down to 4m) and piling may be required to create the foundations for some towers (if required). It is envisaged (depending on the mode of contract) that the surface under the towers will need to be scrabbled to remove unstable materials, or to stockpile topsoil.

121. Mitigation measures must focus on the minimization of impacts. In order to allow the proper functioning of the settlement sites (access to villages) during construction, it is recommended that consideration be given to erect temporary hoardings immediately adjacent to the nearest houses and shops if they are within 15 m of the power distribution line tower construction.

122. If surplus materials arise from the removal of the existing surfaces from specific areas, these should be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside. Moreover, it will also save the cost of bringing the material from some other locations.

123. The subproject detailed designers have so far estimated that no substantial additional materials will be required subject to confirmation at the detailed design stage.

124. At this stage no areas require removal of woodland. However, if specimen trees of religious plantations are affected the owners should be given the resources and opportunity to reinstate the woodland long term and a plantation compensation plan should be drawn up to replant the woodland/trees. In the event that the land is not suitable for plantation then other areas should be identified to replace the cut trees and sufficient areas should be identified to allow plantation of trees at a rate of say 3:1. The replacement ratio should allow for a high mortality rate among the newly planted trees in the dry environment or otherwise as based on advice from the forest authority.

125. Contractual clauses should be included to require each contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to the local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance. Mitigation measures shall seek to control the impacts at source in the first place. The engineer shall be responsible to update the subproject cut and fill estimates and create Materials Master Plan to facilitate materials exchange between the

different contract areas along the power line and sub-contractors on the power line and to provide an overall balance for materials and minimize impacts on local resources.

5.3.3 Trees, Ecology and Protected Areas

126. There are no Reserved or Protected Forests or trees near the transmission line alignment. The proposed subproject of Tranche-IV will require the construction of grid station and installation of towers which will be installed on private agriculture land. The line route will be passing from orchards and agriculture land and hence tree removal is likely to occur. The details of wood and fruit trees present along the transmission line route are presented in Table 5.1.

Table 5.1: Number and Type of Trees along the Transmission Line Route

a. Wood/Timber Trees		
Type of Tree	**No.**	**Average Girth (Feet)**
District Malakand		**-**
Kikar	63	1-2
Shisham	12	1-2
Safaida	139	1-2
Sub Total	214	-
District Mardan		
Kikar	22	1-2
Shisham	63	2.0
Safaida	499	1-2
Popular	162	1-2
Sub Total	746	-
District Charsada		
Shisham	3	2
Safaida	7	1-2
Popular	5	1-2
Sub Total	15	-
Total	**975**	**-**
b. Fruit Trees		
Type of Tree	**No.**	**Average Age**
District Malakand		
Beri	14	10
Orange	95	10
Peach	53	12
Guava	15	10
Japani Fruit	11	13
Apricot	21	10
Sub Total	209	-
District Mardan		
Toot	9	10
Sub Total	9	-
Total	**218**	-

127. If for some unforeseen reason or change of alignment, any trees with religious significance or other trees need to be removed, written permission should be obtained from the forest authority and the owner after written justification by NTDC. Trees shall be planted to replace the lost trees with three trees planted to replace every cut tree (3:1) or more as agreed with the authority.

128. A requirement shall be inserted in the contracts that no trees are to be cut on the line route or outside, without the written permission from the supervising consultant who may permit the removal of trees if unavoidable on safety / technical / engineering grounds after written justification by NTDC and to the satisfaction of the forest authority and the owner.

5.3.4 Hydrology, Sedimentation, Soil Erosion

129. The drainage streams en-route of the subproject should not be impeded by the works. The route involves the crossing some small water channels (nullahs) and as such no impact on it is expected because their routes will not be changed.

5.3.5 Air Pollution from Earthworks and Transport

130. Field observations indicate that ambient air quality is generally acceptable and that emissions from powered mechanical equipment are rapidly dispersed. Earthworks will contribute to increasing dust, and the foundation earthworks will generate dust and the following mitigation measures are needed:

- Dust suppression shall be undertaken where towers are within 50m of houses.
- Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins.
- All vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the national vehicle regulations (NEQS).

131. The material (cement, sand and aggregate) requirements of a typical 220 kV grid station are large that of transmission line. In transmission line construction, sand and aggregate are delivered directly to the tower location from the quarry / source, there is no intermediate or bulk storage of these materials. The quantities of construction material required for a transmission tower are not so larger that they potentially represent a traffic hazard, these requirements are time and space dispersed in case of transmission lines. The contractor will be, however, required to provide a traffic management plan before commencement of work at site. For grid station construction purpose, the construction material will be stored in the boundary wall and no disturbance to surrounding areas is expected.

132. The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles (if required) should not be located within 50m of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.

5.3.6 Noise, Vibration and Blasting

133. It is anticipated that powered mechanical equipment and some local labor with hand tool methods will be used to construct the subproject works. No blasting is anticipated, because the site is located in semi hilly area. Powered mechanical equipment can generate significant noise and vibration. The cumulative effects from several machines can be significant. To minimize such impacts, the contractor for

subproject should be requested by the construction supervision consultants (engineer) to provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet EPA requirements.

134. Noise from construction of the power distribution lines and improvements to substations is not covered under any regulations, however, in order to keep in line with best international practice it is recommended that no construction should be allowed during nighttime (9 PM to 6 AM) and 80dB(A) Leq should be the criterion at other times during the day measured at the boundaries of land from which construction noise is emitted.

135. Vibration from construction of piles to support pads may be required for some tower construction and may be a significant impact but this should be of short duration. Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction. The physical effect of piling should be assessed prior to construction and measures should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. At nearby schools, the contractor shall discuss with the school principals the agreed time for operating these machines and completely avoid machine use near schools during examination times, if such a need arises.

5.3.7 Sanitation, Solid Waste Disposal, Communicable Diseases

136. The main issues of concern are uncontrolled or unmanaged disposal of solid and liquid wastes into watercourses and natural drains, improper disposal of storm water and black water and open defecation by construction workers.

137. In order to maintain proper sanitation around construction sites, access to the nearby lavatories should be allowed or provision of temporary toilets should be made. Construction worker camps will be necessary, based on the scale of the works needed. The construction camp should not be located in settlement areas or near sensitive water resources and portable lavatories or at least pit latrines should be provided.

5.3.8 Disease Vectors

138. Wherever water is allowed to accumulate, in temporary drainage facilities, due to improper storm water management, or improper disposal of wastewater generated from the site, it can offer a breeding site for mosquitoes and other insects. Vectors such as mosquitoes may be encountered if open water is allowed to accumulate at the construction camp site. Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.

5.4 Potential Environmental Impacts in Operation Stage

5.4.1 Air Pollution and Noise from the Enhanced Operations

139. The subproject works will involve the construction of a grid station and 85 km long heavy transmission line but no houses, mosques or schools will be close to the line in the operational phase. The operation of this subproject will not cause any air pollution or will not cause any boost in the ambient noise levels of project corridor. However, it is recommended that an acoustical check be made on the detailed design to determine if

any noise barriers are required. There should be no source of atmospheric pollution from the subproject. In the operational phase any nearby industrial facilities with fuel powered mechanical equipment will be the main polluters. All such emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the subproject.

140. There are not national noise standards in Pakistan for power distribution noise emissions that would apply in the operational stages. A criterion of 80 dB (A) Leq has been used for assessment in previous IEE studies. It is recommended that a check be made on the likely acoustical performance based on makers' specifications of the installed equipment at the detained design stage.

5.4.2 Pollution from Oily Run-Off, Fuel Spills and Dangerous Goods

141. Control measures for oily residues, lubricants and refueling are prescribed in the EMP. In the subproject maintenance yards will be created but these have no dedicated drainage which can capture run-off. Oily residues and fuel should be captured at source and refueling and maintenance should take place in dedicated areas away from surface water resources. No significant impacts should be allowed to arise, on this account, in the subproject area.

5.5 Enhancements

142. Environmental enhancements could be the major consideration in case of this subproject. It is noted that it is common practice at many such sites to create some local hard and soft landscaping and successful planting of fruit trees and shrubs has been accomplished in many sites. This practice should be encouraged as far as practicable. Other opportunities for enhancements can be assessed prior to construction and proposed enhancements should be discussed with the local population to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. Trees removed for construction purposes should be replaced as compensation in line with best practice at ratio of three replaced for one removed however additional trees should be planted as enhancements where there is space in the along the transmission line route and in the open spaces of grid station area.

6. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN

6.1 Environmental Management and Monitoring Plan

143. In this section, the mitigation measures that are required for the proposed subproject of Tranche-IV, to reduce residual impact to acceptable levels and achieve the expected outcomes of the subproject, are discussed. The Environmental Management Plan is based on the type, extent and duration of the identified environmental impacts for the new 220 kV Chakdara Grid Station and about 85 km 220 kV transmission line.

144. The Environmental Management Plan is based on the type, extent and duration of the identified environmental impacts. The EMP has been prepared by reference to and following the best practices and the ADB's Safeguards Policy Statement, 2009.

145. The EMP matrix is presented as **Appendix-I.** The impact prediction (Section 5) has played a vital role in reconfirming typical mitigation measures and in identifying some different approaches based on the feasibility and detailed design assumptions and any alternatives available at this stage.

146. Prior to implementation and construction of the enhancements the EMP shall be amended and reviewed by the NTDC in due course after detailed designs are completed. Such a review shall be based on reconfirmation and additional information on the assumptions made at the feasibility stage on alignment, location scale and expected operating conditions of the project. For example, in this case if there are any additional transmission line or alteration in the route to be included, the designs may be amended and then the performance and evaluation schedules to be implemented during project construction and operation can be updated, and costs estimates can be revised.

147. The EMP plan must be reviewed by the project management and approved by the EPAs before any construction activity is initiated. This is also an ADB requirement in order to take account of any sub-sequent changes and fine tuning of the proposals. It is recommended that before the works contract is worked out in detail and before pre-qualification a full extent of the environmental requirements of the project (IEE/EIA) are included in the bidding documents including the EMP. Past environmental performance of contractors and awareness of environmentally responsible procurement should also be used as indicators for prequalification of contractors.

148. In order to facilitate the implementation of the EMP, during the preparation for the construction phase, the future contractors must be prepared to co-operate with the local population in the mitigation of impacts. Furthermore, the contractor must be primed through the contract documentation and ready to implement all the mitigation measures and engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the EMP will be audited as part of the mid-term review of loan conditions and the executing agency must be prepared for this.

149. In the EMP Matrix, the impacts have been classified into those relevant to the design/preparation stage, construction stage and operation and maintenance stage. The matrix provides details of the mitigation measures recommended for each of the identified impacts, approximate location of the mitigation sites, time span of the implementation of mitigation measures, an analysis of the associated costs and the responsibility of the institution. The institutional responsibility has been specified for the purpose of the implementation and the supervision. The matrix is supplemented with a

monitoring plan (**Appendix-II**) for the performance indicators. An estimation of the associated costs for the monitoring is given with the plan including physical mitigation costs. The EMP has been prepared following the best practices and the ADB's Safeguards Policy Statement, 2009.

150. Prior to implementation of the subproject, the NTDC needs to comply with several environmental requirements, such as obtaining EPA clearance ("No Objection Certificate", compiling acceptable EMP and Clearance Certificate) under PEPA, 1997 (IEE/EIA guidelines and regulations 2000), securing tree removal and replanting permits from the Department of Forests and any permissions required from the Irrigation Department, Provincial Highway Department and Department of Wildlife Services. NTDC will also need to confirm that contractors and their suppliers have complied with all statutory requirements and have appropriate and valid licenses and permits for all powered mechanical equipment, permissions for use of local water supplies in line with the all environmental requirements (e.g. and local authority conditions).

6.2 Institutional Requirements

151. The EMP was prepared taking into account the lack of capacity of the NTDC to conduct environmental assessments of the subprojects. But it is envisaged that the NTDC's Environmental and Social Impact Cell (ESIC) will conduct monitoring of subproject to check the compliance of EMP provisions and will obtain environmental approval from EPA KPK. The ESIC is composed of one Manager, one Deputy Manager, two Assistant Managers and one surveyor. The staff members and the supervisory consultants are responsible for addressing environmental concerns for the ADB's MFF potentially involving hundreds kilometers of power transmission lines and dozens. Most of the environmental work is delegated to consultants. Whereas there is a limited level of awareness, NTDC staff needs more training and resources if they are to effectively provide quality control and oversight for the EMP implementation. Specific areas for immediate attention are in EMP auditing, environmentally responsible procurement, air, water and noise pollution management and ecological impact mitigation. It is recommended that an environmental specialist should be made part of team of supervisory consultants for effective monitoring of EMP provisions.

152. An Environment Specialist should also be the part of Project Management Consultants' team to assist the ESIC and PMU for monitoring and reporting to ADB for all the sub projects of Tranche-IV. This Specialist will;

- work in close coordination to ESIC and PMU, NTDC to ensure all statutory environmental submissions under PEPA, 1997 and other environmentally related legislation are thoroughly implemented;
- to ensure all environmental requirements and mitigation measures from the environmental assessment of subprojects are included in the contract prequalification and bidding documents;
- work with NTDC to execute any additional IEE and IEE requirements needed due to fine tuning of the subprojects and that environmental performance targets are included in the contracts prior to project commencement;
- work in the PMU with NTDC to ensure all environmental requirements and mitigation measures from the IEEs and environmental performance criteria are incorporated in the subproject contracts or variations and that the EMP is effectively implemented;
- work with management consultants, supervising consultants and contractors to manage and monitor the implementation of the project EMP;

- Prepare bi-annual environmental monitoring report for all the subprojects of Tranche-IV for submission to ADB;
- Participate in all safeguards review missions of ADB.

153. Overall implementation of the EMP will become NTDC's responsibility. Other parties to be involved in implementing the EMP are as follows:

154. **Contractors**: Responsible for implementing all measures required to mitigate environmental impacts during construction;

155. **Government Agencies**: Such as provincial environmental agencies, and bureaus, at the local level, will be responsible for monitoring the compliance with implementation of environmental conditions related to statutory approvals of subprojects in their areas.

156. **NTDC Board of Directors**: Responsible to ensure that sufficient timely resources are allocated to process the environmental assessments and to monitor implementation of all construction and operational phase mitigation measures required to mitigate environmental impacts.

157. Considering that other government agencies that need to be involved in implementing the EMP, training workshops should be conducted at every six months or twice each year, for the first 2 years (and annually thereafter) to share the monitoring report on the implementation of the EMP, to share lessons learned in the implementation and to decide on remedial actions, if unexpected environmental impacts occur.

158. The environmental monitoring plan was designed based on the project cycle. During the preconstruction period, the monitoring activities will focus on (i) conducting baseline monitoring; (ii) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (iii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works (protection of specimens and transplantation, design of power transmission etc.) are carried out in good time. Where detailed design is required (e.g. for power transmission lines and avoidance of other resources) the inclusion and checking of designs must be carried out. During the construction period, the monitoring activities will focus on ensuring that environmental mitigation measures are implemented, and some performance indicators will be monitored to record the Project's environmental performance and to guide any remedial action to address unexpected impacts. Monitoring activities during project operation will focus on recording environmental performance and proposing remedial actions to address unexpected impacts. The potential to use local community groups' contacts for monitoring should be explored as part of the activities of the Environmental and Social Impact Cell which should have regular meetings with the NGOs as a matter of good practice and to discuss matters of mutual concern.

159. At this stage, due to the modest scale of the new power transmission lines and by generally keeping to non-sensitive and non-critical areas the construction and operational impacts will be manageable and no insurmountable impacts are predicted providing that the EMP is implemented to its full extent and required in the contract documents. However, experience suggests that some contractors may not be familiar with this approach or may be reluctant to carry out some measures. In order that the contractors are fully aware of the implications of the EMP and to ensure compliance, it is recommended that the cost of environmental measures be treated separately in the

tender documentation and that payment milestones are linked to environmental performance, viz-a-viz the carrying out of the EMP.

160. The effective implementation of the EMP will be audited as a part of the loan conditions and the executing agency must be prepared for this. In this regard, the NTDC (the EA) must be prepared to guide the design engineers and contractors on the environmental aspects.

161. The NTDC procedures for handling PCB need to be strengthened. The maintenance of transformers needs to be based on the manufacturer's instructions. There need to be performance evaluation procedure prescribed and followed for each power transformer. In working areas where PCBs are handled, it is necessary to monitor the levels of chlorinated solvents. In case of emergencies, the first step is to attempt to control the spread of the liquid, this is especially relevant during transportation. In case of spills, emergency measures need to be taken by personnel specially trained and wearing protective clothes. Oil absorptive materials are a useful tool and needs to be spread over the spill. All equipment and surfaces exposed to the spill need to be washed with solvent .The best international procedures and guidelines need be followed, one such guideline is the UNEP 'PCB Transformers and Capacitors –From Management to Reclassification and Disposal, May 2002'.

162. NTDC already prohibits use of PCB's in new power transformers, there is however, need to prepare an inventory of any PCB carrying equipment in the system and all such equipment be replaced. The maintenance instructions prepared by the Technical Services Group needs to be reviewed and revised to add PCB based equipment maintenance and a procedure for handling any PCB spills. These need to be reviewed and upgraded in light of best International practice. This would include provision of special clothing, availability of oil absorptive solvents and availability of steel containers. Training to staff on oil spills and special care during transportation of equipment using PCB's.

6.3 Grievance Redressal System

163. A Grievance Redress System (GRS) will be established by the PMU to handle the community complains received from the complaints. Under this mechanism, a Grievance Redress Cell (GRC) will be established. The project will establish a Project Information Centre at site and a Community Complaints Management Register (CCMR) will be placed there for logging complaints and grievances. All written and oral grievances will be recorded in the Register. The information recorded in the register will include the date of the complaint and particulars of the complainant; a description of the grievance; the follow-up action required; the person responsible for implementing the action; and a target date for its completion.

164. Affected communities and their representatives will be identified during the project preparation stage. The PMU will work towards resolving the grievances recorded in the CCMR in conjunction with the Supervision Consultant within seven calendar days. After this deadline, any unresolved issues will be forwarded to NTDC.

6.4 Environmental and Social Complain Register

165. The consultant's environmental team will maintain an environment & social complaint register at camp site office to document all complaints received from the local communities. The register will also record the measures taken to mitigate these concerns. The final report will be communicated to Environmental section of PMU. The

Project Monitoring team shall carry out the monitoring of the implementation of social and environmental mitigation measures as per ADB Safeguard Policy Statement.

Grievance Resolution Process

Land / Crop Compensation Issues	Project / Other Items Compensation Issues
Complaint resolution will be attempted at office of SDO. If still unsettled, a grievance will be lodged to the Head PMU/NTDC. He will redress in 10 days.	Complaint resolution will be attempted at village level through GRC* in one week. If still unsettled, a grievance can be referred to court of law.

6.5 Environmental Management Cost

166. The total cost for environmental management of the proposed project is about 2858250 Pak. Rupees. Cost estimates of mitigation and other environmental management measures are summarized in Table – 6.1.

Table 6.1: Cost Estimates for Environmental Management

Particulars	Details	Total Cost (PKR)
One dedicated Environmental Officer	1 person for 3 years (60,000/month)	2160000
Implementation of Mitigation Measures	Provision of PPEs (Safety Goggles, shoes, safety masks, eye shields, ear muffs, etc.) and first aid kits.	300,000
	Procurement of one noise level monitor	15000
	Arrangements for daily water sprinkling	100,000
	Plantation of trees/plants in the grid station and along the TL route	100,000
	Arrangements for careful collection and disposal of wastes, oils, lubricants etc.	100,000
Contingency	3% contingency	83250
Total		**2858250**

Note: The land, crop losses, structures and tree costs are covered under the LARP.

7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1 Approach to Public Consultation

167. The Public Consultation (PC) process with various stakeholders has been approached so as to involve public and other stakeholders from the earliest stages. Public consultation has taken place during the planning and design and viewpoints of the stakeholders have been taken into account and their concerns and suggestions for possible improvements have been included where appropriate. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects from the proximity of high voltage power lines.

168. There is also a requirement for ongoing consultation for preparation of Land Acquisition and Resettlement Plan (LARP), which is being documented separately. It is expected that this process will continue through all the stages of the subproject in order to accommodate stakeholders' aspirations and to orient the stakeholders positively towards the project implementation and where possible to harness cooperation over access issues in order to facilitate timely completion.

7.2 Public Consultation Process

169. The public consultation process has commenced in the initial feasibility stages (prior to construction) in order to disclose the project information to the stakeholders and record feedback regarding the proposed sub project and preferences. The stakeholders involved in the process were the population likely to be impacted along the route of the proposed power lines; the village leaders and relevant departments.

170. Prior to the implementation of the sub project, the consultations have been carried out to support this IEE and recorded. The focus of attention has been the population near the proposed grid station and transmission line that may be affected by the subproject. The level of engagement varied from the stakeholder to stakeholder with some registering no major comment but it is noted that none registered any outright opposition to subproject.

171. The disclosure of the enhancement project in advance and subsequent consultation with stakeholders has advantages in the environmental assessment and mitigation of impacts. Public consultation can also provide a conduit for the improvement of the project implementation to better serve the stakeholders.

172. The environmental assessment process under the Pakistan Environmental Protection Act only requires the disclosure to the public after the statutory IEE / EIA has been accepted by the relevant EPA (in this case KPK-EPA) to be in strict adherence to the rules. In this IEE the consultation process was performed to satisfy the ADB requirements.

7.3 Results of Public Consultation

173. The consultations identified some potential environmental and social impacts and perceptions of the affected communities. NTDC will make sure that the crops and trees compensation amounts are assessed justly and paid to the affected, at least fifteen days prior to temporary use of land before starting the civil works. The community generally supports the proposed subproject. The local poor people predominantly requested for unskilled and semi-skilled jobs on priority basis with the contractors during implementation of the project. No land acquisition will be done because grid station land is already in the possession of NTDC. However, compensation will be paid to the

concerned parties / owners of land under the towers and where the loss of some trees and for damage to crops is expected.

174. On the basis of the consultations so far, it appears that the project will have no insurmountable environmental and social impacts, but NTDC will have to make sure that compensation and assistance amounts are assessed justly and that skilled and unskilled employment should be preferentially given to the APs as far as is reasonably practicable.

175. Since, the project area (only transmission line) involves the private land, therefore, it was highlighted by locals that the affectees would be compensated from the construction of the subproject. The water bodies are available in the area for irrigation, it was apprehended by people that the proposed project may not share this water and resultantly we will suffer from water shortage. NTDC has to make sure that the local resources must not be used before prior approval from relevant authority.

7.4 Record of Consultations

176. For consultation purposes, the following stakeholders were visited to share the project information and exchange of views about the proposed new 220 kV Chakdara Grid Station and about 85 km 220 kV transmission line, a subproject of Tranche-IV.

Sr. No.	Date	Location/ Venue	Category of participants	Name of Main Participants
1	09-01-2014	Mora Banda Agency Malakand	APs/ Farmers/ Drivers	- Mr. Hussain Gul S/o Moeen Shah - Sher Dad Khan S/o Mir Dad Khan - Mr. Shahid S/o Gul karim - Mr. Siab Reham S/o Barkat Din - Mr. Noor Jamal S/o Ahmad Shah Bacha
2	10-01-2014	Nalo kala Tehsil Batkhela Distt Malakand	APs/ Farmers/ Transport Dealer	- Mr. Dawood Khan S/o Sadeeq - Mr. Darvesh Muhammad S/o Baghdad Shah - Mr. Muhammad Rasan S/o Zarghon shah - Mr. Muhammad Nasir S/o Parveez Khan - Mr. Muhammad Quam S/o Hafiz Malik - Mr. Akhtar Muhammad S/o Ameer Hamad
3	10-01-2014	Nalo kala Tehsil Batkhela Distt Malakand	APs/ Farmers/ Property Dealer/ shop keeper	- Mr. Kabul khan S/o Nad Ullah - Mr. Haji parveez khan S/o Rehman Gul - Mr. Ameer zeb S/o Fareed Khan

				- Mr Ameer Sultan S/o Zarghon shah - Mr. Aslam khan S/o Sherad Khan
4	10-01-2014	SherKhani Tehsil Batkhela Distt Malakand	APs/ Farmers/ Labour/ Student/ Teacher	- Mr. Muhammad Ameen S/o Ameer khan - Mr. Masha Ali S/o Shahzada - Mr. Noushad S/o Gul zada - Mr Adeel shah S/o Masha Ali
5	11-01-2014	SherKhani Tehsil Batkhela Distt Malakand	APs/ Farmers	- Mr. Muhammad Arif S/o Saeed Naik - Mr. Muhammad Farooq S/o Saeed Naik - Mr. Rehmat Nasar S/o Mumbar Bacha - Mr Fazal Nasar S/o Mumbar Bacha
6	11-01-2014	Barabarn Tehsil Katlang Distt Mardan	APs/ Farmers/ Labour/ shopkeeper	- Mr. Gul Muhammad S/o Shah Sultan - Mr. Ali Akbar S/o Gul Akbar - Mr. Khan Bahadur S/o Gul Muhammad - Mr Naiz Ali S/o Gul Muhammad - Mr. Noor Muhammad S/o Sultan Muhammad
7	12-01-2014	Sarbi Tehsil Katlang Distt Mardan	APs/ Property Dealer/ Labour/ Livestock Holder	- Mr.Yousaf Muhammad S/o Atta Muhammad - Mr. Alamgher S/o Jalendar - Mr. Rahim Shah S/o Amesh Gul - Mr Fareed Khan S/o Maskeen Khan - Mr. Zareen Khan S/o Tosh - Mr. Rasheed S/o Maskeen Khan
8	12-01-2014	Saeed NAWAB kala Tehsil Takhbahi Distt Mardan	APs/ Farmers/ Labour	- Sher Ali S/o Zareen Khan - Mr. Zain Ullah S/o Lal Badshah - Mr. Akbar Ali S/o M. Akram - Mr. Abdul Aziz S/o Shamsha Noor - Sir Saraz S/o Zareen khan

9	12-01-2014	Kalo Shah Tehsil Takhbahi Distt Mardan	APs/ Farmers/ Labour/ Civil Engineer	- Mr. Sami Ullah S/o M. Anwar - Mr. Shahid Khan S/o M. Ayub khan - Mr. Shafi Ullahh S/o Hazrat Jan - Mr. Altaf S/o M. Anwar
10	13-01-2014	Gulabad Tehsil Takhbahi Distt Mardan	APs/ Farmers/ Labour/ Livestock Holder	- Mr. Yaqoub khan S/o Asif Khan - Mr. Rafi Ullah S/o Wazirzada - Mr. Abdur Razzaq S/o Gulzada - Mr Ghulam Ahmed S/o Ghulam Nabi - Mr. Rehman Wali S/o Habib Wali - Mr. Naseeb Zada S/o Sher Afzal
11	14-01-2014	Hasal Din Tehsil Takhbahi Distt Mardan	APs/ Farmers	- Mr. Kabir S/o Khansher - Mr. Ghafar S/o Zaveer Din - Mr. Khan Sher S/o Haji Rehmanudin - Mr Israr Khan S/o Madder gul - Mr. Sulman S/o Haji Merzada - Mr. Ibrahim S/o Abdur Rehman
`12	14-01-2014	Mamondo Garu shah Tehsil Takhbahi Distt Mardan	APs/ Farmers	- Mr. Sher Ali S/o Hazrat gul - Mr. Haji Wazir Muhammad S/o Turbaz - Mr. Ibrahim S/o Sher Ali - Mr Farooq S/o Bahujan
13	14-01-2014	Akbar khan kala Tehsil Takhbahi Distt Mardan	APs/ Farmers/ Student	- Mr. Shoaib S/o Lal muhammad - Mr. Ghayor S/o Sarfarz - Mr. Inam Ullah S/o Gul Muhammad - Mr. Dawood S/o Ihsan ullah

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Findings and Recommendations

177. This study was carried out at the planning stage of the project. Primary and secondary data were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The report has provided a picture of all potential environmental impacts associated with the Project, and recommended suitable mitigation measures. This study recommends that some further follow up studies are to be undertaken during project processing in order to meet the ADB requirements.

178. There are some further considerations for the planning stages such as obtaining clearance for the project under the Pakistan Environmental Protection Act (1997) but environmental impacts from this subproject will mostly take place during the construction stage. There are also some noise impacts and waste management issues for the construction stage that must be addressed in the detailed design and through environmentally responsible procurement. At the detailed design stage the number and exact locations for transmission tower will be known and may change subject to detailed surveys but the impacts are likely to be broadly similar at most locations and impacts have been reviewed in the environmental impact section of this IEE report.

179. There are a number of key actions required in the detailed design phase. Prior to construction the NTDC must receive clearance certification from the EPA KPK and NTDC must complete a site specific EMP that will be accepted by the EPA and agreed by the contractor prior to signing the contract. The information provided in this report can form the basis of any further submission to EPA as required in future.

180. The land for grid station is the ownership of NTDC. During transmission line construction, damages to crops and trees will be involved and compensation to the AP's and concerned parties, if needed will be paid. However, provisions may be made in the LARP, based on the proposed alignments these should not be difficult tasks and can be conducted as the detailed designs are worked out and to dovetail with the existing system and minimize adverse impacts and maximize benefits. A social impact assessment and resettlement action plan (LARP) has been completed in tandem with this IEE for the whole subproject by another individual consultant (Social Expert). The study has:

(i) Examined and assess the overall social and poverty profile of the project area on the basis of the primary and secondary data sources and preparation of a socio-economic profile of the project districts.

(ii) Prepared a social and poverty analysis, taking into account socio-economic and poverty status of the project area of influence, including the nature, extent and determinants of poverty in the project area including assessment. In addition, estimation of the likely socioeconomic and poverty reduction impacts of the project should be included.

(iii) Held consultations with relevant officials from the government and other relevant officials, including consultation with affected communities to assess responses to the project and ascertain the nature and scope of local participation in project planning and implementation.

(iv) Identified, analyzed and, where appropriate, quantified the potential resettlement impacts (minimal) of the proposed Project on the area and the population.

181. Baseline monitoring activities should be carried out during project detailed design stage to establish the baseline of parameters for checking during the construction stage. The monitoring schedule recommends monitoring on two occasions at the site location. The results should be integrated with the contract documentation to establish performance action thresholds, pollution limits and contingency plans for the contractor's performance.

182. During the commissioning phase noise monitoring should ensure that statutory requirements have been achieved. Monitoring activities during project operation will focus on periodic recording environmental performance and proposing remedial actions to address any unexpected impacts.

8.2 Summary and Conclusions

183. The construction of new 220 kV Chakdarra Grid Station and about 85 km transmission line is a feasible and sustainable option from the power transmission, engineering, environmental, and socioeconomic points of view. Implementation of the EMP is required and the environmental impacts associated with the subproject need to be properly mitigated, and the existing institutional arrangements are available. Additional human and financial resources will be required by NTDC to complete the designs and incorporate the recommendations effectively and efficiently in the contract documents, linked to payment milestones. The proposed mitigation and management plans are practicable but require additional resources.

184. This IEE, including the EMP, should be used as a basis for an environmental compliance program and be included as an Appendix to the contract document. The EMP shall be reviewed at the detailed design stage and be converted to site specific EMP (SEMP). In addition, any subsequent conditions issued by EPA KPK as part of the environmental clearance should also be included in the environmental compliance program. Therefore, continued monitoring of the implementation of mitigation measures, the implementation of the environmental conditions for work and environmental clearance, and monitoring of the environmental impact related to the operation of the subproject should be properly carried out and reported at least twice a year as part of the project performance report.

APPENDIX-I : ENVIRONNEMENTAL MANAGEMENT PLAN (EMP) FOR 220 KV CHAKDARA GRID STATION AND ALLIED TRANSMISSION LINE

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
DESIGN STAGE						
1. Social Impacts	To ensure that the adverse impacts on crops and trees are mitigated according to the LARP provisions.	1. NTDC to select the route in a way that minimum impact on trees and crops occur. 2. Assessment of losses of tree and crops damages (if any) due to construction of transmission line towers. 3. Preparation of LARP for the proposed project before commencement of construction activities. 4. All the payments / entitlements are paid according to the Entitlement Matrix, prepared according to the LARP. 5. All the impacts identified by the IEE are incorporated in to the project as well as the LARP and relevant entitlements included into the Entitlement Matrix.	Before the construction of the transmission line and all other structures, the APs should be given sufficient time and compensation to satisfy them.	Affected Persons will be compensated by NTDC through its land acquisition officers.	NTDC / LAOs	MC
2. Hydrological Impacts	To minimize hydrological and drainage impacts during constructions.	1. Hydrological flow in areas where it is sensitive, such as water courses or bridges and culverts. 2. Adequate culverts should be provided where any water channel is needed to be crossed for	Before the commencement of construction activities/during designing stage.	Considered locations are as in the design report.	NTDC with the Design Consultant	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		transmission line construction activities.				
3. Noise Barriers	Ensure cumulative noise impacts are acceptable in operational phase.	1. Conduct detailed acoustic assessment for all residential buildings, schools, (other sensitive structures) within 50m of RoW. 2. If noise at sensitive receiver exceeds the permissible limit, the construction activities should be monitored and controlled.	During detailed design stage, and include in the contract.	Noise sensitive locations to be identified after detailed design.	NTDC with the design consultant	NTDS and Construction Supervision Consultant (CSC if any)
4. Waste Disposal	Ensure adequate disposal options for all waste including unsuitable soils, scrap metal.	1. Identify sufficient locations for disposal of transformer oils, unsuitable soils, scrap metal "cradle to grave". 2. Include in contracts for unit rates for re-measurement for disposal. 3. Designate disposal sites in the contract and cost unit disposal rates accordingly. 4. Prepare a PCB spill handling procedure and equip such teams with special clothing, steel containers and solvents.	1. During designing stage no later than pre-qualification or tender negotiations. 2. Include in the contract.	Locations approved by EPA and NTDC and waste disposal local authorities.	EPA and NTDC with the design consultant	NTDC and CSC
5. Temporary Drainage and Erosion Control	Include mitigation in Preliminary and detailed designs for erosion control and temporary drainage.	1. Identify locations where drainage or irrigation crossing RoW may be affected by works. 2. Include in protection works contract as a payment milestone(s).	During designing stage no later than pre-qualification or tender negotiations.	Locations based on drainage or irrigation crossing RoW.	NTDC and Design Consultant	NTDC and CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
CONSTRUCTION STAGE						
1. Hydrology and Drainage Aspects	To ensure the proper implementation of any requirements mentioned in EPA conditions of approval letter in relation to Hydrology of the project.	1. Consideration of weather conditions when particular construction activities are undertaken. 2. Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. 3. Use of landscaping as an integrated component of construction activity as an erosion control measure. 4. Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.	1. Prepare a thorough plan to be approved by SC one month prior to a commence ment of construction . 2. Proper timetable prepared in consideratio n with the climatic conditions of each area, the different construction activities mentioned here to be guided.	1. Locations of each construction activity to be listed by the engineer. 2. Special locations are identified along the RoW by the contractor to minimize disturbance. 3. A list of locations of irrigation channels/ drains to be compiled by the contractor.	CSC or NTDC to actively supervise and enforce	NTDC
2. Orientation for Contractors, and Workers	To ensure that the CSC, contractor and workers understand and have the capacity	1. NTDC to engage environmental specialist in the PMC to monitor and progress all environmental statutory and recommended obligations.	Induction of all relevant staff required for implementation	All staff members in all categories. Monthly induction and six month	Contractor and the CSC and record	NTDC & CSC to observe and record

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	to ensure the environmental requirements and implementation of mitigation measures.	2. Conduct special briefing for managers and / or on-site training for the contractors and workers on the environmental requirement of the project. Record attendance and achievement test. 3. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. 4. Continuous progress review and refresher sessions to be followed.	of EMP. At early stages of construction for all construction employees as far as reasonably practicable.	refresher course as necessary until contractor complies.	details	success
3. Water Quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized.	1. Compile temporary drainage management plan one month before commencement of works. 2. Proper installation of Temporary Drainage (TD) and Erosion Control (EC) before works within 50 m of water bodies. 3. Proper construction of TD and EC measures, maintenance and management including training of operators and other workers to avoid pollution of water bodies by the considerate operation of construction machinery and equipment. 4. Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies.	Prior to construction, 50 m from water bodies. Timing will depend on the construction timetable.	Relevant locations to be determined in the detailed project design	1.Contractor CSC to enforce 2. Contractor has to check water quality and report to NTDC. 3. CSC supervises monitoring activities.	NTDC review results

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		5. Proper disposal of solid waste from construction activities and labor camps. 6. Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies. 7. Topsoil stripped material shall not be stored where natural drainage will be disrupted. 8. Borrow sites (if required) should not be close to sources of drinking water.				
4. Air Quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	1. Control all dusty materials at source. 2. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. (Relevant regulations are in the Motor vehicles fitness rules and Highway Act). 3. Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. 4. Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions. 5. Vehicles transporting soil, sand and other construction materials shall be covered. 6. Limitations to speeds of such	All construction sites within 100 m of sensitive receivers.	A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.	Contractor should maintain acceptable standard CSC to supervise activities.	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		vehicles necessary. Transport through densely populated area should be avoided. 7. To plan to minimize the dust within the vicinity of orchards and fruit farms. 8. Spraying of bare areas with water. 9. Concrete plants to be controlled in line with statutory requirements should not be close to sensitive receptors.				
5. Noise / Ground Vibration	To minimize noise level increases and ground vibrations during construction operations.	1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations and with effective silencing apparatus to minimize noise. 2. As a rule, the operation of heavy equipment shall be conducted in daylight hours. 3. Hammer- type percussive pile driving operations shall be not be allowed at night time. 4. Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise. 5. Well-maintained haulage trucks will be used with speed controls. 6. Contractor shall take adequate measures to minimize noise	Maximum allowable noise levels should be below 80 dB (A) L_{EQ} at the boundary of the construction site.	During construction stage, the most sensitive locations need special attention.	Contractor should maintain the acceptable standards CSC to supervise relevant activities.	NTDC / CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		nuisance in the vicinity of construction sites by way of adopting available acoustic methods.				
6. **Soil Erosion/ Surface Run-off**	Prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles.	1. Schedule works in sensitive areas (e.g. rivers) for dry season 2. Temporary erosion control plan one month before commencement of works. 3. Proper installation of TD and EC before works within 50m of water bodies. 4. Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC. 5. Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible. 6. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage. 7. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes. 8. In the short-term, either temporary or permanent drainage works shall	Because the area can be subject to un seasonal heavy rain plan before and during construction (cut and fill, land reclamation etc.) while considering the climatic conditions.	1. Locations based on history of flooding problems. 2. A list of sensitive areas during construction to be prepared by the detail design consultant in consideration with the cut and fill, land reclamation, borrow areas etc. 3. Locations of all culverts, irrigation channels, road and highway.	Contractor and CSC	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		protect all areas susceptible to erosion. 9. Measures shall be taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. 10. Contractor should arrange to adopt suitable measures to minimize soil erosion during the construction period. Contractor should consult concerned authorities in the area before deciding mitigation measures. 11. Clearing of green surface cover to be minimized during site preparation. 12. Replanting trees to be done before the site is vacated and handed back to NTDC with appropriate trees (other vegetation cover as appropriate) to ensure interception of rainwater and the deceleration of surface run-off.				
7. Exploitation Handling, Transportation and Storage of Construction Materials	To minimize contamination of the surroundings (Due to Implementation of works, concrete and crushing plants).	1. In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval.	Update monthly	1. List of borrow areas to be prepared one month prior to construction. 2. List of routes of transport of construction	Contractor and CSC to agree format of reporting	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		2. Conditions that apply for selecting sites for material exploitation. 3. Conditions that apply to timing and use of roads for material transport. 4. Conditions that apply for maintenance of vehicles used in material transport or construction. 5. Conditions that apply for selection of sites for material storage. 6. Conditions that apply for aggregate production. 7. Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.		material is to be prepared for the contract and agreed one month prior to construction. 3. Report of vehicle conditions is available. 4. Map of locations of storage is prepared by the contractor. 5. Environmental accident checklist and a list of banned substances are included in the contractor's manual.		
8. **Construction Waste Disposal**	Minimize the impacts from the disposal of construction waste.	1. Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works. 2. Estimating the amounts and types of construction waste to be generated by the project. 3. Investigating whether the waste can be reused in the project or by other	Update monthly	A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement	Contractor and CSC should supervise and take action to complete contractor's relevant	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		interested parties. 4. Identifying potential safe disposal sites close to the project or those designated sites in the contract. 5. Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 6. Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc. 7. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. 8. Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. 9. Machinery should be properly maintained to minimize oil spill during the construction. 10. Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice			activities according to EIA/IEE/ EMP requirement & environmental standards.	
9. Work Camp Operation and	To ensure that the operation of work camps does not	1. Identify location of work camps in consultation with local authorities. The location shall be subject to	Update once a month	Location Map is prepared by the Contractor.	Contractor	NTDC/ MC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
Location	adversely affect the surrounding environment and residents in the area.	approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes. 2. Cutting of trees shall be avoided and removal of vegetation shall be minimized. 3. Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites. 4. Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission 5. The Contractor shall organize and maintain a waste separation, collection and transport system. 6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. 7. At the conclusion of the project, all				

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. 8. Exposed areas shall be planted with suitable vegetation. 9. NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.				
10. Loss of Trees and Vegetation Cover of the Areas for Towers and Temporary Work-space	To avoid several negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover.	1. Land holders will be paid compensation for their standing trees in accordance with prevailing market rates (LARP). The land holders will be allowed to salvage the wood of the affected trees. They will also be encouraged to plant suitable new trees outside the 30 meter corridor of the transmission line in lieu of tree removed. 2. The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes. 3. In order to save the affected orchards (if any), Transmission Line route will need to be changed. However, if unavoidable, use of towers with maximum height will be resorted to. 4. Clearing of green surface cover for	Rerouting and site identification during design stage and other matters during construction of relevant activities	A list of Locations with a Map to be compiled by the design consultant during detailed design and CSC to update as necessary.	Design consultant, Contractor and CSC	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized. 5. Landscaping and road verges to be re-installed on completion. 6. Compensatory planting of trees/shrubs/ornamental plants (at a rate of 3:1) to contribute to the aesthetic value of the area and compensate for the lost capability of the area to absorb carbon dioxide in line with best international practice. 7. At completion all debris and waste shall be removed. 8. All temporary structures, including office buildings, shelters and toilets shall be removed.				
11. Safety Precautions for the Workers	To ensure safety of workers	1. Providing adequate warning signs. 2. Providing workers with skull guard or hard hat. 3. Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. 4. Establish all relevant safety measures as required by law and good engineering practices.	Prior to commencement and during construction	Location to be identified by the CSC with contractor.	Contractor and CSC	NTDC/ CSC
12. Traffic Condition	Minimize disturbance of vehicular traffic and	1. Submit temporary haul and access routes plan one month prior to start of	Prior to and throughout the	The most important	Contractor and	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during works damage/maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.	works. 2. Formulate and implementation of a plan of alternate routes for heavy vehicles. 3. Vicinity of schools and hospitals to be considered. 4. Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered. 5. Provision of culverts on water channels and drains. 6. Widening/upgrading of access paths/roads	construction.	locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements are available.	Engineer	
13.Social Impacts	To ensure minimum impacts from construction labor force. To ensure minimum impacts on public health. To ensure minimum effects of indirect impacts of constructions to the people who are living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting	1. Potential for spread of vector borne and communicable diseases from labor camps shall be avoided (worker awareness orientation and appropriate sanitation should be maintained). 2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor. 3. Contractor should organize temporary means of access and make alternative arrangements to avoid local community impacts and to avoid such short-term negative impacts.	Complaints of APs to be solved as soon as possible. Necessary evacuations to be done as when necessary if construction impacts are of significant duration and close to APs.	The whole alignment route of transmission line.	Contractor and the CSC	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	effects etc. To minimize access problems for local population during construction.					
14. Institutional Strengthening and Capacity Building	To ensure that NTDC officials are trained to understand and to appreciate EMP.	Capacity building activities were taken by Environmental Officer in Tranche 1 and 2. Environmental and Social Impact Cell (ESIC) was setup with in NTDC under GM (Projects) in Tranche 1. Trainings and provisions of proper monitoring facilities to ECIS are recommended.	Initiate preconstruction and continue beyond project completion	Awareness training for all management and senior staff in NTDC at senior engineer and above in PMU and related units.	NTDC	NTDC & ADB
OPERATIONAL STAGE						
1. Air Quality		No Impacts			NTDC	NTDC
2. Noise		No significant Impacts by Tranche-IV subprojects.		All subprojects of tranche-IV.	NTDC	NTDC
3. Compensatory Tree Planting	Maintain survival of trees planted	Employ landscaping contractor to monitor, water, feed and replace dead specimens as necessary.		All subprojects of tranche-IV.	NTDC	NTDC
4. Landslides and soil erosion	Avoid landslips and loss of productive land	No significant Impacts.		All subprojects of tranche-IV.	NTDC	NTDC
5. Water Quality	Avoid disruption to water bodies.	No significant Impacts from this subproject.		All subprojects of tranche-IV.	NTDC	NTDC
6 Crops and Vegetation	Monitor impacts from maintaining tree	Track growth of large trees under the conductors.		All subprojects of tranche-IV.	NTDC	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	clearance under transmission lines					
7. Social safety Impacts	Ensure no encroachments/ construction under the transmission line. No violation of clearances spaces.	Necessary signboards with limits of height clearances to be placed properly. Identify and prevent any illegal encroachments under the transmission line.		All subprojects of tranche-IV.	NTDC	NTDC

LARP = Land Acquisition and Resettlement Plan, APs = Affected Persons, TD = Temporary Drainage. EC = Erosion Control, WM = Waste Management, CSC = Construction Supervision Consultant, NEQS = National Environmental Quality Standards, MC = Management Consultants, MM = Mitigation Measure.

FLAGGING

Some other social impacts during construction, particularly from local cultural and social traditions perspective will require review in the future implementation stage and at this stage have been dealt with in the LARP.

1. *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.*
2. *Usage of Community's common resources like potable water, fuel wood etc. by Contractor workforce may create conflicts between the community and the Contractor.*
3. *Community will have to face the noise and dust problems during the construction activities.*
4. *Induction of outside workers in the Contractor labor may cause cultural issues with the local community.*
5. *Theft problems to the community by the Contractor workers and vice versa.*
6. *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.*
7. *The land under the towers during the operation stage may restrict its current use for agriculture purpose.*
8. *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.*
9. *Due to the erection of towers and passing of the transmission line, the value of land may depreciate in the long term.*
10. *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.*
11. *The rural women normally use the open field latrines and their privacy may suffer due to the project activities.*

12. *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.*
13. *Disturbance to the privacy of the local women when workers will work on the erection of towers*

APPENDIX-II: ENVIRONMENTAL MONITORING PLAN FOR 220 KV CHAKDARA GRID STATION AND ALLIED TRANSMISSION LINE

SR. NO.	MONITORING ACTIVITIES	RESPONSIBILITIES	TIMING FOR MONITORING
1	**DESIGN STAGE**		
1.1	Audit project bidding documents to ensure EIA and EMP is included	NTDC through project implementation unit	Prior to issue of bidding documents.
1.2	Monitor final site selection process and final alignment selection process and its environmental compliance with EMP	NTDC with the assistance of management consultants	Prior to NTDC approval of contractor's detailed alignment survey.
1.3	Review the implementation of the Land Acquisition Plan and expropriation, including considerations concerning vulnerable groups among land-owners, farmers, and farm workers	NTDC with the assistance management consultants	Prior to NTDC approval of contractor's detailed alignment survey.
1.4	Monitor contractor's detailed project design to ensure relevant environmental mitigation measures in EMP have been included	NTDC with assistance of project implementation unit	Prior to NTDC approval of contractor's detailed alignment survey.
1.5	Monitor the thorough implementation of detailed Environmental Guidelines for Construction Works, including procurement, management, works, closing operations	NTDC with the assistance of management consultants	Prior to NTDC approval of contractor's detailed designs.
1.6	Review the management plan for mineral construction materials and waste management	NTDC with the assistance of management consultants	Prior to NTDC approval of contractor's detailed designs.
1.7	Audit detailed designs of facilities and installations to ensure standard environmental safeguards/ mitigation measures (as identified in EMP) have been included	NTDC with assistance of project implementation unit	Prior to NTDC approval of contractor's detailed designs.
1.8	Review landscape design plan, including compensatory planting	NTDC with the assistance of management consultants	Prior to NTDC approval of contractor's detailed designs.
1.9	Monitor the performance of environmental training and briefings and	NTDC with the assistance of	Continuous throughout the

SR. NO.	MONITORING ACTIVITIES	RESPONSIBILITIES	TIMING FOR MONITORING
	of the environmental awareness of project staff and NTDC	management consultants	entire project period.
2	**CONSTRUCTION PHASE**		
2.1	Regular (monthly) monitoring and reporting (quarterly) of contractor's compliance with contractual environmental mitigation measures	NTDC with assistance of project implementation unit	Continuous throughout construction period.
2.2	Monitoring of the implementation of the Landscape Design Plan	NTDC with the assistance of management consultants	During the last phase of construction works
2.3	Commissioning phase monitoring of as built equipment versus environmental performance criteria	NTDC	At commissioning
3	**OPERATION AND MAINTENANCE PHASE**		
3.1	Observations during routine maintenance inspections of facilities and transmission lines rows. Inspections will include monitoring implementation of operational mitigation measures versus environmental criteria specified in EMP, waste management and operational noise.	NTDC	As per NTDC inspection schedules
3.2	Monitoring of the implementation of the Landscape Design Plan	NTDC with the assistance of management consultants	Twice per year for three years of operation.
3.3	Monitoring decommissioning of other plant required for installation of MFF funded components and waste disposal	NTDC	During the life of the project

APPENDIX – III: PHOTOGRAPHIC PROFILE

Figure-1: A view of affected Peach Orchard by 220 kV Transmission Line at Nalo Kalay, Tehsil Thana, District Mardan,

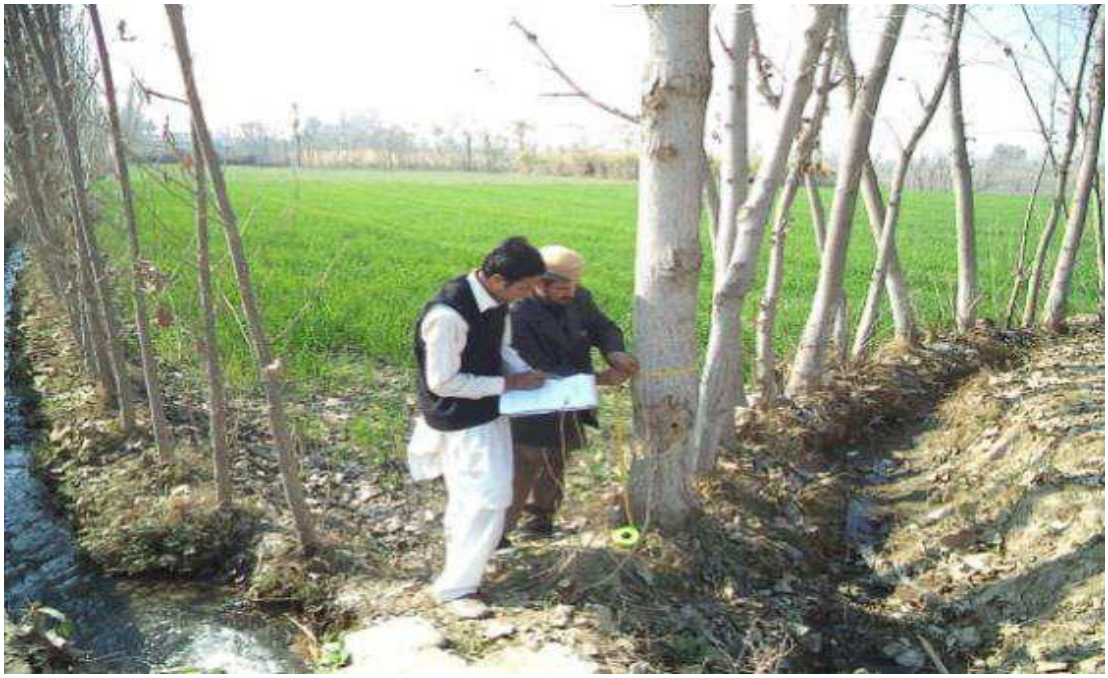

Figure-2: A View of Survey team measuring girth of Wood trees at Mian Gano Kalay, Batkhela, District Mardan

Figure-3: A view of the affected Tomato crops, at Mora Banda, Malakand Agency

Figure-4: Identification of Transmission Line Route by Survey Team