



Environmental Assessment Report

Summary Initial Environmental Examination
Project Number: 37192
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PAK: Power Transmission Enhancement Investment Program

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Asian Development Bank

SUMMARY INITIAL ENVIRONMENTAL EXAMINATION

A. Introduction

1. This document is the Summary Initial Environmental Examination (SIEE) for the upgrading and expansion of various grid sub stations (GSS) and transmission lines (TXL) under Tranche 1 of the Asian Development Bank (ADB) project, Power Transmission and Enhancement Multitranche Finance Facility (PTE-MFF). Government of Pakistan (GOP, the borrower) has requested the Asian Development Bank (ADB) to finance the proposed PTE-MFF that will eventually encompass more sites in all provinces in future tranches. This SIEE presents the results and conclusions of environmental assessments for first nineteen subprojects that form Tranche 1 (T1, Table 1) in the proposed expansion and enhancement program, and includes the introduction of the Environmental Assessment and Review Framework (EARF) for the subsequent tranches. This SIEE is submitted to ADB by the Government of the Pakistan (GOP) Ministry of Water and Power, National Transmission and Despatch Company (NTDC) following work carried out under TA4665. The T1 subprojects are considered for urgent improvement under the PTE-MFF and under ADB requirements environmental assessments have been carried out for all nineteen subprojects to be included in the Tranche 1 subprojects in accordance with ADB's *Environment Policy and Environmental Assessment Guidelines, 2003* and the Government's environmental assessment process has been commenced as required in local regulations and guidelines³ (PEPAct 1997). In Tranche 1, two of the nineteen subprojects under the first PFR are assigned Category B¹ and sixteen of nineteen subprojects are assigned Category C under ADB Environmental Guidelines. Environmental assessments have been carried out for each subproject². An IEE report and an environmental management plan (EMP) with implementation budget have been prepared for the two category B subprojects. A review of environmental implications has been carried out for the Category C subprojects and presented in the feasibility summaries compiled by the consultants. The IEEs and reviews of environmental implications for all nineteen subprojects in Tranche 1 are summarized in this SIEE. Those IEE and feasibility reports and other available information have been used to complete this SIEE that may be disclosed by ADB, if necessary. Environmental assessments will also be prepared in due course for all subprojects in future tranches.

2. The environmental regulations of the GOP³ categorize development projects into two schedules according to their anticipated potential environmental impact. The proponents of projects that have reasonably foreseeable qualitative and quantitative impacts are required to submit an IEE for their respective projects (Schedule I). Proponents of projects that have more adverse environmental impact (Schedule II) are required to submit an environmental impact assessment (EIA) to the respective provincial Environmental Protection Agency (pEPA). Transmission lines and grid substations are included under energy projects and EIA is required by GOP for all projects involving transmission lines of 11kv and above and for grid substations (Schedule II). IEE is required for transmission lines less than 11kv and large distribution projects (Schedule I). Expansion of facilities within existing substations is not listed as requiring environmental assessment but Punjab EPA (PEPA) have requested disclosure of the scope and extent of each subproject in order that the Director General of PEPA can determine if additional

¹ Initial reconnaissance and REA carried out by consultants under ADB guidelines in August 2006 indicated that all the T1 sub-projects will be Category B. Initial project classification Category is B. Most construction impacts will be only local and there are no potentially significant environmental impacts associated with Tranche 1 sub-project construction or operation.

² Environmental Assessment Guidelines (ADB May 2003)

³ The Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

land is required and the need for statutory environmental assessment. The projects in Punjab, Sindh Province, North West Frontier Province and Islamabad shall be disclosed to the respective authorities (PEPA, SEPA, NWFEPa and Federal EPA with the scope and extent of each subproject in order that the respective Directors General can determine the requirements for environmental assessment under GOP legislation.

3. This SIEE is based on information, data and preliminary assessments in the environmental assessment reports received from the consultants during September 2006 for Tranche 1. Other environmental assessment reports may be required to be submitted to provincial environmental protection agencies order to obtain GOP approval to construct the facilities either for Tranche 1 or for subsequent tranches. Those reports, be they IEEs or EIAs shall prepared in line with the GOP's regulations on environmental impact assessment (PEPAct 1997) and also comply with ADB's *Environmental Assessment Guidelines of 2003* and generally following the formats of those reports submitted to support this SIEE.

B. Description of the Project

4. The standards and 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 that support strategic management of the sector, and planning and management of investments. Overall the proposed PTE-MFF facility has been designed to address both investment and institutional aspects in the electrical power sector.

5. The Tranche 1 subprojects can be broadly separated into two groups. Sixteen group one projects (Cat C, S-P 1-3, 5 to 14 16, 17 & 18, Table 1) involve the improvement of facilities and equipment within existing GSS boundaries and should not require any land acquisition. Two group two projects (Cat B, 4 and 15, Table 1) involve construction of new transmission lines (TXL S-P4) and the installation of new equipment within existing GSS (S-P15). Impacts from these two subprojects are potentially greater, although not insurmountable, and some land will need to be acquired for the Right of Way (RoW) that can accommodate the transmission line towers (TXL) as required. The designs for all the subprojects are sufficiently complete (September 2006) to permit reviews environmental implications (Cat C) and initial environmental examination (Cat B). The designs for the Tranche 2 (T2) subprojects and further subprojects in all later tranches will be developed; under the project support component of TA2178.

Table A13: List of Subprojects for Tranche 1

No.	Subproject	Substation (existing)	Transmission Line length km	Expect commissioning	ADB Environmental Category	Technical Justification (without improvements)
1	Transformer Extension at Tarbela 500 kV	Tarbela		2007-08	C	Existing Transformers get overloaded in case of outage of S/C 500 kV Tarbela-Rewat or outage of a Gen. Unit at Tarbela 220 kV
2	Transformer Extension at Mangla 220 kV	Mangla		2007-08	C	Existing Transformers get overloaded in case of outage of S/C 220 kV Mangla-Ghkhar or outage of a Gen. Unit at Mangla 132 kV
3	Transformer Extension at Lahore 500kV	Lahore		2007-08	C	Without Extension, the existing transformers get overloaded
4	Line Bay Extension at Mardan and Transmission Line	Mardan. (Line bay Extension)	D/C from looping point to Mardan 30km	2006-07	B	The existing Tarbela-Mardan 220 kV D/C does not meet N-1 criteria in case proposed hydro IPPs feeding into Mardan do not materialize. If loop In/Out not applied, trip of one circuit overloads other circuit.
5	Transformer Extension at Gatti 500 kV	Gatti		2007-08	C	Without Extension, the existing transformers get overloaded
6	Transformer Extension at Multan 500/220 kV	Multan		2007-08	C	It will relieve the existing 220/132 kV substations of Piranghaib, M-Garh and will replace/delay Multan Ind. From Tranche-2
7	Transformer Extension at Bannu 220kV	Bannu		2007-08	C	N-1 criteria is violated; gets 55 % overloaded
8	Transformer Extension at Yousafwala 220 KV	Yousafwala		2007-08	C	N-1 criteria is violated at this substation and 132 kV network emanating from Yousafwala, Kassowal and Vehari
9	Transformer Extension at Bahawalpur 220 kV	Bahawalpur		2007-08	C	substation crosses its installed capacity, the N-1 criteria is violated at 132 kV network emanating from Yousafwala, Kassowal and Vehari
10	Transformer Extension at Ludewala 220 KV	Ludewala		2007-08	C	Existing two transformers get overloaded
11	Transformer Extension Hyderabad 220 kV	Hala Road		2007-08	C	N-1 criteria is violated at this substation and 132 kV network emanating from Hala Rd.

No.	Subproject	Substation (existing)	Transmission Line length km	Expect commissioning	ADB Environmental Category	Technical Justification (without improvements)
12	Augmentation at Islamabad 220 kV	Islamabad University		2007-08	C	Overloads at Islamabad University, IBD-P. Rd and Rewat-N 220/132 kV substations
13	Transformer Extension at Peshawar 500 kV	Sheikh Muhammadi (Peshawar)		2007-08	C	N-1 criteria is violated during High Water season
14	Transformer Extension at Muzaffargarh 500 kV	Muzaffer Garh		2007-08	C	New power available from KAPCO cannot be evacuated maintaining N-1 criteria
15	New equipment 220 kV GIS substation within BANDALA GSS with Transmission Line	Bandala (near Shahkot)	Gatti – K.S.K D/C In/Out at Bandala Km10 (2 x 5km))	2008-09	B	NTBD 220/132 kV S/S gets overloaded - 132 kV network gets stressed
16	Static Var Compensator located in GSS at New Kot Lakphat	SVC NKL (Lahore)	Static VAR Compensator	2008-09	C	Without SVC, the system faces voltage instability leading to system collapse
17	Transformer Extension at Ghakhar 220 kV	Ghakhar		2008-9	C	N-1 criteria is violated at this substation
18	Augment equipment in GSS at New Kot Lakphat	Augment NKL (Lahore)		2008-09	C	
19	New 220 kV WAPDA Town Grid Station with Transmission line	Lahore	Lahore-NKLPT to be In and out (2x10km)	2008-09	B	Without 220/132 kV Substation Overloads and N-1 criteria is violated at other 220/132 kV substations of Lahore ring

Source: TA 4665-PAK Consultants, September 2006.

6. The **Tarbela** subproject will involve the installation of one 237MVA (3x79MVA) transformer and associated equipment within the boundary of the Tarbela 500/kv grid substation (72°41'E, 34°05'N) near Tarbela NWFP.

7. The **Mangla** subproject will involve the installation of one 138MVA 220kv/132kv auto-transformer within the boundary of the Mangla 220kv grid substation (73°37'E, 33°10'N) near Mangla Dam west of the Mangla Reservoir, Punjab.

8. The **Lahore** subproject will involve the installation of one 600MVA transformer and associated equipment within the boundary of the Lahore 500kv grid substation (74°03'E, 31°40'N). The substation is about 30km north west of Lahore City near Sheikupura, Punjab

9. The **Mardan** subproject will start at the existing Mardan substation (74°08'E, 32°02'N) and a 30km 220kV transmission line supported on 86 towers will be built to connect to the line

between Ghazi Brotha and Shahibagh, NWFP. NTDC will need to acquire land necessary to accommodate the tower bases but two of the spare bays at Mardan GSS will be utilized to accommodate the 220kV circuit breakers and associated equipment and therefore no new land will be needed at the grid station itself.

10. The **Gatti** subproject will involve the installation of one 450MVA transformer within the boundary of the Gatti 500kv grid substation (71°08'E, 31°29'N). The substation is located about 15km to the north of Faisalabad, Punjab.

11. The **Bannu** subproject will involve the installation of one 160MVA transformer and associated equipment within the boundary of the Bannu 500/22kv grid substation (70°41'E, 33°01'N) near Shaikh Jamal Ziarat about 6km to the north east of Bannu Cantonment, NWFP.

12. The **Yousufwala** subproject will involve the installation of one 160MVA transformer and associated equipment within the boundary of the Yousafwala 220kv grid substation (73°12'E, 30°40'N) that is located 31km south west from Okara, Punjab.

13. The **Bahawalpur** subproject will involve the installation of one 160MVA transformer within the boundary of the Bahawalpur 220kv grid substation (71°33'E, 29°38'N) near Chatriwala Dahar about 8km to the south of Bahawalpur, Punjab.

14. The **Ludewalla** subproject will involve the installation of one 160MVA transformer and associated equipment within the boundary of the Ludewalla 220kv grid substation (72°39'E, 32°09'N). The substation is about 10km north of Sargodha City near Ahmadabad town, Punjab.

15. The **Hyderabad** subproject will involve the installation of one 160MVA 220/132kv transformer and associated equipment within the boundary of the Hala Road Hyderabad 220kv grid substation (68°25'E, 25°24'N). The new transformer will be installed alongside the existing two 220/132kv transformers in an existing spare transformer bay. The substation is about 5km north of Hyderabad, towards Hala on the N-H5, in Sindh Province.

16. The **Islamabad** subproject will involve the installation of one 160MVA transformer and associated equipment within the boundary of the Islamabad University 220/kv grid substation (73°06'E, 34°45'N) on the north eastern outskirts of Islamabad.

17. The **Peshawar** subproject will involve the installation of one 160MVA transformer and associated equipment within the boundary of the Shaikh Muhammadi-Peshawar 500/kv grid substation (71°33'E, 33°56'N) near Badber, Peshawar in the NWFP.

18. The **Muzaffargarh** subproject will involve the installation of one 600MVA transformer and associated equipment within the boundary of the Muzaffargarh 500kv grid substation (71°09'E, 30°07'N). The grid station is located about 8km north west from Muzaffargarh city on the Kot Addu Road. The substation is connected to the Muzaffargarh Thermal Power Complex.

19. The **Bandala** subproject will be located in and near the existing Bandala 132kv grid substation (73°23'E, 31°32'N) that is located at about 10km south west of Sha Kot, Punjab. The subproject will involve the installation of one 220kv GIS Substation that will be known as "*Bandala New Grid Substation*" within the boundary of the existing FESCO substation. There will also be about 4km of transmission line to connect to the Gatti-KSK 220kv transmission line that is about 4km to the north. The nearest settlement to the existing substation is Jamlana

village, about 1km away to the west. The nearest settlement to the proposed transmission line is Kalla village which is about 50m to the west of the proposed transmission line.

20. The **New Kot Lakhpat SVC** subproject will involve the installation of one 220kv static var compensator and associated equipment within the boundary of the New Kot Lakhpat 220kv grid substation (74°19'E, 31°28'N). The substation is about 10km south of Lahore, near Model Town and to the east of Kot Lakhpat, Lahore, Punjab.

21. The **New Kot Lakhpat augmentation** subproject will involve the installation of one 220MVA 220/132kv transformer and associated equipment within the boundary of the New Kot Lakhpat 220kv grid substation and the new transformer will replace one of the existing three 220/132kv transformers in an existing transformer bay.

22. The **Ghakkar** subproject will involve the installation of one 160MVA 220kv/132kv transformer within the boundary of the Ghakkar 220kv grid substation (74°09'E 32°N18'E). The substation lies fronting the N-H5 highway on the southern outskirts of Ghakkar about 20km to the north of Gujranwala City, Punjab.

23. The **WAPDA Town** subproject will be located in and near the existing Wapda Town 132kv substation located at about 11km south of Lahore. It involves the installation of one 220kv GIS substation within the boundary of the existing LESCO substation. The transmission line will require 43 towers and 7.5km of in/out single conductor 220kv double-circuit line connecting to the Sheikhpura – New Kot Lakhpat 220kv transmission line. The nearest settlement is Block-G in Wapda Town suburb and the line is about 50-100m away from the nearest houses.

24. When the subprojects detailed designs have been completed the scope of works for each of the subprojects will be generally similar including but not necessarily limited to (i) installation of transformers and other GSS equipment; (ii) survey and construction of civil works for constructing the TXL towers; (iii) constructing other infrastructure and modifications to infrastructure to facilitate installation of the transformers in the GSS and TXL; (iv) constructing and improving service roads; (v) landscape and ancillary works to facilitate operations of the subprojects and (vi) implementation of all environmental and social mitigation measures as recommended in the endorsed IEEs. The Tranche 1 subprojects are expected to be completed by mid-end 2008.

C. Description of the Environment

1. Physical Environment

a. Surrounding Land

25. The **Tarbela** substation is located below the Tarbela Dam about 1.3km to the west of Tarbela settlement immediately below the dam. The physical, biological, and socioeconomic environment of the area surrounding the subproject is characterized by the alluvial plain below the dam that has modified the original habitat. The subproject substation is located in the land between the banks of the River Indus). There are no inhabitants within 1km (Table 7.1) but there is a settlement below the eastern end of the dam about 1300m from the substation. There are no hospitals, schools or places of worship within 3km of the Tarbella 500kv grid substation.

26. The **Mangla** subproject substation is located amidst agricultural land about 10km south of the River Sutlej. The physical, biological, and socioeconomic environment of the area

surrounding the subproject is characterized by irrigated farmlands that have replaced the original habitat of thorn forests and swamps. There are several farms and settlements within 5km of the subject substation but there are no settlements, hospitals, schools or places of worship within 1km of the Mangla 220kv grid substation. The nearest water course is the Bahawal Canal which is more than 500m to the north.

27. The **Lahore**. The physical, biological, and socioeconomic environment of the area surrounding the subproject is characterized by irrigated farmlands and isolated villages that have replaced the original habitat. The subproject substation is located amidst agricultural land about 30km north west of Lahore. There are several farms and settlements within 5km of the subject substation but there are no settlements, hospitals, schools or places of worship within 500m of the Lahore 500kv grid substation.

28. The area surrounding the **Gatti** subproject is characterized by irrigated farmlands that have replaced the original habitat. There are several farms and settlements within a few km but there are no settlements, hospitals, schools or places of worship within 500m of the Gatti 500kv grid substation. The nearest water course is the Rakh branch of the Lower Chenab Canal which is about 6km to the south. The nearest substantial settlement is about 600m to the south west at Tara Garh Kalan.

29. The **Bannu** subproject substation is located about 5km to the north east of Bannu surrounded by alluvial farmlands amidst the higher ground between the Khalbol Khwara and Tangal Algad seasonal tributaries of the Kurram River (a tributary of the River Indus). There are no hospitals, schools or places of worship within 500m and there are few inhabitants within 500m but Shaikh Jamal Ziarat is the main settlement which is about 600m from the substation.

30. The **Yousufwala** subproject is about 6km to the north east of Yousafwala in irrigated farmlands near the Lahore-Multan Road (National Highway 5). There are several farms and settlements within a few km but there are no settlements, hospitals, schools or places of worship within 200m of the substation. The nearest main water course the Katorwala minor canal is about 2km to the east. The nearest substantial settlement is Chak 86-9L at about 300m to the south west.

31. The **Bahawalpur** subproject is also in irrigated farmlands about 10km south of the River Sutlej. There are several farms and settlements nearby but there are no settlements, hospitals, schools or places of worship within 1km of the Bahawalpur substation. The nearest water course is the Bahawal Canal which is more than 500m to the north.

32. The **Ludewalla** subproject is on agricultural land and there are several farms and settlements within 5km of the subject substation but there are no settlements, hospitals, schools or places of worship within 200m of the substation.

33. The **Hyderabad** subproject is on agricultural land o the north of the City and the area surrounding the subproject is the urban fringe. There are trees and other vegetation that provide habitat for some species of wild birds it is not likely that they would be affected by the works in the substation.

34. The **Islamabad** subproject is to the north east of Islamabad and the area surrounding the subproject is characterized by the urban outskirts of Islamabad and there is little left of the original habitat. The surrounding areas are essentially urban fringe. There are trees and other

vegetation that provide habitat for some species of wild birds it is not likely that they would be affected by the works in the substation.

35. The **Peshawar** subproject is located about 1.5km to the east of Shaikh Muhammadi-Peshawar. The area surrounding the subproject is farmland between the Zindhal Khwara and Bara River seasonal tributaries of the Kurram River (a tributary of the River Indus). There are few inhabitants within 1km but the outskirts of Shaikh Muhammadi (the main nearby town) are about 800m from the substation. There are no hospitals, schools or places of worship within 500m of the Peshawar grid substation.

36. The **Muzaffargar** subproject is surrounded by flat irrigated agricultural land about 20km west of the River Chenab. There are several farms and settlements within 5km of the subject substation but there are no settlements, hospitals, schools or places of worship within 500m of the Muzaffargar 500kv grid substation. The nearest water course is the Rangpur Canal which is more than 5km to the east.

37. The **New Kot Lakhpat SVC and augmentation** subprojects are located in the middle of Kot Lakhpat town some 10km south of Lahore. There are roads on two sides (east and south) with residential and commercial developments to the west and north. However there are no hospitals, schools or places of worship within 50m of the New Kot Lakhpat 220kv grid substation. The nearest water course is the Khaire Distributory Canal which is about 200m to the north. The surrounding areas are urban with a few isolated trees and local wildlife would not be affected by the planned works.

38. The **Ghakkar** subproject area is characterized by irrigated farmlands and the substation is located about 10km north of the Upper Chenab Canal. There are several farms and settlements within 5km of the subject substation. The nearest settlement is a village north of Karimabad about 300m from the south west corner of the substation compound. There is a hospital about 140m from the western boundary of the substation. The Ghakkar Girls High School and the Boys High School are about 200m from the northern boundary of the substation. The nearest major water course is the Ghakkar Disributory Canal which crosses under N-H5 about 500m to the south. The surrounding areas are essentially the urban fringes of Ghakkar with agricultural monoculture and isolated specimen trees and occasional scrub further away from the N-H5. There is little or no wildlife in the grid substation or the surrounding areas because of extensive cultivation and human activities.

39. At **Mardan** no new land will be needed at the grid station itself. The subproject area is essentially agricultural monoculture with isolated specimen trees and occasional scrub. There is no wildlife in the grid substation, and the wildlife in the surrounding areas where the towers would be built is not in a natural habitat. Only small plots of land required to accommodate the tower bases and wildlife would not be affected by the planned works. The towers will be about 300m apart across the fields and the IEE has concluded that cumulative impacts should be very minor, if they occur at all.

40. The **Bandala** subproject area is characterized by irrigated farmlands and the substation is located amidst agricultural land about 10km south west of Shah Kot. There are several farms and settlements within 1km of the subject substation and there are several settlements, a clinic, schools and some temples or places of worship within 500m of the new transmission line. The Shah Kot Drain runs about 1km to the north west and there is a main irrigation channel which runs near the Gatti-KSK transmission line to the north.

410. The **Wapda Town** subproject is within a rural agricultural area. The potential environmentally significant features will be limited but they will affect the green field sites and the works will traverse land in Wapda Town and along the drain running to the south which runs through agriculture, scrub, and cereal and vegetable fields. However, disturbance to these areas will be very localized as most of the construction work can take place within the RoW for the irrigation channel. Further major disturbance outside the RoW should not be significant if routine environmental management procedures and engineering controls are implemented.

b. Meteorology and Climate

42. The climate of the subject areas are tropical continental with low rainfall, low humidity, long hot summers, and short mild winters. The summer season is hot and dry except for the rainy months. May and June are the hottest and driest months of the season. The mean maximum temperature ranges from 40°C to 42°C. The project areas are generally frost free except for December and January. The winter season starts from November and lasts until February. The average maximum and minimum temperature recorded during the month of January is about usually 20°C and 6°C respectively.

43. Monsoon usually starts in the first week of July the average annual rainfall about 625 mm. Most of the rainfall comes during monsoon period i.e. July and August. Therefore the best time for construction in rivers is between October and March when there is no significant threat of rain. During monsoon, when a large proportion of the rain occurs in heavy showers, storms are of high intensity.

c. Topography, Geology, and Soils

44. Except for the projects in Lahore (NKL), Islamabad and Hyderabad the surrounding areas for all subprojects are essentially rural or agricultural monoculture with isolated specimen trees and occasional scrub. There is no significant wildlife in the grid substations, and the wildlife in the surrounding areas is not in a natural habitat because of extensive cultivation, high population and human activities. The subproject areas in Punjab are all situated on irrigated farmlands or formerly agricultural urban fringe and soils are classified as loamy, silty-loamy, and silty⁴. The subproject areas in NWFP are in less productive farmlands and soils are less well tended.

45. There are no natural rivers or watercourses very near any of the substation subproject areas. The Bandala TXL will cross a few local irrigation channels. The one exception is the potential impact of the Mardan transmission line which crosses the Kabul River. Those impacts can be avoided by careful timing and other mitigation and impacts have been assessed in the Mardan IEE and are summarized in Table A1 (EMP matrix).

46. Several secondary and tertiary canals support the agricultural area of the sub-project areas permanently with irrigation water. Water-user associations control and regulate the delivery of the irrigation water to the farms.

47. Some shallow wells were observed during the field visits that must be protected during construction.

⁴ WAPDA/IWASRI (2004): National Drainage Programme – Soil Salinity Survey of Lower Bari Doab Canal Command. – Lahore, 160p.

2. Biological Environment

a. Agriculture

48. Agriculture dominates the regional economy. Rural Punjab and Sindh are fertile areas with canal irrigation and productive crops. The yields are high. The sub-project areas are situated on level plains on ancient river terraces. The good soil structure has high productivity and potential for diverse farming. The soils have a wide range of crop adaptability and can be maintained in a highly productive state with modern management practices. Rural NWFP is fertile but less well developed agriculturally and yields are more moderate.

49. As of 2002/3, no soil salinity is reported, although ground-water sources show brackish waters, which are partly not suitable for drinking and irrigation purposes⁵. An earlier inventory from 1981 showed strongly saline soils.

50. There is little unproductive land around the agricultural subproject areas. No forests/woodland areas are reported or observed.

b. Fauna and Flora

51. Whereas there are some valuable ecological resources and protected sites in Punjab the reported data in the environmental assessments for the sites identified for subprojects, does not include any rare or endangered species.

52. Much of the indigenous wildlife has been driven away due to agriculture and urbanization. The remaining animals are common species which are adapted to scavenging (jackals, foxes, hares and wild pigs). Common birds found in the areas include egrets, pond herons, common kingfishers and sandpipers. Other species associated with the human settlements include white-cheeked bulbul, doves, house sparrow, starling and house crow.

53. The common crane is also found in the winter. There are also common reptiles. The districts near the canals support some local fishing with professional fishermen all along some canals and the Chenab River but there is no intensive commercial fishing in the areas near the projects.

3. Social-Cultural Environment

a. Human Issues and Life Quality

54. Common ailments include eczema, gastroenteritis, Acute Respiratory Infection (ARI), malnutrition and anemia. Health care is also provided by government dispensaries and private practitioners. For serious ailments patients visit hospitals and private clinics near the subproject areas.

55. Most families live in brick and cement houses. Structures made completely or partially of wood and mud bricks are less common these days in the study areas.

⁵ Reported by farmers on the sub-project site during public consultation held on 18 August 2006. The actual groundwater table was estimated to be 5m to 6m below ground level.

56. Main occupational groups are daily wage laborers, farmers—primarily owner-cultivators and tenants and factory workers. A small proportion is employed by the government.

57. Rice and wheat are the main crops grown. An acre of land yields approximately 1,400kg of rice and 1,200 kg of wheat. The rice can be export quality.

58. A detailed description of the socioeconomic environment of the study area is given in the Summary Social Impact Assessment report for the project.

b. Cultural and Historical Sites

59. There were no sites of cultural significance found very close to the Tranche 1 study areas. There are some shrines in some nearby villages where people are fed, daily.

D. Environmental Impacts and Mitigation Measures

1. Environmental Impact Associated with the Project Locations

60. The environmental impacts associated with sixteen of the nineteen subproject locations in Tranche 1 will be insignificant as they only involve enhancement of equipment within existing GSS. There are two subproject locations (Mardan and Bandala) which also involve new construction of GSS and/or TXL and in these cases the potential for some significant impacts is greater due to the need to acquire some land for the TXL. Subproject selection criteria have been reported in the IEEs and taken forward in the EARF. The criteria are designed to avoid unnecessary problems as far as possible at the design stage and all Tranche 1 subprojects are generally located in appropriate areas with angle towers positioned to avoid villages and other sensitive receivers. Although land is already fully utilized for agricultural or urban purposes in most subproject areas, there are suitable disturbed areas or less intensively farmed areas and other Government land available for the proposed GSS and TXL routes. TXL will be located as far as possible from local villages and sensitive receivers. The site selection criteria are included in the EARF for the Tranche 2 sites and for all future tranche subprojects.

2. Environmental Impact of Construction Activities and Operation - Mitigation Measures

a. Physical Environment

i. Soil

61. The designated subproject areas will be cleared prior to construction. Total land clearing will involve only about 50 to 150m² for each tower (depending on tower type). New substations may be included in future tranches and in that case a few hectares of land would also be required but such are not included in Tranche 1. The following soil erosion measures will be provided during and after construction:

- (i) The contractor shall stockpile 30cm of topsoil for reuse in landscaping or reinstatement after construction.
- (ii) The contractor will be required to balance the amount of cutting and filling to reduce the need to store excavated materials for a long time before reusing them. Stockpiles should be covered to prevent runoff.

- (iii) Bituminous wastes should not arise in any significant quantity but other waste and spoil materials shall be reused wherever possible within the project or on nearby projects and shall not be dumped on the agricultural land, near streams channels, or near other water bodies.
- (iv) The contractor shall replace topsoil in landscaping after construction.

3. Erosion Control

62. The need to construct towers in or near the banks of water courses raises erosion control as a significant risk. New construction should be phased to occur in the periods of less rain (October to March) but also designed not to conflict with any ecological priorities for migration etc at that time. A consensus approach should be taken with advice from local wildlife experts as to the best time to construct.

4. Air Quality

63. Earthworks and site formation activities and general foundation works will contribute to increasing dust during construction. The following mitigation measures are needed to control dust to acceptable levels:

- (i) Dust suppression should be undertaken at sites where cement and aggregate mixing is undertaken.
- (ii) Compaction of fertile topsoil should be prevented. Haul roads or access paths to construction areas should be cleared of topsoil (stockpiles as above) and maintained and damped down in dry weather by watering regularly. Twice daily watering should take place for works within 50m of sensitive receivers such as schools, hospitals and residences.
- (iii) Construction materials (sand, gravel, and rocks) waste and spoil materials shall be transported by trucks covered with tarpaulins to control dust.
- (iv) Storage on site should be minimized. Materials should be brought to site as needed.

64. It is possible that that the project might still result in some dust emissions even after implementing the mitigation measures given above. However, the impact of those residual emissions is not expected to be significant because they will be for a very short duration.

65. There is ample distance between all sites and the sensitive receivers for the dispersion of exhaust emissions from construction plant and no air quality impacts should arise from that source.

66. No significant air emissions are expected in the operational stages.

5. Noise

67. Most of the proposed locations in Tranche 1 will be too remote from noise sensitive receivers to create construction noise nuisances. However impacts from the operation of some Transformers and the SVC may cause significant impacts and this SIEE must also prepare for potential impacts from subprojects in future tranches which have yet to be identified. Therefore the detailed designs for all T1 and future subprojects shall include an assessment of cumulative

impacts from all new and old operational equipment to ensure no unacceptable nuisances arise in the operational stage. Based on the information provided so far there should be no major impacts but this requires a check at the commissioning stage.

68. In the construction stages all powered mechanical equipment (PME, e.g. excavators, drills, stone crushers, concrete mixers) shall be silenced and only PME shall be used which will generate low levels of noise. However, if several machines have to be operated at the same time, their combined noise level could constitute a disturbance. To minimize this impact, the following mitigation measures will be adopted at all subproject sites during construction.

69. The following mitigation measures will be adopted to mitigate the noise impact caused by project activities:

- Local communities will be informed of all construction activities in advance.
- Horn-blowing will be prohibited. Construction equipment will be properly maintained, tuned, and provided with mufflers and located so as to minimize noise levels.
- The general rule will be that “No construction will be undertaken during the night time”.
- Construction equipment will only be operated in the construction site during the day unless it is established through monitoring that the noise levels at the nearest sensitive receivers is within acceptable standards to operate at other times.
- Installed equipment will be commissioned and designed and operated to be no louder than 70dBA (measured at 15m from source or at the site boundary) in operation.
- If acoustic assessment indicated a need for noise barriers, a brick or masonry wall (with a mass of greater than 10kg/m²) as a noise barrier or other means of noise attenuation, will be constructed around the transformers and SVC to attenuate the noise to acceptable levels at the sensitive receivers and prevent disturbance and nuisance.

70. After implementing the mitigation measures given above the residual risk of the noise generated by project will be insignificant. Noise from PME will be monitored in order to check that acceptable levels are maintained to identify the need to take corrective measures, if complaints arise.

- (i) In any residential area, the noise level at the noise sensitive receivers should be limited at 45 decibels measured in the audible noise bands (dBA) during night (from 9PM to 6AM) and 55 dBA during daytime.
- (ii) For nearby schools, the contractor will discuss with the school principals the agreed time for operating the construction machines.

6. Groundwater

71. No significant effect on groundwater is expected from construction or operation at the Tranche 1 subprojects. However, construction works should not use the groundwater without prior permission from the local water authority.

7. Surface Water

72. The main concerns about surface water conditions during construction are related to construction run-off from unprotected cleared areas, spillage and leakage from storage sites and machines, and domestic sewage from the temporary camps for workers. To address these concerns, the following mitigation measures will be adopted:

- No storage for toxic, hazardous, and harmful construction materials (e.g., asphalt, acidic and caustic substances, and petroleum products) will be near water bodies. Storage areas will be maintained with bunding to contain a total of 110% of the stored materials and checked regularly to control leakage and spillage.
- To avoid contamination from fuel and lubricants on site, all vehicle and equipment used during construction will be properly maintained and refueled off-site. Generators and compressors etc, will be located over metal drip trays or shall have integral drip trays.
- Waste petroleum products will be collected, stored, and sold to registered collectors/recyclers. Transformer insulating oils will be recovered, reconditioned and recycled at the New Kot Lakphat facility.
- If temporary worker camps are needed a sewage collection system for will be properly designed and all the toilet facilities will at least empty to septic tanks that are maintained and emptied in accordance to a defined schedule. Alternatively portable toilet facilities for temporary storage and treatment will be established in the construction camps.
- Temporary drainage will be established at the base of slopes or embankments leading to water bodies including any nearby irrigation channels and designed so that contaminants will not enter water bodies and drainage from construction areas will be filtered at least by sand catchpits or by passing through vegetated areas to settle contaminants.
- Effective temporary diversion of any local irrigation channels must be constructed before any irrigation flows are interrupted.

8. Waste Management

73. Waste management plans (WMP) will be drawn up at the project planning stage of each subproject to ensure that waste disposal measures will be undertaken to reuse and recycle all materials wherever possible minimize the generation of waste. WMPs will be prepared for all subproject packages as part of the environmental management plan to ensure that the waste generated during the construction is disposed in an environment-friendly manner. With the proper implementation of an appropriate waste disposal plan, there will be no residual risk due to improper waste disposal.

9. Ecological Environment

74. The land required for the Tranche 1 subprojects is essentially agro-ecological or urban and does not have high ecological value although the land will need to be cleared of vegetation for construction. To minimize the impact associated with tree cutting during construction, trees should be transplanted where possible or replaced as soon as possible to develop a greenbelt or landscaping around or within the subprojects, such as has already been practiced at the Lahore Sheikupura and New Kot Lakphat substations. New trees and any transplanted specimens must be maintained, fertilized and watered often, so that they survive.

75. It is recommended that planting of 2-3 new trees to replace each one cut be required in line with international standards on landscape and compensatory planting tree mitigation measures. The layouts of the Tranche 1 subprojects should be designed to ensure the least disturbance to natural species, particularly old and large specimens and any special or valuable trees connected with religious rites.

76. To minimize impacts on fauna and flora, the following mitigation measures will be adopted:

- (i) Trees will be transplanted or replaced on a basis of 2-3 trees replaced for every tree removed.
- (ii) No temporary worker camps will be allowed far away from the construction site.

E. Institutional Requirements, Environmental Monitoring Plan

1. Institutional Requirements

77. Prior to implementation of the subproject packages NTDC will need to comply with several environmental requirements of the Government and ADB. This will include disclosure of the subprojects and endorsement of the environmental assessments required by GOP through submission to the Pakistan Environmental Protection Agency (PEPA) at the provincial level (Federal level if the subproject crosses the boundaries of more than one Province). NTDC will have responsibility to ensure the implementation of all mitigation measures and other recommendations in the environmental assessments (IEE/EIA) for each of the respective subprojects. If a formal IEE/EIA is conducted under the PEPA requirements, NTDC must accept the conditions stipulated by PEPA for implementation during construction and operation and obtain written confirmation of compliance from PEPA that the conditions are complied with, before the subproject can be implemented. The EMP is presented in Table 1. (The EARF is Supplementary Appendix B to the RRP).

78. The NTDC will need to confirm that all local statutory requirements and byelaws have been complied with and that contractors have appropriate and valid permits where necessary. Where as no protected antiquities were identified in proximity to the Tranche 1 subproject package sites NTDC shall ensure no activity is undertaken in the proximity antiquities and report any archaeological discovery to the Department of Archaeology.

79. No reserved forests are in the vicinity of the proposed subproject packages for Tranche 1, however compliance with the Forestry Act, 1927 will need to be achieved in the event that such areas are identified near other subproject packages in any future subprojects.

80. Wildlife protection ordinances (e.g. Punjab Wildlife Protection Ordinance, 1972) empower government to declare areas for protection of wildlife and control activities within in these areas. Whereas no activities are currently planned in such areas for the Tranche 1 subproject packages, compliance will need to be achieved in the event that such areas are identified in or near any future subproject packages in future tranches.

81. Because of the similar nature of the works for each subproject the EMPs will to some extent also be similar. In this SIEE a generic EMP (table A1) has been provided based on the designs for the subprojects identified so far. At a later stage it will be necessary to prescribe detailed EMPs for all aspect of each subproject in the construction and operational stages. The actions described in the EMP(s) shall be fully and properly carried out, in accordance with the

time frame(s) set out in the EMP, or as required by PEPA as conditions for compliance with PEPA Act.

82. An environmental unit will be set up in NTDC to provide quality control and oversight for the environmental assessments and EMP implementation. The staff in the environmental unit will need orientation for environmental assessment and will provide training and resources and environmental management of all subprojects in all tranches as well as working towards improving environmental awareness at all levels of NTDC in the medium to long term.

83. For this Project, the project implementation unit will have one dedicated environmental officer to address environmental concerns. The environmental officer will ensure that each subproject has a full suite of environmental clearances, environmental assessments, IEE/EIA and EMP as necessary before construction commences and also follow up to help implement the subproject EMP.

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

- (i) **Contractors:** responsible for implementing all measures required to mitigate environmental impacts during construction;
- (ii) **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.
- (iii) **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 mitigation measures required to mitigate environmental impacts.

2. Training and Monitoring

85. Several government agencies and private sector parties will be involved in implementing the EMP (Table 1). Therefore induction training workshops should be designed and conducted by the environmental officer to suit managerial as well as the working level staff as personnel are brought into work on the subproject tranches. These environmental training workshops shall continue throughout the MFF construction programme in all tranches. Refresher courses shall be carried out over the lifetime of the MFF as experience accumulates and as staff turnover necessitates.

86. As the project proceeds the workshops will disseminate the monitoring results to the workforce, focus attention on the implementation of the EMPs and facilitate remedial actions, if unexpected environmental impacts occur. The EMPs should be regarded as working documents which present plans for the minimum requirement (a starting point) of environmental management, action, monitoring and auditing envisaged at the design stage. These requirements may be modified and increased in response to circumstances as the project proceeds and in response to changing environmental requirements.

87. The monitoring plan (Table 2) was designed based on the Tranche 1 subprojects. During the preconstruction period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental

mitigation measures requirements have been incorporated as part of contractor's assignment. 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 subproject environmental performance and to guide any remedial action to address unexpected impacts. Monitoring activities during project operation will focus on recording compliance with design standards at commissioning, environmental performance and proposing remedial actions to address unexpected impacts.

3. Environmental assessment of subprojects

88. The subprojects (in Tranche 2 and future tranches) will be prepared in due course (TA 2178) and will first be categorized to determine the appropriate level of environmental assessment. The detailed Environmental Assessment Review Framework procedure is presented as a supplementary appendix to the RRP. The salient features of the environmental assessment requirement for the follow-up subprojects are as follows:

- (i) An environmental assessment will be prepared for all subprojects.
- (ii) Subprojects will be categorized following REA to determine the need for IEE/EIA under ADB guidelines and also PEPAct requirements. Any subprojects that are Category A or B sensitive will be conducted in a timely manner to ensure that the SIEE/SEIA and EMP can be made public 120 days prior to the submission of the PFR.
- (iii) The environmental assessment Studies will be undertaken as part of the TA 2178 PAK (by consultants). NTDC will provide funding and resources to scrutinize the environmental assessment studies.
- (iv) No subproject will be located in a designated critically sensitive areas, environmentally sensitive areas or area for protection of wildlife declared under the PEPAct or any other statutory instruments.
- (v) Aside from submitting the IEE and SIEE to the relevant authorities as part of the Government's requirements for environmental clearance, the review of environmental implications, IEE and SIEE will also be submitted to ADB for review and approval.
- (vi) Only subprojects that meet all the Government's environmental requirements and in receipt of clearance certification from the relevant provincial or federal EPA will be funded by the MFF.
- (vii) The results of all environmental impact assessments reports and certificates should be kept orderly as part of the project documentation made available for public scrutiny, if required.

F. Public Consultation and Disclosure

89. Public consultation was conducted in August and September 2006 for the Tranche 1 subprojects that will require land to be acquired outside the existing GSS and for TXL. The meetings were conducted in villages and with other relevant government agencies at the local level. The consultations were carried out with individuals, community leaders and village administration and at local and civil administration levels. Formal and informal methods of consultation were adopted. The consulted stakeholders included local residents, business owners and community leaders and government officials.

90. The consultation was designed to inform the parties consulted about the proposed Project and to identify their concerns. The visits to site and consultation focused on informing

the public and officials about the subprojects and the potential environmental impacts. Consultation sought to determine the major areas of environmental concern or problems considered by the local stakeholders to be important. The findings of public consultation were considered in identifying the mitigation measures and alternatives. In the initial stages of PC there was some considerable opposition to some of the proposed projects mainly due to the perception that acquired land would not be compensated properly. Measures to mitigate issues have been proposed in the SIA and LARP and the scope and location of subprojects will be reviewed if necessary at the detailed design stages and environmental assessments updated if necessary.

G. Findings and Recommendations

91. Primary and secondary data were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The environmental assessments on the subprojects have provided a picture of potential environmental impacts associated with the MFF Tranche 1 and suitable mitigation measures have been recommended in the EMP (summarized in Table 1) monitoring and provisional cost of mitigation have been estimated (Table A2 and A3). In the event that any design details are changed for the locations or scope of any subproject the respective environmental assessment and EMP shall be reviewed. Likewise environmental assessments will need to be carried out for the subprojects in Tranche 2 and further tranches in line with the EARF.

92. The Tranche 1 subprojects considered to date offer robust options for the enhancement of the power transmission system and are conceptually well designed and located from the environmental and socioeconomic points of view. Environmental impacts associated with all the subprojects will need to be properly mitigated and existing institutional arrangements are available. Additional human and financial resources will be required to progress and achieve necessary statutory compliance and environmental clearance certification for the subprojects that also require environmental assessment under the environmental laws of Pakistan.

93. Whereas most environmental impacts related to the subprojects will take place during the construction phases there are no significant potential cumulative impacts during construction or operation. However the construction impacts require to be mitigated and monitored and environmental clauses are recommended to be included in the construction contracts. Environmental monitoring and auditing has been recommended in the Monitoring Programme (Table 2). Environmental reporting is recommended to be included in the monthly progress reports throughout the construction phase and immediately prior to commissioning of subprojects to check on potential operational impacts. The implementation of the environmental mitigation measures during the construction period can be assigned to the contractors providing they are included in contracts and the operational mitigation measures must be taken up by the NTDC during and after commissioning for the lifetime of the subprojects. Contractors and management must have policies and workable strategies to mitigate the environmental impacts which can be put into practice on site.

94. It is likely that contractors will lack environmental awareness and the NTDC has no dedicated environmental unit at present. NTDC must make provisions to develop an environmentally orientated culture from the Board level down and from the working level up in order to manage environmental responsibilities proactively. It has been recommended that an environmental (and social) unit be created in NTDC with Board support with at least one environmental officer to handle all necessary statutory permitting and clearances for all subprojects in Tranche 1 and subprojects in all the future tranches. In the short term the

environmental officer would deal with statutory submissions to EPA, ensure environmental requirements were included in contracts and supervise implementation of all the required environmental mitigation in the construction and operation of the subprojects. This capability could be used to extend environmental awareness throughout NTDC in the medium to long term. NTDC will need to develop robust environmental policies and the environmental officer would also train management and staff at all levels throughout the NTDC on how to discharge environmental obligations consistently. The responsibilities for the implementation of mitigation measures and the parties responsible must be clearly defined in contracts and agreements and the implementation by various parties must be monitored by an environmental supervising (checking) consultant. A direct reporting mechanism from the environmental supervising consultant to the environmental officer and NTDC management needs to be established, with a mechanism to address unexpected environmental impacts, as contingencies.

95. This SIEE, including the EMP, should be used as a basis for an environmental compliance program in a regular programme of environmental monitoring and auditing. In addition, the conditions as part of the environmental compliance from the Government should also be included as a basis for the environmental monitoring and compliance program. Therefore, continued monitoring of the implementation of mitigation measures, the implementation of the conditions environmental compliance and monitoring of the environmental impact related to the operation of the MFF subprojects should be carried out and reported at least quarterly as part of the project performance report. The environmental assessment review framework (EARF) sets out the environmental requirements for all future subprojects.

H. Conclusion

96. The environmental assessments for the nineteen subproject packages so far identified have assessed the main potential environmental impacts forming Tranche 1 of the MFF. The IEE reports are presently based on the conceptual designs and locations and the NTDC will be required to review the IEEs and the respective EMPs and implement schedules of mitigation measures provided in each of the IEE reports (Environmental Management Plans and Monitoring Plans) at the implementation stage. With these measures in place environmental impacts identified by the study should not be insurmountable and will not result in any residual impacts which are above accepted environmental standards.

97. Whereas the conclusions and findings of the environmental assessments for the Tranche 1 subproject packages are subject to re-confirmation after the detailed designs are completed, the conclusions reached so far are robust. In the event that there is a material change to the location or design of any of the Tranche 1 subproject packages the recommendations of the relevant IEE(s) should be revised as necessary, consulted with affected people, and reviewed and the schedules of mitigation measures updated accordingly.

98. Environmental assessments will be required for all the follow-up subprojects in future tranches as and when feasibility studies have been completed and the locations and design details are available. NTDC will adopt the review procedure for the environmental assessment of all subprojects and obtain the necessary environmental clearance from GOP and approval from ADB, as described in the Environmental Assessment Review Framework.

Environmental Management Plan

The EMP matrix presents the minimum environmental management plan (in matrix form) that will apply to additional subprojects. Additional requirements may be necessary for some sub-projects in future tranches. The matrix is developed on the basis of environmental analysis for the T1 subprojects and review of environmental impacts of the typical T1 projects and reasonable assumptions about the scale and scope of future sub-projects. The mitigation measures for the additional subprojects will be developed in the spirit of the principles agreed upon in the following framework EMP Matrix Table. However the EMP for all subprojects will be a working document and any unanticipated consequence(s) of the project will be documented in the regular quarterly reports and environmental mitigation measures will be modified and the EMP updated to take account of unexpected impacts as necessary, throughout the implementation and operational periods.

Table 1. EMP Matrix

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
DESIGN STAGE						
1. Social Impacts	To ensure that the adverse impacts due to the property acquisition and resettlement are mitigated according to the LARP.	<p>1. Social preparation completed (Sep 2006 . LARP etc in place IF UNFORSEEN ADDITIONAL LAND IS REQUIRED</p> <p>2. Acquisition of lands completed to minimize the uncertainty of people.</p> <p>3. Completed implementation of LARP and LARCs to provide compensation and assistance to the APs.</p> <p>4. NTDC selected a route that will not affect any public built-in property or house; no additional land is required..</p> <p>5. All the payments/entitlements are paid according to the Entitlement Matrix, which was prepared according to the LARP.</p> <p>6. All the impacts identified by the EIA are incorporated in to the project as well as the LARP and relevant entitlements included into the Entitlement Matrix.</p>	Before the installation of towers and structures the APs to be given sufficient time with compensation money and to resettle satisfactorily.	Affected Families will be compensated by NTDC through the concerned District Revenue Department and Land Acquisition Collectors.	NTDC / LACs	MC and External Monitors
2. Hydrological Impacts	To minimize hydrological and drainage impacts during constructions.	<p>1. Hydrological flow in areas where it is sensitive, such as water courses for bridges and culverts.</p> <p>2. Design of adequate major and minor culverts facilities will be completed</p>	Before the commencement of construction activities/during designing stage	Considered locations are as in the design report	NTDC with the Design Consultant	NTDC
3. Noise barriers	Ensure cumulative noise impacts are acceptable in operational phase	<p>1. Conduct detailed acoustic assessment for all residential, school, (other sensitive structures) within 50m of GSS and RoW.</p> <p>2. If noise at sensitive receiver exceeds the permissible limit, the construction activities should be monitored and controlled.</p>	<p>1. During detailed design stage. No later than pre-qualification or tender negotiations.</p> <p>2. Include in the contract.</p>	Noise sensitive locations identified in the EIA/EMP (2006) or as required approved by EPA.	NTDC with the design consultant	NTDS and Construction Supervision Consultant (CSC if any)
4. Waste disposal	Ensure adequate disposal options for all waste including transformer oil,	<p>1. Identify sufficient locations for disposal of transformer oil, unsuitable soils, scrap metal "cradle to grave".</p> <p>2. Include in contracts for unit rates for re-</p>	1. During designing stage no later than pre-qualification or tender negotiations	Locations approved by EPA and NTDC and waste disposal local authorities.	EPA and NTDC with the design consultant	NTDC and CSC

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
	unsuitable soils, scrap metal.	measurement for disposal. 3. Designate disposal sites in the contract and cost unit disposal rates accordingly.	2. Include in contract.			
5. Temporary drainage and erosion control	Include mitigation in preliminary and 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 design consultant.	NTDC and CSC
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.	Prepare a thorough plan to be approved by sc one month prior to a commencement of construction Proper timetable prepared in consideration 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 disturbances. 3. A list of locations of irrigation channels / drains to be compiled by the contractor	1. CSC or NTDC to actively supervise and enforce	NTDC
2. Orientation for Contractor, and Workers	To ensure that the CSC contractor and workers understand and have the capacity to ensure that environmental requirements and	1. NTDC to engage environmental specialist to monitor and progress all environmental statutory and recommended obligations. 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.	Induction for all site agents and above including <u>all relevant NTDC</u> staff new project staff before commencement of work.	All staff members in all categories. monthly induction and six month refresher course as necessary until contractor complies	Contractor and the CSC and record details	NTDC & CSC to observe and record success

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
	<i>implementation of mitigation measures.</i>	<p>3. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities.</p> <p>4. Continuous progress review and refresher sessions to be followed</p>	<i>At early stages of construction for all construction employees as far as reasonably practicable</i>			
3. Water quality	<i>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.</i>	<p>Compile temporary drainage management plan one month before commencement of works. Proper installation of TD and EC before works within 50m of water bodies.</p> <p>1. 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.</p> <p>2. Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies.</p> <p>3. Proper disposal of solid waste from construction activities and labor camps.</p> <p>4. Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies.</p> <p>5. Topsoil stripped material shall not be stored where natural drainage will be disrupted.</p> <p>6. Borrow sites (if required) should not be close to sources of drinking water.</p>	<i>Prior to construction, 50m from water bodies. Timing will depend on the construction timetable.</i>	<i>1. Relevant locations to be determined in the detailed project design</i>	<p>1. Contractor CSC to enforce</p> <p>2. Contractor has to check water quality and report to NTDC</p> <p>3. CSCr supervises monitoring activities.</p>	<i>NTDC review results</i>
4. Air quality	<i>To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.</i>	<p>- CONTROL ALL DUSTY MATERIALS AT SOURCE.</p> <p>1. 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).</p> <p>2. Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy</p>	<i>All construction sites within 100m of sensitive receivers.</i>	<i>1. A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.</i>	<i>Contractor should maintain acceptable standard CSC to supervise activities.</i>	<i>NTDC/CSC</i>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
		<p>conditions.</p> <p>3. Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions.</p> <p>4. Vehicles transporting soil, sand and other construction materials shall be covered. Limitations to speeds of such vehicles necessary. Transport through densely populated area should be avoided.</p> <p>5. To plan to minimize the dust within the vicinity of orchards and fruit farms.</p> <p>6. Spraying of bare areas with water.</p> <p>7. Concrete plants. to be controlled in line with statutory requirements should not be close to sensitive receptors.</p>				
<p>5. Noise / Ground Vibration</p>	<p>To minimize noise level increases and ground vibrations during construction operations.</p>	<p>INSTALL, MAINTAIN AND MONITOR ALL MITIGATION</p> <p>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.</p> <p>2. As a rule, the operation of heavy equipment shall be conducted in daylight hours.</p> <p>3. Hammer- type percussive pile driving operations shall not be allowed at night time.</p> <p>4. Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise.</p> <p>5. Well-maintained haulage trucks will be used with speed controls.</p> <p>6. Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods.</p>	<p>Maximum allowable noise levels should be below 70dB(A)_{LEQ} at the boundary of the construction site.</p>	<p>During construction stage, the most sensitive locations need special attention.</p>	<p>Contractor should maintain the acceptable standards</p> <p>CSC to supervise relevant activities.</p>	<p>NTDC / CSC</p>
<p>6. Soil Erosion/Surface</p>	<p>Prevent adverse water quality impacts due to</p>	<p>SCHEDULE WORKS IN SENSITIVE AREAS (e.g. RIVERS) FOR DRY SEASON</p> <p>1. Temporary erosion control plan one month</p>	<p>Because the area can be subject to unseasonal heavy</p>	<p>1. KABUL RIVER FOR MANTDCN SP4 and all</p>	<p>Contractor and CSC</p>	<p>NTDC/ CSC</p>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
Run-off	<p><i>negligence and ensure unavoidable impacts are managed effectively.</i></p> <p><i>To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles T</i></p>	<p><i>before commencement of works.</i></p> <p><i>2. Proper installation of TD and EC before works within 50m of water dies.</i></p> <p><i>Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC</i></p> <p><i>3. Back-fill should be compacted properly in accordance with NTDC design standards and graded to original contours where possible.</i></p> <p><i>4. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage.</i></p> <p><i>5. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes.</i></p> <p><i>6. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion.</i></p> <p><i>7. Measures shall be taken to prevent ponding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours.</i></p> <p><i>6. 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.</i></p> <p><i>8. Clearing of green surface cover to be minimized during site preparation.</i></p> <p><i>9. 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.</i></p>	<p><i>rain plan before and during construction (cut and fill, land reclamation etc.) while considering the climatic conditions.</i></p>	<p>locations based on history of flooding problems</p> <p>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.</p> <p>2. Locations of all culverts, irrigation channels, road and highway.</p>		
7. Exploitation Handling, Transportation and Storage of Construction	<p>To minimize contamination of the surroundings</p> <p>(Due to</p>	<p>SEE ALSO A5 IN DESIGN PHASE (mainly for future trances if civil works)</p> <p>1. In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling ,transportation</p>	<p>Update monthly</p>	<p>1. List of borrow areas to be prepared one month prior to construction</p>	<p>Contractor and CSC to agree format of reporting</p>	<p>NTDC/CSC</p>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
materials	Implementation of works, concrete and crushing plants)	and storage measures to be taken in line with any EPA conditions/recommendations in approval. 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.		2.List of routes of transport of construction 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.	Waste management plan to be submitted to the sc and approved by mc one month prior to starting works. 1.Estimating the amounts and types of construction waste to be generated by the project. 2. Investigating whether the waste can be reused in the project or by other interested parties. 3 Identifying potential safe disposal sites close to the project. or those designated sites in the contract. 4 Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 5. 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 down stream flood plains, dams,	Update monthly	1.Dumping A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement	1.Contractor 2-10. CSC should supervise and take action to complete contractor's relevant activities according to EIA/IEE/ EMP requirement & environmental standards.	NTDC/ CSC

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
		<p><i>lagoons etc.</i></p> <p>6. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. 7. Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA.</p> <p>8. Waste transformer insulating oil to be recycled, reconditioned, reused at New Kot Lakphat SS or other facility.</p> <p>9. Machinery should be properly maintained to minimize oil spill during the construction.</p> <p>10 Solid waste should be disposed at an approved solid waste facility—open burning is illegal and contrary to good environmental practice</p>				
<p>9. Work Operation Location</p>	<p>Camp and</p> <p>To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.</p>	<p>1. Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes.</p> <p>2. Cutting of trees shall be avoided and removal of vegetation shall be minimized.</p> <p>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.</p> <p>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 of to the nearest sanitary landfill or site having complied with the necessary permits at local authority permission.</p> <p>5. The Contractor shall organize and maintain a waste separation, collection and transport system.</p> <p>6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of</p>	<p>UPDATE Once a month</p>	<p>Location Map is prepared by the Contractor.</p>	<p>Contractor</p>	<p>NTDC/ MC</p>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
		<p>according to the given requirements and regulations.</p> <p>7. At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed.</p> <p>8 Exposed areas shall be planted with suitable vegetation.</p> <p>9.NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.</p>				
<p>10. Loss of Trees and Vegetation Cover of the Areas for Towers and Temporary Work-space</p>	<p>To avoid several negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover.</p>	<ol style="list-style-type: none"> 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 near the Karakh town, Transmission Line route need to be changed. However, if unavoidable, use of towers with maximum height will be resorted to. 4. Clearing of green surface cover for 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. 	<p>Rerouting (3) and site identification during design stage and other matters during construction of relevant activities</p>	<p>A list of Locations with a Map to be compiled by the design consultant during detailed design and CSC to update as necessary.</p>	<p>Design consultant, Contractor and CSC</p>	<p>NTDC/CSC</p>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
		8. All temporary structures, including office buildings, shelters and toilets shall be removed.				
11. Safety Precautions for the Workers	To ensure safety of workers	<ol style="list-style-type: none"> 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 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.	<ol style="list-style-type: none"> 1. Submit temporary haul and access routes plan one month prior to start of 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 	Prior to and throughout the construction.	The most important locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements are available.	Contractor and Engineer	NTDC/CSC
13. Impact on Wetlands	To ensure that damage to river ecosystems and wetlands and its ecosystem is minimized during construction	<ol style="list-style-type: none"> 1. Avoid disposal of wash water, solid waste and discarded packing etc. on wetlands (e.g. River Kabul). 2. Piling up of loose material should be done in segregated areas to arrest washing out of soil. In addition, these materials should not be tipped or stockpiled near wetlands (e.g. River Kabul) 3. Leftovers from concrete works should not be dumped close to wetlands. 	Prior to during Construction	River Kabul (MardanSP Tranche 1) and other wetland areas for subprojects identified in future tranches.	Contractor and CSC	NTDC/CSC

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
		<p>4. Avoid temporary structures or stockpiling within banks of river and on wetlands.</p> <p>5. -Special measures will be adopted to minimize impacts on the wild birds, such as avoiding construction activities during the critical periods of breeding and feeding.</p> <p>6. Staff working on the project should be given clear orders, not to shoot, snare or trap any bird (MANDATORY).</p> <p>7. During the period of migration of birds from Central Asia to the plains of Sindh, which are normally the coldest months of December and January and their return journey during February/March, the construction activities, around the wetlands should be kept as efficient as possible to minimize impacts and to encourage these migratory birds to settle at normal feeding grounds in wetlands.</p> <p>8. Contractor will prevent the workers from hunting and fishing for water birds and fish resources, etc</p> <p>9. Food and fuel to be provided by contractor local villages.</p> <p>10. -Erection of towers in the wetlands, will be avoided as far as possible. However, at places where realignment of the transmission is unavoidable, towers with maximum span will be used to minimize the impacts.</p>				
<p>15.Social Impacts</p>	<p>To ensure minimum impacts from construction labor force.</p> <p>To ensure minimum impacts on public health.</p> <p>To ensure minimum effects of indirect impacts of constructions to the people who are</p>	<p>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).</p> <p>2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor</p> <p>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.</p>	<p>Complaints of APs to be solved as soon as possible</p> <p>Necessary evacuations to be done as when necessary if construction impacts are of significant duration and close to APs</p>	<p>All subprojects all tranches</p>	<p>Contractor and the CSC</p>	<p>NTDC/ CSC</p>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
	<i>living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting effects etc. To minimize access problems for local population during construction</i>					
16. Institutional Strengthening and Capacity Building	<i>To ensure that NTDC officials are trained to understand and to appreciate EMP</i>	<i>Capacity building activities by Environmental Officer in Tranche 1. Setting up of a Environmental Management Unit (EMU) within NTDC Development of a strengthening plan for the EMU</i>	<i>Initiate preconstruction and continue beyond project completion</i>	<i>AWARENESS TRAINING FOR ALL MANAGEMENT AND SENIOR STAFF IN NTDC AT SENIOR ENGINEER AND ABOVE IN PMU AND RELATED UNITS</i>	<i>NTDC</i>	<i>NTDC & ADB</i>
<u>OPERATIONAL STAGE</u>						
1. Air Quality		<i>No Impacts</i>			<i>NTDC</i>	<i>NTDC</i>
2.Noise		<i>No significant Impacts Tranche 1. Acoustic designs checking and plan for all future tranches</i>		<i>all subprojects in future tranches</i>	<i>NTDC</i>	<i>NTDC</i>
3. Compensatory tree planting	<i>Maintain survival of trees planted</i>	<i>Employ landscaping contractor to monitor, water, feed and replace dead specimens as necessary</i>		<i>all subprojects in future tranches</i>	<i>NTDC</i>	<i>NTDC</i>
4.Land slides and soil erosion	<i>Avoid landslips and loss of productive land</i>	<i>No significant Impacts Tranche 1. Review designs checking and plan for all future tranches</i>		<i>all subprojects in future tranches</i>	<i>NTDC</i>	<i>NTDC</i>
5. Water quality		<i>No significant Impacts Tranche 1. Review designs checking and plan for all future tranches</i>		<i>all subprojects in future tranches</i>	<i>NTDC</i>	<i>NTDC</i>

ENVIRONMENTAL CONCERN	OBJECTIVES	MITIGATION MEASURES (MM) RECOMMENDED	TIMING TO IMPLEMENT MM	LOCATIONS TO IMPLEMENT MM	RESP IMP MM	RESP MON MM
6 Crops and vegetation	Monitor impacts from maintaining tree clearance under transmission lines	Track growth of large trees under the conductors		all subprojects in future tranches	NTDC	NTDC
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 TXLs..		all subprojects in future tranches	NTDC	NTDC

LARP = Land acquisition and resettlement plan. AP = Affected Persons. LAC = Local Authority Council. TD = Temporary drainage. EC = Erosion control. CSC = Construction supervision consultant or equivalent.. TXL = Transmission line. GSS = Grid substation

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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.

Table 2. Summary Environmental Monitoring Plan for Tranche 1

NO.	ENVIRONMENTAL MONITORING TASKS ⁶	IMPLEMENTATION RESPONSIBILITY	IMPLEMENTATION SCHEDULE
1	Design Phase		
1.1	Audit project bidding documents to ensure IEE 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 an external environmental consultant	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 of an external environmental consultant	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 an external environmental consultant	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 an external environmental consultant	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 an external environmental consultant	Prior to NTDC approval of contractor's detailed designs.
1.9	Monitor the performance of environmental training and briefings and of the environmental awareness of project staff and NTDC	NTDC with the assistance of an external environmental consultant	Continuous throughout the 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 an external environmental consultant	During the last phase of construction works
2.3	Commissioning phase monitoring of as built equipment	NTDC	At commissioning

⁶ Monitoring of issues related to compensation of landowners for land acquisition and loss of production, etc. are addressed in the Resettlement Action Plan.

NO.	ENVIRONMENTAL MONITORING TASKS ⁶	IMPLEMENTATION RESPONSIBILITY	IMPLEMENTATION SCHEDULE
	versus environmental performance criteria		
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 an external environmental consultant	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

Table 3. Summary of Estimated Costs for EMP Implementation for Tranche 1

ITEM	SUB ITEM	ESTIMATED TOTAL COSTS	ESTIMATED TOTAL COST
		[PRS]	[USD]
Staffing, audit and monitoring	1 person for 2 years	1,200,000	19,900
Monitoring activities	As detailed under EMP	5,000,000	83,000
Mitigation measures	As prescribed under EMP and IEE	8,000,000	132,800
Transport	1 dedicated vehicle 2 years	1,000,000	16,600
Contingency	3% contingency	456,000	7,600
Total		15,656,000	259,900