

Environmental Assessment Report

Summary Initial Environmental Examination
Project Number: TA 4876
February 2008

PAK: Multitranche Financing Facility Power Distribution Enhancement TA 4876-PAK

Prepared by the Pakistan Electric Power Company for the Asian Development Bank (ADB).

The summary initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

CURRENCY EQUIVALENTS

(as of January 2008)

Currency Unit Pakistan Rupee/s (Re/Rp)
 \$1.00 = RS60

ABBREVIATIONS

| | | |
|--------|---|---|
| ADB | – | Asian Development Bank |
| COI | – | Corridor of Influence |
| CSP | – | Country Strategy Program |
| DOF | – | Department of Forests |
| DFO | – | Divisional Forest Officer |
| DGS | – | distribution grid substation |
| DISCO | – | electricity distribution company |
| DX | – | distribution transformer |
| DGL | – | distribution network transmission line |
| DIZ | – | Direct Impact Zone |
| EA | – | Environment Assessment |
| EARF | – | Environment Assessment Review Framework |
| EIA | – | Environment Impact Assessment |
| EMP | – | Environmental Management Plan |
| FESCO | – | Faisalabad Electricity Supply Company Limited |
| GDP | – | Gross Domestic Product |
| GEPCO | – | Gujranwala Electricity Supply Company Limited |
| GIS | – | Gas Insulated Switchgear |
| HESCO | – | Hyderabad Electricity Supply Company Limited |
| IESCO | – | Islamabad Electricity Supply Company Limited |
| IEE | – | initial environmental examination |
| LESCO | – | Lahore Electricity Supply Company Limited |
| Leq | – | equivalent sound pressure level |
| MEPCO | – | Multan Electric Power Company Limited |
| MFF | – | multitranche financing facility |
| MPL | – | maximum permissible level |
| NEQS | – | National Environmental Quality Standards |
| NGO | – | Non Governmental Organization |
| NTDC | – | National Transmission and Dispatch Company |
| PC | – | public consultation |
| PEPA | – | Provincial Environmental Protection Agency |
| PEPAct | – | Pakistan Environment Protection Act 1997 (as amended) |
| PEPCO | – | Pakistan Electric Power Company |
| PESCO | – | Peshawar Electricity Supply Company Limited |
| PFR | – | Project Financing Request |
| PPMS | – | Project Performance Monitoring System |
| QESCO | – | Quetta Electricity Supply Company Limited |
| REA | – | Rapid Environmental Assessment |
| ROW | – | right-of-way |
| SIA | – | Social Impact Assessment |
| SIEE | – | summary initial environmental examination |
| SR | – | Sensitive Receiver |
| TOR | – | Terms of Reference |

WEIGHTS AND MEASURES

| | | |
|----------------|---|--|
| dB(A) | – | decibels measured in the audible noise bands |
| Ha | – | Hectare |
| km | – | Kilometer |
| m ³ | – | cubic meter |

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APPENDIXES

- 1. Environmental Management Plan (matrix) including Monitoring Plan & Costs.
- 2. Typical Public Consultation for a Tranche 1 subproject
- 3. Environmental Assessment Review Framework

I. INTRODUCTION

1. This document is the summary initial environmental examination (SIEE) for the upgrading and expansion of various distribution grid sub stations (DGS) and distribution lines (DGL) under Tranche 1 of the Asian Development Bank (ADB) project, Power Distribution Enhancement Multitranche Finance Facility (PDE-MFF). The Government of Pakistan (the Government, the borrower) has requested the Asian Development Bank (ADB) to finance the proposed PDE-MFF that will eventually encompass more sites in all jurisdictions of all DISCOs in many provinces in future tranches.

2. This SIEE presents the results and conclusions of environmental assessments for first one hundred and nineteen (119) subprojects that form Tranche 1 (main Appendix 4) in the proposed expansion and enhancement programme. This SIEE is submitted to ADB by the Pakistan Electric Power Company (PEPCO) for and on behalf of the eight independent power distribution companies (DISCOS) following work carried out under TA4876. The T1 subprojects are considered for urgent improvement under the PDEMFF and under ADB requirements initial environmental examinations (IEEs) have been carried out for all T1 subprojects.¹² This SIEE summarises the assessments in the IEEs produced for all sites in Tranche 1. The IEE reports that have been used to complete this SIEE are summarized in Table 1. Those reports and other available information may be disclosed by ADB, if necessary. The T1 sites were tentatively classified as Category B in accordance with ADB's *Environmental Assessment Guidelines*; therefore IEEs are prepared for each site. Environmental assessments will also be prepared in due course for the remaining subprojects in future tranches that will also be classified and subject to environmental assessment in due course in line with the EARF.

3. The environmental regulations of the Government 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 (EPA). Distribution lines of 11kV and below and large distribution projects require IEE (Schedule I). [Distribution lines and grid substations are included under energy projects and EIA is required by the Government for all projects involving distribution lines of more than 11kV and for grid substations (Schedule II)]. Augmentation of facilities within existing substations is not listed as requiring environmental assessment. However in response to an environmental framework submitted by NTDC to the Pakistan EPA³ it has been clarified that all proponents must follow section 12 of the Pakistan Environmental Protection Act for all projects and furthermore that only for augmentation projects by following the environmental framework, the required procedures under section 12 would be completed. Pakistan EPA has also assumed that all proponents will consult with the relevant provincial EPAs (PEPA) and follow their advice. In 2006 Punjab EPA requested disclosure of the scope and extent of each subprojects. As such all subprojects will be disclosed to the relevant provincial EPA. An Environmental Assessment and Review Framework (EARF) is also prepared to select, assess, monitor, and manage the potential environmental impacts of any subprojects in future tranches.

¹ Initial reconnaissance and REA carried out by consultants under ADB guidelines in June 2007 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 Letter dated 29th June 2007 – Ref 2(1)2004-W/KCP-DD from Pak EPA Sajjad Hussein Talpur, Dy Director (EIA/Mont) to NTDC, Muhammad Tahir Khan, Project Director PPTA, NTDC, WAPDA House, Islamabad.

4. This SIEE is based on (i) information, data and preliminary assessments in the draft Initial Environmental Examination reports received from the consultants during 2007. The Initial Environmental Examination reports will be submitted to Provincial Environmental Protection Agencies (PEPA) in order to obtain approval to construct the facilities. The IEEs are to be prepared in line with the Government's regulations on environmental impact assessment (PEPAct) and will also comply with ADB's *Environmental Assessment Guidelines 2003*.

II. DESCRIPTION OF THE PROJECT

5. The standards and conditions of the power distribution system in Pakistan are inadequate to meet rapidly growing demand for electrical power. This situation limits national development and economic growth. To cope with the constraints, the existing power distribution 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 PDEMFF Project has been designed to address both investment and institutional aspects in the electrical power sector.

6. The Tranche 1 major site (STG) subprojects can be broadly separated into two groups. Group 1 has one hundred and ten subprojects (main Appendix 4) that involve the improvement of facilities and equipment within existing DGS boundaries. The Group 1 subprojects should not require any work or impacts outside the substations and no land acquisition is involved. These Group 1 subprojects essentially add an extra transformer or augment capacity in an existing substation by replacing a transformer. Subprojects that will add a transformer are also referred to as *extension* projects in the feasibility studies (FS). *Augmentation* projects will replace an existing transformer with one of a higher capacity in an existing substation. The FS sometimes also refer to these augmentation subprojects as "increase transformer capacity" or "ITC" (Table 1).

7. Group 2 has seven subprojects (main Appendix 4) that involve the either construction of new grid substations (DGS) on a new site (e.g. Lar MEPCO) with accompanying connection to the grid or construction of new 132kV grid substations within the boundaries of an existing 66kV substation (e.g. Shadan Lund MEPCO). In either case there will be construction of new connecting distribution lines to the network (DGL). Enhancement or augmentation within an existing DGS may therefore also be included with a DGL subproject. Impacts from Group 2 subprojects are potentially greater than Group 1. Although the impacts are not insurmountable, Group 2 subprojects will require work outside the substations and impacts are likely on some land where mitigation measures or other compensation will be required. In some cases access will be required to the right-of-way (ROW) that can accommodate the new distribution line and towers or poles. The designs for the Group 1 and Group 2 subprojects are sufficiently complete (January 2008) to permit initial environmental examination. The designs for the Tranche 2 (T2) and later subprojects will be developed under project support components in due course.

Table 1: List of IEEs of Subprojects for Tranche 1 Used to Complete this SIEE

| DISCO | Subprojects | Coverage of IEE Reports in Brief | Report | Km of Line |
|-------|---------------------------|--|------------------|------------|
| FESCO | 13 sites | Adding transformers and ITC | IEE E&A | |
| GEPCO | Fateh Pur | Substation Upgrade 66-132kV | IEE S/S and line | 17 |
| HESCO | 10 sites | Adding transformers and ITC | IEE E&A | |
| IESCO | 25 sites | Adding transformers and ITC | IEE E&A | |
| LESCO | Sukh Chayn Multan Road | New S/S (s/s only, in out line by LESCO) | IEE S/S and line | 7 |
| LESCO | 28 sites | Adding transformers and ITC | IEE E&A | |
| MEPCO | Lar | New S/S and in out, Multan-bahawalnagar, d/c | IEE S/S and line | 1 |
| MEPCO | Shadan Lund | Substation Upgrade 66-132kV and in out | IEE S/S and line | 3 |
| MEPCO | Fazil Pur | Substation Upgrade 66-132kV and in out | IEE S/S and line | 1 |
| MEPCO | 13 Sites | Adding transformers and ITC | IEE E&A | |
| PESCO | Karak | Adding transformers and ITC | IEE S/S and line | 11 |
| PESCO | 15 sites | Adding transformers and ITC | IEE E&A | |
| QESCO | Alizai | Substation Upgrade 66-132kV | IEE S/S and line | 10 |
| QESCO | Kanak | Substation Upgrade 66-132kV | IEE S/S and line | 5 |
| QESCO | 7 sites | Adding transformers and ITC | IEE E&A | |

Source: TA4876 consultants. Lengths of the proposed distribution lines are approximate.

E&A = extension and augmentation. ITC Increase transformer capacity.

A. FESCO Subprojects

8. **FESCO Extension and Augmentation Subprojects.** The Faisalabad Electricity Supply Company (FESCO) has identified thirteen extension and augmentation subprojects (Table 1). The extension and augmentation projects and all are within existing substations sites in the FESCO jurisdiction. There are seven extension subprojects that will add an additional transformer. There are six augmentation subprojects that will replace an existing transformer with a new one with increased capacity (main Appendix 4). One subproject at Lalian is already under construction by FESCO and an additional transformer will be added under Tranche 1.

B. GEPCO Subprojects

9. The Gujaranwala Electric Power Company (GEPCO) has identified one new substation and line subproject. There are no extension and augmentation projects for GEPCO in the first Tranche.

10. **Fateh Pur.** The new substation is at Fateh Pur, Gujaranwala. The subproject will be the DGS and DGL. The DGS will require the extension or upgrading of the existing 66 kV DGS into a 132 kV DGS. The scope of work includes addition of 2X 26 MVA, 132/11kV power transformers and allied equipment and buildings. The SP also requires a connection to the grid comprising 17.4 km of 132 kV DGL to be carried on about 63 towers. Therefore the distribution line component of the project (as well as the 11kV distribution network) are an integral part of the subproject and have been studied together in the present IEE in line with ADB Guidelines².

C. HESCO Subprojects

11. **HESCO Extension and Augmentation Subprojects.** The Hyderabad Electricity Supply Company (HESCO) has identified ten extension and augmentation subprojects (Table 1). The extension and augmentation projects and all are within existing substations sites in the HESCO

jurisdiction. There are three extension subprojects that will add an additional transformer. There are seven augmentation subprojects that will replace an existing transformer with a new one with increased capacity (main Appendix 4).

D. IESCO Subprojects

12. **IESCO Extension and Augmentation Subprojects.** The Islamabad Electricity Supply Company (IESCO) has identified twenty five extension and augmentation subprojects (Table 1). The extension and augmentation projects and all are within existing substations sites in the IESCO jurisdiction. There are five extension subprojects that will add an additional transformer. There are twenty augmentation subprojects that will replace an existing transformer with a new one with increased capacity (main Appendix 4).

E. LESCO Subprojects

13. The Lahore Electricity Supply Company (LESCO) has identified twenty eight extension and augmentation subprojects (Table 1) and one new substation subproject. The extension and augmentation projects are all within existing substations around Lahore.

14. **Sukh Chayn.** The new substation is at Sukh Chayn Gardens a new residential development south of Lahore in the new suburbs near Thokar Niaz Baig. The land for the construction of the new DGS has been set aside at the northern edge of the development near the canal. The developers of Sukh Chayn Gardens have cordoned off the area. There will be a requirement to connect to the network but the construction of the in-out connecting transmission line and towers (DGL) is not included in the MFF Tranche 1 but the alignment propose has been inspected and assessed in line with ADB guidelines. The DGL will be constructed along the canal from the northern portion of the development. Based on observation there is a sufficiently wide unimpeded strip of Government land along the canal to accommodate about twenty towers for the 6.5km of DGL that will connect to the grid.

15. **LESCO Extension and Augmentation Subprojects.** The twenty eight (28) extension and augmentation projects and all are within existing substations sites in the LESCO jurisdiction. There are five (5) extension subprojects that will add an additional transformer. There are twenty four (24) augmentation subprojects that will replace an existing transformer with a new one that has a greater capacity (main Appendix 4).

F. MEPCO Subprojects

16. The Multan Electric Power Company (MEPCO) has identified fourteen subprojects including eleven (11) extension and augmentation subprojects (Table 1) and three (3) new substation and/or line subprojects. The extension and augmentation projects are spread out around sites within the MEPCO jurisdiction (main Appendix 4).

17. **Fazil Pur.** Fazil Pur is about 150 km south west of Multan and 20 km north of Rajanpur on the main A55 Indus Highway, to the east of the Dera Ghazi Kahn Canal. The existing 66kV substation at Fazil Pur will be refitted to 132kV standard within the existing kV66kV substation boundary. The new line will be carried on towers for about 1.1km and will come from the north side of the existing substation to two towers that will carry the line to the north to avoid villages. At about 300m north the line will turn west for about 750m to connect to the 132kV Rajanpur–Jampur DGL. Five new towers and about 1100m of line will be required to connect to the Rajanpur–Jampur DGL line which is about 750m to the west. The line will cross cultivated fields, the Dera Ghazi Kahn Canal and the existing Fazil Pur Kot Addu 66kV line. The line will pass

well away from residential and other buildings. The towers can be located just outside the substation boundary and on agricultural land in between and joined into the existing 132kV line.

18. **Lar.** The land for the new substation at Lar is owned by MEPCO and is former agricultural land adjacent to the east side of the main A5 Multan - Bahawalpur highway. Two new towers and about 300m of line will be required to connect to the 132kV Multan - Bahawalpur transmission line which is immediately to the east. There are isolated residential buildings, cultivated fields and orchards in the vicinity. However due to the short length of line required one tower can be located just outside the proposed substation boundary and the other joined into the existing 132kV line. The line will pass over some land that was formerly cultivated. The land for the construction of the new DGS is owned by MEPCO.

19. **Shadan Lund.** Shadan Lund town is about 50km north west of Multan and to the east of the Dera Ghazi Kahn Canal on the main A55 Indus Highway. The existing 66kV substation at Shadan Lund will be refitted to 132kV standard within the existing 66kV substation boundary with transformers provided by MEPCO. The new line will come from the south side of the existing substation to three towers that will carry the line first to the south and east to avoid the main villages that are outside the substation to the north. At about 600m east and beyond the existing Shadan Lund Kot Addu 66kV line towers the line will turn north for 3.5km across agricultural land. Thirteen new towers and about 1400m of line will be required to connect to the 132kV Kapco - Taunsa transmission line which is about 3km to the north. The line will cross cultivated fields and pass well away from residential and other buildings in Shadan Lund town. The towers can be located just outside the substation boundary and on agricultural land in between to the junction with the existing 132kV line.

20. **MEPCO Extension and Augmentation Subprojects.** The thirteen (13) extension and augmentation projects and all are within existing substations sites in the MEPCO jurisdiction. There are seven (7) extension subprojects that will add an additional transformer. There are six (6) augmentation subprojects that will replace an existing transformer with a new one with increased capacity (main Appendix 4).

G. PESCO Subprojects

21. The Peshawar Electric Supply Company (PESCO) has identified sixteen subprojects including fifteen (15) extension and augmentation subprojects (Table 1) and one (1) new substation and line subprojects. The extension and augmentation projects are spread out around sites within the MEPCO jurisdiction (Appendix 1).

22. **PESCO Karak.** The land for the new substation at Karak subproject will be located in District Karak NWFP. The transmission line will require 56 towers and 14 km of 132 kV in/out conductor to connect to the Kohat Banu 132kV transmission line. The nearest settlement is Karak Town and the villages of Sultan Abad and Rahmat Abad. On average the alignment that has been studied line is about 150 to 200 meters away from the nearest houses and other places of human settlement.

23. **PESCO Extension and Augmentation Subprojects.** The Peshawar Electricity Supply Company (PESCO) has identified fifteen (15) extension and augmentation subprojects (Table 1) and all are within existing substations sites in the PESCO jurisdiction. There are eleven (11) extension subprojects that will add an additional transformer. There are four (4) augmentation subprojects that will replace an existing transformer with a new one with increased capacity (main Appendix 4).

H. QESCO Subprojects

24. The Quetta Electric supply Company (QESCO) has identified nine (9) subprojects including seven (7) extension and augmentation subprojects (Table 1) and two (2) new substation and line subprojects. The extension and augmentation projects are spread out around sites within the QESCO jurisdiction (main Appendix 4).

25. **QESCO Alizai.** The Alizai DGS is on the main road from Huramzai to Alizai in the District of Pishin, Balochistan. The subproject will involve installation of one 26MVA 132/11kV power transformer and allied equipment at the existing Alizai DGS as well as construction of about 10km of a new 132kV DGL involving erection of about 35 towers. The existing 66kV line will be subsequently disconnected from the network after the new installations are operational.

26. **QESCO Kanak.** The Kanak DGS is about 55km from Quetta City on the Quetta – Noshki Road near Derangar village. The subproject will involve installation of one 26MVA 132/11kV power transformer and allied equipment within the existing DGS. QESCO intends to construct 132kV distribution line connecting the existing grid station at Kanak to the 132 kV Quetta – Mastung transmission line. The Kanak subproject will involve the installation of about 5km of in/out double conductor 132kV dual circuit transmission line on about 16 towers to connect to the existing Quetta - Mastung Line.

27. **QESCO Extension and Augmentation Subprojects.** The Quetta Electricity Supply Company (QESCO) has identified seven extension and augmentation subprojects (Table 1). The extension and augmentation projects and all are within existing substations sites in the QETTA jurisdiction. There are six (6) extension subprojects that will add an additional transformer. There are two subprojects that will replace an existing transformer with a new one with increased capacity. The Kalat project is both augmentation and extension. (main Appendix 4).

Other Line Extension and Capacitor Installation Subprojects. In addition to the above substation and line based subprojects there are also several other proposals for line extensions and installation of additional capacitors.

28. **The Tranche 1 subprojects are expected to be completed by mid-end 2009.**

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Environment

1. Meteorology and Climate

29. The climate is semi-arid and sub-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 area 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.

30. Monsoon usually starts in the first week of July the average annual rainfall about 625mm. Most of the rainfall comes during monsoon period i.e. July and August. The country

receives about two thirds of the rainfall during monsoon, when a large proportion of the rain occurs in heavy showers and storms of high intensity. Climate should have very little bearing on the implementation of the subprojects.

2. Topography, Geology, and Soils

31. The subproject areas for LESCO, MEPCO GEPCO and FESCO in the Punjab area are all situated on an ancient river terraces. Soils are classified as loamy, silty-loamy, and silty⁴. The subproject areas for PESCO, QUESCO and HESCO are in the more arid areas with deep and well drained soils in the plains and gravelly aprons bordering the mountains and plains. IESCO is predominantly urban area with little exposed soil. Soil type should have very little bearing on the implementation of the subprojects.

3. Surface and Groundwater

32. The proximity of the subprojects to natural water courses varies greatly. There are no natural rivers very any of the subproject areas for subprojects 15 to 18 in the Punjab area.

33. The only natural streams, which cross the district, are the Satluj and Ravi, which form its Southern and Northern boundaries. The Ravi has the longer course then the Satluj but is a much smaller river but the volume of water in the flood season has decreased during the last 50 years.

34. A typical important primary irrigation channel is the Sukh aur khushki – Bais, which forms the boundary not only between the Northern and Southern thesils of the district. The irrigation system bases on the Ravi and Satluj.

35. 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.

36. Some shallow wells were observed during the field visits that must be protected during construction. However surface and groundwater should not be significantly affected by the implementation of the subprojects.

B. Biological Environment

1. Agriculture

37. Agriculture dominates the regional economy. Rural Punjab is a fertile area with canal irrigation and productive crops. The yields are high.

38. 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.

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

39. 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.

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

2. Fauna and Flora

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

42. 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 some of the areas near some projects 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. The common crane is also found in the winter. There are also common reptiles. The district is an important ground for fishing with professional fishermen all along the Chenab River but there is little fishing in the areas near the projects.

C. Social-Cultural Environment

1. Human Issues and Life Quality

43. 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.

44. 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.

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

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

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

2. Cultural and Historical Sites

48. There were no sites of cultural significance found very close to the Tranche 1 study areas. There are shrines nearby in some villages where people are fed daily. The larger grid substation residential colonies sometimes have their own dedicated mosque within the substation boundary wall next to the residential colony.

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

IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Environmental Impact Associated with Planning, Location and Design

50. The environmental impacts associated with one hundred and eleven of the one hundred and nineteen subproject locations in Tranche 1 will be insignificant as they only involve extension and augmentation of equipment within existing DGS. There are eight subproject locations which also involve new construction of DGS and/or DGL and in these cases the potential for some significant impacts is greater due to the need to construct on some new land or to traverse active agricultural land to construct the DGL. The subprojects have been located in order to avoid unnecessary problems as far as possible at the design stage and all Tranche 1 subprojects are generally located in appropriate areas. Although land is generally fully utilized for agricultural or urban purposes in many subproject areas, there are also some suitable disturbed areas, poor or underutilized agricultural areas and other Government land available for the proposed DGS sites and DGL routes. In Tranche 1 DGL have been relocated and in some cases diverted over longer routes to avoid impacts on local villages and other sensitive receivers as far as possible. The site selection criteria are included in the EARF for the Tranche 2 sites.

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

52. Best international practice and ADB guidelines will also require that all new switchgear or other gas insulated equipment will not contain CFCs or other ozone depleting halons. Industry standard SF6 switchgear is however likely to be the preferred type of gas insulated switchgear and selected SF6 equipment should have a nominal leakage and replacement rate of less than 1% per year.

53. The current grid substation layouts do not include any dedicated drainage or secondary containment to control residual oil spills. In order to comply with best international practice to prevent contamination of soil, groundwater and surface water all the new substations will be designed to include dedicated surface drainage and secondary containment to control residual oil spills from installation, maintenance or decommissioning. The secondary containment (bundling) will seal the surface with concrete and be of sufficient capacity to hold 110% of the contents of the banded equipment in the event of a catastrophic failure with loss of all transformer oil. This is not necessarily an unlikely event in Pakistan where some power distribution facilities have been the target of bomb attacks in 2007. The EMP includes and recommends that an integrated approach be introduced to waste management for materials such as surface soils that have become contaminated with residual oils from maintenance activities.

B. Environmental Impact of Construction Activities - Mitigation Measures

1. Physical Environment

a. Soil

54. The designated subproject areas will be cleared prior to construction. Total land clearing will involve only about 100m² for each tower. A few hectares of land will also be required for the DGS at various locations. The land for the substation sites and tower bases is generally quite arid farmland and no major soil erosion problems are expected. However the following soil erosion control measures will be provided during and after construction to minimize the possibility of loss of useful soil resources:

- (i) The contractor shall stockpile 30cm of topsoil for reuse in landscaping 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 (and dust).
- (iii) 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. Bituminous or cement wastes should not arise in any significant quantity.
- (iv) The contractor shall replace topsoil in landscaping after construction and as near to the source as reasonably practicable.

b. Air Quality

55. 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 the surface soil is exposed and where cement and aggregate mixing is undertaken.
- (ii) Haul roads or access paths to construction areas should be cleared of topsoil (stockpiled as above) and maintained and damped down in dry weather by watering regularly. Twice daily watering of exposed soil and stockpiles 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.
- (v) Prefabrication of concrete structures off site should be utilized wherever practicable.

56. 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.

57. There is ample distance between all sites and the sensitive receivers for the dispersion of exhaust emissions from construction plant and no significant air quality impacts should arise from those sources.

c. Noise

58. 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 construction may cause significant impacts for a short duration 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 construction activities to ensure no unacceptable nuisances arise.

59. 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.

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

- (i) Local communities will be informed of all construction activities in advance.
- (ii) Horn-blowing will be prohibited. Construction equipment will be properly maintained, tuned, and provided with mufflers and located so as to minimize noise levels.
- (iii) The general rule will be that "No construction will be undertaken during the night time."
- (iv) 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.

61. 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 65dBA during daytime.
- (ii) For nearby schools, the contractor will discuss with the school principals the agreed time for operating the construction machines.

d. Groundwater

62. 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.

e. Surface Water

63. 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:

- (i) 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 stored materials checked regularly to control leakage and spillage.
- (ii) 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.
- (iii) Waste petroleum products will be collected, stored, and sold to registered collectors/recyclers.
- (iv) 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.
- (v) 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 runoff will not enter water bodies direct and drainage from construction areas will be filtered at least by sand catchpits or by passing through vegetated areas to settle sediments.
- (vi) Proper temporary diversion of any local irrigation channels must be constructed before any irrigation flows are interrupted.

f. Waste Management

64. 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.

2. Ecological Environment

65. The subprojects identified for Tranche 1 will not be located within national parks or wildlife sanctuaries or any of the critical areas published by Pakistan EPA on their website. Neither do any of the Tranche 1 subprojects affect any land near monuments of cultural or historical importance.

66. The clearing of any forest resources will not be required as the land required for the Tranche 1 subprojects is essentially agricultural or urban and does not have high ecological value although the land will need to be cleared of vegetation for construction.

67. To minimize the impact associated with cutting down solitary trees 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 in some of the LESCO and MEPCO substations. New trees and any transplanted specimens must be maintained, fertilized and watered often so that they survive.

68. It is recommended that planting of 3 new trees for each one cut be required in line with international standards for landscape and 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 specimen trees and any special or valuable trees connected with religious rites.

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

- (i) The boundary of the site shall be defined by a 2m high fence.
- (ii) Trees will be transplanted or replaced on a basis of 3 trees replaced for every tree removed.
- (iii) No temporary worker camps will be allowed off the construction site in any area.

C. Environmental Impact of Operation - Mitigation Measures

1. Physical Environment

a. Air Quality

70. It is not likely that the subprojects will give rise to any significant accumulations of air emissions in the operational stage. The SF6 switchgear should be monitored to ensure that topping up of SF6 is below 1% by volume per year for all items. Leaking equipment should be withdrawn from services as leakage will indicate faulty and possible unsafe operating conditions for the network. There is ample distance between all sites and the sensitive receivers for the dispersion of any minor leaks of residual SF6.

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 author

b. Noise

72. The equipment that will be in use and the fact that the proposed locations in Tranche 1 are remote from noise sensitive receivers means that noise will not be sufficient to create operational 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 cumulative nuisances arise in the operational stage.

73. It is recommended that the following mitigation measures will be adopted to mitigate the noise impact caused by project activities: (i) 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 and (ii) a brick or masonry wall (with a mass of greater than 10kg/m²) as a noise barrier or other means of noise abatement, will be constructed around the transformers and SVC to attenuate the noise to acceptable levels at the sensitive receivers and prevent disturbance and nuisance.

74. After implementing the mitigation measures given above the residual risk of the noise generated by project will be insignificant.

c. Groundwater and surface water

75. No significant effect on groundwater or surface water is expected from operation at the Tranche 1 subprojects. However, secondary containment should be included in the designs for all new substation transformers and for transformer oil storage areas to prevent residual contamination from essential maintenance and decommissioning activities.

d. Waste Management

76. Waste management plans (WMP) should be drawn up for each subproject substation to ensure that measures will be undertaken to reuse and recycle all equipment and oil wherever possible and minimize the generation of waste. WMPs shall ensure that any residual oily waste and other contaminated waste generated in that operational phase is disposed in line with provincial EPA and local authority requirements. With the proper implementation of an appropriate waste disposal plan, there will be no residual risk due to improper waste disposal.

2. Ecological Environment

77. The subprojects identified for Tranche 1 will not be located within national parks or wildlife sanctuaries or any of the critical areas published by Pakistan EPA on their website. Neither do any of the Tranche 1 subprojects affect any land near monuments of cultural or historical importance.

78. The clearing of any forest resources will not be required as the land required for the Tranche 1 subprojects is essentially agricultural or urban and does not have high ecological value although the land will need to be cleared of vegetation for construction.

D. Cumulative Environmental Impact Associated with the Project Locations

79. There should be no significant adverse cumulative impacts expected from the subprojects in Tranche 1. These subprojects are scattered amongst the eight DISCOs and are therefore separated by significant distances. The layouts of the Tranche 1 substation subprojects include a 2m high boundary wall of about 2m and are therefore generally designed to ensure the least disturbance to surrounding environs.

80. Whereas there are few adverse cumulative impacts from the projects the improvement in the power system in Pakistan will potentially lead to growing industrial and commercial activities that may indirectly lead to additional pollution. It is not possible to quantify these impacts at this stage but the statutory provisions under the Pakistan Environmental Protection Act cover pollution control that may require improvements in resources for enforcement and better institutional arrangements and capacity to support strategic management of pollution control in the long term.

V. INSTITUTIONAL REQUIREMENTS, ENVIRONMENTAL MONITORING PLAN

A. Institutional Requirements

81. Prior to implementation of the subproject packages each DISCO will need to comply with several environmental requirements. This will include disclosure of the subprojects and endorsement of the environmental assessments required by the Government through submission to the Pakistan Environmental Protection Agency (PEPA) at the provincial level. DISCOs 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, each DISCO 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. A draft EARF for screening, assessing and monitoring subprojects in future tranches are in Appendix 4.

82. The DISCOS 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.

83. Whereas no protected antiquities were identified in proximity to the subproject sites, each DISCO shall also ensure no activity is undertaken in the proximity antiquities and report any archaeological discovery to the Department of Archaeology.

84. No reserved forests are in the vicinity of the proposed subprojects, 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 Tranche 2.

85. Wildlife protection ordinances at the federal and provincial level (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 other subproject packages in Tranche 2.

86. Because of the similar nature of the works for each subproject the EMPs will also be similar. In this SIEE a generic EMP (Attachment 2) has been provided based on the designs for the subprojects identified so far for Tranche 1. At a later stage it will be necessary to review this summary EMP and prescribe any additional detailed mitigation measures for all aspects 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.

87. An environmental and social unit will be set up in each DISCO to oversee and provide quality control for the IEE/EIA 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 DISCOs in the medium to long term.

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

89. Overall implementation of the EMP will become DISCO 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 implementation of environmental conditions related to subprojects in their areas.

- (iii) **DISCO Boards of Directors:** responsible to ensure that sufficient resources are allocated in advance to allow the appropriate time to process the environmental assessments and to implement all construction and operational mitigation measures required to mitigate environmental impacts.

B. Training and Monitoring

90. Several government agencies and private sector parties will be involved in implementing the EMP (Appendix 2). 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 the subproject tranches. The environmental training workshops shall continue throughout the MFF construction programme in all tranches and refresher courses shall be carried out over the lifetime of the MFF as staff turnover necessitates.

91. As the projects proceed 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 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.

92. It is also recommended that in order to achieve harmonization between the approach in all DISCOs that workshops or coordinating and monitoring meetings (at say six monthly intervals) be inaugurated between the environmental cells of the DISCOs as the Tranche 1 MFF is rolled out. In this way the dedicated environmental officers can discuss and address environmental concerns with mutual support. The environmental officers can then aim to ensure a common approach to the environmental clearance necessary before construction commences.

93. The monitoring plan (Appendix 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.

C. Environmental assessment of subprojects

94. The subprojects (in Tranche 2) will be prepared in due course and will first be categorized to determine the appropriate level of environmental assessment. The detailed Environmental Assessment Review Framework procedure is presented in Appendix 4. The salient features of the environmental assessment requirement for the follow-up subprojects are as follows:

- (i) An IEE 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 IEE Studies will be undertaken prior to the submission of the PFR (by DISCO environmental officers with support from or consultants as necessary). DISCO will provide funding and resources to scrutinize the IEE studies.
- (iv) No subproject will be located in a designated critically sensitive areas, environmentally sensitive areas or areas 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 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 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.

VI. PUBLIC CONSULTATION AND DISCLOSURE

95. Public consultation was conducted in July and August 2007 for the Tranche 1 subprojects. The meetings were conducted near the substations and in villages along the proposed line subprojects 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, community leaders and local officials.

96. The consultation was designed to inform the parties consulted about the proposed Project and to identify their concerns. The site visits 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. Local support for the subproject was almost unanimous and local employment opportunities are expected by most of the consulted parties. Appendix 3 provides an example the consultation conducted on 06 July 2007 in Shahdan Lund, MEPCO. The IEE reports on the various subprojects have provided documentation of individual consultation, as relevant, associated with the MFF Tranche subprojects.

VII. FINDINGS AND RECOMMENDATIONS

97. Primary and secondary data were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The IEE reports on the various subprojects have provided a picture of potential environmental impacts associated with the MFF Tranche 1 and suitable mitigation measures have been recommended (Appendix 2). 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 IEEs will need to be carried out for the subprojects in Tranche 2 and further tranches.

98. The Tranche 1 subprojects considered to date offer robust options for the enhancement of the power distribution system and are conceptually well designed and located from the environmental, legal, 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.

99. Whereas most anticipated environmental impacts related to the subprojects will take place during the construction phases there are few potential cumulative impacts during operation which require environmental monitoring and auditing. However environmental reporting is nevertheless recommended to be included in the monthly progress reports throughout the construction phase and immediately prior to commissioning of subprojects. 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 DISCO 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.

100. It is likely that contractors may need environmental awareness training and the DISCO must also make provisions to develop an environmentally orientated culture from the respective Board levels down and from the working level up in order to encourage the penetration of environmental awareness in the DISCOs at all levels and in so doing to aim to facilitate management of environmental responsibilities, proactively. It has been recommended that an environmental and social unit be created in each DISCO with at least one graduate environmental officer to handle all necessary statutory environmental permitting and clearances for all subprojects in Tranche 1 and the remaining tranches. Two DISCOs (LESCO and MEPCO) have already appointed their environmental officers. In the short term the environmental officers will ensure environmental requirements are 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 DISCOs in the medium to long term. DISCOs will need to develop robust environmental policies and the environmental officer would also train management and staff at all levels throughout the DISCOs 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 DISCOs management needs to be established, with a mechanism to address unexpected environmental impacts, as contingencies.

101. 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, any conditions included 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 (i) the implementation of mitigation measures, (ii) the implementation of the conditions of environmental compliance and (iii) 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 and be annually to ADB.

VIII. CONCLUSION

102. The IEE reports for the subproject packages 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 DISCOs will implement schedules of mitigation measures and monitoring program provided in each of the IEE reports (including Environmental Management Plans and Monitoring Plans) at the implementation stage. With these measures in place environmental impacts identified by the study should be manageable and will not result in any residual impacts which are above accepted environmental standards. No further or additional impacts assessment is considered necessary at this point.

103. Environmental assessment will be required for all the follow-up subprojects in future tranches when feasibility studies have been completed and the locations and design details are available. DISCOs will adopt the review procedure as required in the Environmental Assessment Review Framework (Appendix 4) and will have adequate capacity by then to implement the EARF as required under the MFF.

SUMMARY ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan -- Matrix July 2007 (to be reviewed with PFR before commencement of each tranche).

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Respon MM |
|---|---|--|---|---|---|-----------------------------|
| DESIGN STAGE | | | | | | |
| 1. Contract clauses | Ensure requirements and recommendations of environmental assessment are included in the contracts. | <ol style="list-style-type: none"> 1. Include EMP Matrix in tender documentation and make contractors responsible to implement mitigation measures by reference to EIA/IEE in contract. 2. Include preparation of EMP review and method statement WM plan, TD and EC Plan in contract as a payment milestone(s). 3. Require environmental accident checklist and a list of controlled chemicals / substances to be included in the contractor's work method statement and tender documentation. | <ol style="list-style-type: none"> 1. During tender preparation. 2. No later than pre-qualification or tender negotiations 3. In bidding documents as evaluation criteria. | Noise sensitive locations identified in the IEE/EIA/EMP or as required / approved by PEPA. | DISCO ESU with the design consultant | DISCO ESU and CSC (if any). |
| 2. Procurement | Ensure environmentally responsible procurement. | <ol style="list-style-type: none"> 1. Require in procurement specifications that transformers, transformer oil and other equipment are to be free from PCB and other petroleum fractions that may be injurious to environment or equipment. 2. Require new switchgear to be free from CFCs in procurement specifications. SF6 gas insulated equipment to be effectively leak free with nominal SF6 top up less than 1% per year. | <p>During tender preparation.</p> <p>No later than pre-qualification of tender negotiations.</p> | Tender negotiations | DISCO ESU with the design consultant | DISCO ESU and CSC (if any). |
| 3. Waste disposal | Ensure adequate disposal options for all waste including transformer oil, residually contaminated soils, scrap metal. | <ol style="list-style-type: none"> 1. Create waste management policy and plan to identify sufficient locations for, storage and reuse of transformer oils and recycling of breaker oils and disposal of transformer oil, residually contaminated soils and scrap metal "cradle to grave". 2. Include in contracts for unit rates for re-measurement for disposal. 3. After agreement with local authority, designate disposal sites in the contract and cost unit disposal rates accordingly. | <ol style="list-style-type: none"> 1. Prior to detailed design stage no later than pre-qualification or tender negotiations 2. Include in contract. | DISCO ESU. Locations approved by EPA and DISCO and local waste disposal authorities. | DISCO ESU and EPA with the design consultant. | DISCO ESU and CSC |
| 4. Hazardous waste disposal | To ensure responsible disposal of hazardous waste in line with best practice. | <ol style="list-style-type: none"> 1. Waste management plan to identify any remaining PCB containing equipment to be replaced and appropriate method for disposal. | During tender preparation. | All DISCO substations. | DISCO ESU with the Design Consultant | DISCO |
| 5. Prevent spills & contamination. | To prevent spills, contamination of soil groundwater and surface water. | <ol style="list-style-type: none"> 1. Design of adequate secondary containment facilities in new substations to include concrete bases with bunding to prevent contamination from a major catastrophic failure and residual contamination from installation, maintenance and decommissioning. 2. Review design of existing transformer and oil treatment location to aim to improve secondary containment facilities, concrete bases and bunding if retrofitting is technically | <p>During design stage.</p> <p>Before tender prequalification.</p> | <ol style="list-style-type: none"> 1. All new and upgraded substations and where new transformers. 2. Where augmentation of transformers requires significant civil works that can accommodate required improvements. | DISCO ESU with the Design Consultant | DISCO |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|---|--|---|--|---|--------------------------------------|-----------------------------|
| | | feasible and will provide benefits at reasonable cost. 3. Design all transformers to be located over bunds to comply with best international practice so that transformer oil and other residual contamination does not run to ground and can be captured for controlled disposal. (commence designs in new substations). 4. Integrate proposals with waste management policy and plan to identify sufficient locations for, storage and disposal of transformer oil and residually contaminated surface water or soil "cradle to grave". 5. Include in contracts for unit rates for construction of bunds and new style drainage requirements. 6. In consultation with EPA identify designate residual oil disposal sites in each DISCO and design disposal accordingly. | | | | |
| 6. Hydrological impacts | To minimize hydrological and drainage impacts during construction. | 1. Design of adequate major and minor culverts facilities to be integrated in design to avoid effects on hydrological flow in areas where it is sensitive, such as water courses or bridges and culverts. 2. Identify locations where drainage or irrigation crossing RoW may be affected by works. 3. Include protection works in contract as a payment milestone(s). | During design stage. Before the commencement of construction activities | If lines or substation are relocated near water courses, culverts or bridges in the design stage reports | DISCO ESU with the Design Consultant | DISCO |
| 7. Temporary drainage and erosion control | Include mitigation in preliminary designs for erosion control and temporary drainage. | 1. Conduct detailed acoustic assessment for all residential, school, (other sensitive structures) within 50m of DGS and line. 2. If noise at sensitive receiver exceeds the permissible limit, the construction activities should be mitigated, monitored and controlled. 3. If noise at sensitive receiver will exceeds the permissible limit in operational phase the design to include acoustic mitigation (noise barrier or relocation of noisy equipment) and monitoring. | During design stage. No later than pre-qualification or tender negotiations. | Locations based on drainage or irrigation crossing RoW near DGS. | DISCO ESU and design consultant. | DISCO ESU and CSC |
| 8. Noise | Ensure cumulative noise impacts are acceptable in construction and operational phase. | 1. DISCO to prefer to select a site that will not affect any local public in property or house such that no additional land is required. 2. Social preparation completed. LARP etc. (if required) in place IN CASE UNFORSEEN ADDITIONAL LAND IS REQUIRED. 3. Acquisition of lands completed to minimize the uncertainty of people. 4. Completed implementation of LARP and LARCs to provide compensation and assistance to the APs. 5. All the payments / entitlements are paid according to the Entitlement Matrix, prepared according to the LARP. 6. All the impacts identified by the EIA are incorporated in to the | Commence as early as possible and complete one month before the construction of the GSS and all the included structures, the APs to be given sufficient time with compensation money and to resettle satisfactorily. | Noise sensitive locations identified in the IEE/EIA/EMP or as required / approved by PEPA. | DISCO ESU with the design consultant | DISCO ESU and CSC (if any). |
| 9. Social Impacts | To ensure that the adverse impacts due to constructing lines over private land, property acquisition and resettlement are mitigated according to the LARP. | | | Affected Families will be compensated by DISCO through the concerned District Revenue Department and Land Acquisition Collectors. | DISCO ESU / LACs | ADB and External Monitors |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|---|---|--|---|--|--|--|
| | | project as well as the LARP and relevant entitlements included into the Entitlement Matrix. | | | | |
| 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. | <ol style="list-style-type: none"> 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. | <p>Prepare a thorough drainage management plan prior to be approved by CSC one month prior to a commencement of construction</p> <p>Proper timetable prepared in consideration with the climatic conditions of the area, the different construction activities mentioned here to be guided.</p> | <ol style="list-style-type: none"> 1. Locations of each construction activity to be listed by the CSC engineer. 2. Special locations are identified on the site by the contractor to minimize disturbances. 3. A list of locations of irrigation channels / drains to be compiled and included in the contract. | 1. Contractor supervised by CSC or to actively supervise and enforce. | DISCO ESU |
| 2. Orientation for Contractor, and Workers | To ensure that the CSC contractor and workers understand and have the capacity to ensure the environmental requirements and implementation of mitigation measures. | <ol style="list-style-type: none"> 1. DISCO ESU 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 for contractors site agents. 3. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. 4. Continuous progress review and refresher sessions to be followed. | <p>Induction course for all site agents and above including all relevant DISCO staff / new project staff before commencement of work.</p> <p>At early stages of construction for all construction employees as far as reasonably practicable.</p> | All staff members in all categories. Monthly induction and six month refresher course as necessary until contractor complies. | DISCO ESU, Contractor and the CSC and record details. | DISCO & CSC to observe and record success. |
| 3. Water quality | To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized. | <p>Compile temporary drainage management plan one month before commencement of works.</p> <ol style="list-style-type: none"> 1. Proper installation of temporary drainage and erosion control before works within 50m of water bodies. 2. Proper maintenance and management construction of TD and EC measures, including training of operators and other workers to avoid pollution of water bodies by the considerate operation of construction machinery and equipment. 3. Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. | 1 month prior to construction. | <ol style="list-style-type: none"> 1. 50m from water bodies 2. Relevant locations to be determined in the detailed project design. | <ol style="list-style-type: none"> 1. Contractor (DISCO ESU & CSC to enforce). 2. Contractor has to check water quality and report to DISCO. | DISCO review results |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|-----------------------|--|--|--------------------------------|---|--|-----------------------|
| | | <p>4. Proper disposal of solid waste from construction activities.</p> <p>5. 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>6. Topsoil stripped material shall not be stored where natural drainage will be disrupted.</p> <p>7. Borrow sites (if required) should not be close to sources of drinking water.</p> <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 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> | | | 3. CSC supervises implementation activities. | |
| 4. Air quality | To minimize dust effectively and avoid complaints due to the airborne particulate matter released to the atmosphere. | <p>1. Review requirements for piling and use of powered mechanical equipment within 100m of SRs.</p> <p>2. Review conditions of buildings and conduct public consultation with SRs to establish less sensitive time for works involving piling and schedule works accordingly.</p> <p>3. Non-percussive piling methods to be used wherever practicable.</p> <p>4. Percussive piling shall be conducted in daylight hours.</p> <p>5. Hammer-type percussive pile driving operations shall not be allowed at night time.</p> | During all construction. | <p>1. Construction sites within 100m of sensitive receivers.</p> <p>2. A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.</p> | Contractor should maintain the acceptable standards CSC to supervise relevant activities. | DISCO ESU / CSC |
| 5. Ground Vibration | To minimize ground vibrations during construction. | <p>1. Review requirements for use of powered mechanical equipment within 100m of SRs.</p> <p>2. Conduct public consultation with SRs to establish less sensitive time for works and schedule works accordingly.</p> <p>3. 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>4. Heavy equipment shall be operated only in daylight hours.</p> | 1 month prior to construction. | <p>1. Construction sites within 100m of sensitive receivers.</p> <p>2. A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.</p> | Contractor should maintain the acceptable standards CSC to supervise relevant activities. | DISCO ESU / CSC |
| 6. Noise | To minimize noise increases during construction. | | 1 month prior to construction. | <p>1. Construction sites within 100m of sensitive receivers.</p> <p>2. A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.</p> | Contractor should maintain the acceptable standards CSC to supervise | DISCO ESU / CSC |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|-----------------------------------|--|--|--|--|-----------------------------|-----------------------|
| | | <p>5. Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise.</p> <p>7. Well-maintained haulage trucks will be used with speed controls.</p> <p>8. Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods.</p> <p>SCHEDULE WORKS IN SENSITIVE AREAS (e.g. NEAR RIVERS) FOR DRY SEASON</p> <p>1. In the short-term, temporary drainage and erosion control plan to be presented with tender. Temporary drainage and erosion control plan one month before commencement of works to protect all areas susceptible to erosion. (Permanent drainage works shall be in the final design).</p> <p>2. Installation of TD and EC before works construction within 50m of water bodies.</p> <p>3. Clearing of green surface cover to be minimized during site preparation.</p> <p>5. Meaningful water quality monitoring up and downstream at any lower site during construction within a river or stream bed. Rapid reporting and feedback to CSC.</p> <p>5. Back-fill should be compacted properly in accordance with DISCO design standards and graded to original contours where possible.</p> <p>6. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage.</p> <p>7. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes or cause slippage.</p> <p>8. Measures shall be taken to prevent ponds of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours.</p> <p>9. Contractor should arrange to monitor and adjust working and adopt suitable measures to minimize soil erosion during the construction period. Contractor's TD and EC plan should be endorsed and monitored by CSC after consulting with concerned authorities.</p> <p>10. Replanting trees to be done before the site is vacated and handed back to DISCO with appropriate trees (other vegetation cover as appropriate) to ensure interception of rainwater and the deceleration of surface run-off.</p> | | | relevant activities. | |
| 7. Soil Erosion / Surface Run-off | <p>Prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively.</p> <p>To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles.</p> | <p>(consider also for future trances if civil works)</p> <p>1. Use only EPA licensed sites for raw materials in order to</p> | <p>1 month prior to construction because the area can be subject to unseasonal heavy rain Plan before and during construction (cut and fill, land reclamation etc.) while considering the climatic conditions.</p> | <p>1. Locations based on history of flooding problems indicated by local authorities .</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>3. Locations of all rivers, streams, culverts, irrigation channels, roads and highways.</p> | Contractor and CSC | DISCO ESU / CSC |
| 8. Exploitation, Handling, | To minimize disruption and contamination of | | month prior to starting of works. Update | 1. List of borrow areas to be prepared with tender stage | Contractor and CSC to agree | DISCO ESU / |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|--|---|---|--|--|---|-------------|
| Transportation and Storage of Construction materials | the surroundings, minimize and or avoid adverse environ-mental impacts arising out of construction material exploitation, handling, transportation and storage by using sources that comply with EPA license conditions | <p>minimize adverse environmental impacts.</p> <p>2. Measures to be taken in line with any EPA license conditions, recommendations and approval to be applied to the subproject activities using the licensed source including:</p> <p>(i) Conditions that apply for selecting sites for material exploitation.</p> <p>(ii) Conditions that apply to timing and use of roads for material transport.</p> <p>(iii) Conditions that apply for maintenance of vehicles used in material transport or construction.</p> <p>(iv) Conditions that apply for selection of sites for material storage.</p> <p>(v) Conditions that apply for aggregate production.</p> <p>(vi) Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.</p> | monthly. | <p>contractors method statement and updated one month prior to construction.</p> <p>2.List of routes of transport of construction material is to be prepared for the contract and agreed one month prior to construction.</p> <p>3. Map of locations of storage is prepared by the contractor.</p> | format of reporting | CSC |
| 9. Construction Waste Disposal | Minimize the impacts from the disposal of construction waste. | <p>1. Waste management plan to be submitted to the CSC and approved by DISCO ESU one month prior to starting of works. WMP shall estimate the amounts and types of construction waste to be generated by the project.</p> <p>2. Investigating whether the waste can be reused in the project or by other interested parties without any residual environmental impact.</p> <p>3 Identifying potential safe disposal sites close to the project, or those designated sites in the contract.</p> <p>4 Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites.</p> <p>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, lagoons or other water bodies.</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.</p> <p>7. Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA.</p> <p>8. Waste breaker insulating oil to be recycled, reconditioned, or reused at DISCO's facility.</p> <p>9. Machinery should be properly maintained to minimize oil spill during the construction.</p> <p>10. Machinery should be maintained in a dedicated area over drip trays to avoid soil contamination from residual oil spill during maintenance.</p> <p>11 Solid waste should be disposed at an approved solid waste facility and not by open burning which is illegal and contrary to good environmental practice.</p> | <p>One month prior to starting of works.</p> <p>Update monthly</p> | <p>1.Dumping: A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement</p> | <p>1.Contractor</p> <p>2-11. CSC and DISCO ESU should supervise and take action to ensure that contractor's complete relevant activities according to EIA / IEE / EMP requirement & NEQS.</p> | DISCO/ CSC |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|---|---|--|---|---|---------------------------------------|-----------------------|
| 10. Work Camp Operation and Location (if required) | To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area. | <ol style="list-style-type: none"> 1. Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the DISCO. If possible, camps shall not be located near settlements or near drinking water supply intakes. 2. Cutting of trees shall not be permitted and removal of vegetation shall be minimized. 3. Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites. 4. Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed of to the nearest sanitary landfill or site having complied with the necessary permits of local authority permission. 5. The Contractor shall organize and maintain a waste separation, collection and transport system. 6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. 7. At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. 8 Exposed areas shall be planted with suitable vegetation. 9.DISCO and Construction Supervising Consultant shall inspect and report that the camp has been vacated and restored to pre-project conditions. | UPDATE Once a month | Location Map is prepared by the Contractor. | Contractor | DISCO ESU / CSC |
| 11. Loss of Trees and Vegetation Cover of the Areas for Towers and Temporary Work-space | To avoid negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover. | <ol style="list-style-type: none"> 1. Tree location and condition survey to be completed one month before tender. 2. The route for the distribution line should be selected so as to prevent the loss or damage to any orchard trees or other trees. Use of higher towers to be preferred to avoid trees cutting. 3. Clearing of green surface vegetation cover for construction, borrow of soil for development, cutting trees and other important vegetation during construction should be minimized by careful alignment. Written technical Justification for tree felling included in tree survey. 4. At completion all debris and waste shall be removed and not burned. 5. The contractor's staff and labour will be strictly directed not to damage any vegetation such as trees or bushes outside immediate work areas. Trees shall not be cut for fuel or works timber. 6. Land holders will be paid compensation for their standing trees in accordance with prevailing market rates (LARP). The | Route design and site identification (1 & 2) during design stage and other matters during construction of relevant activities | Tree survey to be completed one month before tender at relevant Locations with a Map to be compiled prior to tender by the design consultant / DISCO ESU during detailed design and CSC to update as necessary. | Design consultant, Contractor and CSC | DISCO ESU / CSC |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|--|---|--|---|--|--------------------|------------------|
| | | <p>land holders will be allowed to salvage the wood of the affected trees.</p> <p>7. The contractor will plant three (3) suitable new trees outside the 30 meter corridor of the transmission line in lieu of one (1) tree removed.</p> <p>8. Landscaping and road verges to be re-installed on completion.</p> <p>9. Compensatory planting of trees/shrubs/ornamental plants (at a rate of 3:1) in line with best international practice.</p> <p>10. After work completion all temporary structures, including office buildings, shelters and toilets shall be removed.</p> | | | | |
| 12. Safety Precautions for the Workers | To ensure safety of workers | <p>1. Providing induction safety training for all staff adequate warning signs in health and safety matters, and require the workers to use the provided safety equipment.</p> <p>2. Providing workers with skull guard or hard hat and hard toe shoes.</p> | Prior to commencement and during construction | Location to be identified by the CSC with contractor. | Contractor and CSC | DISCO/ CSC |
| 13. Traffic Condition | Minimize disturbance of vehicular traffic and pedestrians during haulage of construction materials and equipment. | <p>1. Submit temporary haul and access routes plan one month prior to start of works.</p> <p>2. Routes in vicinity of schools and hospitals to be avoided.</p> | Prior to and throughout the construction. | The most important locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements to be made available. | Contractor and CSC | DISCO/ ESU / CSC |
| 14. Impact on Wetlands (if relevant). | To ensure that damage to river ecosystems and its ecosystem is minimized during construction. | <p>1. Erection of towers in the wetlands, will be avoided as far as possible. However, at places where realignment of the distribution is unavoidable, towers with maximum span will be used to minimize the impacts.</p> <p>2. Avoid disposal of wash water, solid waste and discarded packing etc. on wetlands.</p> <p>3. 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.</p> <p>4. Residual concrete from works should not be dumped close to wetlands.</p> <p>5. Avoid temporary structures or stockpiling within banks of river and on wetlands.</p> <p>6. -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>7. Staff working on the project should be given clear orders, not to shoot, snare or trap any bird (MANDATORY).</p> <p>8. Schedule construction for April to July and September to November to avoid the monsoons and periods of mass migration of birds from Central Asia to the plains of Sindh and</p> | Prior to and during Construction | Tausna wetland (Ramser Site) is located 85 km from the project site. | Contractor and CSC | DISCO/ ESU / CSC |

| Environmental concern | Objectives | Mitigation Measures recommended | Timing to implement MM | Locations to implement MM | Resp imp MM | Resp mon MM |
|---|---|---|--|--|------------------------|-------------|
| | | <p>their return journey (December to March).</p> <p>9. Construction activities confined to small areas to minimize impacts and encourage migratory birds to settle as normal.</p> <p>10. Contractor will prevent the workers from hunting and fishing for water birds and fish resources, etc</p> <p>11. Food and fuel to be bought by contractor at local villages too boost local income.</p> | | | | |
| 15. Social Impacts | To ensure minimum impacts from construction labour force, on public health. | <p>1. Potential for spread of vector borne and communicable diseases from labour camps shall be avoided (worker awareness orientation and appropriate sanitation should be maintained).</p> <p>2. Complaints of the people on construction nuisance / damage close to ROW to be considered and responded to promptly.</p> <p>3. Contractor should make alternative arrangements to avoid local community impacts.</p> | Complaints of public to be solved as soon as possible | All subprojects all tranches | Contractor and the CSC | DISCO/ CSC |
| 16. Institutional Strengthening and Capacity Building | To ensure that DISCO officials are trained to understand and to appreciate EMP | Capacity building activities were taken by Environmental Officer in Tranche 1. Environmental Management Unit (EMU) was setup with in DISCO under Director Operations in Tranche 1. Development of strengthening plan for the EMU should be taken up with resources. | Initiate preconstruction and continue beyond project completion. | Awareness training for all management and senior staff in DISCO at senior engineer and above in PMU and related units. | DISCO ESU | DISCO & ADB |
| OPERATIONAL STAGE | | | | | | |
| 1. Air Quality | Minimize air quality impacts | No significant impacts Tranche 1. Monitor designs and plans for all future tranches. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 2. Noise | Minimize noise impacts | No significant impacts Tranche 1. Acoustic designs checking and plan for all future tranches. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 3. Waste disposal | Minimize improper waste disposal | Continue waste management arrangements in operational phase of all subprojects and DISCO activities. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 3. Compensatory tree planting | Maintain survival of trees planted | Employ landscaping contractor to monitor, water and feed replacement saplings and replace dead specimens as necessary. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 4. Land slides and soil erosion | Avoid landslips and loss of productive land | No significant impacts in Tranche 1. Review designs checking and plan for all future tranches. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 5. Water quality | Minimize water quality impacts | No significant impacts in Tranche 1. Review designs checking and plan for all future tranches. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 6 Crops and vegetation | Monitor impacts from maintaining tree clearance under transmission lines | Track growth of large trees under the conductors. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |
| 7. Social safety Impacts | Ensure no encroachments / construction under the transmission line. No violation of clearance spaces. | Necessary signboards with limits of height clearances to be placed all along the line. Identify and prevent any illegal encroachments under the DGLs. | Operational phase | all subprojects in future tranches | DISCO | DISCO ESU |

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

Table A2: 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 | DISCO 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 | DISCO with the assistance of an external environmental consultant | Prior to DISCO 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 | DISCO with the assistance of an external environmental consultant | Prior to DISCO 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 | DISCO with assistance of project implementation unit | Prior to DISCO 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 | DISCO with the assistance of an external environmental consultant | Prior to DISCO approval of contractor's detailed designs. |
| 1.6 | Review the management plan for mineral construction materials and waste management | DISCO with the assistance of an external environmental consultant | Prior to DISCO 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 | DISCO with assistance of project implementation unit | Prior to DISCO approval of contractor's detailed designs. |
| 1.8 | Review landscape design plan, including compensatory planting | DISCO with the assistance of an external environmental consultant | Prior to DISCO 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 DISCO | DISCO 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 | DISCO with assistance of project implementation unit | Continuous throughout construction period. |
| 2.2 | Monitoring of the implementation of the Landscape Design Plan | DISCO with the assistance of an external environmental consultant | During the last phase of construction works |
| 2.3 | Commissioning phase monitoring of as built | DISCO | 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 ^b | Implementation Responsibility | Implementation Schedule |
|-----|--|---|--|
| | equipment versus environmental performance criteria | | |
| 3 | Operation and Maintenance Phase | | |
| 3.1 | Observations during routine maintenance inspections of facilities and distribution lines rows. Inspections will include monitoring implementation of operational mitigation measures versus environmental criteria specified in EMP, waste management and operational noise. | DISCO | As per DISCO inspection schedules |
| 3.2 | Monitoring of the implementation of the Landscape Design Plan | DISCO 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 | DISCO | During the life of the project |

Table A3: Summary of Estimated Costs for EMP Implementation for Tranche 1

| Item | Sub Item per DISCO | Estimated Total Costs [PRS]# | Estimated Total Cost [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 |

tentative costs

* per disco

TYPICAL SUMMARY OF PUBLIC CONSULTATION (SHADDAN LUND MEPCO)

| No. | Town | Name | Participants | Address | Date | Issues Raised/Concerns Expressed/Suggestions and Requests | Measures Proposed | Action Taken/ Proposed |
|-----|--------------|-----------------|---------------|--------------|---------|--|---|---|
| 1 | Shahdan Lund | Moulavi Usman | Mouliwi | Shahdan Lund | 06-July | He supports the up gradation and expansion, as he expects more reliable supply of electricity. | --- | --- |
| 2 | Shahdan Lund | Abdur Rashid | Barber | Shahdan Lund | 06-July | He is fed up of load-shedding, and expects uninterrupted electricity by the construction of GSS. | --- | --- |
| 4 | Shahdan Lund | Ahmad | Taylee | Shahdan Lund | 06-July | No Comments | ----- | ----- |
| 5 | Shahdan Lund | Ismail | Cobler | Shahdan Lund | 06-July | Fair and prompt payment should be made to land owners for damage to crops and trees where the new towers will be installed. He thinks the GSS project will assist in development of area and help the poor. | MEPCO should make sure that the process of compensation is fair. | Compensation for crops and trees damaged should be paid according to ADB and national guidelines. |
| 7 | Shahdan Lund | Usman | Cobler | Shahdan Lund | 06-July | He wanted the project should offer casual labour opportunities to them, and expected improved electricity to help business | ----- | ----- |
| 8 | Shahdan Lund | Muhammad Khalid | Factory Labor | Shahdan Lund | 06-July | He is also fed up of load-shedding, and expects the up gradation of GSS to improve the supply of electricity. He requested that the route of the new lines should be kept away from houses. | Skilled and un-skilled employment should be preferred to local people | MEPCO should employ locals for skilled / un-skilled jobs on priority. |
| 9 | Shahdan Lund | Muhammad Nadeem | Student | Shahdan Lund | 06-July | Improved supply of electricity will allow farmers to use electric motors and turbines to supplement irrigation water, to help the local crops of gram, wheat and cotton. The use of diesel peter engines is expensive. | The new line should be laid along uninhabited area as far as possible | MEPCO should discourage and educate people not to construct houses under power lines. |
| 10 | Shahdan Lund | Qadir Baksh | Teacher | Shahdan Lund | 06-July | | ----- | ----- |

| No. | Town | Name | Participants | Address | Date | Issues Raised/Concerns Expressed/Suggestions and Requests | Measures Proposed | Action Taken/ Proposed |
|-----|-----------------|------------------------|----------------|-----------------|---------|---|---|---|
| 11 | Shahdan Lund | Ahmad Baksh | Teacher | Shahdan Lund | 06-July | Load-shedding is more in villages, and affects all spheres of life, including schools. The GSS project should improve the situation in Shahdan Lund area. | ----- | ----- |
| 12 | Shahdan Lund | Abdur Rashid | Barber | Shahdan Lund | 06-July | He thinks shortage of electricity is affecting everybody, especially business. | ----- | ----- |
| 13 | Basti Tali wala | Muhammad Naeem Laghari | Tractor Driver | Basti Tali Wala | 06-July | He supports the project. No other comments. | ----- | ----- |
| 14 | Basti Tali wala | Haleema Mai | House Wife | Basti Tali wala | 06-July | The project should offer job opportunities to local people of the village. | Skilled and un-skilled employment should be preferred to local people | MEPCO should employ locals for skilled / un-skilled jobs on priority. |
| 15 | Basti Tali wala | Amna Bibi | House Wife | Basti Tali wala | 06-July | Prolonged load shedding in the summer is a nuisance. She hoped the new GSS will improve the situation. | ----- | ----- |
| 16 | Basti Tali wala | Bashiran Bibi | House Wife | Basti Tali wala | 06-July | No comment / suggestion | ----- | ----- |
| 17 | Basti Tali wala | Fatima Bibi | House Wife | Basti Tali wala | 06-July | No comment | ----- | ----- |
| 18 | Shahdan Lund | Bhrawan | House Wife | Shahdan Lund | 06-July | No comment / suggestion | ----- | ----- |
| 19 | Shahdan Lund | Hajran Bibi | House Wife | Shahdan Lund | 06-July | The existing lines are passing close to our roofs, and are a source of danger. The new lines should be kept away from the villages. | The new line should be laid along uninhabited area as far as possible | MEPCO should discourage and educate people not to construct houses under power lines. |
| 20 | Shahdan Lund | Jannatan bibi | House Wife | Shahdan Lund | 06-July | No comment / suggestion | ----- | ----- |
| 21 | Shahdan Lund | Zuhran bibi | House Wife | Shahdan Lund | 06-July | The project should offer job opportunities to men of the village. | Skilled and un-skilled employment should be preferred to local people | MEPCO should employ locals for skilled / un-skilled jobs on priority. |
| 22 | Shahdan Lund | Sakina Bibi | House Wife | Shahdan Lund | 06-July | No comment / suggestion. | ----- | ----- |

Source: Consultants.

ENVIRONMENTAL ASSESSMENT AND REVIEW FRAMEWORK

A. Development Activities Requiring Environmental Assessment and Review

1. The Government of Pakistan (the Government) has requested the Asian Development Bank (ADB) to provide a multi-tranche financing facility (MFF) to facilitate investments in power distribution and development of networks of the eight independent distribution companies (DISCOs) to distribute power to end user consumers. The MFF funding from ADB is expected to be released in stages (tranches). The Power Distribution Enhancement (PDE) Investment Program is part of the Government's long term energy security strategy. The proposed ADB intervention will finance new investments in PDE and assist capacity building of sector related agencies. The investment program will cover necessary PDE development activities in all distribution networks of the eight independent distribution companies (DISCOs) who distribute power to the end user/consumers of Pakistan. The development activities include additional and replacement transformers, distribution line extensions, new and replacement distribution lines, additional substations, transformer protection and other non network activities such as automatic meter reading, construction equipment, computerized accounting. New distribution lines to and from various network facilities and some of the above activities will also be included in the later tranches.

2. Under the MFF loan procedures of ADB, implementation of safeguards is to be achieved by environmental assessment of every subproject to be undertaken following *ADB Environment Policy (2002)* and *ADB Environmental Assessment Guidelines (2003)*. Power distribution enhancement and development type projects, that are limited to expansion of already developed facilities, have typically been classified as Category B.

3. The Government's regulations, the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations (2000) also categorize development projects into two schedules according to their potential environmental impact. The proponents of projects that have reasonably foreseeable impacts are required to submit an IEE for their respective projects (Schedule I). Projects that have more adverse environmental impact (Schedule II) are required to submit an environmental impact assessment (EIA) to the respective provincial Environmental Protection Agency (EPA). Distribution lines and substations are included under energy projects and IEE is required for distribution lines less than 11kV and large distribution projects (Schedule I). EIA is required by the Government for all projects involving distribution lines of kV11kV and above and for grid substations (Schedule II). Expansion of facilities within existing substations is not scheduled as requiring environmental assessment. However disclosure of the scope and extent of each subproject to the relevant provincial EPA is recommended.

4. The first batch of investments (Tranche 1), with more than one hundred (100) subprojects, is dominated by replacement and installation of additional transformers and other equipment in existing substations, additional substations and connecting distribution lines as improvement and development of power distribution. Environmental assessments have been carried out for each subproject. Initial Environmental Examinations (IEEs) have been carried out following ADB's *Environment Policy 2002* and *Environmental Assessment Guidelines 2003* and the Government's environmental assessment regulations and guidelines, and a summary IEE (SIEE) with environmental management plan (EMP) and a monitoring budget is prepared for Tranche 1's subprojects.

5. This Environmental Assessment and Review Framework (EARF) has been prepared for the additional subprojects that will arise in the subsequent tranches, as required by ADB. The EARF identifies the broad scope of the MFF and outlines the policy, procedures and institutional requirements for preparing subsequent sub-projects under the MFF loan. The

EA is Pakistan Electricity Planning (PEPCO). The Implementing Agency (IA) for each of the future subprojects will be the DISCO for that area. The DISCOs will be responsible for preparing environmental assessments (and implementing EMPs for subprojects as outlined in this framework) that must be submitted to ADB for review and approval prior to finalization of contracts or commencement of work. This EARF shall apply to all subprojects under the MFF so as to ensure that the environmental impacts are appropriately addressed and mitigated to acceptable levels.

6. Each subproject will undergo environmental assessment after categorisation and focus on the most significant issues. An SIEE for the tranche will be conducted after identifying the categories of the additional subprojects but before the PFR is submitted. Where a subproject requires an IEE at least one public consultation will be conducted with local community and potentially affected people. IEE will be approved before commencement of detailed design while IEE results will be communicated to the local community before commencement of construction. Any subprojects that are categorised "A" will require full environmental impact assessment (EIA) and will include two rounds of public consultation. The second consultation will be conducted after the draft EIA is prepared which include the EMP. A summary EIA (SEIA) will be made available to the general public at least 120 days before the subproject approval by ADB. Similar procedure will also apply to Category "B Sensitive" subprojects, with an IEE and SIEE (including an EMP) as required.

7. The Framework of Environmental Assessment on power extensions and augmentation subprojects, prepared and submitted to the Pakistan EPA, after hearings with provincial EPAs, has received a response. It has been clarified that all proponents must follow section 12 of the Pakistan Environmental Protection Act for all projects and furthermore that, only for augmentation projects, by following the Framework of Environmental Assessment the required procedures under section 12 will be met. Pakistan EPA has also assumed that all proponents will consult with the relevant provincial EPAs (PEPA) and follow their advice. It is noted that in 2006 Punjab EPA requested disclosure of the scope and extent of each subproject in order that the Director General of PEPA can determine if additional land is required and the need for IEE or EIA.

B. Environmental criteria for additional subproject selection

8. Potential adverse environmental impacts associated with PDE projects can be avoided or minimized through careful location, design, and route selection. Specific environmental criteria for subproject selection are:

- (i) Potential environmental impacts associated with the subprojects will be minimized by realignment or selection of alternative sites or routes as preferred alternative.
- (ii) The subprojects should not disturb any cultural heritage designated by the Government or by international agencies such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- (iii) The future subprojects will not be located within or near the core zone of any protected areas such as national parks, nature reserves, or wildlife sanctuaries as designated by EPA.
- (iv) An environmental management plan (EMP) with adequate implementation and monitoring budget will be developed for each subproject.
- (v) Clearing of any existing forest resources will be avoided if possible, and where unavoidable will be minimized and compensatory planting included in the EMP and budget for each subproject.
- (vi) The environmental assessment of the subprojects will be conducted according to ADB's *Environment Policy 2002* and ADB *Environmental Assessment Guidelines 2003*, the Government's environmental assessment

- regulations and guidelines, and the Environmental Assessment Review Framework (EARF).
- (vii) The subprojects shall only involve activities that follow Government's laws and regulations.

C. Responsibilities/Authorities of Various Agencies

9. The DISCOs as IAs will be solely responsible for the implementation of the entire environmental assessment and review procedures for selecting additional subprojects. This will include, but not be limited to, ensuring that the subproject selection criteria are strictly adhered to, that preparation of IEEs/SIEE or EIA/SEIA will be carried out in a timely and adequate manner, environmental monitoring and institutional requirements will be fully met while meaningful public consultations will be carried out satisfactorily. The IAs will submit the categorization checklist, IEE/SIEEs and EIA/SEIAs, and monitoring reports to ADB for review.

10. Prior to the submission of the PFR for a Tranche of subprojects the IAs will:

- (i) Prepare an environmental screening checklist to classify the subprojects in each Tranche.
- (ii) Prepare the terms of reference for environmental consultants to conduct environmental assessments, prepare environmental assessments, IEE/EIA reports including an EMP, and SIEE/SEIA for public disclosure.
- (iii) Ensure that adequate public consultation has been undertaken with affected groups and local NGOs, review the environmental assessments and submit the IEE/EIAs, EMPs, SIEE/SEIA documents to ADB.

11. Prior to the commencement of civil works for a subprojects in a Tranche the IAs will:

- (i) Submit the IEE/EIAs for regulatory approval of the relevant provincial environmental protection agency and obtain approval, e.g., environmental clearance, Non-Objection Certificate (NOC), forest clearance, and water board clearance as per the regulatory requirements of the Government.¹
- (ii) Ensure that all regulatory clearances for the subproject that are obtained from the relevant Government authorities are submitted promptly to ADB.
- (iii) Ensure that the required mitigation measures during construction or the EMP are included in the bidding document of the subproject and that the all bidding contractors have access to the EIA/IEE and EMP.

12. During the implementation of civil works for a subprojects in a Tranche the IAs will:

- (i) Ensure that an environmental management plan, including all proposed mitigation measures and monitoring programs, are properly implemented.
- (ii) Monitor the implementation of EMP and present its monitoring report.
- (iii) In case unpredicted environmental impacts occur during project implementation, inform ADB, review the EMP with the contractor, and implement alternative environmental mitigation program.
- (iv) In case a subproject changes in scope, inform ADB and reconfirm the environmental classification, determine whether a supplementary IEE or EIA study is required with ADB, and carry out the study.
- (v) Submit the requisite reports on social and environmental compliance and implementing the Environmental Management Plan (EMP) as required by the Pakistan EPA and ADB.
- (vi) Ensure that ADB be given access to undertake environmental due diligence for all subprojects. However, the IA shall have the main responsibility for

undertaking environmental due diligence and monitoring of all the subprojects. The due diligence report as well as monitoring reports on EMP implementation will be systematically prepared and be available to the public, if requested.

13. ADB will be responsible for regular review and timely approval of subproject checklists and IEE/SIEEs and EIA/SEIAs. Technical guidance will be provided by ADB to the DISCO as needed. ADB will also be responsible for reviewing regular monitoring reports and officially disclosing the environmental assessments for selected subprojects on the ADB website.

14. During the MFF ADB will:

- (i) Review environmental assessment reports as a basis for subproject and Tranche approvals.
- (ii) Publicly disclose the SIEE and SEIA for category B sensitive and A subprojects, respectively, 120 days before Tranche Approval via ADB websites
- (iii) Monitor the EMP implementation and due diligence as part of MFF reviews.
- (iv) Provide assistance to IAs, if required, in carrying out its responsibilities and for building capacity for safeguard compliance.
- (v) Facilitate the required consultations with project affected groups and local NGOs, and to ensure that the borrower or project sponsor provides relevant information on the project's environmental issues in a form and language(s) accessible to those being consulted.

D. Environmental assessment and review procedures of additional subprojects

1. Application of Selection Criteria

15. Any additional subproject not meeting the criteria listed above will not be put forward for consideration or inclusion under the MFF tranches. The environmental assessment of the subprojects will be conducted by the IA prior to the submission of the PFR for subsequent tranches and in line with the requirements of the FFA. A final check on conformity with the selection criteria will be made at the submission of detailed IEEs of additional subprojects for ADB's clearance.

2. Environmental Classification

16. Environmental categorization using the Rapid Environmental Assessment checklist approach in compliance with the ADB *Environmental Assessment Guidelines* will be applied to all subprojects.

3. Preparation of Detailed Design

17. Detailed design work for each additional subproject will include and follow the recommendations of the environmental assessments. The DISCOs will include the requirements of the EMP and IEE/EIAs in the bid documents and ensure the detailed designs include such requirements before contracts are finalized. Where modifications to designs are incorporated at a later stage, the requirements of the EMP and IEE/EIAs will also be included. Certification to ADB that the detailed designs comply with IEE/EIAs (including EMP) recommendations will be required before contracts can be signed and made effective. The DISCOs shall also allocate sufficient resources to create and operate an Environmental and Social Cell to monitor the environmental assessment process for all subprojects under the MFF.

4. Preparation of Construction Contracts

18. Early in the implementation period, model construction contracts will be prepared incorporating general environmental safeguards and practices. Specific, individual contracts will be based on the model contracts, but will also be checked by the DISCOs to ensure that all special or particular safeguard requirements and mitigation measures, recommended in the IEE/EIA (including EMP) for the particular additional subproject, are all incorporated within the contract. The DISCO shall also allocate sufficient resources to the Environmental and Social Cell to monitor and undertake the environmental mitigation measures of all construction contracts under the MFF.

5. Monitoring During the Construction Period

19. Monitoring during construction will be the responsibility of the DISCO's. Monitoring will relate to compliance with construction contracts, the state and health of the nearby environmental resources, and the effectiveness of mitigation measures. Reporting will be to the relevant provincial or federal EPA on a regular basis (at least quarterly) and to ADB semi-annually.

6. Monitoring of subproject operations

20. It is desirable to formulate the EMP in such a way so as to minimize recurrent responsibilities and costs. However in circumstances where staff, expertise and finances are limited, some aspects of additional subproject design may require continuous monitoring to guard against negative environmental impacts. Reporting will be to the relevant provincial or federal EPA on a quarterly basis and to ADB semi-annually.

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

E. Public Disclosure

22. In disclosing the environmental document to the public, (i) PEPCO is responsible for ensuring that all environmental assessment documentation, including the environmental due diligence and monitoring reports, are properly and systematically kept as part of an PEPCO /DISCO project-specific record; (ii) all environmental documents are subject to public disclosure, and therefore may be made available to public; (iii) for category-A and B-sensitive subprojects, the SEIA/SIEE will be publicly disclosed through ADB's websites 120 days before civil works start, while the SEIA/SIEE be reviewed by ADB prior to disclosure; and (iv) DISCOs will ensure that public consultations, particularly with project affected persons, are undertaken adequately during the IEE/EIA process for any future subprojects.

23. PEPCO will ensure that each of the DISCOs plans and establishes Social and Environmental Cells. The Cell will ensure that the environmental assessment and review framework is strictly implemented. Environment consultants will be hired, under the guidance of the staff of the Cell and ADB to (i) prepare IEEs and EIAs for the follow-up subprojects and (ii) supervise the implementation of mitigation measures and monitoring programs as part of the EMP. The responsibility for preparing the monitoring report on EMP implementing will rest with the staff of this Social and Environmental Cell. The project costs for Tranche 1 have incorporated a budget and resource needed to (i) implement the environmental review and screening procedure, (ii) undertake the IEE/EIA studies for the follow-up subprojects, (iii) undertake environmental mitigation measures as required and (iv) monitor the implementation of EMPs. Discussion on medium and long term capacity building assistance to the Social and Environmental Cell will be undertaken annually.

24. Annex 1 summarizes an environmental management plan in matrix form that will apply to future subprojects. Additional requirements may be necessary for some subprojects. The matrix is developed on the basis of environmental assessment for the Tranche 1 subprojects. The mitigation measures for the additional subprojects will be developed in the spirit of the principles agreed upon in this EMP. 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 while environmental mitigation measures will be modified to take account of unexpected impacts as necessary, throughout the implementation period.

25. Environmental monitoring will consist of regular systematic checking that the above-mentioned environmental management measures have been implemented effectively during each stage of the project. Table 1 presents the summary monitoring plan for the Project. Table 2 presents the indicative estimated costs for EMP implementation of the Tranche 1 subprojects.

Table 1: Summary Environmental Monitoring Plan

| Environmental Monitoring Tasks | Implementation Responsibility | Implementation Schedule |
|---|--|--|
| PRE Construction Phase | | |
| Audit project bidding documents to ensure IEE/EIA and EMP is included. | DISCO through project implementation unit | Prior to issue of bidding documents. |
| Monitor contractor's detailed alignment survey to ensure relevant environmental mitigation measures in EMP have been included. | DISCO with assistance of project implementation unit | Prior to DISCO approval of contractor's detailed alignment survey. |
| Audit detailed designs of Facilities to ensure standard environmental safeguards/mitigation measures (as identified in EMP) have been included. | DISCO with assistance of project implementation unit | Prior to DISCO approval of contractor's detailed designs. |
| Construction Phase | | |
| Regular monitoring and Reporting of contractor's compliance with contractual environmental mitigation measures. | DISCO with assistance of project implementation unit | Continuous throughout construction period. |
| Operation and Maintenance Phase | | |
| Observations during routine maintenance inspections of facilities and distribution lines ROWs. Inspections will include monitoring implementation status of mitigation measures specified in EMP. | DISCO | As per DISCO inspection schedules |

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

F. Institutional Arrangements

26. The implementing agency for the Project will be DISCO. An Environment Officer shall be in post for the duration of the MFF loan and shall report directly to the head of the region of DISCO, who will be accountable and responsible for implementation of the EMP. The dedicated Environmental Officer to coordinate consistently the implementation of the EMP in all subprojects.

27. The Environmental Officer shall also be responsible for coordinating and supervising environmental monitoring, quality control, and writing the quarterly progress reports on implementation of the EMP. The implementation of EMP shall commence immediately upon commencement of the construction. The Environmental Officer will therefore be designated at least one month before and released for duty before the loan becomes effective. DISCOs

will further ensure the release of resources for environmental management and that monitoring budgets are made available for timely EMP implementation.

Table 2: Summary of Estimated Costs for EMP Implementation

| Item | Sub Item | Total Cost (\$) |
|---|---------------------------------|-----------------|
| Monitoring activities | As detailed under EMP | – |
| Mitigation measures | As prescribed under EMP and IEE | – |
| Independent audit and monitoring agencies | As described above | |
| Contingency | 3% contingency | – |
| Total | | – |

G. Disclosure, Consultation and Grievances

28. The EMP (as part of the IEE) prepared for additional sub projects will be translated into local language(s) and made available to the public. Public disclosure and a complaints contact person in each of the DISCOs will be set up for each of the subproject locations to address all concerns and grievances of the local communities and affected parties. A responsible official from region/corporate office will represent DISCO and will be responsible to disseminate information about the expected performance the contractor. The contact person will meet with local communities if requested or as required.

H. Monitoring and Evaluation

29. The EMP will have both internal and external monitoring. The Environmental Officer at the local level will be responsible for internal monitoring of the EMP implementation, and will forward quarterly progress reports to DISCO. The reports will contain progress made in EMP implementation with particular attention to compliance with the principles and matrix set out in the EMP. The DISCO will submit semi-annual monitoring report to ADB.