

**Power Distribution Enhancement Investment  
Program Tranche 2  
Loan 2727 SF-PAK**

***ENVIRONMENTAL IMPACT ASSESSMENT  
OF***

**Sheranwala Bagh DGS and (TXL as associated  
Sub-project)**

*Submitted to*

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**Asian Development Bank**

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By

**Gujranwala Electric Power Company**

**Government of the Islamic Republic of Pakistan**

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## ABBREVIATIONS

ADB	Asian Development Bank
COI	Corridor of Influence
CSP	Country Strategy Program
DoF	Department of Forests
DFO	Divisional Forest Officer
DGL	Distribution transmission line
DGS	Distribution grid substation
DIZ	Direct Impact Zone
EA	Environmental Assessment
EARF	Environment Assessment Review Framework
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GOP	Government of Pakistan
GIS	Gas Insulated Switchgear
LARP	Land Acquisition and Resettlement Plan
GEPCO	Gujranwala Electric Power Company
Sheranwala Bagh SP	Sheranwala Bagh 132kV Grid substation
LARP	Land Acquisition and Resettlement Plan
Leq	Equivalent sound pressure level
MPL	Maximum permissible level
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
PC	Public consultation
PEPA	Punjab Environmental Protection Agency
PEPAct	Pakistan Environment Protection Act 1997 (as regulated and amended)
PPMS	Subproject Performance Monitoring System
REA	Rapid Environmental Assessment
SIA	Social Impact Assessment
S-P	Sub-project
SR	Sensitive Receiver
TOR	Terms of Reference

Rupees, PKR

Unit of Pakistan Currency \$ US approx. Rs. 87

## 1. INTRODUCTION

### 1.1 Overview

1. This document is the Environmental Impact Assessment of the Tranche-2 Sheranwala-Bagh substation and distribution line (as an associated subproject) proposed by the Gujranwala Electricity Power Company (GEPCO), (Figs 1.1 and 1.2), under the Asian Development Bank (ADB) subproject, Power Distribution and Enhancement Multi-Tranche Finance Facility (PDEP\_MFF). Under ADB Guidelines, the substation and distribution line are to be taken as one integral subproject and the guidelines require environmental assessment of all components of subprojects whether financed by ADB, governments or other co financiers.

2. Government of Pakistan (GoP) has requested ADB to provide the PDEP\_MFF to facilitate investments in power distribution and development of networks of eight independent distribution companies (DISCOs) that distribute power to end user consumers. The funding from ADB is expected to be released in stages (tranches). The Power Distribution Enhancement (PDE) Investment Program is part of the GoP 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 secondary transmission/ distribution networks of eight DISCOs. The PDEP\_MFF activities include extension (additional transformers) and augmentation (replacement of transformers with higher capacity) distribution line extensions, new and replacement distribution lines, additional substations, transformer protection and other non network activities such as automatic meter reading, construction equipment and 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. The proposed PDEP\_MFF facility has been designed to address both investment and institutional aspects in the electrical power sector.

3. This EIA presents the results and conclusions of environmental assessment for the Sheranwala gate subproject proposed by GEPCO, and are submitted by Pakistan Electric Power Company (PEPCO) on behalf of GEPCO. PEPCO has been nominated by Ministry of Water and Power (MOWP) to act as the Executing Agency (EA) with each DISCO being the Implementing Agency (IA) for work in its own area. PEPCO's role in the processing and implementation of the investment program is that of a coordinator of such activities as preparation of PC-1s and PFRs, monitoring implementation activities; that includes submission of environmental assessments for all subprojects in all tranches of the PDEP\_MFF under ADB operating procedures. An EIA has been carried out to fulfill the requirements of ADB Guidelines (May 2003<sup>1</sup>). This EIA study report is used to complete the Summary Initial Environmental Examination (SIEE) for disclosure by ADB if necessary<sup>3</sup>.

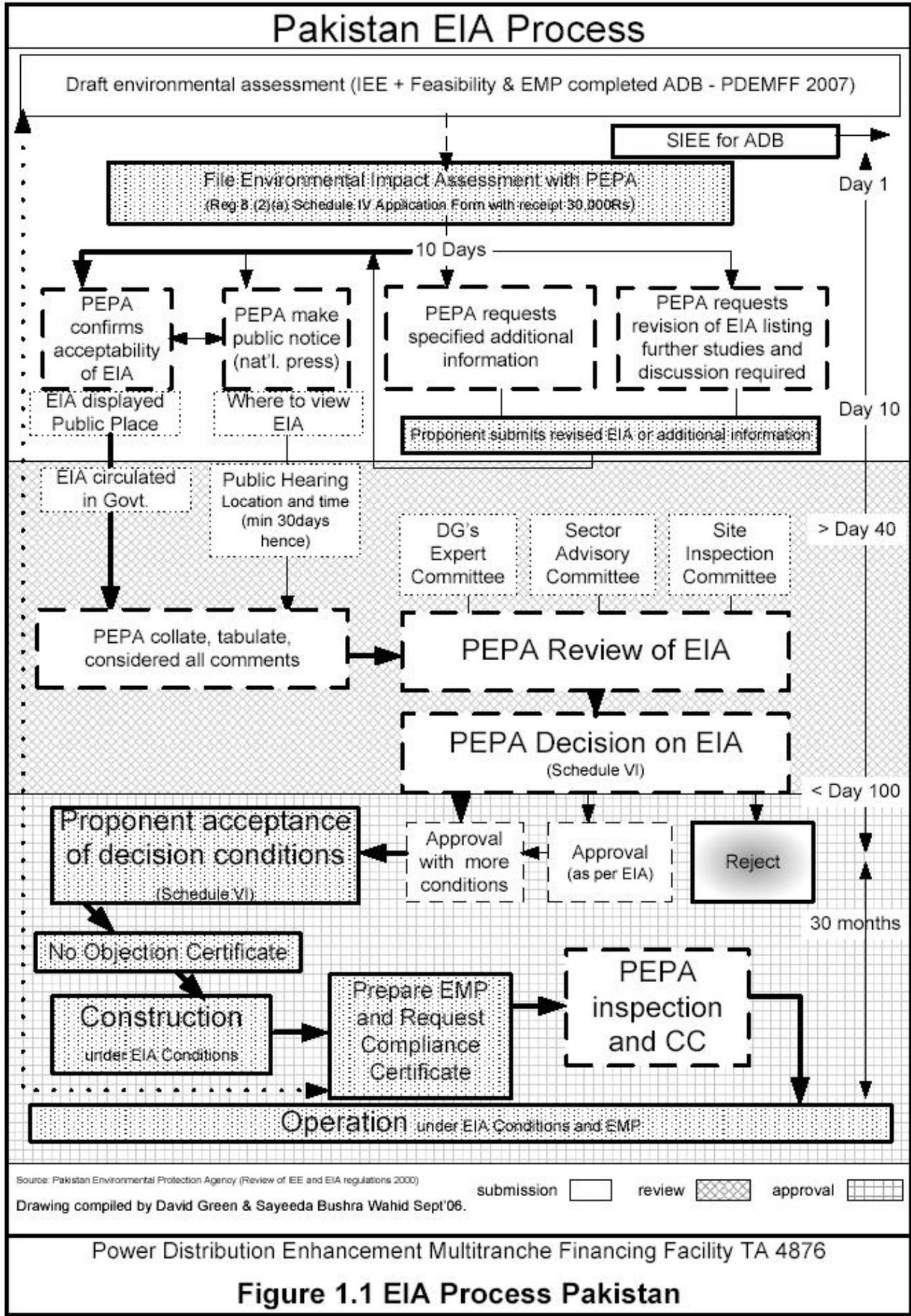
4. The environmental assessment requirements of the GoP for grid stations and power distribution subprojects are different to those of ADB. Under GoP regulations, the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations (2000) categorize development subprojects into two schedules according to their potential environmental impacts. The proponent of subprojects that have reasonably foreseeable impacts are required to submit an IEE for their respective subprojects (Schedule-I). The proponents of subproject that have more adverse environmental impacts (Schedule-II) are required to submit an environmental impact assessment (EIA). Distribution lines and substations are included under energy subprojects and IEE is required for sub transmission/ distribution lines of 11kV or less and large distribution subprojects (Schedule I). EIA is required by GoP for all subprojects involving sub-transmission/ distribution lines of 11kV and above and for DGS substations (Schedule-II).

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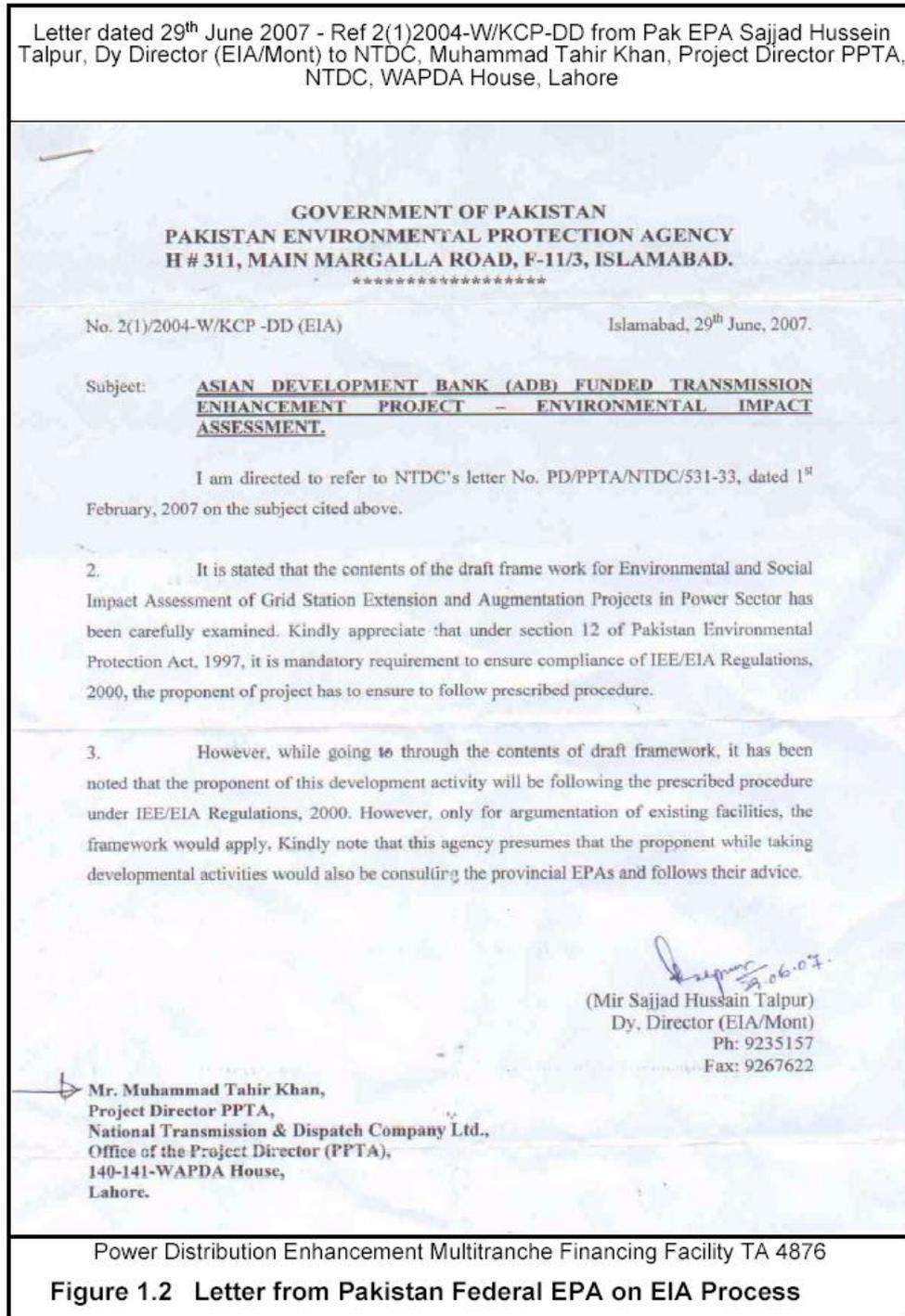
<sup>1</sup> Initial subproject classification was carried out in 2006 and the Category is B. Most of the construction impacts will take place with only local impacts and there are no potential significant environmental impacts associated with the T1 (tranche one) sub-subproject construction. Initial environmental reconnaissance and REA carried out by consultants under ADB guidelines in August 2008 indicated that all the T2 sub-subprojects will be Category B.

<sup>2</sup> Environmental Assessment Guidelines (ADB May 2003).

<sup>3</sup> Category A subprojects that are deemed by ADB's chief compliance officer to be environmentally sensitive for the purposes of (i) the 120 day rule, and (ii) the environmental management plan requirement could involve subprojects that are near or in environmentally sensitive areas. At this stage no component of the T1 sub-subprojects under consideration is actually within a critical area and therefore the MFF tranche as a whole is Category B.



5. Clarification has been sought from Pakistan EPA on the requirements for environmental assessment for certain energy sub-projects and for sub-transmission/ distribution lines. A Framework of Environmental Assessment (FEA) on power extensions and augmentation subprojects was prepared by consultants and submitted to the Pakistan EPA, after hearings with provincial EPAs. In response to the FEA submitted by NTDC to the Pakistan EPA<sup>4</sup> it has been clarified that all proponents must follow section 12 of the Pakistan Environmental Protection Act for all subprojects. 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 subproject in order that the Director General of PEPA can determine if additional land is required and the need for IEE or EIA. A review of the need for EIA/IEE for submission to GoP is therefore required by the relevant environmental protection agency, in this case the Punjab Environmental Protection Agency.



<sup>4</sup> Letter dated 29<sup>th</sup> June 2007 – Ref 2(1)2004-W/KCP-DD from Pak EPA Sajjad Hussein Talpur, Dy Director (EIA/Mont) to NTDC, Muhammad Tahir Khan, Subproject Director PPTA, NTDC, WAPDA House, Lahore.

## 1.2 Scope of the IEE Study and Personnel

6. The Study Area included the identification of irrigation facilities, water supply, habitable structures, schools, health facilities, hospitals, religious places and sites of heritage or archaeological importance and critical areas<sup>5</sup> (if any) within about 100m of the DGS boundary. The works are generally envisaged to involve construction of the DGS along with 4.3 km Dxl, construction of the bases, foundation pads and towers to support the distribution line will be carried out also under the same sub-project by GEPCO.

7. The field studies were undertaken by the subproject's environment team with experience of environmental assessment for power subprojects in Pakistan. Mrs. Syeda Bushra Waheed conducted preliminary scoping, survey and assessment activities, coordinated the field sampling and analysis, and were also responsible to supervise collation of information and co-ordinate the various public consultation activities. The team conducted preliminary scoping, survey and assessment activities, and carried out the report writing. Dr David Green (International Environmental Consultant of BPI) provided leadership and guidance in planning the field work, and in finalization of the report. The environmental team also benefited from technical support and other information on the impacts of the proposed power works provided in feasibility summaries prepared with GEPCO 6 by expert consultants of BPI dealing with engineering, power distribution, socio-economic, re-settlement and institutional aspects.

8. A scoping and field reconnaissance was conducted on the subproject site, during which a Rapid Environmental Assessment was carried out to establish the potential impacts and categorization of subproject activities. The methodology of the EIA study was then elaborated in order to address all interests. Subsequently primary and secondary baseline environmental data was collected from possible sources, and the intensity and likely location of impacts were identified with relation the sensitive receivers; based on the work expected to be carried out. The significance of impacts from construction of the DGS and DGL was then assessed and, for those impacts requiring mitigation, measures were proposed to reduce impacts to within acceptable limits.

9. Public consultation (PC) was carried out in July 2008, in line with ADB guidelines<sup>2</sup>. Under ADB requirements the environmental assessment process must also include meaningful public consultation during the completion of the draft EIA. In this EIA the PC process included verbal disclosure of the sub-subproject works as a vehicle for discussion. Consultations were conducted with local families and communities around and Sheranwala Bagh SP site, and along DGL route, and staff of the subproject management. The responses from correspondents have been included in Attachment 7 and summarized in Section 6 of this EIA.

## 2. POLICY AND STATUARY REQUIREMENTS IN PAKISTAN

10. Direct legislation on environmental protection is contained in several statutes, namely the Pakistan Environmental Protection Act (1997) the Forest Act (1927) the Punjab Wildlife Act (1974). In addition the Land Acquisition Act (1894) also provides powers in respect of land acquisition for public purposes. There are also several other items of legislation<sup>7</sup> and regulations which have an indirect bearing on the subproject or general environmental measures.

### 2.1 Statutory Framework

11. The Constitution of Pakistan distributes legislative powers between the federal and the provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal List covers the subjects over which the federal government has exclusive legislative power, while the Concurrent List contains subjects regarding which both the federal and provincial governments can enact laws. "Environmental pollution and ecology" is included in the concurrent list; hence both the federal and the provincial governments can enact laws on this subject. However, to date, only the federal government has enacted laws on environment, and the provincial environmental institutions derive their power from the federal law. The Punjab Environmental Protection Act 1996 is now superseded by the Pakistan Environmental Protection Act (1997). The key environmental laws affecting this subproject are discussed below.

<sup>5</sup> Critical areas as published by the PEPA on the website put in specific reference

<sup>6</sup> Feasibility Summary submitted to the Asian Development Bank by the Gujranwala Electric Power Company, Pakistan under Power Distribution Enhancement Subproject PPTA 4876-PAK. Subproject Number , 132 kV Sheranwala Bagh Grid Substation and Dxl

### 2.1.0 Pakistan Environmental Protection Act, 1997

12. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed subproject relate to the requirement for an initial environmental examination (IEE) and environmental impact assessment (EIA) for development subprojects. Section 12(1) requires that: “No proponent of a subproject shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination [IEE] or, where the subproject is likely to cause an adverse environmental effect, an environmental impact assessment [EIA], and has obtained from the Federal Agency approval in respect thereof.” The Pakistan Environmental Protection Agency has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies, in this case the Punjab EPA. (Fig 1.1)

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

The Pakistan Environmental Protection Act, 1997 (PEP Act) provides for two types of environmental assessments: initial environmental examinations (IEE) and environment impact assessments (EIA). EIAs are carried out for subprojects that have a potentially ‘significant’ environmental impact, whereas IEEs are conducted for relatively smaller subprojects with a relatively less significant impact. The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2007 (the ‘Regulations’), prepared by the Pak-EPA under the powers conferred upon it by the PEP Act, categorizes subprojects for IEE and EIA. Schedules I and II, attached to the Regulations, list the subprojects that require IEE and EIA, respectively.

The Regulations also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process (see also Attachment 1):

- (i) A subproject is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.
- (ii) An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.
- (iii) The EIA or IEE is submitted to the concerned provincial EPA if it is located in the provinces or the Pak-EPA if it is located in Islamabad and federally administrated areas. The Fee (depending on the cost of the subproject and the type of the report) is submitted along with the document.
- (iv) The IEE/ EIA is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.
- (v) The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- (vi) The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.
- (vii) Then the EPA accords their approval subject to certain conditions:
- (viii) Before commencing construction of the subproject, the proponent is required to submit an undertaking accepting the conditions.
- (ix) Before commencing operation of the subproject, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- (x) An EMP is to be submitted with a request for obtaining confirmation of compliance.
- (xi) The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- (xii) The IEE/ EIA approval is valid for three years from the date of accord.
- (xiii) A monitoring report is to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operation.

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

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<sup>7</sup> The Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000

There are no formal provisions for the environmental assessment of expanding existing distribution lines and grid substations but Punjab EPA have requested disclosure of the scope and extent of each subproject in order that their Director General can determine if additional land is required and the need for statutory environmental assessment<sup>1</sup>. The details of this subproject will be forwarded to the Punjab EPA, in order to commence the local statutory environmental assessment process.

### **2.1.2 National Environmental Quality Standards**

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in 1995 and 2000. The following standards that are specified in the NEQS may be relevant to the Tranche-1 subprojects:

Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities and the sea (three separate sets of numbers) Maximum allowable concentration of pollutants (2 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.

### **2.1.3 Other Relevant Laws**

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

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

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

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

## **2.2 Structure of Report**

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

- Description of the Subproject
- Description of Environmental and Social Conditions
- Assessment of Environmental Impacts and Mitigation Measures
- Environmental Monitoring Plan
- Public Consultation
- Recommendations and Conclusions

### 3. DESCRIPTION OF THE PROJECT

#### 3.1 Type of Project

The subproject will be the DGS and DGL. That is, the DGS will require construction of a new substation. The scope of work includes addition of 2X 26 MVA, 132/11 kV Power Transformers and allied equipment and buildings. The SP requires interconnection to the system by a double circuit 4.2 km long 132 kV DGL, the TXL is to be constructed by the DISCO from their own funds and is only assessed as an associated subproject, comprising about 27 poles (26 poles on NHA land and 1 pole on land owned by irrigation Department), to join the grid with the proposed DGS. There are no other developments in the proposed route of the DGL (July 2008) and future developments should not be allowed directly under the DGL. The DGS has its main entrance on the 220 ft. wide GT Road, on Southern side is the 20 ft. approach road to Wapda Colony with separate gate. Across this road Wapda School and Wapda Hospital are located, on the northern side 15 ft. road with settlement of Camp No. 4 and lawn of hostel on western side of the proposed DGS site. Figure 2.2 and Appendix 1 shows the location of the DGS site.

#### 3.2 Categorization of the Project

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

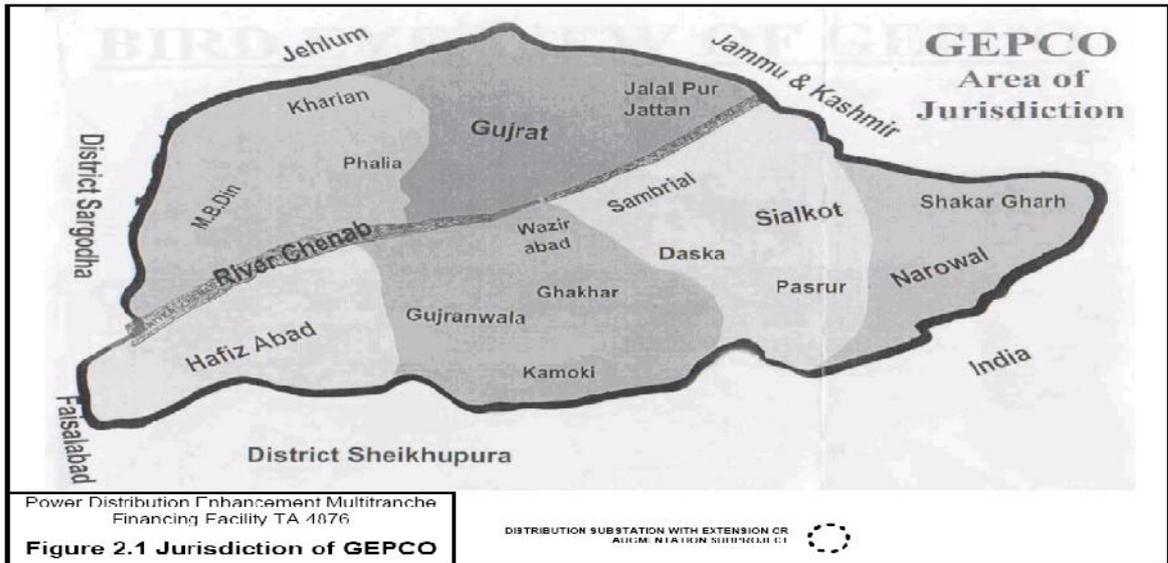
The Sheranwala Bagh SP is categorized as a Category B sub-subproject under ADB requirements 1.3 and this EIA report is based on that assumption.

#### 3.3 Need for the Project

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 PDEP\_MFF facility has been designed to address both investment and institutional aspects in the electrical power sector.

Power demands in the Sheranwala Bagh area of Gujranwala jurisdiction (Fig 2.1) have increased rapidly, especially in summer months, so that the existing DGS are unable to cope up with the increasing demands of the domestic, commercial and industrial sectors. Therefore, GEPCO has planned to construct a new 132KV DGS, at a place of existing WAPDA petrol pump near the entrance of GEPCO WAPDA colony at GT road. Land for this DGS is already available, so no additional land is needed.

**Figure 2.1: Jurisdiction Map of GEPCO**

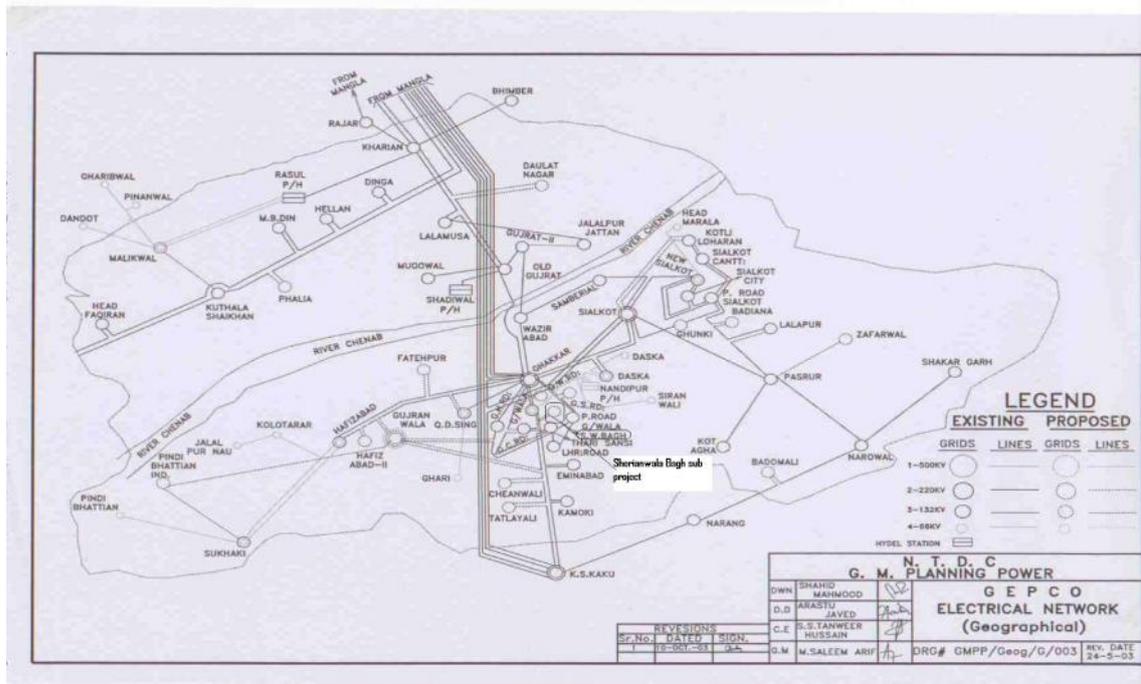


### 3.4 Location and Scale of Project

This EIA has included field reconnaissance of the site and surroundings of the Sheranwala Bagh SP and DXL. The Sheranwala Bagh DGS is located within GEPCO jurisdiction Figure 2.2 presents the location of the sub-station.

The Sheranwala Bagh subproject will involve the construction of a new 132 kV substation and a 132kV DGL (requiring installation of 27 poles). The proposed route to the nearest 132kV line appears to be environmentally feasible and technically appropriate and will join the DGS with an existing 132kV line at about 4.2km from the DGS.

**Figure 2.2: Location Sheranwala Bagh Sub Station**



This EIA has been conducted based on the assumptions available in late August 2008 when the preliminary designs for the DGS and DXL were completed and the overall requirements for installation of the equipment had been identified (Appendix 1). The detailed designs are currently being progressed by GEPCO. At this stage, the construction activities under the SP are expected to include the usual localized civil works such as extension of the main yard, including excavation and concreting of foundations for the new transformers, capacitor banks, cable trays, terminal tower (within the DGS compound), installation of the transformers, equipment and fittings, erection of the towers, cabling,



## 4. DESCRIPTION OF THE ENVIRONMENT

### 4.1 Project Area

#### 4.1.1 General Characteristics of Project Area

The 132kV Sheranwala Bagh DGS will be located on G.T Road in Wapda Colony at Parao Camp, Tehsil and District Gujranwala within the City of Gujranwala. The DGS site is located in a generally urban area, with settlements on Northern side, School and hospital on southern side, Wapda hostel on western side, and G.T Road on the east of proposed DGS site. A 5 meter wide road and 7 meter wide road is located on north and south sides of proposed DGS site.

#### 4.1.2 Affected Administrative Units

The area to be indirectly affected by the extension works for the Sheranwala Bagh DGS falls in camping ground area no. 4 in Wapda Colony, Tehsil and District Gujranwala. DGL will pass through camp No. 4 Rana Colony Kangni-wala, Sialkot by Pass, Therisanci and Province of Punjab (Figure 2.1). Interviews were conducted with the public near the DGS site and DGL corridor (Appendix 7) to obtain their views on the subproject, and any perceived impacts. In addition to main Highway, settlements along highway, there are factories of various types, educational institutions, and police stations along the RoW. The nearest of these settlements include Parao camp Rana Colony Kangniwala, Hashmi colony is located 1 km from DGS.

### 4.2 Physical Resources

#### 4.2.1 Topography, Geography, Geology and Soils

With the exception of the southeastern corner of the district which is traversed by the Dekh Nallah, the district is a flat plain. The district can broadly be divided into two parts. The low-lying area closes to the Chenab River and the Dekh Nallah and uplands between the two. The uplands decrease in fertility as the distance from the Himalayas increases until in the southwest it merges into what is known as the Bar tract in its natural aspect was a level prairie. Canal irrigation has, however, made the wastelands fit for cultivation. The main types of soil in the district are (i) Gora, an artificial soil highly manure, commonly found around villages and wells; (ii) Rohi, the finest natural soil and stiff clay dark/reddish dark in color; (iii) Doshair or Missi which is a fine clay soil; (iii) Maira, which is of less loam with less clay than sand; (iv) Tibba, which is inferior Maira; (v) Kallar, which is a sour and barren clay unsuitable for cultivation within adequate suitable treatment and (vi) Bela of the river rain soil is a fine alluvial soil mixed with sand.

#### 4.2.2 Climate and Hydrology

There is no variation of altitude above sea level in the land along the alignment and the short length of the transmission line means no variation between the climates of the sub-project area. The climate at Sheranwala Bagh SP is typical of that of the Punjab.

The maximum temperature in summer reaches 40°C. In winter the minimum is 6°C. The mean maximum and minimum temperatures in summer for this period are 40 C and 27 C respectively and in winter 19°C and 5°C respectively. The summer season starts from April and continues till October. May, June and July are the hottest months. The winter season on the other hand starts from November and continues till March, December, January and February are the coldest months.

The rainy season starts in July and ends in September. Average Annual rainfall during 1961-98 is about 629 mm. More rains occur in July and August than any other months. Most of the non-monsoon rains are received in the months of March and April.

#### 4.2.3 Groundwater and Water Supply

Irrigation is largely dependent on the canals, but tube wells have also been sunk in the areas where water is fit for irrigation. The chemical quality of ground water in the district varies in different areas and at different depths. Potable water is available in the district. Irrigation supplies are perennial and tube wells have been installed to make up the deficiencies. The strata near the DGS and DGL are water bearing and alluvial deposits, giving groundwater potential throughout the subproject area and the water table is about ten to twelve meters below the surface. The water table is not seasonal and dug wells do not generally run dry. Ground water sources exist in the area there are, however, no tube wells within

500m of the proposed DGL poles. The local population near most of the DGS & DGL is generally reliant on supply from tube wells.

#### 4.2.4 Surface water

##### Rivers and Tributaries

The river Chenab is the only river in the district. The Chenab River forming the northern boundary has been described as a broad shallow stream. Its deposits are sandy, but its floods are extensive and owing to the loose texture of the soil on its banks, the moisture percolates far inland, but the weirs at Khanki and Marala have affected the river, and its usefulness as a fertilizing agent for the riverside tract has been reduced considerably.

There are several Nallahs in the district which form channels for floodwater in the rains. The most important of them are Palkhu, Aik, Khot, Beghwala and Dekh.

**Irrigation:** The main sources of irrigation in the district are the two canals known as the Lower Chenab Canal and Upper Chenab canal. The Lower Chenab canal takes off from the Chenab River at Khanki head works in the Wazirabad Tehsil and enters the Hafizabad district at Muradian and irrigates Wazirabad Tehsil. The Upper Chenab Canal takes off from the Chenab River at Marala Head works in Sialkot district and enters the Gujranwala district at Nandipur, thirteen Kilometers to the northeast of Gujranwala city and runs southwest into the Sheikhpura district and irrigates western half of the Wazirabad and Gujranwala Tehsil. The other source of irrigation is tube well. There were 29,797 tube wells in Gujranwala district.

##### Groundwater and Water Supply

Irrigation is largely dependent on two irrigation canals i.e. Lower Chenab Canal and Upper Chenab Canal, but tube wells have also been sunk in the areas where water is fit for irrigation. Potable water is available. Irrigation supplies are perennial and tube wells have been installed. The strata of the subproject area are water bearing and alluvial deposits, giving groundwater potential throughout the district. The water table is not seasonal and dug wells do not generally run dry. Groundwater sources exist in the area. The local population is generally reliant on supply from the hand pumps in rural areas while in urban areas population using drinking water from WASA piped water supply scheme. Residents of Wapda colony are using drinking water from tube well located within Wapda colony.

#### 4.2.5 Air Quality

Air quality in most of the project area appears good based on observation during the study period. Emissions should be controlled at source under the EMP There will be a few items of powered mechanical equipment to be used in the construction of the GSS works that may give rise to complaints of dust and other emissions; however these should be minor and easily dissipated. Domestic sources of air pollution, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households, are minor. Although there are some industries of crockery but there are no other industrial pollution sources in the vicinity of the Sheranwala Bagh SP. The project area is distant from major sources of air pollution like industries, domestic sources such as burning of wood and kerosene stoves, etc. or fugitive sources such as burning of solid wastes. Air quality in the project area appeared very good during the study period. Air quality measurements in major urban centers, carried out by Pak-EPA, revealed that CO, SO<sub>2</sub> and NO levels were in excess of the acceptable levels in some areas but the average levels were found below WHO standards. Air quality testing by DISCOs (average values are: TSP 1.09 mg/m<sup>3</sup> CO 634 ppb, SO<sub>2</sub> 24.34 ppb, NO<sub>2</sub> 23.73 ppb) through various consultants has revealed that most sub stations have NO<sub>2</sub>, CO<sub>2</sub> and CO values below international standards although TSP levels at some locations was higher than international standards .

There should be no source of atmospheric pollution from the project. In the operational phase the industrial facilities with fuel powered mechanical equipment will be the main polluters. All such emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the project. The other major source of air pollution is dust arising from construction and other ground or soil disturbance, during dry weather, and from movement of vehicles on poorly surfaced or damaged access roads. It has been observed that dust levels from vehicles may even be high enough to obscure vision significantly albeit temporarily.

#### 4.2.6 Noise

Noise from vehicles and other powered mechanical equipment is intermittent. There are also the occasional calls to prayer from the PA systems at the local mosques but there are no significant disturbances to the quiet residential setting. However, the construction from the proposed power expansion will use powered mechanical equipment. Subjective observations were made of background noise and also of individual vehicle pass by events. Based on professional experience background daytime noise levels are probably well below 55dB (A) L90. DISCOs have carried out noise level measurements at various sub stations and transmission line locations within the system. These analyzed to calculate Leq values have resulted in Leq values much below the 85 dBA limit prescribed under the NEQs established by the EPA or the 75 dBA used by DISCOs /NTDC/ PEPCO in the equipment specifications. Typical values were: average 46.21 dBA; high 63.14 dBA; and low 34.35 dBA.

### 4.3 Biological Resources

#### 4.3.1 Wildlife, Fisheries and Aquatic Biology

There are no areas of wildlife significance near the subproject area. The wild animals are very few and are almost entirely confined to the river area. Wild boar is fairly common in the forest reserve around Wazirabad and in the river area. Black buck, river deer, and hog deer are sometimes, though rarely, found in the Belas around Wazirabad after heavy rains. Wolves are common in forests along the Jhang border. Hare and Jackal are fairly common all over the district. There are no reservoirs or other water bodies except Chenab River that forms the northern boundary of the district.

#### 4.3.2 Terrestrial Habitats, Forests and Protected Species

##### Vegetation cover and trees

The subproject area, which is not dry, is dominated by urban suburbs and with various factories present in the subproject area. Common floral species with rooted vegetation are also present near most of the water bodies of the area.

However, there is very little vegetation in the RoW for the line (Attachment 8). Just either side of the distribution line alignment planted trees the planted Eucalyptus trees and that have been cultivated. Amongst the trees, mainly Eucalyptus trees are common.

Common vegetation found in the district. Dalbergia sissoo [Shisham], Poplar, Kikar (Accacia arabica) trees in the areas near the works, but natural forest cover in the district has been significantly reduced in the past due to clearance for cultivation.

##### Protected and religious trees

About 2,101 acres of land is under forest in the district and there is no protected forest near the areas of works There are also planted trees along canals and roads. The major trees grown in the forest are Shisham (Dalbergia sissoo), Kikar (Acacia arabica) and Poplar and Eucalyptus. There are 5 trees on proposed DGS site and 5 trees within the RoW which will be cut down but these are on NHA land owned by Forest Department. In general permission should be sought from the local concerned department for the felling of any trees. A due diligence report for the Sheranwala Bagh SP has been prepared which made provision for compensation for concerned departments, if needed after detailed study. 5 No. Eucalyptus trees in ROW belonging to NHA and 3 Nos. Eucalyptus trees are likely to be removed from the existing petrol pump which is going to be converted into DGS. The 3 trees belonging to GEPCO are needed to be re-planted. The works must deal with trees that need to be lopped or removed for safety reasons with the necessary permissions.

#### 4.3.3 Protected Areas/ National Sanctuaries

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

## 4.4 Economic Development

### 4.4.1 Agriculture and Industries

**Cropping Patterns:** The main crops in the subproject area during winter are wheat, gram, barley, pulses, sesame, linseed, barseem and green fodder. In summer rice is the chief canal irrigated crop and is grown on 93% of the cultivated area, and the other crops during summer are cotton, maize, swanky, sugarcane, Bajra, tobacco are grown.

**Horticulture:** The main fruits grown in the area are Jambolin (*Syzygium cumini*), Falsa (*Grewia asiatica*), banana, orange (type of Citrus fruit), Kinno (type of Citrus fruit), fruiter (type of Citrus fruit), sweet lemon, plum, mulberry, mango, guava and pomegranate. The principal vegetables grown are onions, potatoes, ginger, egg-plant, arum, ladyfinger, spinach, mint, tomato, turnip, cloguxtida, carrot, cauliflower, bitter-gourd, garlic, pea, radish, cucumber, etc.

**Industry:** This district has made tremendous progress in light as well as heavy industries. There are large industrial units of chemicals, food products, textiles and engineering. The engineering industry includes manufacturing of air conditioners, electric transformers, electric motors, electric washing machines, fans, etc. other industries are sugar manufacturing, paper and paperboard, tannery, steel re-rolling, pipes electric wires/ropes, edible oils and ghee, synthetic fibers, turbines and steel containers, small industrial units include lighting and scientific equipment, utensils, hosiery and non-metallic work. Some industries like Anwar Industry, Master Sanitary Fittings, Gujranwala Ceramics, Super Asia, Golden Pump, are located along GT road in the subproject area.

#### Transportation

There is a network of metalloid and un-metalloid roads in the district. There are also metalloid canal roads. All Tehsil headquarters and important towns are connected through metalloid roads. The Grand Trunk Road passes through Gujranwala, entering the district from Lahore side at Sadhoke and going up to Wazirabad.

Gujranwala is situated on the main railway line which runs from Karachi to Peshawar. There are two branch lines, one from Wazirabad junction, to Sangla Hill Junction, and other from Wazirabad Junction to Sialkot Junction.

Gujranwala district is not linked by air with other parts of the country but it is connected with other parts of the country through Lahore International Airport which is about 50 km from Gujranwala.

### 4.4.2 Energy Sources

More than 40% housing units are using wood as cooking fuel in their houses while 34% are using gas for their purpose. About 4 percent are using kerosene oil and 21% are using other sources of cooking fuel in their houses.

## 4.5 Social and Cultural Resources

### 4.5.1 Population Communities and Employment

The total population of Gujranwala district is 3,400,940 as enumerated in March, 1998. The 1998 Census the population showed the district is 95% Muslims. The next higher percentage is of Christian with 4%, followed by Ahmadi less than 1%. While other minorities like Hindu (Jati), Scheduled castes etc. are very small in number. The proportion of population of Muslims in rural and urban areas is 97%. Christians are found more in urban areas than in rural areas. Similarly Ahmadis are more in urban areas. Punjabi is the predominant language being spoken in the district by 97% of the population followed by Urdu spoken by 2%, and Pushto 1% while others speak Siraiki, Sindhi, Balochi, Brahavi and Dari of the total economically active population 79.3% were registered as employed in 1998. Nearly three-fifths i.e. 57.9% were self employed, 16.5% government employees and 16.2% private employees. Unpaid family helpers were recorded as 3.1%. The difference in proportions of employed population was significant between the genders and urban and rural residences.

#### 4.5.2 Education and Literacy

##### Literacy

The literacy ratio in Gujranwala district has increased from 29.9% in 1981 to 56.6% in 1998. The literacy ratio for males is 63.6% and 48.8% for females. The ratio is much higher in urban areas when compared with rural areas both for male and female.

There are 2,442 educational institutions in Gujranwala district imparting education from Mosque/Primary School to postgraduate level. The number of institutions, enrolment and teaching staff available in 1995-96 is given in the following table. There are Wapda Schools for Girls and Boys in Wapda Colony. There are many Government and Private Schools for Boys and a virtual University. Punjab College for Boys is located at 1 km from the DGS. The educational institution in the district is presented as follows:

#### Educational Institutions

Type of Institute	Institute		Enrolment		Teaching Staff	
	Male	Female	Female	Male	Male	Female
Primary	806	824	98,000	93,000	3,131	2,308
Middle	147	113	46,000	43,000	1,891	1,312
Secondary	168	65	102,000	62,000	3,861	1,532
Higher Secondary (Class xi-xii)	4	3	9,268	6,976	376	206
Intermediate and Degree Colleges	8	8	9,744	9,047	342	209
Mosque Schools	296	-	13,576	-	577	-
Total	1,429	1,013	278,588	214,023	10,178	5,567

**Source:** Punjab Development Statistics, Bureau of Statistics, Punjab.

#### 4.5.3 Health Facilities

In all, there are 13 hospitals with 1086 beds, 49 dispensaries with 96 beds, 10 Rural Health Centers with 200 beds working in the district. Besides there are also 92 Basic Health Units, 2 T.B. Clinics, 34 Sub Health Centers and 13 M.C. Health Centers in the district.

The hospitals at Gujranwala proper are: the District Headquarters Hospital; Police Hospital; Haji Murad Eye Hospital [near tee off tower]; Sardar Family Hospital; Marry Home Hospital and; District Jail Hospital. There is one hospital each at Tehsil Headquarters. There is one T.B. Centre at Gujranwala and one T.B. Clinic at Wazirabad. There are Government dispensaries and many private clinics hospital in the city, Wapda hospital is located at 10m across the road, from proposed substation site and Family hospital is located at 1 km from proposed DGS site.

### 5. Cultural Heritage and Community Structure

There are no officially protected heritage sites or historic, religious or archaeologically important sites located in the subproject works areas. There are no major historic or archaeological features of note but there are a few places of worship within about 500m of the works.

The main tribes in Gujranwala inhabited are Arain, Jatt, Rajput, Syed, Gujjar, Awan. Of them Jatt is the most important tribe and owns most of the land. The important class of Jatt are Cheema, Virk, Warraich, Chattha, Tarar, Goraya, Malhi, Lodike, Kharal, Hanjra, Gondal, Bajwa and Wahla

## 6. SCREENING POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 6.1 Subproject Location

#### 6.1.1 Impact Assessment and Mitigation

This Tranche 2 subproject will involve the construction of 132kV DGS, and 4.2 km DGL, implying an expansion of facilities, both outside and within the existing boundaries of the Wapda colony [DGS will be constructed on land presently occupied by Petrol pump owned by GEPCO] There are a few sensitive receivers (SR), including some houses, schools, colleges, factories, which are more than 500 m away from the DGS boundary, and there are no sensitive receivers close to the DGS which could be possibly affected by certain activities of the SP works. There are some other sensitive receivers (SR). The DGL will also cross some roads and a highway, canal and could require the removal of some trees, but there are no other sensitive receivers on its route, which could be affected by the works.

The location and scale of the works are very important in predicting the environmental impacts. Therefore, it is essential that a proper analysis is carried out during the subproject planning period. This process of impact prediction is the core of the EIA process and it is critical that the recommendations and mitigation measures are carried out according to, and with reference to the conditions on the ground in the affected areas in the spirit of the environmental assessments process (Figures 2.1 and 2.2 shows the location of the proposed DGS). In this section the potential environmental impacts are reviewed. Where impacts are significant enough to exceed accepted environmental standards, mitigation is proposed in order to reduce residual impact to acceptable levels. In this regard, the impact prediction plays a vital role as these predictions are used for developing mitigation measures and any alternative options, if appropriate. When the detailed designs are completed the impacts and mitigation measures will need to be further reviewed to take account of how the contracts are set up and in the light of any fine tuning of the subproject proposals.

The environmental management plan (Section 5 and EMP matrix Appendix-4) has been reviewed based on the assessment and shall be reviewed in due course at subproject inception and through construction in order to provide a feed back on any significant unpredicted impacts. It is based on the analysis of impacts, primarily to document key environmental issues likely to arise from subproject implementation, to prescribe mitigation measures to be integrated in the subproject design, to design monitoring and evaluation schedules to be implemented during subproject construction and operation, and to estimate costs required for implementing subproject mitigation measures. The EMP must be reviewed at the subproject inception by the subproject management and approved before any construction activity is initiated, to take account of any subsequent changes and fine tuning of the proposals.

### 6.2 General Approach to Mitigation

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

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

The location of the residences, mosques, schools, hospitals and civic, cultural and other heritage sites has been reviewed in Section 3. Residences or schools are close enough to the subproject on which there could be some potential impacts in the construction stage from disturbance and significant noise

and dust. This is because the DGL is very short (only 4.2km) and the alignment is along G.T. Road and has no human settlements and structures.

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

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

### **6.2.1 Cultural Heritage, Mosques, Religious Sites and Social Infrastructure**

The location of mosques and other cultural and other heritage SR sites has been reviewed in Section 3. There are no mosques or other religious sites close to the DGS site. The new line will also not affect or disturb any such site. (Appendix 8)

The nearest clinic / hospital is more than 50m from the edge of the Subproject or DGL route, but the nearest school is at 1 km from the DGS adjacent to the Subproject, and the nearest houses at about 45m from the DGS. The DGL will also cross some road including the G.T road, and a canal. Apart from these features, there will be sufficient buffer distance between the works and any other SRs, so that no significant impacts should be expected. Public consultation should be undertaken at the implementation stage to ensure nuisances are not allowed to escalate for the SRs close to the DGS sites.

## **6.3 Potential Environmental Impacts in Construction**

### **6.3.1 Encroachment, Landscape and Physical Disfiguration**

The extent of the proposed power expansion is moderate and should not extend beyond the power corridor (RoW) created by the subproject. No significant landscape impacts are expected from construction of the Sheranwala Bagh SP.

### **6.3.2 Cut, Fill and Waste Disposal**

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

Mitigation measures must focus on the minimization of impacts. In order to allow the proper functioning of the settlement sites (access to villages) during construction it is recommended that consideration be given to erect temporary hoardings immediately adjacent to the nearest houses and shops if they are within 15m of the power distribution line tower construction. If surplus materials arise from the removal of the existing surfaces from specific areas, these should be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside.

The subproject detailed designers have so far estimated that no substantial additional materials will be required subject to confirmation at the detailed design stage. At this stage no areas require removal of woodland. However if specimen trees of religious plantations are affected the owners should be given the resources and opportunity to reinstate the woodland long term and a plantation compensation plan should be drawn up to replant the woodland/trees. In the event that the land is not suitable for plantation

then other areas should be identified to replace the cut trees and sufficient areas should be identified to allow plantation of trees at a rate of say 3:1. The replacement ratio should allow for a high mortality rate among the newly planted trees in the dry environment or otherwise as based on advice from the forest authority.

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

### **6.3.3 Trees, Ecology and Protected Areas**

There are no Reserved or Protected Forests or trees near the DGS site or DGL alignment. But about 3 nos. eucalyptus trees are planted in the proposed DGS site that need to be removed for the conversion of Petrol pump into 132 kV DGS. The proposed line will require the installation of 29 poles out of which 27 poles will be installed on NHA land along G.T road and 2 poles in Irrigation department land. The DGL route disclosed by GEPCO (August 2008) will affect 5 no. Eucalyptus trees. In case of removal of all the trees on private or forest land during the works, written permission should be sought.

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

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

### **6.3.4 Hydrology, Sedimentation and Soil Erosion**

The drainage streams en-route of the subproject should not be impeded by the works. The scale of the works does not warrant hydrological monitoring.

### **6.3.5 Air Pollution from Earthworks and Transport**

The material (cement, sand and aggregate) requirement of a typical 132 kV substation (about 150 cum) and a 132 kV transmission tower (4.8 cum, or 40 bags of cement per tower) are not large. In transmission line construction sand and aggregate are delivered directly to the tower location from the quarry/ source, there is no intermediate or bulk storage of these materials. Similarly construction materials for the substation are stored within the substation site are scheduled as per the work progress (which is staggered as the buildings which require bulk of the construction materials are built in phases over 6 to 12 months period), which means that at any given point in time the amount of construction material stored is not significant. The quantities of construction material required for a typical sub-station or transmission tower are not so large that they potentially represent a traffic hazard, these requirements are time dispersed in case of sub stations and time and space dispersed in case of transmission lines. The contractor will be, however, required to provide a traffic management plan before commencement of work at site. Field observations indicate that ambient air quality is generally acceptable and that emissions from traffic and other powered mechanical equipment in the area are rapidly dispersed. There will be a few items of powered mechanical equipment to be used in the construction of the distribution line works that may give rise gaseous emissions. However, these should be well dissipated. The major sources of complaint will likely be any necessary earthworks and local soil compaction.

Earthworks will contribute to increasing dust, and the foundation earthworks for the transformers and the line poles will generate dust and the following mitigation measures are needed:

Dust suppression facilities (water sprayers / hosepipe) shall be available where earth and cement works are required. Areas of construction (especially where the works are within 50m of the SRs) shall be maintained damp by watering the construction area. Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins. Storage piles will be at least 30m downwind of the nearest human settlements.

All vehicles (e.g., trucks, equipment, and other vehicles that support construction works) shall be well maintained and not emit dark, smoky or other emissions in excess of the limits described in the NEQS. The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles should not be located within 50m of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.

### **6.3.6 Noise, Vibration and Blasting**

It is anticipated that powered mechanical equipment and some local labor with hand tool methods will be used to construct the subproject works. No blasting is anticipated. Powered mechanical equipment can generate significant noise and vibration. The cumulative effects from several machines can be significant. To minimize such impacts, the contractor for subproject should be requested by the construction supervision consultants (engineer) to provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet EPA requirements.

A criterion of 70 dB(A) Leq (exterior, boundary of DGS) has been used for assessment in previous EIA studies. Any noisy equipment should be located within DGS as far from SRs as possible to prevent nuisances to dwellings and other structures from operation.

Noise from construction of the power distribution lines and improvements to substations is not covered under any regulations however in order to keep in line with best international practice it is recommended that no construction should be allowed during nighttime (9 PM to 6 AM) and 70dB(A)Leq should be the criterion at other times during the day measured at the boundaries of land from which construction noise is emitted. A criterion of 70 dB(A) Leq (exterior, boundary of DGS) has been used for assessment in previous EIA studies. Any noisy equipment should be located within DGS or as far from SRs as possible to prevent nuisances to dwellings and other structures from operation.

Vibration from construction of piles (none are envisaged in this sub project) to support pads may be required for some tower construction and may be a significant impact but this should be short duration. Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction. The physical effect of piling should be assessed prior to construction and measures should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. At nearby schools, the contractor shall discuss with the school principals the agreed time for operating these machines and completely avoid machine use near schools during examination times, if such a need arises.

### **6.3.7 Sanitation, Solid Waste Disposal and Communicable Diseases**

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

In order to maintain proper sanitation around construction sites, access to the nearby DGS lavatories should be allowed or provision of temporary toilets should be made. Construction worker camps will not be necessary, based on the scale of the works needed. If for some unforeseen reason a larger workforce is needed any construction camp should not be located in settlement areas or near sensitive water resources and portable lavatories or at least pit latrines should be provided.

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

## 6.4 Potential Environmental Impacts in Operation

### 6.4.1 Air Pollution and Noise from the Enhanced Operations

The subproject works will extend the power distribution lines but no houses, mosques or schools will be close to the new DGL in the operational phase. Nevertheless some houses, a school, a hospital and a hostel are close to the DGS. The DGS will be constructed at already functioning Petrol pump in the locality on G.T Road, and the extended level of operation of the facility is not likely to cause any appreciable increase in the noise level already generated by the existing equipment. However, it is recommended that an acoustical check be made on the detailed design to determine if any noise barriers are required. There should be no source of atmospheric pollution from the subproject. In the operational phase any nearby industrial facilities with fuel powered mechanical equipment will be the main polluters. All such emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the subproject.

Noise impacts from the operation of the DGS equipment should be reviewed at the detailed design stage. There are/not national noise standards in Pakistan for power distribution noise emissions that would apply in the operational stages. A criterion of 70Db (A) Leq (exterior, boundary of DGS) has been used for assessment in previous EIA studies. It is recommended that a check be made on the likely acoustical performance based on makers specifications of the installed equipment at the detailed design stage

### 6.4.2 Pollution from Oily Run-off, Fuel Spills and Dangerous Goods

No significant impacts from oily residues such as transformer oil and lubricants are expected to arise in this subproject. However control measures will be needed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Transformer oil is supplied in drums from an imported source and tap tanks are topped up as necessary on site. There are facilities in some subproject DGS maintenance yards for recycling (dehydrating) oil from breakers. However the areas upon which these recycling facilities are located have no dedicated drainage which can capture run-off. Oily residues and fuel and any contaminated soil residues should be captured at source and refueling and maintenance should take place in dedicated areas away from surface water resources. Contaminated residues and waste oily residues should be disposed at a site agreed with the local authority. Appendix 6 presents typical bunds for transformers. DISCOs are served by the Technical Services Group (TSG), TSG prepare a detailed routine maintenance schedule for each piece of hardware. TSG also supervise and monitors the implementation of this schedule by Grid System Operation (GSO). Transformer oil has a long life (typically over 15 years, which depends upon the level of load the transformer serves). Oil spills are very rare and are preempted by routine maintenance. TSG and GSO have a written down procedure to deal with oil spills.

The DISCO procedures for handling PCB need to be strengthened. The maintenance of transformers needed to be based on the manufacturer's instructions. The performance evaluation procedure prescribed and followed for each power transformer. In working areas where PCBs are handled, it is necessary to monitor the levels of chlorinated solvents. In case of emergencies, the first step is to attempt to control the spread of the liquid, this is especially relevant during transportation. In case of spills, emergency measures needed to be taken by personal specially trained and wearing protective clothes. Oil absorptive materials are useful tools and needs to be spread over the spill. All equipment and surfaces exposed to the spill need to be washed with solvent. The best international procedures and guidelines need be followed; one such guideline is the UNEP 'PCB Transformers and Capacitors—from Management to Reclassification and Disposal, May 2002'. This, however, is not relevant as this EIA is related to the development and construction of a new substation and PEPCO /DISCOs have already banned the use of any equipment that uses PCB.

GEPCO already prohibits use of PCB's in new power transformers, there is however need to prepare an inventory of any PCB carrying equipment in the system and all such equipment be replaced. The maintenance instructions prepared by the Technical Services Group needs to be reviewed and revised to add PCB based equipment maintenance and a procedure for handling any PCB spills. The Kot-Lakhpat workshop already follows. Such procedures, however, these need to be reviewed and upgraded in light of best International practice. This would include provision of special clothing, availability of oil absorptive solvents and availability of steel containers. Staff training is needed about oil spills and special care during handling and transportation of equipments using PCB. TSG ensure that the maintenance schedule of each piece of hardware is adhered to. DISCOs have also established a safety unit, which among other tasks, investigates all accidents. Frequency of accidents, on average is about 1 per DISCO

per year (based on last 4 years record) about 60 % of these are non-fatal. Most accidents occur due to staff and supervision negligence. Detailed report of each accident is prepared.

### **6.5 Enhancement**

Environmental enhancements are not a major consideration within the Sheranwala gate subproject site. However, it is noted that it is common practice at many such sites to create some local hard and soft landscaping and successful planting of fruit trees and shrubs has been accomplished in many sites. This practice should be encouraged as far as practicable. Other opportunities for enhancements can be assessed prior to construction and proposed enhancements should be discussed with the local population to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. Trees removed for construction purposes should be replaced as compensation in line with best practice at ratio of three replaced for one removed however additional trees should be planted as enhancements where there is space in the DGS and along the DGL.

## 7. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN

In this section, the mitigation measures that are required for the Sheranwala Bagh SP Tranche 2 subproject, to reduce residual impact to acceptable levels and achieve the expected outcomes of the project, are discussed. The Environmental Management Plan is based on the type, extent and duration of the identified environmental impacts for the Sheranwala Bagh SP Tranche 2 subproject. The EMP has been prepared following best practice and by reference to the ADB Environmental Assessment Guidelines 2003.

It is important that the recommendations and mitigation measures are carried out according to the spirit of the environmental assessment process and in line with the guidelines. The EMP matrix is presented as Appendix 4. The impact prediction (Section 4) has played a vital role in reconfirming typical mitigation measures and in identifying any different approaches based on the feasibility and detailed design assumptions and any alternatives available at this stage.

Prior to implementation and construction of subprojects the EMP shall be amended and reviewed by the GEPCO in due course after detailed designs are complete. Such a review shall be based on reconfirmation and additional information on the assumptions made at this feasibility stage on positioning, alignment, location scale and expected operating conditions of the subprojects. For example, in this case if there are any additional transmission lines or extension of the substation boundaries to be included, the designs may be amended and then the performance and evaluation schedules to be implemented during project construction and operation can be updated and costs estimates can be revised. The EIA and EMP should then be revised on a subproject by subproject basis.

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

In order to facilitate the implementation of the EMP, during the preparation for the construction phase, GEPCO must prepare the future contractors to co-operate with all stakeholders in the mitigation of impacts. Furthermore, the contractor must be primed through the contract documentation and ready to implement all the mitigation measures. GEPCO will need to engage at least one trained environmental management staff and the staff should audit the effectiveness and review mitigation measures as the subprojects are rolled out. The effective implementation of the EMP will be audited as part of the midterm review of loan conditions and the executing agency must prepare for this at the inception stage.

The details of the EMP given in the Appendix 4 are for the Sheranwala Bagh subproject. The EMP matrix will have much in common for many other future (Tranche 2) substation and line projects that have a similar scale of works and types of location but will be different for more complicated substation and line projects that involve impacts to land outside the existing substations and for lines traversing more sensitive land. In all cases separate dedicated EIA must be prepared.

The impacts have been classified into those relevant to the design/preparation stage, construction stage and operation and maintenance stage. The matrix provides details of the mitigation measures recommended for each of the identified impacts, time span of the implementation of mitigation measures, an analysis of the associated costs and the responsibility of the institution. The institutional responsibility has been specified for the purpose of the implementation and the supervision. The matrix is supplemented with a monitoring plan (Appendix 5) for the performance indicators. An estimation of the associated costs for the monitoring is given with the plan. The EMP has been prepared following best practice and the ADB environmental assessment guidelines 2003.

Prior to implementation of the subproject GEPCO needs to comply with several environmental requirements, such as submitting and EIA/ IEE to PEPA and obtaining PEPA clearance (“No Objection Certificate” compiling acceptable EMP and Clearance Certificate) under PEPA (guidelines and regulations 2000) and any other permissions required from other authorities. GEPCO will also need to confirm that contractors and their suppliers have complied with all statutory requirements and have

appropriate and valid licenses and permits for all powered mechanical equipment and to operate in line with local authority conditions.

The EMP (Appendix 4) was prepared taking into account the limited capacity of GEPCO to conduct environmental assessments of the subprojects. GEPCO has yet to engage any graduate staff with field experience. However an environmental manager will be required. It is envisaged that experience in this field should therefore develop in the near future. However it is also strongly recommended that for subprojects in future Tranches that the GEPCO be prepared to engage more support where necessary (e.g. senior environmental specialist with at least 3 years experience in environmental management one year site experience in environmental monitoring and auditing) to guide the subsequent formal assessment and submission process under the PEPAct and monitor compliance with the EMP. As of August 2007, the GEPCO has demonstrated only limited commitment to developing in-house environmental and social capability.

The appointed environmental manager has to have a good level of awareness and will be responsible for addressing environmental concerns for subprojects potentially involving hundreds kilometers of distribution lines and DGS. Whereas some of their work may in future be delegated to consultants they will need more training and resources if they are effectively provide quality control and oversight for the EMP implementation. They will require robust support from senior management staff members and the management consultant if they are to address all environmental concerns for the subprojects effectively. Specific areas for immediate attention are in EMP auditing, environmentally responsible procurement, air, water and noise pollution management and ecological impact mitigation. It is recommended that an environmental specialist consultant with 10 years experience be made available to all the DISCOs to cover these aspects full time for at least the first six months of the PDEP\_MFF project and that on a call off basis with local support those services are retained for the life of the PDEP\_MFF loan. The newly appointed graduate environmental manager can then shadow the environmental specialist to improve awareness and hopefully provide independent quality control and oversight for the EMP implementation for the first 12 months.

In order to achieve good compliance with environmental assessment principles the graduate environmental manager for the project implementation team must be actively involved prior to the outset of the implementation design stage to ensure compliance with the statutory obligations under the PEPAct. It is also recommended that GEPCO Board allow direct reporting to Board level from the in-house Environmental and Social Unit (ESU). If the ESU requires resources for larger subprojects then environmental specialist consultants could be appointed through the project implementation unit to address all environmental aspects in the detailed design. It is recommended that the project management unit (PMU) should liaise directly with the ESU to address all environmental aspects in the detailed design and contracting stages. The graduate environmental manager will cover the implementation of environmental mitigation measures in the project packages.

Overall implementation of the EMP will become GEPCO's responsibility. GEPCO and other parties to be involved in implementing the EMP are as follows:

Contractors: responsible for carrying out the contractual obligations, implementing all EMP measures required to mitigate environmental impacts during construction;

The GEPCO Board of Directors will be responsible to ensure that sufficient timely resources are allocated to process the environmental assessments and to monitor implementation of all construction and operational mitigation measures required to mitigate environmental impacts, and other government agencies such as the regional PEPA and state pollution authorities, department of Forests, department of wildlife services, who will be responsible for monitoring the implementation of environmental conditions and compliance with statutory requirements in their respective areas and local land use groups at the local levels.

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

The monitoring plan (Appendix 5) was designed based on the project cycle. 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 and making sure that any advance works are carried out in good time. Where detailed design is required (e.g. for power distribution lines and avoidance of other resources) the inclusion and checking of designs must be carried out. During the construction period, the monitoring activities will focus on ensuring that environmental mitigation measures are implemented, and some performance indicators will be monitored to record the Subprojects environmental performance and to guide any remedial action to address unexpected impacts.

Monitoring activities during project operation will focus on recording environmental performance and proposing remedial actions to address unexpected impacts. The potential to use local community group's contacts for monitoring should be explored as part of the activities in setting up the Environmental and Social Unit which should have regular meetings with the NGOs as a matter of good practice and to discuss matters of mutual concern.

At this stage, due to the modest scale of the new power distribution projects and by generally keeping to non-sensitive and non-critical areas the construction and operational impacts will be manageable. No insurmountable impacts are predicted providing that the EMP is implemented to its full extent and required in the contract documents. However, experience suggests that some contractors may not be familiar with this approach or may be reluctant to carry out some measures. In order that the contractors are fully aware of the implications of the EMP and to ensure compliance, it is recommended that environmental measures be costed separately in the tender documentation and that payment milestones are linked to environmental performance, via the carrying out of the EMP.

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

## **8. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**

### **8.1 Approach to Public Consultation**

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

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

### **8.2 Public Consultation Process**

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

Prior to the implementation of the consultation, feedback, etc. has been carried out to support this EIA and recorded. The focus of attention has been the population near the proposed DGL that may be affected by the Subproject expansion. The level of engagement varied from the stakeholder to stakeholder with some registering no major comment but it is noted that none registered any outright opposition to subproject.

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

The environmental assessment process under the Pakistan Environmental Protection Act only requires the disclosure to the public after the statutory IEE / EIA has been accepted by the relevant EPA to be in strict adherence to the rules. In this EIA the consultation process was performed to satisfy the ADB requirements. The locations of consultation and people consulted are listed in the full table of public consultation presented in Appendix 7.

### **8.3 Results of Public Consultation**

The consultations identified some potential environmental and social impacts and perceptions of the affected communities. The public consultation resulted in 32 responses in July 2008 (Appendix-7). The community generally supports the construction of the DGS. The local poor people predominantly requested for unskilled and semi skilled jobs on priority basis with the contractors during implementation of the project. No land acquisition and resettlement is involved in this subproject. However, compensation will be paid to the concerned parties/ owners of land under the towers and where the loss of some trees and for damage to crops is expected.

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

## 9. CONCLUSIONS

### 9.1 Findings and Recommendations

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

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

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

No land acquisition, compensation and resettlement is involved. However, some trees will be compensated to the concerned parties, if needed. However, provisions may be made in LARP, based on the proposed alignments these should not be difficult tasks and can be conducted as the detailed designs are worked out and to dovetail with the existing system and minimize adverse impacts and maximize benefits. A social impact assessment and resettlement action plan (LARP) has been completed in tandem with this EIA for the whole subproject. The study has:

- (i) *Examined and assessed the overall social and poverty profile of the project area on the basis of the primary and secondary data sources and preparation of a socio-economic profile of the project districts.*
- (ii) *Prepared a social and poverty analysis, taking into account socio-economic and poverty status of the project area of influence, including the nature, extent and determinants of poverty in the project area including assessment. In addition, estimation of the likely socioeconomic and poverty reduction impacts of the project should be included.*
- (iii) *Held consultations with relevant officials from the government and other relevant officials, including consultation with affected communities to assess responses to the project and ascertain the nature and scope of local participation in project planning and implementation.*
- (iv) *Identified, analyzed and, where appropriate, quantified the potential resettlement impacts (minimal) of the proposed Project on the area and the population.*

Baseline monitoring activities should be carried out during project detailed design stage to establish the baseline of parameters for checking during the construction stage. The monitoring schedule (Attachment 3) recommends monitoring on two occasions at the site location. The results should be integrated with the contract documentation to establish performance action thresholds, pollution limits and contingency plans for the contractor's performance.

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

## 9.2 Summary and Conclusions

The expansion of the Sheranwala Bagh SP is a feasible and sustainable option from the power transmission, engineering, environmental, and socioeconomic points of view. Implementation of the EMP is required and the environmental impacts associated with the subproject need to be properly mitigated, and the existing institutional arrangements are available. Additional human and financial resources will be required by GEPCO to complete the designs and incorporate the recommendations effectively and efficiently in the contract documents, linked to payment milestones. The proposed mitigation and management plans are practicable but require additional resources.

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