Initial Environmental Examination

Project Number: 50174-001
November 2017

Zorlu Solar Power Project (Pakistan)

Prepared by Renewable Resources (Private) Limited.

ORIGINAL

INITIAL ENVIRONMENTAL EXAMINATION (IEE)
OF
100 MW SOLAR PV POWER PROJECT IN BAHAWALPUR PUNJAB-PAKISTAN

PROJECT SPONSORS:

ZORLU SOLAR PAKISTAN (PRIVATE) LIMITED

PROJECT CONSULTANTS:

RENEWABLE RESOURCES (PVT.) LTD PAKISTAN

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Prepared in October, 2017

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APPROVAL SHEET

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DOCUMENT NUMBER	:	RE2-131-202-002 Issue: 02
CLASSIFICATION	:	**UN CLASSIFIED**
SYNOPSIS	:	This document is a report on Initial Environmental Examination (IEE) of 100MW Solar PV Power Project in Bahawalpur, Punjab, Pakistan. Project is owned by Zorlu Solar Pakistan (Pvt.) Ltd (ZSPPL). The report is prepared by Renewable Resources Pvt. Ltd.

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DATE	:	October, 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
CBD	Convention on Biological Diversity
CITES	Convention on Trade of Endangered Species
CLs	Core Labor Standards
FESCO	Distribution Companies
Db	decibel
DMC	Developing Member Countries
EIA	Environmental Impact Assessment
EHS	Environment Health and Safety
EMP	Environment Management Plan
ESMC	Environmental and Social Management Cell
EPA	Energy Purchase agreement
EMMP	Environment Monitoring and Management Plan
GAD	Gender and Development
GHG	Greenhouse Gas Emissions
GRM	Grievance Redressal Mechanism
IA	Implementation Agreement
IEE	Initial Environmental Examination
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
Km	Kilometers
LAA	Land Acquisition Act
LOI	Letter of Intent

LOS	Law of Seas
MEA	Multilateral Environmental Agreements
MW	Mega Watt
MWh	Mega Watt Hour
MJ/sq.m	Mega Joule per square meter
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
NOx	Nitrate Oxides
NREL	National Renewable Energy Laboratories
NTDC	National Transmission and Dispatch Company
O & M	Operation and Maintenance
PEPA	Pakistan Environment Protection Act
POPs	Persistent Organic Pollutants
Pak-EPA	Pakistan Environment Protection Agency
PM	Particulate Matter
PPB	Parts Per Billion
PV	Photo Voltaic
RE2	Renewable Resources (Pvt.) Ltd
SCR	Social Complaint Register
SHEE	Safety Health Environment and Energy
Sox	Sulphate Oxides

UNFCC	United Nation Framework on Climate Change
WAPDA	Water And Power Development Authority
WHO	World Health Organization
WID	Women in Development

COMPANY CONTACT INFORMATION

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EXECUTIVE SUMMARY

Introduction:

Zorlu Enerji Group, founded in 1993 with the foundation of Zorlu Energy Electricity Generation Inc. Zorlu Enerji is a global group of companies providing services in different areas of the energy sector. Zorlu Enerji Group offers an integrated service mix with the activities of different sectors of the energy sector, mainly electricity and steam production and sales carried out by Zorlu Energy, the only public company. Zorlu Enerji has a total installed power of 991 MW, of which 525 MW is in Turkey.

Zorlu Enerji has a 100 percent share of Zorlu Energy Pakistan that is 56.6 MW Wind Power Plant located in the Jhimpir Sindh. The Wind power plant, in Jhimpir started commercial activity in 2013. The facility, which is Pakistan's first wind power plant, produces approximately 159 million kWh of electricity per year.

100MW solar project in Pakistan is our first Solar Project in Pakistan and one of the biggest projects at overseas countries, The advanced technology for best performance of project is being focused and used it is targeted to make it one of its kind reference project in Pakistan. Along with this project, it is planned to add 200MW solar project in Quaid-e-Azam Solar Park, Pakistan to make our contribution for Pakistan nations in relieving energy –shortage such social problem.

The report is ***Initial Environmental Examination (IEE)*** for submission to Environment Protection Agency (EPA)-Punjab as per Pakistan Environment Protection Act, 1997.

Sponsor's Introduction:

Zorlu Enerji Group, founded in 1993 with the foundation of Zorlu Energy Electricity Generation Inc. Zorlu Enerji is a global group of companies providing services in different areas of the energy sector. Zorlu Enerji Group offers an integrated service mix with the activities of different sectors of the energy sector, mainly electricity and steam production and sales carried out by Zorlu Energy, the only public company. Zorlu Enerji has a total installed power of 991 MW, of which 525 MW is in Turkey.

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Consultant's Introduction:

Renewable Resources (Pvt.) Ltd is the professional technical advisor for the Project. Renewable Resources is a consulting company specialized in Renewable Energy (RE), Energy Efficiency (EE) and Environment (Env) Projects. The company is owned by group of professionals who have been intimately involved in the renewable energy program of Pakistan, and have a fundamental understanding of issues relating to power project development, which include but are not limited to feasibility studies, regulatory approvals, concession and security documents, and applicable policies.

RE2 is capable of conducting full feasibility package featuring power production estimates, grid interconnection and tariff model. RE2 also has the expertise to deal with all technical aspects regarding the legal documents of power projects. The professional team of RE2 is well acquainted with the policies, regulations, methodologies and standards of RE power Projects and its work output meets international standards. RE2 is presently a consultant for various power Projects in Pakistan sponsored by local and international investors, with international banks.

RE2 has gained significant experience in conducting Environmental and Social Impact Assessments (ESIA) and Initial Environmental Examinations (IEE) of renewable energy projects in accordance with national and international laws and standards. These studies cover all baseline environmental conditions and anticipated environmental impacts of projects and provide comprehensive Environmental Management Plans.

To date, RE2 has conducted thirty (30) environmental studies of renewable energy projects, which have all been approved by the relevant Environmental Protection Agencies.

Study Methodology:

The study was conducted using standard methodology prescribes by national and international agencies. The IEE comprises of baseline data on existing conditions on physical and biological environment, and social environment together with the anticipated environmental impacts and proposed mitigation measures. Detailed assessment of the social and biological environment of

the area was conducted through field survey for the distance up to 10 Km radius of the project site, however the influence zone of the environmental impacts is considered as 5 Km.

Data was also collected through secondary sources such as published literature and internet to support the findings of the field survey.

The present document reports the finding of Initial Environmental Examination (IEE) carried out to identify potential environmental issues associates with the project and ensures appropriate mitigation measures to cope with those issues.

The IEE study was conducted in four phases.

- Phase-I involved the definition and categorization of the Project components, collection of baseline data and information of the defined Project area through physical survey and consultation with the local inhabitants near the Project area.
- Phase-II involved the laboratory analysis of the different environmental parameters which includes (Ambient Air Monitoring, Ambient Noise, and Water quality analysis of the project area conducted by the third party and the reports are attached in the **annexures.**
- Phase-III involved assessment of potential impact assessment of the pre-construction, construction, operation and Decommission phase of the Project.
- Phase-IV involved the mitigation measures, formulation and monitoring of an Environmental and Social Management Plan (ESMP) to minimize the environmental and social impacts of the Project during construction and operation phase.

The approach of IEE study includes the following steps:

- ❖ Describing the Project and details of Project Proponents
- ❖ Review of applicable Statutory Requirements and compliances
- ❖ Establishing environmental baseline conditions through survey and consultation with the local stakeholders
- ❖ Scoping the issues and establishing the boundaries of the assessment
- ❖ Review of Project Alternatives
- ❖ Assessing the potential environmental and social effects of the Project, including residual and cumulative effects
- ❖ Identifying potential mitigation measures to eliminate or minimize the potential adverse environmental and social impacts
- ❖ Environmental and Social Management & Monitoring Plan and follow-up programs

Statutory Requirements:

This report is prepared in compliance of the following regulatory requirement:

- Guidelines published by Pakistan Environmental Protection Agency (Pak-EPA),
- Punjab Environmental Protection Agency
- Punjab Environmental Protection Agency Regulations, 2016
- Asian Development Bank Safeguard Policy Statement 2009
- IFC Guidelines
- Performance Standards of IFC and World Bank group
- The best practices followed at international level.

Project Overview:

The Project Site is acquired at Quaid-e-Azam Solar Park, District Bahawalpur-Punjab through a Land Lease Agreement. The project site is located around 37 kilometers away from Bahawalpur City.

The total land area of the project site is about 500 acres allotted to the project owners for the implementation of 100 MW Solar PV project by Punjab Government. The proposed site located at latitude of 29°16'28.08"N and longitude of 71°47'45.96"E with elevation of around 127m meters.

Description of Environment

A data collection survey that included investigations of geology, meteorology, hydrology, ambient air quality, water quality, soil characteristics, noise levels, flora and fauna, land use pattern, and socioeconomic conditions was undertaken in the vicinity of the site. Primary data was collected to establish baseline conditions for the soil, water (surface and ground) quality, flora and fauna, and noise. Secondary data was collected for land, ecology, climate, and socioeconomic factors.

The physical survey of the site was conducted by Mr. Irfan Parvez of Renewable Resources Pvt. Limited. The environmental and social baseline conditions observed in the Project area are presented in **Section 4** of this report.

Stakeholder Consultation:

Stakeholder consultation was carried out as part of IEE study which included consultation with the World Wide Fund for Nature (WWF), Wildlife department, District Officer Environment, Forest Department and the local surrounding villages. The main objectives of the consultations were to apprise the stakeholders about the proposed project activities; obtain their views, concerns and recommendations; and address / incorporate them in the project design - thus enhancing the environmental and social performance of the project.

Impact Assessment and Mitigation

During the IEE, the project potential social and environmental impacts were identified through site visit conducted by RE2 and observe the gaps. Each identified impact was then characterized with respect to its nature, reversibility, geographical extent, consequence-severity and likelihood. Based upon this characterization, the impacts were then assessed to be of high, medium or low significance. The key potential environmental and social issues identified during the study included contamination of soil and water, safety hazards, damage to infrastructure, air quality deterioration, noise emissions, threat to wildlife and habitat modification. Similar impacts during the plant operation were identified; these included soil and water contamination, safety hazards, species mortality, habitat modification, noise and vibration. The IEE has recommended appropriate mitigation measures in Section 07 of the report to address the above concerns, and to keep the residual impacts within acceptable limits.

Environmental and Social Management Plan (ESMP)

An Environmental and Social Management Plan (ESMP) had been developed to provide an implementation mechanism for the mitigation measures mentioned above - according to local legislative and foreign lender (IFC) requirements. The ESMP provides the organization structure for the environmental and social management system during the project, and defines the roles and responsibilities of project players. The ESMP includes a mitigation plan, a monitoring plan, the communication and documentation requirements, and training needs, in the context of the environmental and social management of the project.

Finding and Recommendation

Four solar projects are already existing in the project area which is a huge chunk of land and installation of another solar project will not cause any significant impact in the project area and nearby surroundings. The Project will not cause any significant lasting environmental and social impacts. The proposed solar project will not cause physical or economic displacement as the solar farm has been established and the area has not been inhabited by individuals even before the establishment of the solar park. No IPs will be impacted by the project. A social due

diligence report was prepared in relation to social safeguards and other social matters and attached to this document as Annex _XVII. The environmental disturbance normally associated with construction activities will be minimized through an ESMP, implementation of which will continue during EPC and which includes monitoring arrangements. As solar PV technology is a clean energy source with no significant impacts on the environment and no GHG gas emissions - once it is operational. However the consistent monitoring through ESMP shall be conducted to mitigate or reduce the risk of impact if accountable.

The project has been discussed with local people, government officials and NGO like; WWF, Bahawalpur Wildlife department and Bahawalpur and Lalsuhanra Forest department. The consultations elicited general support for the project. There were no serious environmental and social issues raised during these consultations. The main concerns expressed by the locals were for the project company to ensure that local people will be employed by the project. Meanwhile, measures should be in place to avoid excessive noise and dust.

The following Annexures are attached with the report in order to support the results and findings of the report.

Annexure-I: Environmental Management and Monitoring Plan
Annexure-II: EMP Implementation Cost Estimates
Annexure-III: Pakistan Environmental Protection Agency Act 1997 and (Review of IEE and EIA) Regulations, 2000
Annexure-IV: Punjab Environmental Protection Agency Act 2012 (Ammended) and (Review of IEE and EIA) Regulations, 2016
Annexure-V: Pakistan National Environmental Quality Standards
Annexure-VI: IFC Environmental Guidelines 2012 for Solar Power Project
Annexure-VII: Laboratory Analysis Report for (Ambient Air, Water and Noise)
Annexure-VIII: Social Survey Forms
Annexure-IX: Snapshots of Community Consultation
Annexure-X: Snapshots of Stakeholders Consultation
Annexure –XI: Copy of Land allotment Letter
Annexure –XII: Copy of LOI
Annexure –XIII: Letter of District Government, EPA
Annexure –XIV: Letter of Wildlife Department, Bahawalpur
Annexure –XV: Letter of Meteorological Department
Annexure –XVI: Copy of Panels Certificate
Annexure -XVII: Social Due Diligence Report

SECTION 1

INTRODUCTION AND PURPOSE OF STUDY

1 INTRODUCTION AND PURPOSE OF STUDY

1.1 PROJECT PROPONENT

Zorlu Enerji Group, founded in 1993 with the foundation of Zorlu Energy Electricity Generation Inc. Zorlu Enerji is a global group of companies providing services in different areas of the energy sector. Zorlu Enerji Group offers an integrated service mix with the activities of different sectors of the energy sector, mainly electricity and steam production and sales carried out by Zorlu Energy, the only public company. Zorlu Enerji has a total installed power of 991 MW, of which 525 MW is in Turkey.

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1.2 PROJECT BACKGROUND AND JUSTIFICATION

Pakistan's major electricity sources are thermal and hydro generation, meeting approximately 70% and 28% (respectively) of the country's annual electricity demand. The primary thermal generation fuels employed are furnace oil and gas. While both are produced domestically, demand already outstrips supply by a considerable amount. Oil import is a significant burden on the national exchequer and the increasing import bill continues to exert further pressure on the foreign exchange reserves. Electricity mix of Pakistan (2013-2014) is presented in **Figure 1.1**.

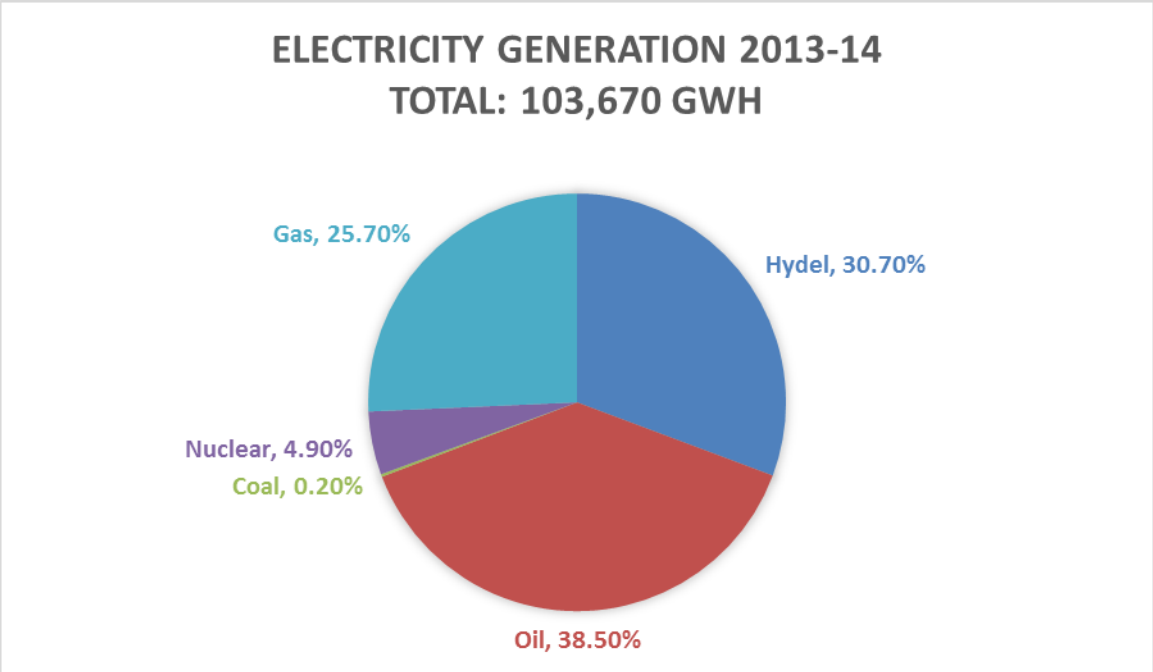


Figure 1-1: Electricity Mix of Pakistan by Source[1]

Import of gas could be seen as a viable option to overcome the depleting domestic reserves. However gas import has significant issues, mainly the need for substantial capital investment in infrastructure, security difficulties and physical terrain concerns. Moreover, it would increase Pakistan's reliance on imported fuels with associated foreign exchange burdens. This must be considered in the context of rising fuel costs for gas and oil-based fuels as a result of uncertainty over future supply.

Alternatives to further fuel imports for electricity generation are the production of domestic coal, generation from hydro-electric power, or other renewable sources, such as wind and solar power. These options will assist in reducing Pakistan's reliance on imported oil and protect against resulting vulnerability to changes in global oil prices, which will in turn also have a positive effect on the current trade deficit and inflating import bill.

As with gas, securing future supplies of domestic coal and hydro-electric power would require significant spending on infrastructure. While Pakistan has domestic reserves of coal, it currently makes up a very small proportion of the country's total power generation. This is due, in part, to the fact that most of the reserves are located in the remote Thar Desert region. Exploiting the coal reserves would require significant upfront investment in local infrastructure (including

[1] Energy Year Book of Pakistan 2014

provision of water supplies), development of mines, housing and related infrastructure, and investment in transmission lines, as a pre-requisite to any power plant development. Hydro-electric power already supplies almost 30% of the domestic electricity that is generated, and numerous sites for future investment exist. However, due to their locations, this would also require significant investment in transmission and other infrastructure. Moreover, there are various political issues relating to the development of hydro-electric and coal generation power plants, which remain to be resolved.

In light of the prevailing circumstances at how the country's future electricity needs might be in a way that supports the environmental objectives of the Government of Pakistan; solar power generation appears to be a viable and environmental friendly alternative for meeting Pakistan's urgent electricity demands. The development of solar power generation projects could reduce dependence on oil based thermal power generation, increase diversity in Pakistan's electricity generation mix, and reduce greenhouse gas (GHG) emissions, all of which will contribute towards projecting a positive image of Pakistan within the international community. Also the per kWh tariff for solar power projects are now comparatively lower than that of furnace oil projects; particularly the Rental Power Projects, which were previously inducted to meet the urgent needs of electricity shortfalls.

2 PROSPECTS OF SOLAR ENERGY IN PAKISTAN

Solar energy has excellent potential in areas of Pakistan that receive high levels of solar radiation throughout the year. Every day, for example, the country receives an average of about 19 Mega Joules per square meter of solar energy.

Pakistan being in the Sun Belt is ideally located to take advantage of solar energy technologies. This energy source is widely distributed and abundantly available in the country. The mean global irradiation falling on horizontal surface is about 200-250 watt per sq.m in a day. This amounts to about 2500-3000 sun shine hours and 1.9 - 2.3 MWh per sq.met in a year. It has an average daily global insolation of 19 to 20 MJ/sq.met per day with annual mean sunshine duration of 8 to 8.5 hours (6-7hrs in cold and 10-12 hrs in hot season) and these values are among the highest in the world. For daily global radiation up to 23MJ/m2, 24 (80%) consecutive days are available in this area for solar energy. Such conditions are ideal for solar thermal applications.

To summarize, the sun shines for 250-300 days per years in Pakistan with an average sun shine hours of 8-10 per day. This gives huge amount of energy to be used for electricity generation by solar thermal power plants.

A quick idea for the potential of solar energy in Pakistan can be obtained from the satellite map of solar radiation released by National Renewable Energy Lab (NREL) of USA shown in **Figure 2.1.**

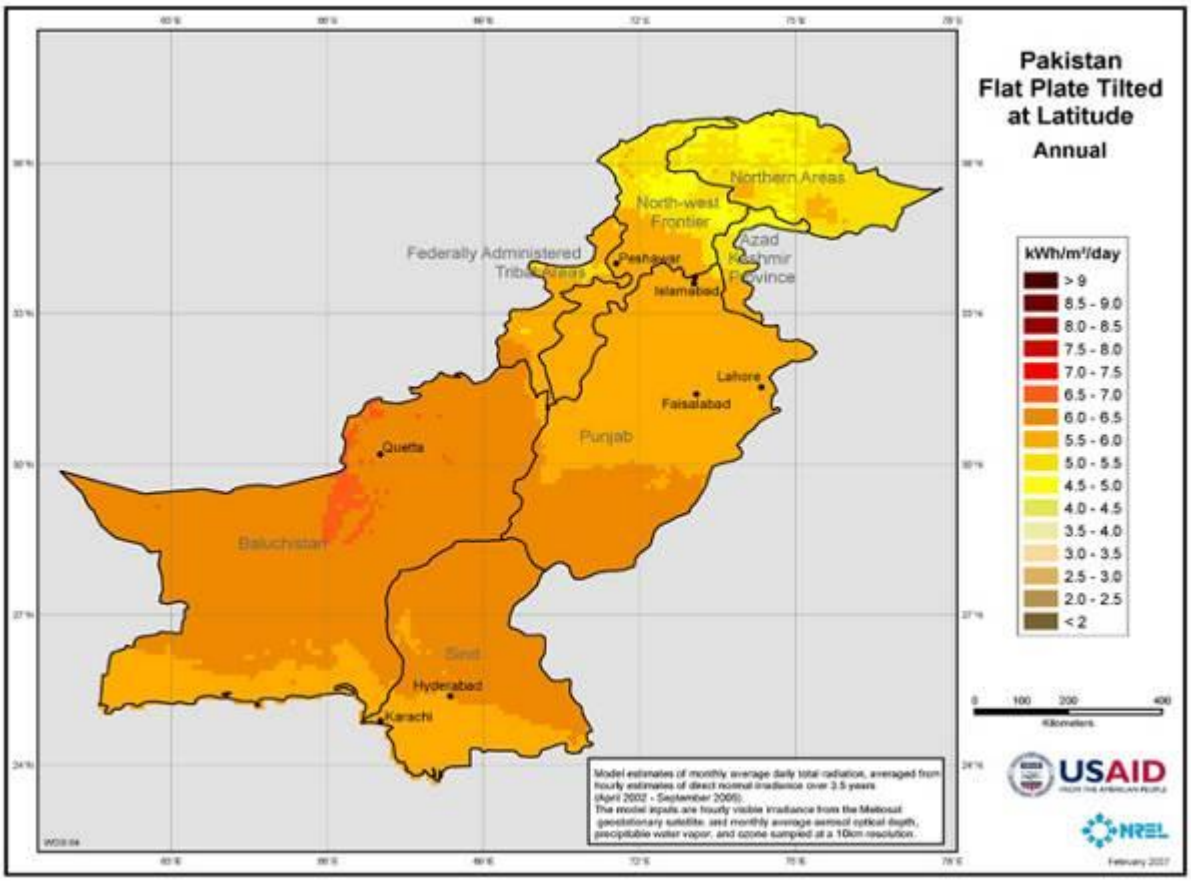


Figure 2.1: NREL Solar Map of Pakistan

2.1 PROJECT OVERVIEW AND OBJECTIVES

The Solar Power Project is located in Lal Soharnra for the development of Quaid-e-Azam Solar Park (Extension), District Bahawalpur, which is approximately 37 km from Bahawalpur City, Pakistan. The Project site consists of 500 acres of land, which has been leased by the Government of Punjab. Zorlu Solar Pakistan (Pvt.) Limited got LOI from PPDB in year 2017, 17th January to develop 100 MW solar PV power project in the area of Lal Soharnra, Bahawalpur, Punjab Pakistan.

The total land area acquired for the installation of 100 MW Solar PV Project is 500 acres leased by the Government of Punjab to M/s Zorlu Solar Pakistan (Pvt) Ltd, a special purpose vehicle (SPV) established by M/s Zorlu Elektrik Uretim, for 25 years.

The proposed project brings in multifold advantages. Not only does it produce clean, pollution free energy, it also has the capacity to provide employment to the people living around the area. It has the capacity of turning the area into clean energy producing hub which will be emulated in other areas of the country.

The brief overview of project is summarized in **Table 1.1** below;

Table 2.1: Project at a Glance

S. No	Particulars	Description
1	Project Site	Lal Soharnra, Bahawalpur, Province Punjab-Pakistan
2	Land Available for project	500 acres
3	Project Capacity	100MW
4	Total number of Solar PV modules to be installed	869,701
6	Estimated Project Cost	101.4 million USD

The overall objectives of the project are;

i. Contribute to meeting the electricity supply deficit in project area in particular; and country in general.

ii. Provide electricity to stimulate and support the expansion of local industry and service businesses.

iii. By using indigenous renewable resources of power generation, avoid depletion of natural resources for future generation and environmental stability.

iv. Create employment opportunities during construction and operations and also provide opportunities for developing ecotourism.

v. Contribute to improved electricity supply service delivery to a limited extent specifically having a wide rural outreach.

vi. Improve microeconomic efficiency of the power sector by reducing fossil fuel usage.

vii. Reduce greenhouse gas emissions from power generation and contribute to negligible emission, effluent, and solid waste intensity of power generation in the system.

viii. Conserve natural resources including land, forests, minerals, water, and ecosystems.

ix. Improve the local physical infrastructure such as roads and transmission network in the project area.

x. Develop the local economy and create employment, particularly in rural areas and in a district that is considered as backward area, a priority concern of the Government of Pakistan.

2.2 NEED AND OBJECTIVES OF IEE STUDY

Pakistan Environmental Protection Act 1997 (PEPA 1997) requires the proponents of every development project in the country to submit either an Initial Environmental Examination or Environmental Impact Assessment to the concerned environmental protection agency.

The IEE/EIA Regulations 2000 issued under PEPA 1997 provides separate lists for the projects requiring IEE or EIA. Since the total power generation capacity of proposed project is less than 200 MW, therefore IEE study is performed. Also in various meeting organized by AEDB, EPA, UNEP, it was agreed to follow the same criteria for IEE or EIA as stipulated for thermal and hydro projects.

Both guidelines provide separate lists for the projects requiring IEE or EIA. This Initial Environmental Examination (IEE) report has been prepared in accordance with the provisions in the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000. According to these regulations, an IEE is required for projects falling in any category listed in Schedule-I of the regulations, and an EIA is required for projects listed in Schedule-II of the regulations. These are also mentioned in the Punjab Environmental Protection Agency Regulations, 2016 and according to these regulation the e project falls in Schedule-I and required IEE study.

The document has also been made to comply with the requirements of **ADB's Safeguard Policy Statement 2009** as well as local and national standards. To comply with other lender's requirement, the IEE report also addresses **IFC's and World Bank group performance standards**.

In the context of the scope of the project, the IEE report has addressed the following objectives, where applicable;

The purpose of Initial Environmental Examination (IEE) is to identify the reasonably foreseeable environmental and social effects of the activities that will be conducted under this project;

- Category of the project consistent with Pakistan Environmental Protection Act, 1997
- Highlight baseline environmental and social conditions of the project area along with identification of environmentally sensitive area and concerned stakeholders
- Relevant host country laws, regulations, applicable treaties and agreements

- Protection of human health, cultural properties and biodiversity including endangered species and sensitive ecosystems
- Major hazards; Occupational health and safety; Fire prevention and life safety
- Socio-economic impacts; Land use: Land acquisition; Involuntary resettlement
- Impacts on indigenous peoples and communities; if applicable
- Cumulative impacts of existing, proposed and anticipated future projects
- Efficient production, delivery and use of energy; and
- Pollution prevention and waste minimization, pollution controls (liquid effluent and air emissions) and solid and chemical waste management.
- GHG reduction potential.

2.3 APPROACH AND METHODOLOGY

The IEE study is focused at developing the environmental profile of the project area so as to evaluate the (baseline data) existing conditions on physical and biological environment, and social environment together with the anticipated environmental impacts and proposed mitigation measures. Detailed assessment of the social and biological environment of the area was conducted through field survey for the distance up to 10 Km radius of the project site, however the influence zone of the environmental impacts is considered as 5 Km.
The main purpose of IEE study is to ensure that:

- Any major adverse impact on the environment (physical, ecological and social) during different phases of projects viz. siting, design, construction and operation are identified.
- Adverse impacts are appropriately addressed and adequate mitigation measures are incorporated in the siting, design, construction and operation phases of project. Socioeconomic aspects are identified, and mitigation measures have been identified.
- Alternatives to achieve the objectives are analyzed.
- Environmental and Social Management Plan (ESMP) for sustainable development and operation of the project is developed for implementation and monitoring of the project activities.

The present IEE report has identified the significant environmental and social aspects and screened the potential aspects to ensure that the likely impacts due to proposed activities during construction, installation of SPV's and operation of the proposed project, and the residual impact on adoption of mitigation measures have been critically assessed with respect to compliance with the Pakistan Environmental Protection Act 1997, Punjab Environment Protection Act 1997 (Amended 2012), the ADB Safeguard Policy Statement 2009 and World Bank, IFC.

The overall methodology and the main phases specifically adopted for conducting the IEE of The Project may be summarized as follows;

2.3.1 Scoping

The key activities of this phase included:

Project Data Compilation: A generic description of the proposed activities relevant to environmental assessment was compiled with the help of the - Primary and Secondary data collection through literature, EHS guidelines, national and international standards and on-ground Surveys & environmental testing. A list of potential environmental & as well as social issues was developed. A stakeholder analysis was carried out for the consultation carried out subsequently as mentioned in Section 08.

Published Literature Review: Secondary data on weather, soil, water resources, wildlife, and vegetation were collected from internet, published literature and books. The data was then reviewed and compiled.

Legislative Review: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.

***Identification of Potential Impacts*:** The information collected in the previous steps was reviewed and potential environmental and social issues identified.

Baseline Data Collection:
Primary Data To collect primary data, a field visit was conducted to verify and collect primary data on the site alternatives. A questionnaire was developed and views of local inhabitants were taken about the solar power Project. It also include the social including social and

biological surveys, and laboratorial testing conducted by the SGS for the purpose of analyzing environmental parameters in order to quantify either they are meeting with NEQS standards.
Secondary Data A reasonable data of baseline information on the Project area was available from some alternative resources including existing literature, internet help, existing available information, field surveys and associated departments.

2.3.2 Impact Assessment

The environmental, socioeconomic, and project information collected was used to assess the potential impacts of the proposed activities. The issues studied included potential project impacts on:

- Geomorphology
- Groundwater and surface water quality
- Ambient air quality and ambient noise levels
- Ecology of area, including flora and fauna
- Local communities
- Noise impact
- Visual Impact
- Shadow Impact

Wherever possible and applicable, the discussion covers the following aspects:

- The present baseline conditions
- The potential change in environmental parameters likely to be effected by project related activities
- The identification of potential impacts
- The evaluation of the likelihood and significance of potential impacts
- The definition of mitigation measures to reduce impacts to as low as practicable
- The prediction of any residual impacts, including all long-term and short-term; direct and indirect; beneficial and adverse impacts
- The monitoring of residual impacts
- An Environment Management Plan (EMP) for the mitigation measures identified during the project

2.3.3 Documentation

This report documenting the IEE process and results is prepared accordance with the relevant guidelines set by the Pakistan Environment Protection Agency (Pak-EPA).

Chapter 1 gives the overview of project introduction and purpose of the IEE study. **Chapter 2** discusses the ADB policies IFC Guidelines and standards, as well as the regulatory, legislative and institutional setup in the country, relevant to the environmental and social assessment. **Chapter 3** provides a simplified description of the proposed project and its components. The project alternatives are discussed in **Chapter 4**. The environmental and social baseline conditions of the project area are presented in **Chapter 5**. The stakeholder consultation has been covered in **Chapter 6**. The environmental and socioeconomic impacts of the project are assessed and their respective mitigations recommended in **Chapter 7**. **Chapter 8** outlines the implementation mechanism for the mitigation measures, in the form of an environmental management plan. Finally, **Chapter 9** presents the findings and conclusion of the study.

2.4 METHOD FOR EVALUATING IMPACT

The description of baseline conditions represents the basis for evaluating the impacts of the project. The description and evaluation of the environmental impacts and proposals for measures to be taken to mitigate and compensate for any determined environmental impacts during construction and operation phase are presented in Environment Management Plan (EMP) (Annexure-I). In the interest of transparent presentation and evaluation, tabulated evaluation procedures have been applied. On the basis of a point system, the severity of a particular environmental impact together with its general trends i.e. negative or positive is described. The evaluation scale applied is as follows


=High


=Medium


=Low


=No Impact


=Locally Favorable


=Regionally Favorable

For this judgment, international and national standard like those of the World Bank, WHO, etc are used. According to these standards, impacts are evaluated as follows;

High	International and national standards are exceeded.
Medium	Between international and national standards
Low	International and national standards are met

SECTION 3

LEGISLATIVE REQUIREMENTS OF IEE

3 LEGISLATIVE REQUIREMENTS OF IEE

This chapter describes the relevant: (i) national and international policies; (ii) legal and administrative framework; and (iii) institutional setup, in respect of the environmental and social assessment of the proposed Project.

A number of laws exist in Pakistan containing a number of clauses concerning protection of the environment. However, the first legislation on environmental protection was issued in 1983.

The Pakistan Environment Protection Ordinance, 1983 was the first legislation promulgated for the protection of environment. Pakistan Environment Protection Agency was established in 1984. No significant environmental policy, guidelines and regulations were made till early 1990s. The National Conservation Strategy was developed and approved by the federal cabinet in 1992. Provincial Environment Protection Agencies were also established in 1992-93. National Environmental Quality Standards (NEQS) were established in 1993. Detailed environmental guidelines were issued in 1996. The National Assembly and the Senate conferred Pakistan Environment Protection Act in 1997. Most of the existing laws on environmental and social issues have been enforced over an extended period of time, and are context-specific.

3.1 NATIONAL ENVIRONMENTAL LAWS

There are several laws in Pakistan which contain provisions relating to the protection of the environment. However, the enactment of comprehensive legislation on the environment, in the form of an act of parliament, is a relatively new phenomenon. Most of the existing laws on environmental and social issues have been enforced over an extended period of time, and are context specific. The laws relevant to development projects are briefly reviewed below.

3.2 POLICY GUIDELINES (www.epa.gov.pk)

3.2.1 National Conservation strategy

The National Conservation Strategy (NCS) is the primary policy document of the Government of Pakistan (GOP) on national environmental issues of the country. The Strategy approved by the Federal Cabinet in March 1992 was also recognized by International Financial Institutions, principally the World Bank. The NCS had identified 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage. It had also recommended immediate attention to the stated core areas in order to preserve the environment of Pakistan.

A mid-term review of the NCS in 2000 concluded that achievements under the NCS were primarily awareness raising and institutional building rather than meaningful improvement of the environment and natural resources and that the NCS was neither designed nor adequately focused as a national sustainable development strategy (GoP, November 2002). Thus the need for a more focused National Environmental Action Plan (NEAP) was formulated and approved by the Pakistan Environmental Protection Council in 2001 to practically improve the national environment with emphasis on poverty reduction, and economic as well as sustainable development.

NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that would safeguard public health, promote sustainable livelihoods and enhance the quality of life of the people of Pakistan.

The GOP and United Nations Development Programme (UNDP) have jointly initiated an umbrella support programme called the NEAP-Support Programme that was signed in October 2001 and implemented in 2002. The development objective supported by NEAP-Support Programme is environmental sustainability and poverty reduction in the context of economic growth. The objectives of new policy has total 171 guidelines on sectorial and cross sectorial issues. The objectives of new policy include assurance of sustainable development and safeguard of natural wealth of country. The following are the approved Sectorial Guidelines:

- Water Supply and Management
- Air Quality and Noise
- Waste Management
- Forestry
- Biodiversity and Protected Areas
- Climate Change and Ozone Depletion
- Energy Efficiency and Renewable
- Agriculture and Livestock
- Multilateral Environmental Agreements
- Biodiversity Action Plan

The key to protection of the biological heritage of Pakistan lies in the involvement of local people and in the support provided by competent institutions for conservation and sustainable use. The Government of Pakistan has recognized the importance of these measures in the

preparation of National Conservation Strategy and in becoming a signatory to, and ratifying, the Convention on Biological Diversity (CBD) in 1994. Developing the Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss. This law is applicable for all the project and cover the core 14 points of NCS to sustain the environment for the betterment of future generation.

3.2.2 The Biodiversity Action Plan

The Biodiversity Action Plan (BAP), which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country.

The Pakistan Environment Protection Act, 1997 is the key legislation empowering the government to frame regulations for the protection of the environment. Detailed rules, regulations and guidelines required to enforce the Environment Protection Act are still in various stages of development.

3.3 ENVIRONMENT INSTITUTIONS AND ADMINISTRATION

The Constitution of Pakistan distributes the legislative powers between the federal and the provincial governments through Federal and Concurrent Lists. The Federal list depicts the areas and subjects on which the Federal government has exclusive powers. The second, concurrent list contains areas and subjects on which both Federal and Provincial governments can enact laws.

The Ministry of Climate Change, Local Government and Rural Development is responsible for environmental issues at federal level. The NCS unit within the Ministry ensures implementation of the National Conservation Strategy.

The Pakistan Environment Protection Agency at the federal level is responsible for administering the provisions of the Environment Protection Act. It is responsible to ensure compliance with the NEQS, develop monitoring and evaluation systems and initiate legislation when necessary.

The provincial Environment Protection Agencies (Environment Protection Department in Punjab for this project) are responsible for environmental planning and development, approval of Initial Environmental Examination (IEE) and Environmental Impact Assessments (EIA) of new projects at provincial level.

3.4 LAWS, REGULATIONS AND GUIDELINES

Pakistan Environment Protection Act, 1997 is the basic law that empowers the Government of Pakistan to develop policies and guidelines for the protection of the country's natural environment. A Brief description of the laws is given below;

3.5 PAKISTAN ENVIRONMENTAL PROTECTION ACT, 1997

The PEPA, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a broad 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 project relate to the requirement for an initial environmental examination (IEE) and EIA for development projects. Section 12(1) requires that: "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof." The Pak-EPA has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies. As the proposed project will be located in the Lal Sohanra, Bahawalpur Punjab province, it falls under the jurisdiction of the EPA-Punjab.

3.6 PAKISTAN ENVIRONMENT PROTECTION AGENCY REVIEW OF IEE AND EIA REGULATION, 2000

The Pakistan Environment Protection Agency Review of IEE and EIA Regulations provide the necessary details on preparation, submission and review of the IEE and EIA. Categorization of projects of IEE and EIA is one of the main components of the Regulations.

The IEE-EIA Regulations, 2000 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:

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.

- An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.
- The EIA or IEE is submitted to the concerned EPA—provincial EPAs if the project is located in the provinces or the Pak-EPA if it is located in Islamabad.
- A fee, depending on the cost of the project and the type of the report, is submitted along with the document.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.
- 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.
- 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.
- If the EPAs accord their approval subject to certain condition, then before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions as per mentioned in schedule VII.
- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the EIA.
- An Environment Management Plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The EIA approval is valid for three years from the date of accord.

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

Complete guidelines of Preparation of EIA/IEE along with details of other concerned laws and regulations given in Pakistan Environment Protection Act are given in Annexure-III for reference

3.7 PUNJAB ENVIRONMENT PROTECTION AGENCY REVIEW OF IEE AND EIA REGULATION, 2016

The PEPA review of IEE and EIA regulations, 2016 (the 'regulations'), prepared by the PEPA under the powers conferred by section of Punjab Environmental Protection Act, 2012 provide the necessary details on the preparation, submission and review of the IEE, EIA and environmental checklist of the project

These regulations classify projects on the basis of expected degree of severity of environmental impacts and list them in three separate schedules. Schedule-I lists projects that may not have significant environmental impacts and require an IEE. Schedule-II lists projects of potentially significant environmental impacts requiring preparation of an EIA. Schedule-III list projects of screening and requiring preparation of environmental checklist. The Regulations also require under the schedule-II solar energy projects if falls under any sensitive, protected area and under the Clause I: that all projects located in environmentally sensitive areas require preparation of an EIA. PEPA (Review of IEE /EIA regulations) 2016 has been provided in the report. The Project Area does not fall under the protected area; accordingly IEE report has been prepared.

Complete guidelines of Preparation of EIA/IEE along with details of other concerned laws and regulations outlined in the Punjab Environment Protection Act 2016 are provided in Annexure- IV for reference

3.8 POLICY FOR DEVELOPMENT OF POWER GENERATION PROJECTS, 2006

The Alternative Energy Development Board was established as an autonomous body attached to the Cabinet Division on 12th May 2003. The AEDB was established to act as a central agency for the development, promotion, and facilitation of renewable energy technologies; the formulation of plans and policies; and the development of a technological base for manufacturing of renewable energy equipment in Pakistan. In February 2006, the administrative control of the AEDB was shifted from the Cabinet Division to the Ministry of

Water & Power. The AEDB has developed the national policy for promoting renewable energy sources in the medium and long term, which is known as the Policy for Development of Renewable Energy for Power Generation, 2006 (Power Policy). AEDB is also responsible for procuring land leases from the Revenue department for solar and wind farm projects. The current Project is developed under provisions of the Policy for Development of Renewable Energy for Power Generation, 2006.

3.9 PROJECT DEVELOPMENT IN TERMS OF POLICY FRAMEWORK

The following paragraphs describe the progress of the Project and timelines mentioned in the table below in terms of the Power Policy:

Sr. No.	Activity Description	Duration (From 0 months)
1.	Issuance of Letter of Allocation of Project Land	0 months
2.	Completion and approval of feasibility studies (FS)	2 months
3.	Application of Generation License and Tariff Determination to NEPRA.	3 months
4.	Agreed Terms Sheet for Debt	4 months
5.	Achievement of Financial Close	5 months
6.	Achievement of Commercial Operation Date (COD)	6 months

3.9.1 Letter Of Intent (LOI)

The first step for the development of a project pursuant to the Policy is to register with the PPDB and obtain a Letter of Intent. The sponsors of the Project successfully filed their application and obtained their LOI from the PPDB on 17th Jan, 2017 after depositing their bank guarantee. The LOI is the official mandate for the Project Company to commence working on the Project, with the support of the PPDB and other government departments. The LOI heralds the commencement of activities leading to the preparation of a feasibility study and acquisition of land for the Project. LOI is attached in **Annexure XII.**

3.9.2 Acquisition of Land

The land is being allocated by the Government of Punjab in the Quaid-e-Azam Solar Park (Extension) Lal Sohanra area. Land measures 500 acres of area. The leasing document of land is attached in the **Annexure XI.**

3.9.3 Submission of Feasibility Study

The Project Company is required to submit a detailed feasibility study, including Technical Feasibility, Electrical Grid Studies, and Environmental Studies, to the PPDB for their approval. The feasibility study of the Project is in progress. The proponent has been submitted the complete set of feasibility studies to PPDB. The complete feasibility study will submitted to PPDB on 28th, February, 2017.

3.9.4 Generation License

In order to produce and sell electricity in Pakistan, a project is required to obtain a "Generation License" from the regulator, NEPRA. The Project Company is therefore required to make an application to NEPRA for its Generation License. An application for the generation license along with necessary documents will be submitted to NEPRA after submission of Feasibility Study to PPDB.

3.9.5 Tariff Determination

A Tariff petition will be submitted by the Project Company to NEPRA for approval of Cost Plus tariff. This application will be submitted simultaneously with the application of Generation License.

3.9.6 Letter of Support (LOS)

Once the tariff gets approved, the Project Company can engage its lenders to finalize its financing terms and conditions. After award of Tariff, AEDB & PPDB will issue a Letter of Support to the Project Company as soon as the Project Company submits a bank guarantee in respect of its obligation to achieve Financial Close. The amount of the Bank Guarantee is calculated at PKR 10,500,000/. The Letter of Support provides the Project Company with a continued mandate to develop the Project, and provides certain assurances of support from governmental entities and departments. The Letter of Support remains valid until the effectiveness of the EPA and IA.

3.9.7 Energy Purchase Agreement (EPA)

The agreement between the Power Purchaser and the Project Company is called the Energy Purchase Agreement (EPA). This agreement lists terms and conditions for the sale and purchase

of electricity between the two parties. Discussions relating to the EPA normally commence as soon as the feasibility study is submitted and the tariff petition is filed with NEPRA.

3.9.8 Implementation Agreement (IA)

The Implementation Agreement (IA) is an agreement between the Project Company and the GOP, where in the GOP mandates the Project Company to develop the power project, and provides certain assurances and concessions to the Project, its lenders, shareholders and contractors. Importantly, the IA provides certain guarantees in respect of the performance of the power purchaser. The IA also assures the project of compensation in case of any termination resulting from a default or force majeure. These discussions normally commence alongside the EPA.

3.9.9 Financial Close

Upon approval of feasibility study, grant of generation license, approval of tariff, and the signing of Project documents (EPA and IA); the Project Company shall move forward to financial close.

3.10 NATIONAL AND INTERNATIONAL ENVIRONMENTAL STANDARDS

3.10.1 National Environmental Quality Standards, 2005

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and were last revised in 2010. The NEQS specify the standards for industrial and municipal effluents, gaseous emissions, ambient air requirements, vehicular emissions, noise levels and water quality standards.
The National Environmental Quality Standards (NEQS), promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources,
- Maximum permissible limits for motor vehicle exhaust and noise,
- For power plants operating on oil and coal:
  - Maximum allowable emission of sulfur dioxide,
  - Maximum allowable increment in concentration of sulfur dioxide in ambient air,

- Maximum allowable concentration of nitrogen oxides in ambient air
- Maximum allowable emission of nitrogen oxide for steam generators as function of heat input.
- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate set of numbers).

Applicability of NEQs

NEQs are the standard document and would be applicable to all the projects and it can be further based on Environmental Quality standards set by the EPA. On the basis of these standards, the results of analysis would be compared with these standards to check the compliance of these standards.

Selected NEQS for liquid effluents discharged to inland waters, gaseous emission from industrial sources, emissions from motor vehicles, noise, ambient air quality and water quality standards are provided in Annexure-V

3.10.2 National Environmental Policy, 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country.
The broad Goal of NEP is, "{to protect, conserve and restore Pakistan's}" environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies the following set of sectorial and cross-sectorial guidelines to achieve its Goal of sustainable development.

a. Sectorial Guidelines:

Water and sanitation; air quality and noise; waste management; forestry; biodiversity and protected areas; climate change and ozone depletion; energy efficiency and renewable; agriculture and livestock; and multilateral environmental agreements.

b. Cross Sectorial Guidelines

Poverty; population; gender; health; trade and environment; environment and local governance and natural disaster management. The NEP suggests the following policy instruments to overcome the environmental problems throughout the country:

- Integration of environment into development planning
- Legislation and regulatory framework
- Capacity development
- Economic and market based instrument
- Public awareness and education
- Public private civil society partnership

Applicability of NEP

NEP is a policy document and does not apply directly at the project directly. However, the development projects like power generation from solar energy should not add to the aggravation of the environmental issues identified in NEP. In any event, mitigation measures would be adopted to minimize or avoid any contribution of the projects and of course, being the Solar a renewable source of energy, Solar Power production can be considered as a means to integrate the environment into development planning.

3.10.3 Land Acquisition Act, 1984

The Land Acquisition Act (LAA) of 1894, amended from time to time, has been the de-facto policy governing land acquisition and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.

For the proposed project, the proponents have leased land from the Government of Punjab and no settlement or any structure existed at the site. The LAA is not applicable to the acquisition of land for the proposed project.

3.10.4 Telegraph Act, 1985

This law was enacted to define the authority and responsibility of the Telegraph authority. The law covers, among other activities, installation and maintenance of telegraph lines and posts (poles). The Act defines the mechanism to determine and make payment of compensation associated with the installation of these lines and posts.

Under this Act, the land required for the poles is not acquired (or purchased) from the owner, nor the title of the land transferred. Compensation is paid to the owner for any structure, crop or tree that exists on the land; cost of the land is not paid to the owner.

3.10.5 The Punjab Wildlife (Protection, Preservation, Conservation and Management Act), 1974

This act was enacted on 1st February 1974. This law was enacted to protect the province's wildlife resources directly and other natural resources indirectly. It classifies wildlife by degree of protection i.e. animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances. The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife protected areas i.e. National Parks, Wildlife Park, zoological garden or zoo and safari park, Wildlife Sanctuaries and Private Game Reserve.

Applicability on the Project

This Act will not be applicable to the proposed project because there is not any national and wildlife park in the vicinity of the project area. The letter of wildlife department is attached in **Annexures XIV.**

3.10.6 Forest Act, 1927

The Forest Act, 1927 empowers authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act prohibits any person to set fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for cultivation or any other purpose.

Applicability on the Project

As there is no forest or plantation grown in the project area, so no need to implement but as per the requirement of CSR, the plantation will be grown in the surrounding area during the construction phase of the project. The consultation with the forest department has been conducted and discuss the project.

3.10.7 Canal and Drainage Act, 1873

The Canal and Drainage Act (1873) prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.

This Act will be applicable to the construction and O & M works to be carried out during the proposed project. As per the proposed location of the project, there is no canal or any surface water body passing in the surrounding area.

3.10.8 Antiquity Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act defines "antiquities" as ancient product of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect "antiquities" from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. 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 archeological significance.

Under this Act, the project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity, and if during the course of the project an archeological discovery is made, it should be protected and reported to the Department of Archeology, Government of Pakistan, for further action.

There is no any antiquity or archeological site present in the project area.

3.10.9 Mines, Oil Fields and Mineral Development Act, 1948

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

These procedures will have to be followed during the construction and operational phase of proposed project.

3.10.10 Factories Act, 1934

The clauses relevant to the proposed project are those that address the health, safety and welfare of the workers, disposal of solid waste and effluents, and damage to private and public property. The Act also provides regulations for handling and disposing toxic and hazardous substances. The Pakistan Environmental Protection Act of 1997 (discussed above), supersedes parts of this Act pertaining to environment and environmental degradation.

Applicability on Project

As the solar power project is the source of clean energy and it will not create any impact on the project land. This law is not applicable for this project because it cannot generate any toxic and hazardous emissions during the construction phase and neither generate any waste that effect the environment. It generate only packing materials, plastic pallets and cardboard materials etc.

3.10.11 Pakistan Explosive Act, 1884

This Act provides regulations for the handling, transportation and use of explosives during quarrying, blasting and other purposes. The transmission line tower installation sometimes needs blasting at rocky/mountainous areas. However, for the proposed project, no such blasting is envisaged.

3.10.12 Employment of Child Act, 1991

Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows the child labor in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth years of age. The ECA states that no child shall be employed or permitted to work in any of the occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out. The processes defined in the Act include carpet weaving, bidi (kind of a cigarette) making, cement manufacturing, textile, construction and others.

Zorlu Solar Pakistan Ltd and its contractors will be bound by the ECA to disallow any child labor at the project sites or campsites.

Pakistan National Labor Laws/policies were announced five times by the government since 1955 to 2002. All these polices basically laid-down the parameters for the growth of trade unionism; the protection of workers' rights; the settlement of industrial disputes and redressal of worker grievances. After 2002, no Labour Policy has been introduced although a number of developments took place in the intervening period, which would have necessitated the same.

Social and economic well-being of the people is one of the principal objectives of the present people's government. Labor Policy, like policies in other fields, should also aim in attaining the objectives in a manner best suited to the resources of the country and the present state of

economy. There is an urgent need to revitalize the economy, required sustained efforts, to increase the level of productivity, promotion of investment and maximization of employment. There is an equally genuine requirement to create among workers and employers, a better awareness of their obligations to the national objectives stated above. At the same time, the Government recognizes that workers and employers must enjoy reasonable benefits as can be sustained by the economy without suffering set-backs. Keeping these priorities in view, the Government considers that a balanced labor policy should be based on the following objectives:

- Worker's right to form unions and unions should be protected and an institutional framework be made available to foster close cooperation between workers and employers at establishment level.
- Equitable adjustment of rights between workers and employers should be ensured in an atmosphere of harmony, mutually beneficial to the workers and the management.
- Consultations between workers and employers on matters of interest to the establishment and welfare of workers should be made more effective.
- Adequate security of jobs should be available to the workers and there should be expeditious redressal of their grievances.
- Conditions should be created that workers and employers are committed in enhancing the labor productivity.
- Promotion to higher jobs be ensured at all levels based on suitability and merit and for this purpose arrangements should be made for in-service training facilities.
- Facilities for proper matching of job opportunities and the job seekers be strengthened and standard procedures be streamlined.
- Social insurance schemes to be further strengthened.

3.10.13 Civil Aviation Rules, 1994

These rules apply to flight operations within Pakistan by aircrafts other than military aircrafts and, except where otherwise prescribed, to flight operations by aircrafts registered, acquired or operating under these rules, wherever they may be. The rules with relevant significance to the power project:

- No person shall erect any temporary or permanent structure, nor position a vehicle or other mobile object on or in the vicinity of an aerodrome (airport), that will be within the clearance area, or will protrude through an obstacle limitation surface, at that aerodrome.

- No person shall operate a light in the vicinity of an aerodrome which because of its glare is liable to dazzle pilots of aircraft taking off from or landing at that aerodrome; or which can be mistaken for an aeronautical ground light. If such a light is operated it shall be

extinguished or satisfactorily screened immediately upon notice being given to the person or persons operating the light, by the Director-General or by the Manager or by a person authorized by him.

- No person or persons shall operate a radio station or electrical equipment in the vicinity of an aerodrome or of a radio aid to navigation serving an airway or an air route in Pakistan which is liable to cause interference with radio communications between aircraft and an Air Traffic Services Unit, or which is liable to disturb the signal from a navigational radio aid.

- A Captive balloon or a kite shall not be flown at a height above 200ft within 6km of an aerodrome, and a free balloon shall not be flown at any place, except with the express permission of the Director-General and in compliance with the conditions attached to such permission.

- An aircraft shall not be flown over congested areas of cities, towns, or settlements or over an open air assembly of persons, except by permission of the Director-General, unless it is at such height as will permit, in the event of an emergency, a landing to be made without undue hazard to persons on the ground, and except when it is taking off or landing, shall not be flown closer than 500ft to any person, vessel, vehicle or structure.

However, there is no airport in close proximity to the project area, therefore, it is highly unlikely that Solar Power Project construction and operation activities might be affected by any of the Aforementioned rules. The project site is not located in the vicinity of any aircrafts pathways so that there is no need to require any precautionary measures related to aircraft and the reflections through solar panels.

3.10.14 Pakistan Penal Code, 1860

The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization.
The Code also addresses control of noise, noxious emissions and disposal of effluents. Most of the environmental aspects of the Code have been superseded by the Pakistan Environmental Protection Act, 1997.

3.10.15 National Resettlement Policy / Ordinance

The Ministry of Environment, Local Government and Rural Development formulated a draft policy in 2004 on involuntary resettlement with technical assistance from ADB. The policy aims to compensate for the loss of income to those who suffer loss of communal property including common assets, productive assets, structures, other fixed assets, income and employment, loss of community networks and services, pasture, water rights, public infrastructure like mosques, shrines, schools and graveyards. The government has also developed a document entitled "Project Implementation and Resettlement of the Affected Persons Ordinance, 2002", later referred to as the "Resettlement Ordinance", for enactment by provincial and local governments, after incorporating local requirements. The Ordinance, being a new law, shall be supplementary to the LAA as well as other laws of Pakistan, and wherever applicable under this policy. However, if necessary, appropriate amendments to the LAA 1894 will also be proposed to facilitate the application of the Resettlement Ordinance. There has not been much progress on the enactment of the Resettlement Ordinance. The establishment of solar farm within Quaid-e-Azam Solar Park will not entail physical or economic displacement, hence this is not applicable for the proposed project.

3.10.16 Provincial Local Government Ordinance, 2001

These ordinances were issued under the devolution process and define the roles of the local governments. Under this Ordinance, three tiers of the local governments have been introduced at the district, tehsil and union levels. The top most tiers are the district government, followed by the Tehsil (subdivision of a district) government, known as the Tehsil Municipal Administration (TMA). The lowest tier of the local government is the Union Administration. In addition to the local governance and municipal administration functions, the local government ordinances also address the land use, conservation of natural vegetation, air, water and land pollution, disposal of solid waste and wastewater effluents, as well as matters relating to public health.

3.10.17 Motor Vehicles Ordinance, 1965, and Rules, 1969

The Motor Vehicles Ordinance, 1965, was extended in 1978, to the whole of Pakistan. The ordinance deals with the powers of motor vehicle licensing authorities and empowers the Road Transport Corporation to regulate traffic rules, vehicle speed and weight limits, and vehicle use; to erect traffic signs; and to identify the specific duties of drivers in the case of accidents. It also describes the powers of police officers to check and penalize traffic offenders at the provincial level. At the same time, the ordinance also empowers the Regional Transport Authority to

operate as a quasi-judicial body at the district level to monitor road transport, licensing requirements, and compensations for death or injury to passengers on public carriers.

3.10.18 Cutting of Trees (Prohibition) Act, 1975

This Act prohibits cutting or chopping of trees without permission of the Forest Department. During the site survey conducted by the team of environmentalist and socialist, there is no tree on the site. Hence this law is not relevant to the proposed project.

3.11 ASIAN DEVELOPMENT BANK (ADB) POLICIES & STANDARDS

ADB policies and standards to manage social and environmental risks and impacts are considered;

- Safeguard Policy Statement 2009
- Policy on Gender and Development
- Social Protection Strategy
- Public Communications Policy 2011
- Core Labor Standards

3.11.1 ADB Safeguard Policy Statement 2009

ADB operational policies include three basic safeguard policies mentioned below. This safeguard policy statement applies to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees (hereafter broadly referred to as projects).

Involuntary Resettlement Safeguards

The Involuntary Resettlement Safeguards aims to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The involuntary resettlement safeguards covers physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected

areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary.

Indigenous Peoples Safeguards

The Indigenous Peoples safeguards are triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset. The term Indigenous Peoples is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees: (i) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (ii) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; (iii) customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and (iv) a distinct language, often different from the official language of the country or region. In considering these characteristics, national legislation, customary law, and any international conventions to which the country is a party will be taken into account. A group that has lost collective attachment to geographically distinct habitats or ancestral territories in the project area because of forced severance remains eligible for coverage under this policy.

Environmental Policy

The ADB Environmental Safeguards aims to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Policy on Gender and Development

The Asian Development Bank (ADB) first adopted the Policy on the role of the Women in Development (WID) in 1985 and over the passage of time has progressed from WID to Gender and Development (GAD) approach that allows gender to be seen as a cross cutting issue influencing all social and economic processes.

ADB's Policy on GAD will adopt mainstreaming as a key strategy in promoting gender equity. The key elements of ADB's policy will include the following;

***Gender sensitivity*:** to observe how ADB operations affect women and men, and to take into account women's needs and perspectives in planning its operations.

***Gender analysis*:** to assess systematically the impact of a project on men and women, and on the economic and social relationship between them.

***Gender planning*:** to formulate specific strategies that aim to bring about equal opportunities for men and women.

***Mainstreaming*:** to consider gender issues in all aspects of ADB operations, accompanied by efforts to encourage women's participation in the decision making process in development activities.

***Agenda setting*:** to assist Developing Member Country (DMC) governments in formulating strategies to reduce gender discrepancies and in developing plans and targets for women's and girl's education, health, legal rights, employment, and income-earning opportunities.

3.11.2 Policy on Gender and Development

It is the set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labor markets, diminishing people's exposure to risks and enhancing their capacity to protect themselves against hazards and interruption/loss of income. Social Protection consists of five major elements

Labor Markets policies and programs designed to facilitate employment and promote efficient operation of labor markets;

Social Insurance programs to cushion the risks associated with the unemployment, health, disability, work injury and old age.

Social Assistance and Welfare Service program for the most vulnerable groups with no other mean of adequate support.

Micro and Area Based Schemes to address vulnerability at the community level and

Child Protection to ensure the healthy and productive development of future Asian Workforce.

Social Protection System in Asia and Pacific Region

In considering the demand of social protection with Asian sub regions, it is important to identify the circumstances faced by their vulnerable groups. A common trait to all countries in the region is the need to address child and youth priorities, extend coverage to poorer communities, improve governance, and promote institutional development.

3.11.3 2011 Public Communications Policy

In 2011 Public Communications Policy that the Asian Development Bank (ADB) adopted in 2005. As approved by the Board on 25 October 2011 and with an effective date of 2 April 2012, the policy supersedes the provisions of the 2005 policy. The main objective of the policy is;

- To reduce poverty by promoting inclusive economic growth, environmentally sustainable growth, and regional integration.
- To achieve this objective, ADB funds a variety of projects and other activities to support development.
- For its projects to meet demands and be effective, ADB must seek the views of its borrowers and clients, partners, and other stakeholders, and keep them abreast of its activities.
- The overall objective of the policy is to enhance stakeholders' trust in and ability to engage with ADB. The policy recognizes the right of people to seek, receive, and impart information about ADB operations. It supports knowledge sharing and enables participatory development or two-way communications with affected people.
- 11.

ADB's public communications policy provides a framework to enable ADB to communicate more effectively. The policy aims to enhance stakeholder's trusts in an ability to engage with ADB. The policy promotes

- ❖ Awareness and understanding and results of ADB activities, policies, strategies, objectives and result;
- ❖ Sharing and exchange of development knowledge and lessons learned, so as to provide fresh and innovative perspectives and development issues;
- ❖ Greater two-way flow of information between ADB and stakeholders' including project affected people, in order to promote participatory development; and
- ❖ Transparency and accountability of ADB operations

3.11.4 2001 Social Protection Strategy

ADB adopted a commitment to Core Labor Standards (CLS) as part of its Social Protection Strategy in 2001. Since then, ADB ensures that CLS are duly considered in the design and implementation of its investment projects. In this regards a handbook for CLS has been developed by ADB with cooperation of International Labor Organization (ILO). The objective is to convince decision makers that the introduction of CLS and labor standards in general will not impede development. The labor standards are simple the rules that govern how people are treated in a working environment. Labor standards cover a very wide variety of subjects, mainly concerning basic human rights at work, respect for safety and health and ensuring that people are paid for their work. CLS are a set of four internationally recognized basic rights and principles at work.

- Freedom of association and the effective recognition of the right to collective bargaining;
- Elimination of all forms of forced or compulsory labor;
- Effective abolition of child labor; and
- Elimination of discrimination in respect of employment and occupation

3.12 WORLD BANK GUIDELINES ON ENVIRONMENT

The principal World Bank publications that contain environmental guidelines are listed below.

- Environmental Assessment Operational Policy 4.01.Washington, DC, USA. World Bank 1999. Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross Sectorial Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991,Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.Environmental Health and Safety (EHS) guidelines, International Finance Corporation (IFC) World Bank Group, 2007.
- The first two publications listed here provide general guidelines for the conduct of an IEE, and address the IEE practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects in mind, and is especially relevant for the impact assessment of large-scale infrastructure projects, contains a wealth of information which is useful to environmentalists and project proponents.
- The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts,

provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment, and emphasizes the need to incorporate socio-economic issues in IEE exercises.

The EHS guidelines published by IFC are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background d and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during construction, operation, and decommissioning phase of project or facility.
The World Bank Guidelines for noise are provided in Table 2-1.

Table 3.1 World bank Guidelines for Noise levels

No.	Receptor	Day (07:00-22:00)	Night (22:00-07:00)
1.	Residential & Institutional educational	55	45
2.	Industrial & Commercial	70	70

Source: Pollution Prevention and Abatement Handbook World Bank Group (1998)
Notes: Maximum allowable log equivalent (hourly measurements) in dB(A)

3.13 Equator Principles

The Equator Principles are a set of guidelines, promoted by the International Finance Corporation (IFC) that address the environmental and social issues associated with major development projects worldwide. They provide a common baseline and framework for the implementation of internal environmental and social procedures and standards for project financing activities across all industries.

Principle 1: Review and Categorization (of projects)
Principle 2: Social and Environmental Assessment
Principle 3: Applicable Social and Environmental Standards
Principle 4: Action Plan and Management System
Principle 5: Consultation and Disclosure
Principle 6: Grievance Mechanism
Principle 7: Independent Review

Principle 8: Covenants
Principle 9: Independent Monitoring and Reporting
Principle 10: EPFI Reporting

Review and categorization

An EPFI will categorize a project, based on the magnitude of the potential social or environmental impacts and risks of that project, in accordance with IFC classification criteria.

These categories are:

Category A: Projects with potential significant adverse social or environmental impacts that is diverse, irreversible or unprecedented.
Category B: Projects with limited adverse social or environmental impacts that is few in number, generally site specific, largely reversible and readily addressed through mitigation measures.
Category C: Projects with minimal or no social or environmental impacts.
Solar Energy projects, by their nature; tend to fall into Categories B or C, being medium or low risk. Certain EPFIs as a matter of policy for example treat every solar power project as
Category D: The Equator Principles apply to projects over 10 million US dollars. The Principles state that adopting financial institutions will provide loans directly to projects only under the following circumstances:
This IEE study has adequately addressed the Equator Principles applicable to risky projects as stated hereunder:

Principle 1 (Review and Categorization): The study has reviewed the National and International Laws and Guidelines on different environmental aspects and has categorized the Zorlu Solar Power Pakistan Pvt. Ltd Solar Power Project in Category C (Low Hazard) as mentioned in Section 03.

Principle 2 (Social and Environmental Assessment): The Study has been prepared to respond to the National and International requirements and to satisfactorily address the key environmental and social issues as mentioned in the report of Section 07.

Principle 3 (Applicable Social and Environmental Standards): For the purpose of this IEE Study, primary data on the baseline environmental and social conditions have been generated wherever necessary to address the requirements of National laws and regulations; applicable International Treaties and Agreements; sustainable development and use of renewable natural resources; protection of human health, cultural properties, and biodiversity and other physical,

ecological and socioeconomic issues required to be addressed under this Principle. The baseline data is also provided in Section 05 of the IEE report.

Principle 4 (Action Plan and Management System): Section-6 of this study screens the potential environmental impacts and proposes/provides Mitigation Measures to reduce the severity of impact. The study also includes the Environmental Monitoring and Management Plan.

Principle 5 (Consultation and Disclosure): Being a project of Category C, the public consultation is limited to the scoping sessions with stakeholders and an extensive socio economic survey of the villages/hamlets that are all outside the boundary of the Project area. The surveys and consultation meetings have established that no settlements or temporary relocation or acquisition of land is involved in the project area. This has mentioned in Section 08 of the IEE report and briefly explain this matter.

Principle 6 (Grievance Mechanism): This Principle will not apply since 'no' resettlement or temporary relocation or acquisition of land is involved. It not only restrict the resettlement issues but also include the issues related to public complaints and some other related issues. A separate register will be maintained on site during the construction phase of the project.

Principle 7 (Independent Review): Being placed in Category C, an independent review is not required.

Principle 8 (Covenants): The IEE study has incorporated Covenants linked to compliance. Moreover, No Objection Certificates are issued to Proponents of Project under conditions of compliance with the Mitigation and Performance Monitoring Plan during the construction and operational phase of the project. Needless to say that if the proponent does not comply with the agreed terms, Punjab EPA is authorized to take corrective and even coercive action.

Principle 9 (Independent Monitoring and Reporting): This Principle will be applicable to the Zorlu Solar Power Pakistan Pvt. Ltd for Solar Power Project since it falls in category C of projects requiring an IEE.

Principle 10 (EPFI Reporting): The concerned EPFI may safely commit to report publicly at least annually about its Equator Principles implementation processes and experience.

3.14 IFC Performance Standards on Social and Environmental Sustainability

International Finance Corporation (IFC) applies the Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in its member countries eligible for financing. The Performance Standards are also applied to the projects in emerging markets. Together, the eight Performance Standards establish standards that the Proponent is to meet throughout the project.

The objectives of Performance standards are given below:

- To identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence
- To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities , and the environment
- To promote improved social and environment performance of companies through the effective use of management systems.

Performance Standard-1: Social & Environmental Assessment and Management System

This Performance Standard seeks to:

- Identify and assess social and environment impacts in the project's area of influence;
- Avoid, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment;
- Ensure that affected communities are appropriately engaged on issues that could potentially affect them; and
- Promote improved social and environment performance of the project through the effective use of management systems.

Under this Standard, the project is required to establish and maintain a social and environmental management system appropriate to the nature and scale of the project and in accordance with the level of social and environmental risks and impacts. The management system is required to incorporate the following elements:

- Social and Environmental Assessment;
- Management program;

- Organizational capacity;
- Training;
- Community engagement;
- Monitoring; and
- Reporting

This IEE study has been conducted to respond to requirements of national legislation and international Guidelines as well fulfills the above requirements of the IFC Performance Standards PS1.

Performance Standard-2: Labor and Working Conditions

This PS seeks to establish, maintain and improve the worker-management relationship; promote fair treatment, non-discrimination and equal opportunity for workers, and compliance with national labor and employment laws; protect the workforce by addressing child labor and forced labor issues; and promote safe and healthy working conditions, and to protect and promote the health of workers.

The Sponsors of proposed project and their contractors will be required to adhere to this PS, in particular with regard to compliance with national labor and employment laws; employment of child labor, and promoting safe and healthy working conditions, besides protecting and promoting the health of workers.

Performance Standard-3: Pollution Prevention and Abatement

The PS 3 seeks to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities, and to promote the reduction of emissions that contribute to climate change. The Standard requires the project to consider during its entire lifecycle ambient conditions and apply pollution prevention and control technologies and practices that are best suited to avoid or, where avoidance is not feasible, minimize or reduce adverse impacts on human health and the environment while remaining technically and financially feasible and cost-effective.

PS 3 will be applicable to all stages of the Zorlu Solar Power Pakistan Pvt. Ltd for the Project. Various aspects of pollution prevention and abatement of the proposed project are discussed separately in this report.

Performance Standard-4: Community Health, Safety and Security

The PS 4 seeks to avoid or minimize risks to and impacts on the health and safety of local community during the project lifecycle from both routine and non-routine circumstances, and to ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security. The PS requires the project to evaluate the risks and impacts to the health and safety of the affected community during the design, construction, operation, and decommissioning of the project and establish preventive measures to address them in a manner commensurate with the identified risks and impacts.

The present assessment addresses the requirement of PS 4 for the proposed project, and has evaluated the impacts of sitting the project on health, safety and security of the community in the microenvironment as well as the macro environment. The Environmental Management Plan also addresses company community aspects.

Performance Standard-5: Land Acquisition and Involuntary Resettlement

This PS aims to address the adverse impacts associated with land acquisition and involuntary resettlement caused by the project. The PS seeks to:

- Avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs.
- Mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by: (i) providing compensation for loss of assets at replacement cost; and (ii) ensuring that resettlement

activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.

- ❖ Improve or at least restore the livelihoods and standards of living of displaced persons.
- ❖ Improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.

The project site is the Zorlu Solar Power Pakistan Pvt. Ltd. Moreover there is no permanent settlement or hamlet within the designated area nor its surroundings. Project Land has been leased by the Government of Punjab to Zorlu Solar Power Pakistan Pvt. Ltd.

Performance Standard-6: Biodiversity Conservation and Sustainable Natural Resource Management

The PS 6 seeks to protect and conserve biodiversity, and promote sustainable management and use of natural resources through adoption of practices that integrate conservation needs and development priorities.

The present environmental assessment addresses the potential impacts of the proposed project on the biodiversity. This IEE has recommended measures for the conservation of flora, fauna and other natural resources.

Performance Standard-7: Indigenous Peoples

The PS 7 seeks to address the impacts of the project on the indigenous people. Specifically, the objectives of the PS are to:

- ❖ Ensure that the development process fosters full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples.
- ❖ Avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not feasible, to minimize, mitigate, or compensate for such impacts, and to provide opportunities for development benefits, in a culturally appropriate manner.

- ❖ Establish and maintain an ongoing relationship with the Indigenous Peoples affected by a project throughout the life of the project.
- ❖ Foster good faith negotiation with and informed participation of Indigenous Peoples when projects are to be located on traditional or customary lands under use by the Indigenous Peoples.
- ❖ Respect and preserve the culture, knowledge and practices of Indigenous Peoples

  No indigenous people - with a social and cultural identity distinct from the existing dominant society that makes them vulnerable to being disadvantaged in the development process of the proposed project are known to exist in and around the proposed site. No such people were found in the area during the present study either. Therefore, this PS is not applicable for the proposed project.

Performance Standard-8: Cultural Heritage objectives have been set in the IFC performance standards to achieve sustainable development.

The objectives of this PS-8 are to protect cultural heritage from the adverse impacts of project activities and support its preservation, and to promote the equitable sharing of benefits from the use of cultural heritage in project activities.

No sites of cultural heritage are known to exist at or in the immediate vicinity of the project location. There are also no indications of any old settlement in the area, nor is there any site covered under the listing of cultural heritage sites. This PS will therefore not be applicable to the Project.

3.15 INSTITUTIONAL SETUP FOR ENVIRONMENTAL MANAGEMENT

The apex environmental body in the country is the Pakistan Environmental Protection Council (PEPC), which is presided by the Chief Executive of the Country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, AJK and Northern Areas), and environmental tribunals. The EPAs were first established under the 1983 Environmental Protection Ordinance; the PEPA 1997 further strengthened their powers. The EPAs have been empowered to receive and review the environmental assessment reports (IEEs and EIAs) of the proposed projects, and provide their approval (or otherwise). The

proposed project would be located in Punjab Province, hence this IEE report will be sent to the Punjab-EPA for review.

3.16 OBLIGATION UNDER INTERNATIONAL TREATIES

Pakistan is signatory of several Multilateral Environmental Agreements (MEAs), including:

- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal,
- Convention on Biological Diversity (CBD),
- Convention on Wetlands (Ramsar)
- Convention on International Trade in Endangered Species (CITES),
- UN Framework Convention on Climate Change (UNFCCC),
- Kyoto Protocol,
- Montreal Protocol on substances that deplete the ozone layer,
- UN Convention to Combat Desertification,
- Convention for the Prevention of Pollution from Ships (MARPOL),
- UN Convention on the Law of Seas (LOS),
- Stockholm Convention on Persistent Organic Pollutants (POPs),
- Cartina Protocol.

These MEAs impose requirements and restrictions of varying degrees upon the member countries, in order to meet the objectives of these agreements. However, the implementation mechanism for most of these MEAs is weak in Pakistan and institutional setup nonexistent. Although almost all of the above MEAs would apply to the projects in one way or the other, the ones which have direct relevance for the proposed project include the Basel Convention Montreal Protocol, Stockholm Convention, UNFCCC and Kyoto Protocol. Kyoto protocol apply for the proposed project because it's used in CDM (Clean Development Mechanism) A CDM project activity might involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient supply system. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

SECTION 4

PROJECT DESCRIPTION

4 PROJECT DESCRIPTION

4.1 LOCATION OF PROJECT

The proposed project site is located in Quaid-e-Azam Solar Park (Extension) Lal Sohanra, District Bahawalpul-Punjab. It is around 37 kilometers away from Bahawalpur City. The land area of about 500 acres is leased by the Government of Punjab to Zorlu Solar Pakistan (Pvt) Ltd for the implementation of 100 MW solar PV project. The total boundary of land and the portion selected for project site is shown in the **Figure 4.1.**

Bahawalpur was a princely state of the Punjab in what is now Pakistan, stretching along the southern bank of the Sutlej and Indus Rivers. It became part of Pakistan in 1947 and is divided into three districts: Bahawalpur, Rahimyar Khan and Bahawalnagar. Bahawalpur is located in Punjab and its a 12th largest city in Pakistan. The city is capital of Bahawalpur District. The city was once the capital of the former princely state and later the province of Bahawalpur. The city was home to various Nawabs (rulers) and counted as part of the Rajputana states (now Rajasthan, India). The city is known for its famous palaces such as the Noor Mahal, Sadiq Ghar Palace, and Darbar Mahal, as well as the ancient fort of Derawar in the Cholistan Desert bordering India. The city is home to one of the few natural safari parks in Pakistan, Lal Suhanra National Park.

The princely state of Bahawalpur was founded in 1802 by Nawab Mohammad Bahawal Khan II after the break-up of the Durrani Empire. The city is over 4.51 kilometres long. Nawab Mohammad Bahawal Khan III signed a treaty with the British on 22 February 1833, guaranteeing the independence of the Nawab. The state acceded to Pakistan on 7 October 1947 when Nawab Sadiq Muhammad Khan Abbasi V Bahadur decided to join Pakistan at the time of independence. The predominantly Muslim population supported Muslim League and Pakistan Movement. After the independence of Pakistan in 1947, the

minority Hindus and Sikhs migrated to India while Muslims refugees from India settled down in the Bahawalpur state. Bahawalpur became a province of Pakistan in 1952 and was merged into the province of West Pakistan on 14 October 1955. When West Pakistan was divided into four provinces Sindh, Balochistan, Khyber Pakhtunkhwa, and Punjab Bahawalpur was merged in Punjab.

The location of site can be viewed in **Figure 4.1 and Figure 4.2.** Nearby areas of the project site is shown in **Figure 4.3.**

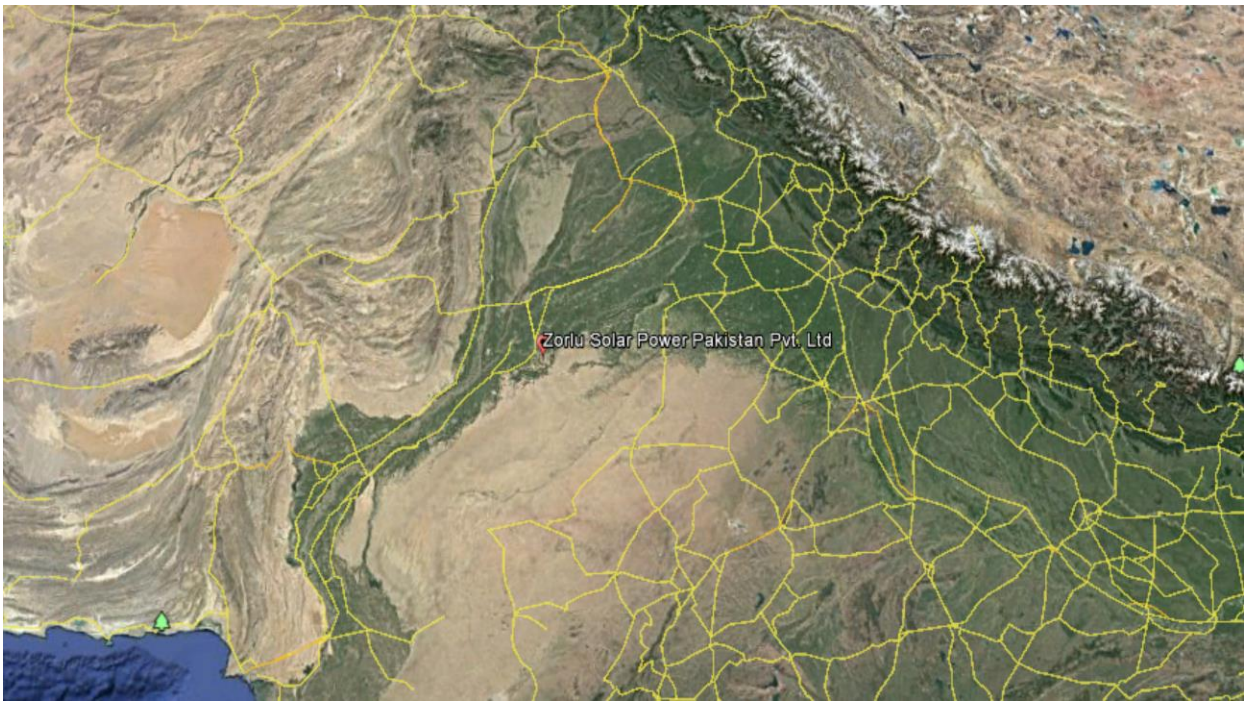


Figure 4.1: Location of Site on Pakistan Map

Figure 4.2: Project Site Overview

Below is the map of Bahawalpur district showing the towns, places and road network;

Figure 4.3: Map of Bahawalpur

The coordinates of Project Site are given in **Table 4.1** and marked in **Figure 4.4**;

Table 4.1: Geographical Coordinates of Project Site

Boundary Point	Geodetic	
	Latitude	Longitude
1.	29°16'50.10"N	71°47'19.98"E
2.	29°16'50.10"N	71°48'22.08"E
3.	29°16'30.54"N	71°48'22.08"E

4.	29°16'30.54"N	71°48'9.66"E
5.	29°16'20.76"N	71°48'9.66"E
6.	29°16'20.76"N	71°47'57.24"E
7.	29°16'1.20"N	71°47'57.24"E
8.	29°16'1.20"N	71°47'13.98"E

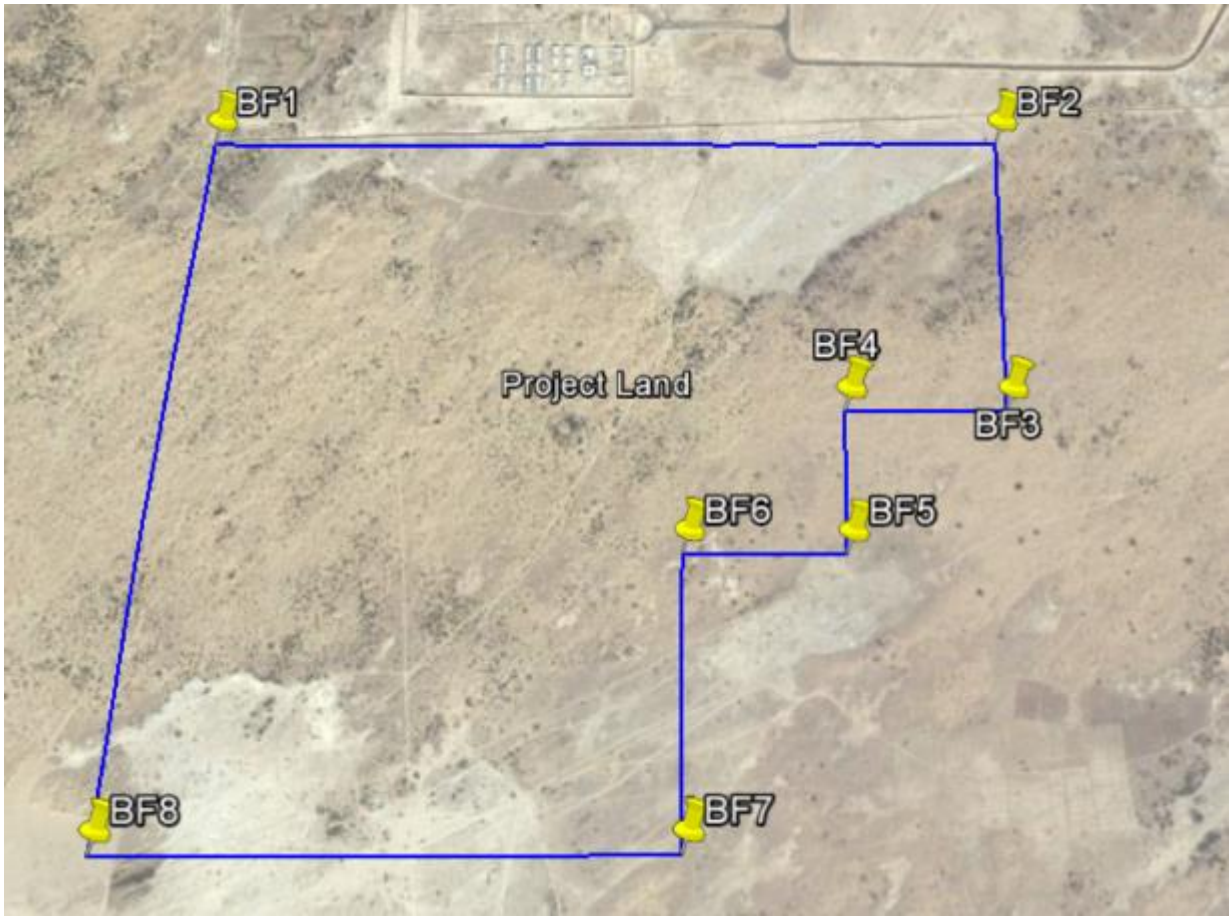


Figure 4.4: Project Site Coordinates

The project area is open and can be seen from the images below;

Project Site (View-1)

Figure 4.5: A View of Project Site

4.2 ROAD ACCESS

The Project Site is easily accessible. Going from Bahawalpur city, there is two main roads Canal Road and Hasilpur Road towards project site and the panels will be import through ships Via Qasim Port (Karachi) and will be transported on project site by using trailer (heavy vehicles). The movement is planned from Port Qasim to the site using National Highway (N-5) and Super Highway (M-9). The major track from Karachi to site is multi-lane as well as single carriage road.

The track towards the project site from Canal Road is shown with blue path in **Figure-4.6.**

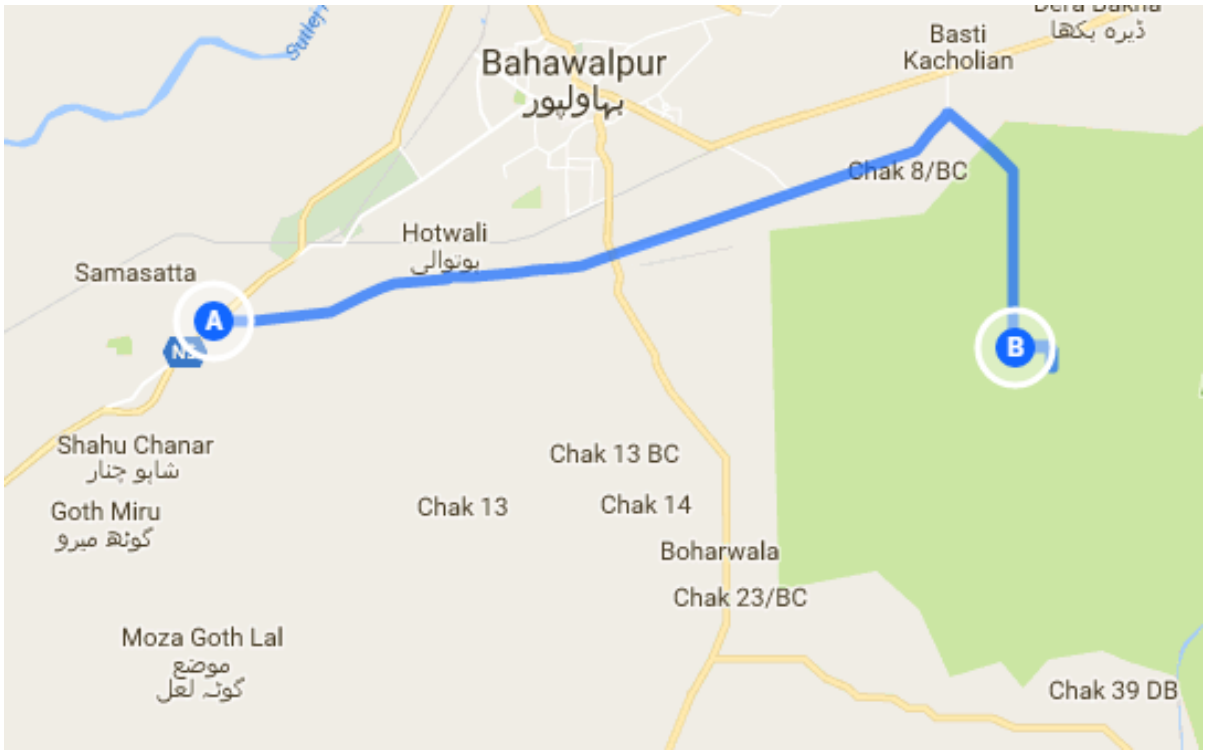


Figure 4.6: Road Access to Project Site through Canal Road

Distance from Bahawalpur City to Lahore is approx. 635 kms. One way from Lahore to Bahawalpur City, then and goes towards Multan Road N-5. Continue towards Multan Road N-5 and take turn on left onto Noorpur Thal – Shergarh Road N-5. After this move towards the Okara Bypass Road and then Sahiwal Bypass and also touched from Multan Road then goes on Multan Road. Then move toward the Chichawatni Bypass and continue move towards the Multan Lahore Road N-5. After that cross the Mian Channu Bypass and after that move left towards Multan-Faisalabad Motorway (M-4). Then take left from M-4 to N-5 National highways Multan Road towards Bahawalpur City. From Bahawalpur City to project site reached through Canal Road. It took around six to seven hours to reach on project site from Lahore through this track.

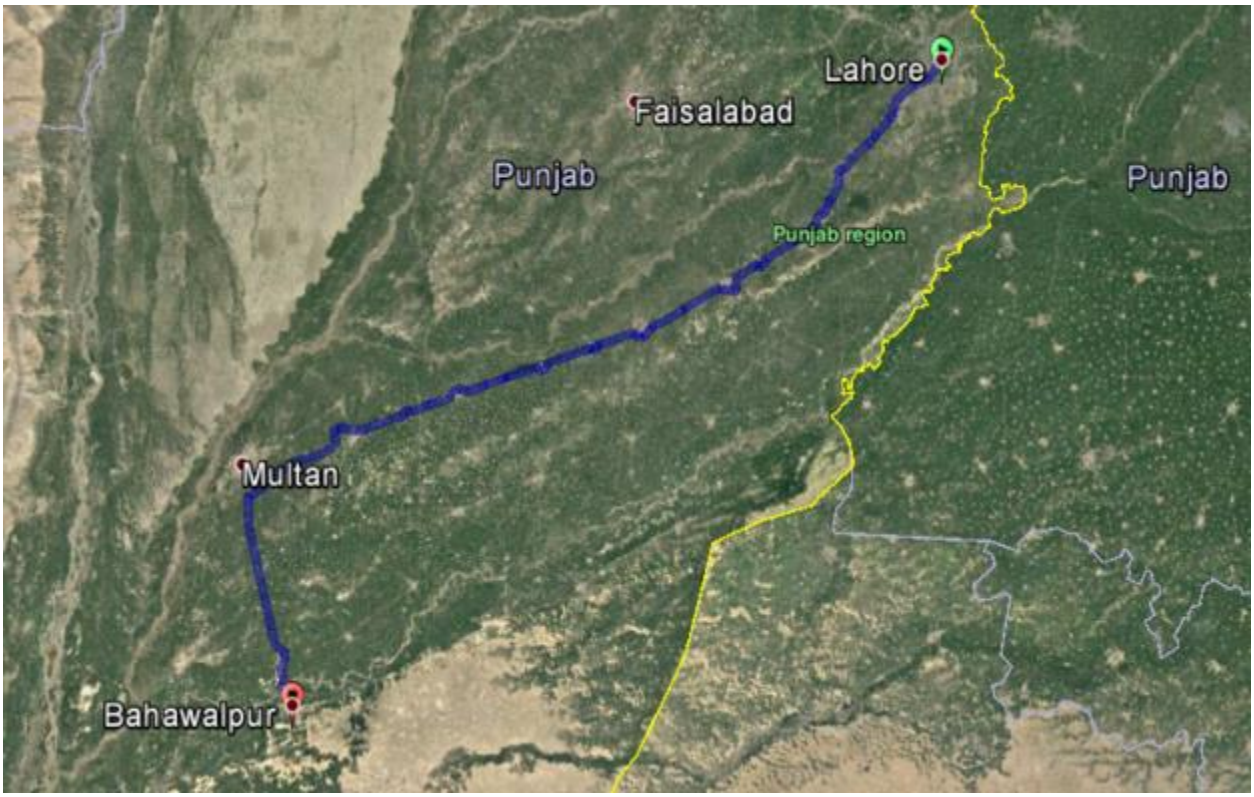


Figure 4.7: Road Access to Project Site through Lahore-Bahawalpur Road

Arial distance of the port from the site is approximately 660 km. Total track length between Port Qasim and site is approximately 855 km. There are few bridges on the way from Bin Qasim port to the site. The load bearing capacity of the bridges in between the site and the port is reliable. Considering, the track has already been used for heavy transportation therefore road conditions are reasonable for transportation of equipment.

The track starts from Port Qasim and after covering 10 km distance through Pakistan Steel Mills Road, it joins National Highways (N5). After 08 km on N5 the track moves to N5-M9 Kathore link Road and covers around 20 km and joins Super Highway M9. After distance of almost 120 km on M9, the track joins N5 again after Hyderabad Bypass. After almost 670 km on N5, the track moves towards Site through Canal Road and after 23 km the track enters Quaid-e-Azam Solar Park road and reaches the Site after 15 km on QASP Main Road. Detailed access to the site from Port Qasim Karachi is shown in Figure 8.8.

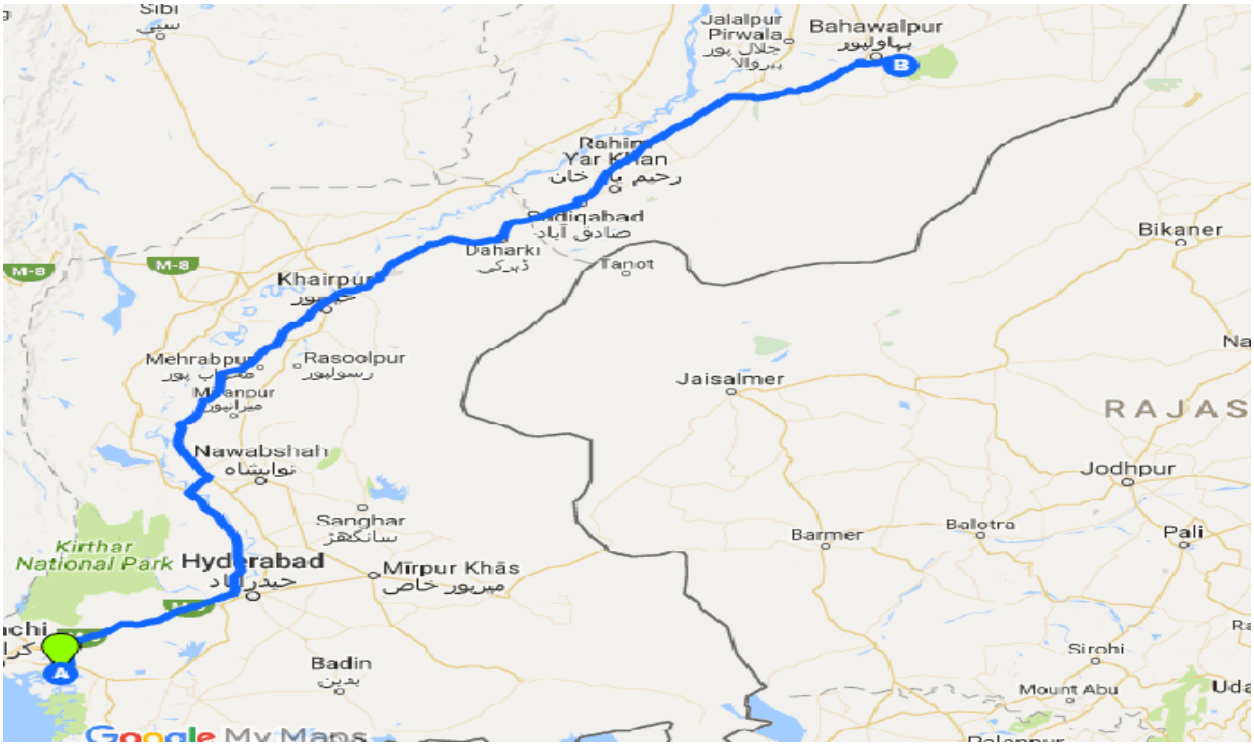


Figure 8.8: Detailed Access to the Site

4.3 LOCATION OF GRID

Pakistan has a vast transmission and distribution system ranging from Northern areas to the farthest corner of Balochistan and Sindh. National Transmission and Dispatch Company (NTDC) is the main authority which manages all the transmission facilities and the National Grid with the help of 08 distribution companies, the MEPCO.

The project site is located around 500 meters from the nearest 220 kVA Lal Suhanra – Bahawalpur Grid Station. The power generated from this Solar PV plant will be transmitted or supply to the Lal Suhanra – Bahawalpur Grid Station. A new sub-station, 500 meters within the solar park, will be tapped for the project and will immediately connect to the national grid outside the solar park to feed the energy generated. The T/L will not entail any physical or economic impact to any individual or household. A separate electrical and grid interconnection study will be conducted for the project including Power Quality, Load Flow, Short Circuit and Power Evacuation. Generally the transmission line is constructed by the NTDC and not the project company. Also it is part of the Energy purchase Agreement, which is signed between NTDC and the project company at a much later stage.

4.4 SCOPE & LAYOUT

A 100 MW solar PV plant will be constructed and operated on the site. Each array is one mechanical assembly and has 869,701 solar panels; each of First Solar FS4112-3, FS4115-3 and FS4118-3 SEGP6-60 (260W). Modules from the PV manufacturer First Solar with a power rating of 112.5 Wp, 115 Wp & 117.5 Wp, are being considered to be installed for the Project. The modules will be mounted on fixed installed structures in portrait position, 2 modules rows per mounting table.

The Quality of Solar panels are thin films CdTe Cadmium telluride (CdTe) photovoltaics and the number of panels will be installed are 869,701.

The electricity generated will be directly fed into the Sub-Station and then transferred to the National Grid which is located around 500 meters from project boundary. The national grid is located immediately after the solar park boundary.
Interconnection of PV modules and information of arrays is shown in **Figure 4.9**.

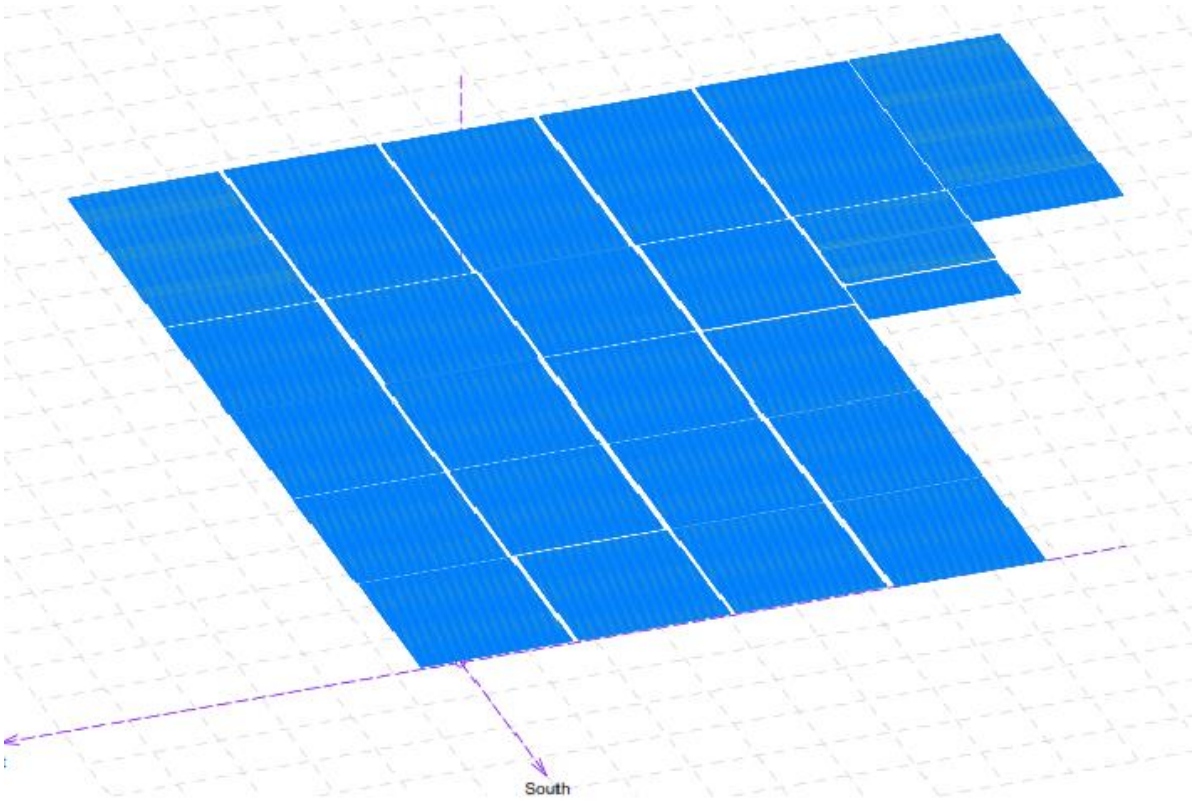


Figure 4.9: General PV Layout

SECTION 5

BASELINE ENVIRONMENTAL CONDITIONS

5 BASELINE ENVIRONMENTAL CONDITIONS

5.1 PROJECT AREA

The Project Site will be located in Quaid-e-Azam Solar Park (Extension) in Lal Sohanra, District-Bahawalpur Punjab. The project site is located around 37 Kilometers away from Bahawalpur City.

The total land area requirement for the implementation of 100 MW Solar PV project is about 500 acres and the land within the solar park has been leased by the Government of Punjab to Zorlu Solar Pakistan (Pvt) Ltd. Bahawalpur is one of the oldest cities of Pakistan and is located at 40 km away from project site. Bahawalpur is located near the Cholistan Desert and it is situated on the south of Sutlej River.

There are no settlements in the vicinity of the project within 2-5 km radius. The nearest settlement is Chak 40 DB village which is 04 to 05_ kilometers away from the solar park. The solar park was developed in 2015 and no individuals or households were displaced as the whole area is uninhabited. The settlements visited to get the environmental and social baseline information are far away. An Area of 5 Km from the project site is considered as influence zone shown in **Figure 5.1** and hence it has been taken as study area during site survey and collection of primary and secondary environmental and social data.

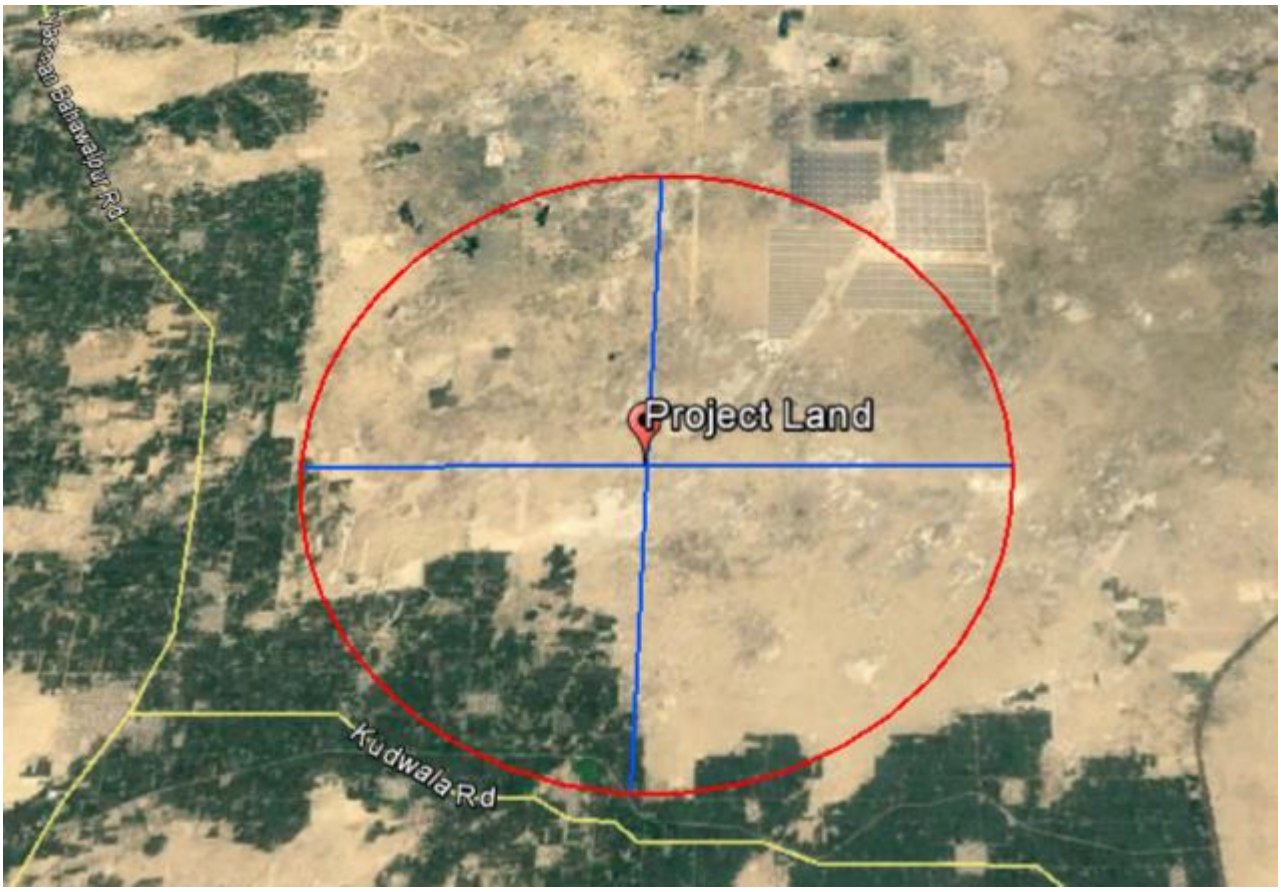


Figure 5.1: Boundary of Project Influence Zone

5.2 TOPOGRAPHY

Topographically speaking, location of Bahawalpur division appeared as follows: in the north its boundaries were limited to River Sutlej, Panjnad and Indus River, which separates Multan and Dera Ghazi Khan, (where the adjacent districts of Sahiwal, Vehari, Multan, Lodhran, Muzaffargarh and Dera Ghazi Khan are located); while Sukkur Division of Sind province lies in south west. The East Punjab province of India and ex-princely states of Bekaneer and Jessalmer were adjacent to the south of Bahawalpur. This area is extremely important regarding national defense and from a strategic point of view. Three districts of Division Bahawalpur are integral part of it: Bahawalnagar, Raheemyar Khan and Bahawalpur District. Bahawalpur division was an administrative unit of the Punjab Province of Pakistan, until the reforms of 2000 when the third

tier of government was abolished. Bahawalpur got the charge of district, and it was bound on North by Lodhran District, on the East by Bahawalnagar District and India, on the South by India and on the West by Rahimyarkhan and Muzafar Garh Districts. Bahawalpur is one of the largest districts of the Punjab covering an area of 24,830 square miles. It has peculiar demographic, topographic and geographical characteristics. The district is situated almost in the center of the country at an elevation of 152 meters from the sea levels. It has Five Tehsils; Bahawalpur, Ahmad Pur East, Yazman (i/c Cholistan), Khair pur Tamewali, Hasilpur.

Its topography comprises of sand dunes that are sparingly dotted with wild bushes. Owing to scanty rainfall the vast expanse of land remains largely uncultivated, but the banks of the river are lined with cultivation and vegetation. Some areas have been made cultivatable by means of canals and tube wells. The Lal Sohanra is almost barren and consist of small bushes and sand dunes. But the proposed location for the installation of plant is totally barren land and there is no plantation in the vicinity of the project area. The site is already allocated for the Quaid-e-Azam Solar Park and there are four solar projects that have been developed in the project area.

The water level in this area is higher than in the upland. The soil is sandy. The upland is flat plains. The general height of the area is from 118 to 127 meters above the sea level. Topographic map of Bahawalpur derived from satellite mapping is shown in **Figure 5.2.**

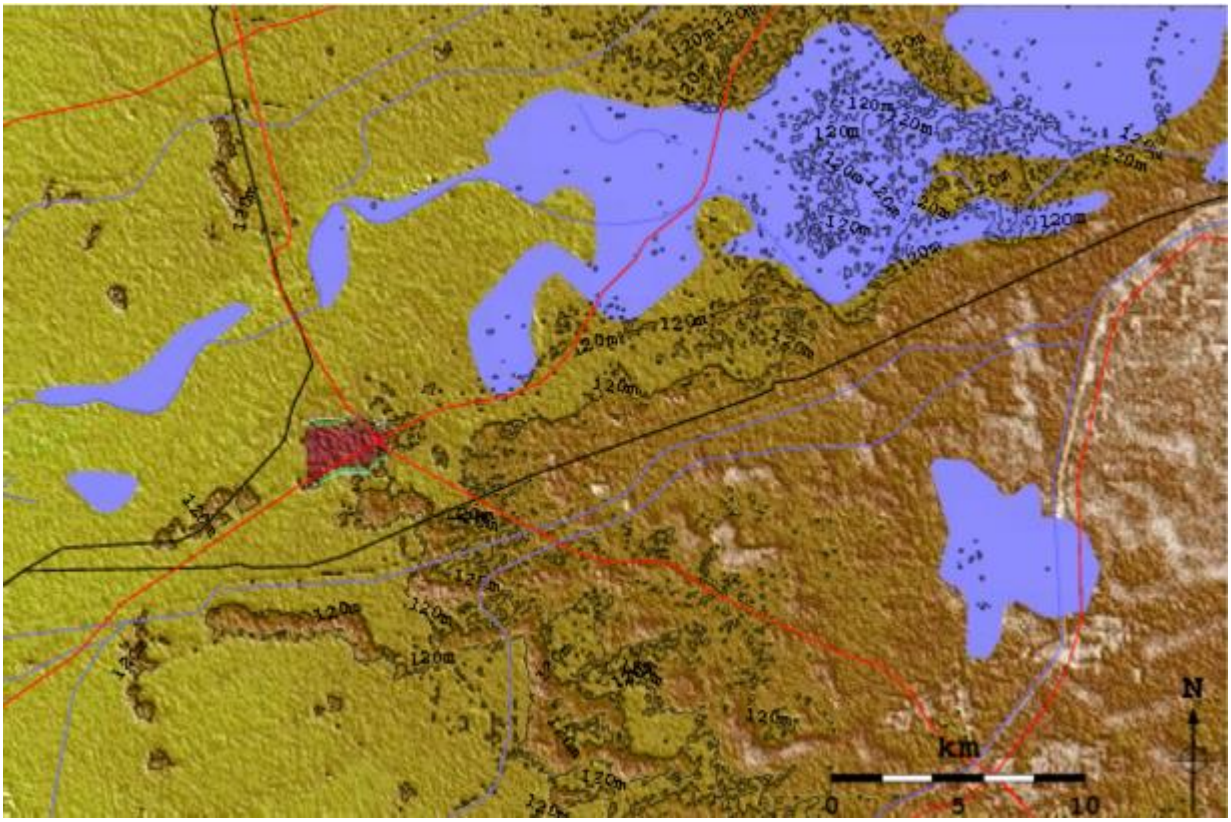


Figure 5.2: Topographic Map of Bahawalpur District

5.3 CLIMATOLOGY

The climate of Bahawalpur is hot because, being adjacent to Rajputana desert, this area overall resembles the dry climate of an arid desert. The summer season lasts from the month of March to October for almost eight months, while the weather is pleasant and cold from November to February. The average temperature in the summer season remains between 40 and 50 degree centigrade, while during winter it is between 5 and 15 degree centigrade, which ruins the crops. Before the launching of canal system, when the Bahawalpur region mostly comprised of sand dunes, the temperature of Fort Abbas and Khanpur sometimes used to match that of Jacobabad and became the cause of sand storms.

The weather conditions of Bahawalpur varies from different conditions like; seasonal variations, weather pattern shifts, monsoon season, peak summer season etc. The project area falls in Cholistan Desert which is a part of the world's seventh largest desert, the Great Desert, which is stretched along the south border of Punjab province, Pakistan. The total area of proposed project is 500 acres; with an altitude of about 120 m above sea level, the

important geological features of the area is the old Hakra River, which was dried out about 600 years ago. Historically, the area received heavy monsoon downpours along with the Indus Valley, which is the home of world's oldest civilizations, Mohenjo-Daro and Harappa, date back to 5000 years. A gradual change in climate caused a shift in monsoon winds away from the area resulting in a decline in precipitation, and ultimately converting the area into a desert (Arshad et al., 2002).

The climate in project area is harsh, sub-tropical hot and arid, and influenced by seasonal monsoons. One of the most remarkable features of the project area is the occurrence of dry years in clusters, i.e., for 4-6 years continually. Annual and even daily temperature varies greatly. Mean summer temperature varies from 35 to 50 °C during the month of May to June and winter from 15 to 20 °C during December to February. Annual rainfall is low and erratic, ranging from 100-250 mm annually, with its maximum during July to September in summer monsoons and January to March in winters.

Climate Change Scenario in Pakistan

Pakistan is also facing the change in its climatic conditions, especially in the temperature which seems to be risen considerably. Climate has intrinsic variability and has been changing in past decades, even, before we started measuring the climate parameters. But the uniqueness of this issue in modern world is that human activities are now playing significant role in causing the climate to change. This is evident from the recent rise in carbon dioxide (CO2) concentration in the atmosphere and in response the rise of global temperatures on land and ocean's surface. The country is on number 12 in the list of most vulnerable nations in the world (R. K. Pachauri, 2009).

According to ADB report on climate change profile of Pakistan, the annual mean temperature in Pakistan has increased by roughly 0.5°C. The number of heat wave days per year has increased nearly fivefold in the last 30 years. Annual precipitation has historically shown high variability but has slightly increased in the last 50 years. . Average annual rainfall is not expected to have a significant long-term trend, but is expected to exhibit large inter-annual variability. In Pakistan, the energy sector is the largest contributor of GHG emissions. In 2012, energy sector emissions accounted for 46% of the total national GHG emissions inventory (footnote 38). The major likely impact of climate change on the energy sector is predicted to be changes in precipitation patterns, temperatures rising, and extreme weather events. The country's current energy needs are heavily dependent on oil and gas while the demand far exceeds supply, Moreover, Pakistan's water resources are at severe risk to climate change.

Climate Change Assessment and impacts

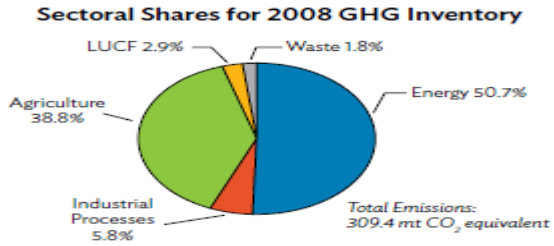
A. Effects of the Environment on the Project

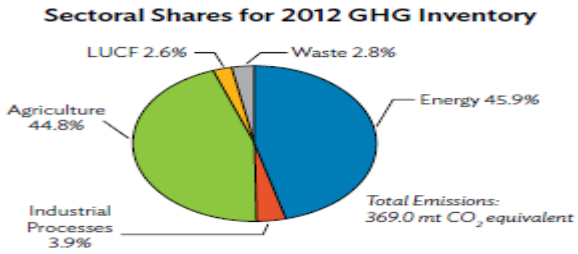
The Project is engineered and designed to integrate into its environmental surroundings and operate safely and reliably over the lifetime of the Project. Solar photovoltaic panels have an operating lifetime of 25 and more years and photovoltaic systems are vulnerable to flood, wind and extreme temperatures (Patt et al. 2010). Solar cell output is rated at 25°C with output decreasing by about 0.39% for each temperature rise of 1°C. Cell temperatures for roof-mounted arrays in warm climates can easily reach 50°C–75°C. The module structure foundations will be designed to the current standards related to potential storm, and the risk is expected to be minimal based on the competent ground conditions and the modest potential for storm in the south of the Punjab province.

In the project area, there is very little impact on it because there is not any emissions of gases, pollutants discharge, and not any type of hazardous waste. As there is only reflection of panels which is almost negligible to the environment or may rise some temperature in the area. To mitigate these issues, a proper waste handling mechanism will be implemented, third party EPA-certified will be hired to handle the waste, waste water will be stored in the socking pits, waste will be collected from the site and will be properly dumped on the municipal dumping site finalized by the EPA.

Greenhouse Gas Emission Profile of Pakistan

According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), global greenhouse gas (GHG) emissions have accelerated to an unprecedented level despite global efforts to cut down emissions. According to the national GHG inventory of Pakistan for the year 2011–2012, its total GHG emissions was at 369 million tons of carbon dioxide equivalent (MtCO2e) with 45.9% share of energy, 44.8% share of agriculture and livestock sector, 3.9% share of industrial processes, and 2.6% share of land use change for forestry sectors. The energy and agriculture livestock sectors alone account for 90.7% of the total emissions pool and have thus far remained the biggest emitters of GHGs since 1994. Sector Share Comparison of Greenhouse Gas Inventories for Pakistan, 2008 and 2012





Pakistan ranks relatively low among countries on a per capita GHG emissions basis, due to its relatively low level of development and high population.

B. Climate Change Trends in Pakistan

- During the last century, Pakistan's average annual temperature increased by 0.57°C compared to 0.75°C for South Asia, and average annual precipitation increased by 25%. The warming is mainly due to increase in winter temperature.
- Heat wave days per year increased by 31 days in the period 1980 to 2007. Cold waves decreased in north eastern and southern parts, and increased in western and north western parts of the country.
- Observed sea level rise along the Karachi coast was 1.1 millimeters per year in the past century.

- Future Projections

  - ✓ Pakistan's projected temperature increase is expected to be higher than the global average.
  - ✓ Projected temperature increase in northern parts is expected to be higher than the southern parts of the country.
  - ✓ The frequency of hot days and hot nights is expected to increase significantly.
  - ✓ Pakistan's rainfall projections do not indicate any systematic changing trends.
  - ✓ Major crop yields such as of wheat and rice are expected to decrease significantly.
  - ✓ Water availability per capita is projected to decrease to an alarming level.

- ✓ An increasing trend in the rainfall over the Upper Indus Basin and decreasing trend in the Lower Indus Basin.

- It is observed in this study that the warming trend during winter is greater than in summer
- The PMD (Pakistan Metrological Department) conducted another significant study that computed temperature and precipitation change for different regions of Pakistan from 2011 to 2050. The climate models show a maximum rise in the northern areas of Pakistan, central and south Punjab
- The average mean sea level rose to 1.1 mm/year for Pakistan

C. Sector Climate Change Impacts

- Climate Change Impacts on Agriculture, Livestock, and Forestry

  - ✓ It is estimated that with rise of temperature (+0.50C–20C), agricultural productivity will decrease by around 8%–10% by 2040.Different simulation studies, using the crop–growth simulation model, estimated a decrease in yield of major crops, specifically for wheat and rice, and the length of growing season in four agro-climatic zones of Pakistan
  - ✓ A general assumption is it will be through degradation of grazing systems such as pastures and grazing lands due to drought, floods, and a rise in temperature and, ultimately, loss of land productivity, decrease in fodder quality and quantity, and increase in disease epidemics
  - ✓ It is assessed that the nine dominant plant types or biomes for the climate change impact. Out of nine biomes selected, three biomes (alpine tundra, grassland or arid woodlands, and deserts) showed a reduction in their area, and five biomes (cold conifer or mixed woodland, cold conifer or mixed forests, temperate conifer or mixed forests, warm conifer or mixed forests, and steppe or arid shrub lands) showed an increase in their areas

D. Climate Change Impacts on Water Sector in Pakistan

Key Findings on the Water Challenges for Pakistan in a Changing Climate

- ✓ Increased variability of river flows due to increase in the variability of monsoon and winter rains;
- ✓ Uncertainty about future river flow and glaciers melting;

- ✓ Increased demand of irrigation water because of higher evaporation rates at elevated temperatures in the wake of reducing per capita availability of water resources and increasing
- ✓ Reduction in water storages capacities due to increased sediments (0.2 million acre foot/year);
- ✓ Conventional irrigation system with high water losses and low crop water productivity (wheat at 24% and rice at 55% less than the world averages);
- ✓ Influence of groundwater recharge due to high level of abstraction and changes in precipitation and evapotranspiration; and
- ✓ Lack of transboundary river inflows and glaciers monitoring infrastructure.

E. Climate Change Impacts on Energy Sector

With climate change in the future, the energy sector will largely be affected by extreme weather events such as flooding, storm surges, and drought that will affect energy sources, and the supply and distribution infrastructure.Pakistan's water resources are at severe risk to climate change.

Bahawalpur has 5-7 hours of sunshine daily on average. As there will be no rise in temperature due to reflections of the panels on the atmosphere because the panels are lined with anti-reflection coating (ARC) on the surface which help to reduce the reflection of the panels to almost zero. Adopted measures during rain and sandstorm are to generate or produce electricity is to be reduced. Mitigation measures for reducing GHG have been proposed in ESMP (Annexure I). The weather data is gathered from Pakistan Meteorological Department. The letter is attached in **Annexures XII.**

The detailed data are given in **Table 5.1**:

Table 5.1: Rainfall Statistics for Bahawalpur District in 2016

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Precipation (mm)	0.2	4.0	31.6	4.2	2.0	33.1	34.1	4.9	0.0	0.0	0.0	0.0

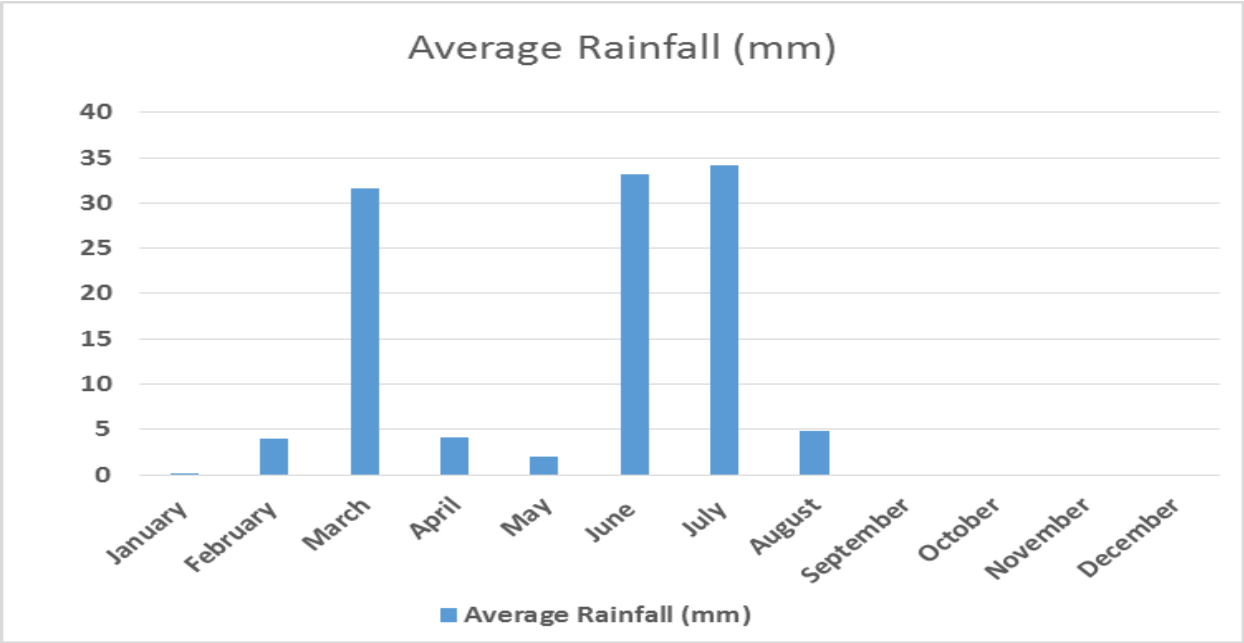


Figure 5.3: Monthly Average Rainfall Profile of Bahawalpur

Maximum and Minimum Temperature Regime Map of Pakistan is shown in **Figure 5.4**, **Figure 5.5** & **Figure 5.6.**

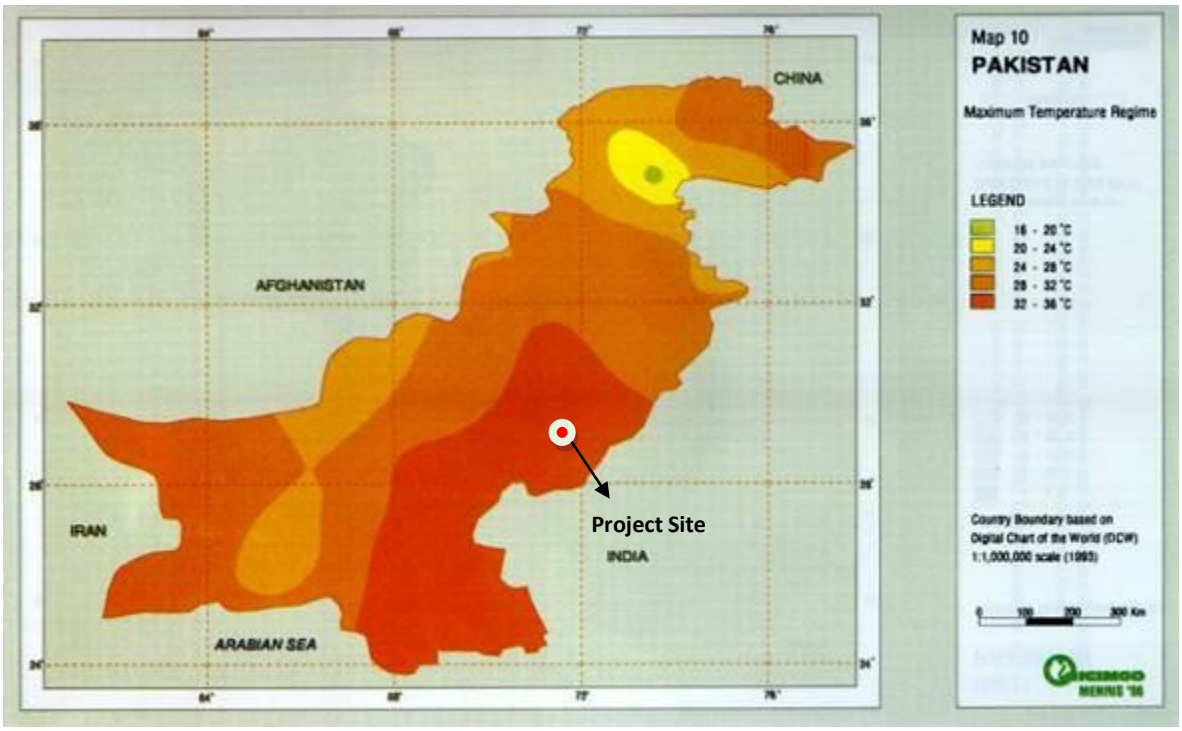


Figure 5.4: Maximum Temperature Regime Map of Pakistan

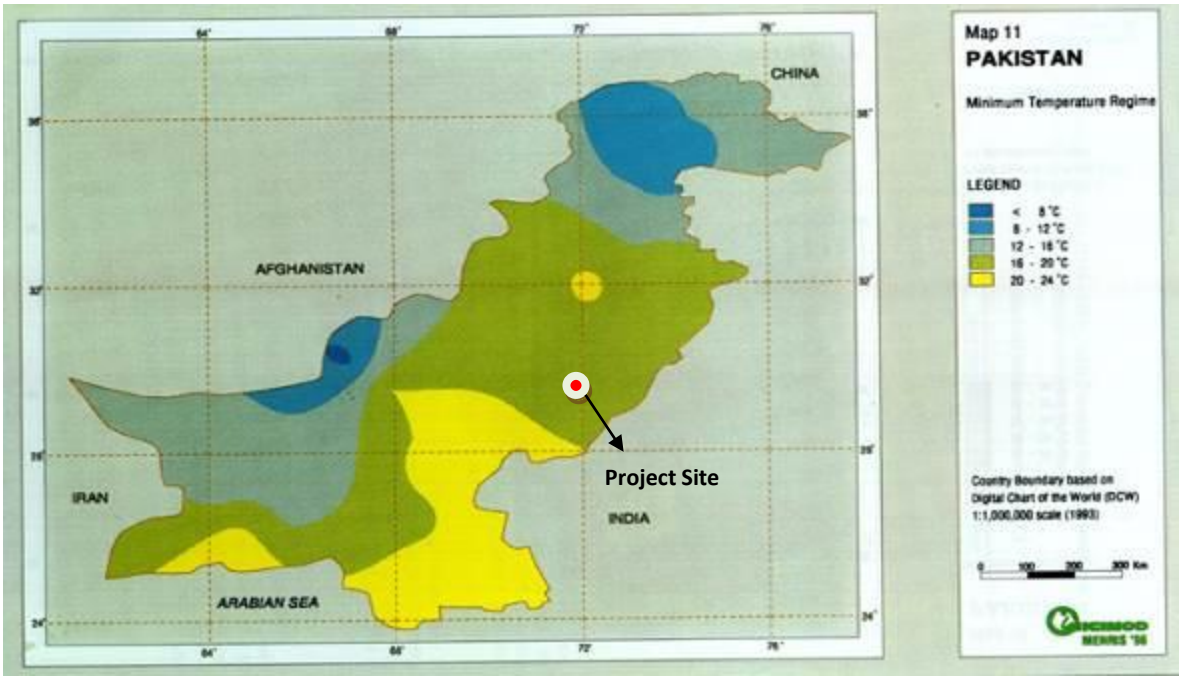


Figure 5.5: Minimum Temperature Regime Map of Pakistan

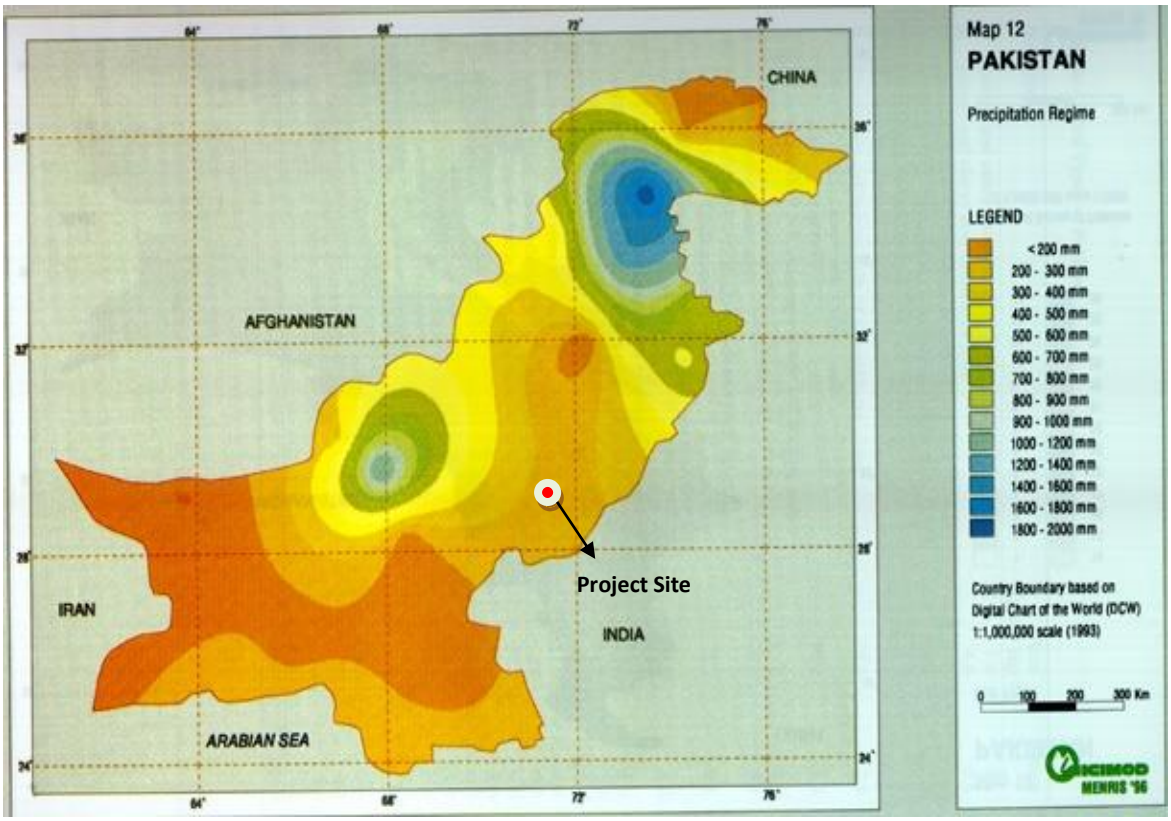


Figure 5.6: Rainfall Map of Pakistan

5.4 Biological Environment

5.4.1 Flora

The biological studies was conducted in the area by 16th Feb, 2017. Flora of the district has been greatly modified by the old open forests of small trees and shrubs; there remains only a few or portions of forest which are kept as gazing ground for cattle in some area. Amongst trees the most important are Kikar (Acacia Nilotica), Frash (Tamasix Aphylla), Pillu (Salvadora Oleoides), Jand, Kareer (main diet of Houbara Bustard), Phog, Khar, Grasses, Shrubs, Hurbs etc are present in the area.

The main crops for which Bahawalpur is recognized are cotton, sugarcane, wheat, sunflower seeds, rape/mustard seed and rice. Bahawalpur mangoes, citrus, dates and guavas are some of the fruits exported out of the country. Vegetables include onions, tomatoes, cauliflower, potatoes and carrots.

The project area has no plantation except some shrubs and hurbs and most of the land has been levelized by the project company so there is no or minor impact on the species. There is no such threatening or endangers species exist as indicated by IUCN red list of the species. There is not any environmentally sensitive area located in or near to the buffer zore of the project, Lal- Sohanra National Park is located approximately 10.5 km away from the project boundary. There is no impact of project activity on environmental sensitive area.

5.4.2 Fauna

There are different birds and mammal species are present in the area. Like; Caracal, Chinkra, Houbara Bustard, Great Indian Bustard, Sand, Groud, Desert Costal, Grey Baridrige, Doves, Raptors, Vultures, Diversified Lizards and snakes, Diversified song birds, different types of shrikes, Jackal and Jungle cat. As for the birds, there is no impact on the birds due to the solar panels; the panels that are used in the project are lined with anti-reflection coting which helps to reduce the reflection of the panels to almost zero. The fences will be made at the project boundary to control the movement of animals in the area.

5.5 HUMAN SETTLEMENT PATTERN

Bahawalpur is one of the largest district of the Punjab covering an area of 24830 Sq.km. The district is situated almost in the center of the country at an elevation of 152 meters from the

sea levels. It has Five Tehsils. Bahawalpur its area is 2372 Sq.km and its population is 7,98,509, Ahmad Pur East, area is 1707 Sq.km and its population is 7,14,102, Yazman (i/c Cholistan) area 18491 Sq.km and its population is 4,02,573, Khair pur Tamewali area 888 Sq.km and its population is 1,83,250 and Hasilpur area 1372 Sq.km and its population is 3,12,132. That covers the total area is 24830 and the population is 2410,566.

The population of Bahawalpur district has increased from 1.453 million in 1981 to 2.411 million in 1998 showing a growth rate of 3.88 % per year as compare with 3.3 % of Punjab. Population density has increased from 59 in 1981 to 97 in 1998 as compared with 353 of the Punjab.

There is no population and settlements located near the project site within the radius of approximately 2 to 5 km out from the boundary of the project area. Chak 40 DB is about 4.6 kms in distance from the project site while Chak 41 DB is 2.7 kms in distance with a combined population of 500-700 people.

The first 100 MW were commissioned in May 2015, and were completed by Tebian Electric Apparatus, a subsidiary of Xinjiang SunOasis. Before the installation of Solar Park, the land is barren and vacant and there is no houses in that area and its all vacant land own by the government of Pakistan. the government has leased the land to the project companies for the installation of Solar power Projects.These are only two main settlements whaich are located near to the project boundary i.e., Chak 40 DB is about 4.6 km, Chak 41 is about 2.7km. The people living in that area are also working in existing installed Splar plants, most of them are working as a labor, for washing the solar panels and some other contruction activities. Also during the construction and operation phase, the locals will be hire for different jobs both skilled and unskilled jobs.

These communities does not belong to any tribal group, and there is also no indigenous communities living in the project area. The people of nearby communities are satisfied with the projects because most of the peoples are working in the existing projects. The people are doing farming, small businesses and also the females of those communities are also working in the fields during wheat and cotton seasons and also made handicrafts, embroidery, cloth stitching etc. These activities help support the financial needs of the family. There are also some political influence at low level like local bodies, administrative bodies to resolve the issues of local peoples. Most of the peoples speak the same language like Punjabi but they also know the national language Urdu. The literacy rate in these areas are very low as compared to the others areas.

5.6 SOCIO-ECONOMIC ENVIRONMENT

5.6.1 Occupational Pattern

Main occupation of the residents of Bahawalpur district is agriculture. The agricultural area of District is 155,648 acres. Based on the 1998 census, , of the total employed persons, 44.7% had elementary occupations followed by 34.8% skilled agricultural and fishery workers, service workers, shop and market sales workers, representing 3.5% and 19.2% respectively. In rural areas people having elementary occupations were again in majority, followed by skilled agriculture and fishery workers and service workers, shop and market sales workers representing 56.3%, 31.7% and 5.3% respectively. The highest percentage in urban area is of elementary occupation; followed by service workers, shop and market sales workers having 43.1% and 19.4% respectively.

Bahawalpur district is essentially agrarian. Agriculture is the backbone of its economy and main source of earning for almost entire 78% rural population directly or indirectly. It is well known cotton and wheat growing area and produces 14% of cotton and 4% of wheat of the total Punjab's production. Rice, Sugarcane, Gram, Pulses and Sunflower/Soybean/Canola (oil seed) are the other major crops. The total cropped area in Bahawalpur equals 696,000 hectares. Out of this irrigated area is 686,000 hectares and 10,000 hectares is unirrigated land.

With the exception of few big units, industrial activities in the district are restricted to agro-based industry dealing with the processing of basic raw material. Bahawalpur has 232 large, medium, and small sector industries including that of Caustic Soda, Cotton Ginning & Pressing, Flour Mills, Fruit Juices, General Engineering, Iron & Steel Re-rolling Mills, Looms, Oil Mills, Poultry Feed, Sugar, Textile Spinning, Textile Weaving and Vegetable Ghee & Cooking Oil.

The occupational pattern in the area is farming, small businesses and also working in different factories as a labor. Also the females of that communities are also working in the field during wheat and cotton seasons and also make handicrafts, embroidery, cloth stitching etc which help support the needs of the family.

5.6.2 Available Facilities

Local people of the nearby villages have access to urban areas through link roads and public transport available. Electricity is available in the area. However, Sui gas facility is yet not available in the villages and people are using wood as a source of fuel. PTCL telephone services are available and no PTCL access in village level mobile services are available at village level only.

5.6.3 Education and Health Facilities

The district has literacy rate of 35% (1998 census) with male literacy rate at 44.9% and female at 24%. Looking across regions, 57% of urban population (Male: 52.9%; Female: 47.1%) and 26.3% rural population (Male: 36.4%; Female: 15.1%) of Bahawalpur are literate. However, according to (Multiple Indicator Cluster Surveys) MICS 2007-08 survey, the literacy rate above 10 years is 45% (Male 51.66%; Female: 48.34 %). Similarly, urban rural distribution shows 65% urban population (Male: 52.5 %; Female: 47.5%) and 37% rural population (Male: 51.3 %; Female: 48.7%) is literate.

There are over 1600 government primary schools- 45% of which are for girls. Middle schools are 226, over 60% are for girls, and 39% for boys, while high schools are 125 and 62% are for boys. As level of education increases, percentage of boys schools increases in the district. However, higher secondary schools are the same in the district, 14 each. Total number of arts and science degree colleges are 18 having enrolment of almost 20,000 students and teaching strength of 543. The higher education institutions in Bahawalpur district include; Islamia University of Bahawalpur, Asian college of Technology Hasilpur Road Bahawalpur, Rise School of Accountancy, Tebiya College, Four Elementary colleges for teaching training, Quaid-e-Azam Medical College (QAMC), Government Sadiq Egertin College (SE College), Government Sadiq Degree College for Girls, Millat College and Post Graduate College Baghdad Road.

The district has 187 health facilities including 4 Tehsil Headquarter Hospitals, 1 Police Hospital, 11 Rural Health Centers, 80 Basic Health Units, 70 Dispensaries, 10 Mother and Child Health Centers, and 3 T.B. Clinics.

5.6.4 Protected Sites

There is no protected area in the vicinity of project site.

5.7 COMMUNICATION NETWORK

5.7.1 Road Links

The District Bahawalpur lies south of the Sutlej River. It is situated in the south of Punjab province, 90 km from Multan, 420 km from Lahore, 122 km from Burewala, 90 km from Vehari, 270 km from Faisalabad and about 700 km from Islamabad. It is linked to these other cities by major railway.

Bahawalpur lies at the junction of trade routes from the east, south-east, and south. It is also an important marketing center for the surrounding areas and is located on the crossroads between Peshawar, Lahore, Quetta and Karachi.

5.7.2 Rail Links

The national express railway line is passing through the city. The district is linked with Multan & Karachi through railway network.

5.8 WATER RESOURCES

Most of the town is served with water supply system whereas rest of the area is without it and people have their own sources of water mostly hand pumps / power pumps. Some areas are partly served with this facility Existing Condition. The present main source of water in Bahawalpur is ground water. Water table is 40-50 feet below the ground level. The underground water of the district is mostly brackish.

Drinking water supply situation of Bahawalpur is much below as compared to all other cities; the service coverage is about 3% of population. The city faces similar issues related to drinking water supplies i.e, Low coverage ratio, Poor water quality delivered to users, Illegal connections, not enough trained and qualified staff, the water quality is reported to be poor. PCRWR carried out a survey of major cities in the Punjab among which was Bahawalpur. The results of the survey indicated that around 24% of the sampled water was polluted with E.Coli, 52% samples were found to be contaminated with Coliform bacterium, and 76% possessed excess Arsenic (As) - most of the samples contained more than 50 ppb which is 5 times more than the limits set by the WHO.

The water supply network covers 10% of the town and serves 3% of the total population. Ground water in the Municipal area is generally saline except along the irrigation canals and the river. Presently PHED is executing rehabilitation and augmentation of Urban Water Supply Scheme for Bahawalpur City. This would help in drinking water supply needs and increase in service coverage. Southern Punjab Basic Urban Services Project (SPBUSP) also helping in water supply service provision and expenditure has been made of PKR 414.203 million and physical progress is 93%.

Main Components of the existing system include tube wells, overhead reservoir and distribution network. The maintenance level of pumping machinery is not so reasonable.

Privately installed hand pumps / power pumps have been installed. Evidently, during post irrigation phase, the water table has been raised, thereby improving the sub soil water quality.

The project is located on the south of the Sutlej River and lies in the Cholistan region near the Thar Desert, where effect of recharge is significant. As such, the sub soil water quality has improved over the period. The Aerial distance from project site to the River Indus is approximately 20 km away as shown in figure.

Figure 5.7: Overview Map of the Bahawalpur and Sutlej River

5.9 SUB SOIL AND GROUND WATER HYDROLOGY

In general, subsurface stratigraphy at the site consists of three basic litho logical units as given below:

a) Lean Clay/Silty Clay
b) Sandy Silt/Silt
c) Silty fine Sand/fine Sand

The soil is alluvial with sandy textured sand dunes covering 50 to 60 percent of the area. These soils are the alluvial deposits of the recent geologic times.

The soil of central Bahawalpur mostly consists of the plains of Indus basin, which is at the height of not more than 150 meters above sea level. But the southwestern desert, which is called Rohi or Cholistan, is mostly undulated due to the presence of sand dunes. The height of the sand dunes does not exceed 150 meters

Main soil types of Cholistan desert are sand dunes (44%), sandy soils (37%), loamy soils (2%) and saline-sodic clayey soils (17%).
The average water table in Chak 40 DB is 40-50 feet. The water of shallow wells present in the expansion areas contains higher values of TDS and therefore is not suitable for human consumption.

The depth of water table is also depleting over the period. Due to increased number of private tube wells being installed in the location of sub project, the ground water is depleting. Recharge from surface /rain water is helping in reduction of depth of sub soil water table. During dry periods, the situation sometimes becomes quite serious.

5.10 AIR QUALITY

To check the air quality of the area, the Ambient Air monitoring were conducted in the project vicinity by the 3rd party (SGS) on 18th February, 2017 and the reports are attached in the **annexures VII**. Beside this, no authentic data is available regarding air quality measurements specifically of Lal Suhanra, Bahawalpur. However comparing with other cities like Lahore the air quality in Bahawalpur is far better and comparatively less polluted. Major air pollution contributors are the motor vehicle emissions. As the city is surrounded by agricultural land, a number of trees and vegetation is there to minimize the impacts of gaseous emissions.

5.11 NOISE QUALITY

The project area is completely quite area. There is no traffic or industrial activity in the vicinity of 5 Km of the project site. The report of noise monitoring is attached in **annexures VII.**

5.12 SEISMIC HAZARDS

According to Seismic Zoning map of Pakistan, Project area falls in Zone 2A which is minor to moderate damage area. There is no earthquake recorded in the history of region above Richter scale 4.5. Also no damage to the infrastructure and human settlement is reported in the area.

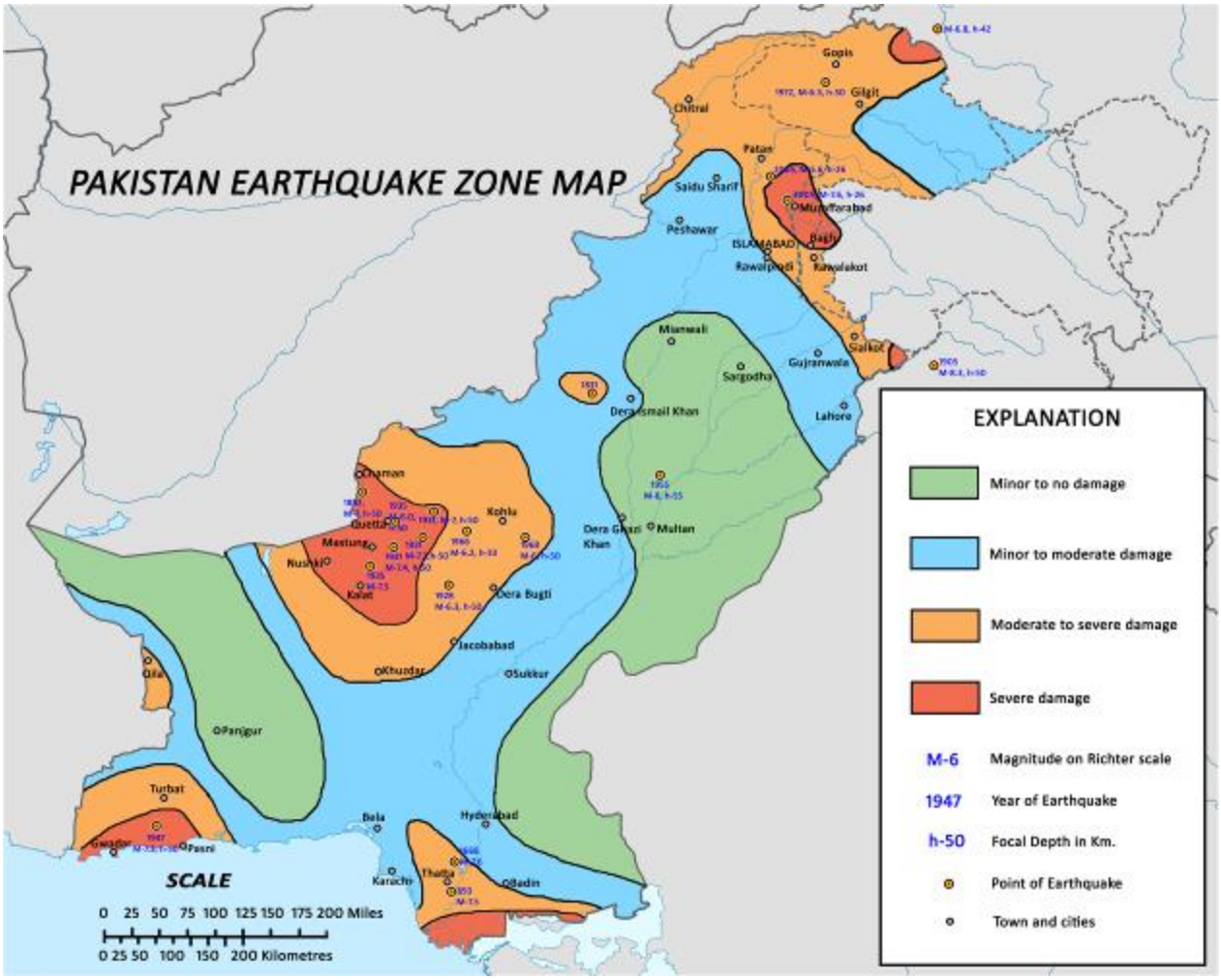


Figure 5.7: Seismic Hazard Zones of Pakistan

5.13 FLOODS

Bahawalpur is situated on the south of SUTLEJ River. History is evidenced that Bahawalpur is seldom faced flood hazard. First mentionable flood came in 1945 when the city was the part of Bahawalpur state (abolished in 1954) and affected the areas nearby river Sutlej i.e. Khanwah Khander, Goth Laskder, Jhangiwala, Dera Bakha etc. The next devastating flood was witnessed in 1988 and at that time much more damages have been occurred on both sides of the river Sutlej and people homes, installed tube wells, standing crops, model colonies and small industrial estate badly flooded.

In 2013, a flood likes 2010 damages many districts of Punjab including Bahawalpur, Vihari, Dera Ghazi Khan, Rajanpur, Narowal, Multan, Sahiwal, Muzaffargarh etc. Early estimates have shown that 25 districts in Pakistan have been affected by floods according to WHO Report of 2013 where 207 people have been died and 1,122 had injured in flood. More than 13,33,066 people have been affected in country due to flooding and over 12,48,644 acres of standing agricultural crops have been damaged. Among all provinces and territories in Pakistan, Punjab has been severely affected by flood in all sectors (National Disaster Management Authority (NDMA), 2013). Later, on the basis of updates from different sources it is found that about 46 districts in Pakistan have been flooded in 2013 flood where 25 were located in Punjab province

After passing 25 years in 2013, heavy monsoon rains in upper parts of the country and huge volume of water released by India in river Sutlej (that is almost abandon from many years) caused flood in nearby areas of Goth Laskder, Jhangiwala, Dera Bakha etc. in Bahawalpur city. Due to high flood in river Sutlej, erosion had been inundated several villages and destroyed thousands of acres of crops from Minchinabad to Ahmadpur East in Bahawalpur. In the consequence of a high tide in river Sutlej, several villages have been submerged due to breaches in embankments in different areas as hundreds of acres were submerged due to flood in river Sutlej and Chenab at Mauza Kachi Shikrani near Uch Sharif, Ahmedpur East due to a breach in an embankment. Thus, Ahmedpur East is one of the flood prone area in Bahawalpur that is regularly been facing severe flood damages since 2010. Flood 2013 also brought similar destruction in Ahmedpur East's many Union Councils (UCs) and Mouzas. Therefore, damages assessment of flood is essential to saving these financially backward and flood prone areas to formulate a comprehensive flood prevention plan and preparedness strategy to cope up the flood risks.

Floods can be critical natural hazard in the project with respect to solar PV project due to River Sutlej flowing around 20-30 Km away from the project area. Bahawalpur is considered as not flood prone districts of Pakistan according to the map released by Emergency Resource Center

(ERC). Below maps in **Figure 5.8** shows Flood Prone districts of Pakistan developed by World Food Programme.

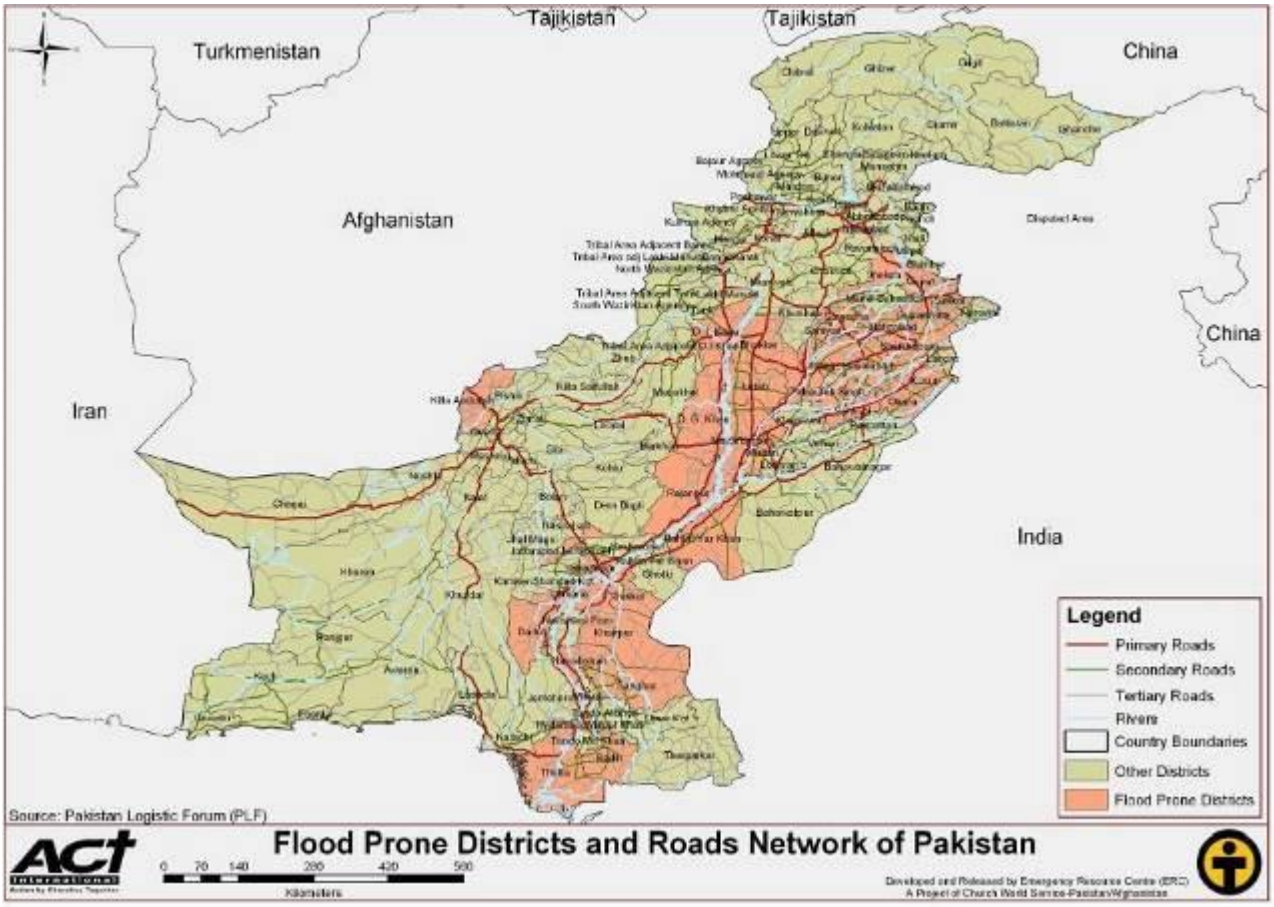


Figure 5.8: River Flood Prone Districts of Pakistan

Figure 5.9 shows closer view of Project area on map for River Flood Prone areas by map released by NDMA; the area is prone to floods from runoff from river Sutlej.

The flood was reported in year 2012 in District Bahawalpur due to high floods in River Sutlej. Therefore, it would be necessary to make the foundations of the solar panels high to avoid any damage or short circuiting of the plant.

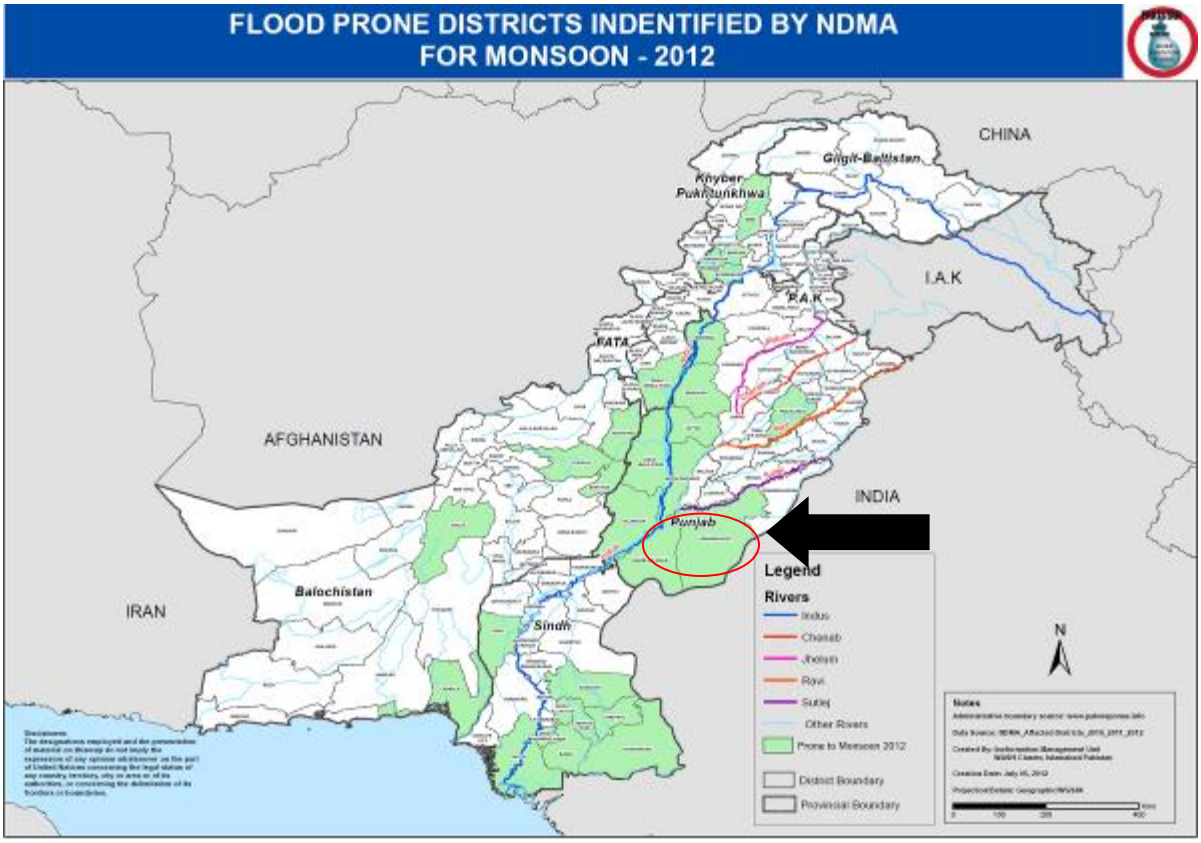


Figure 5.9: Flood Prone Districts

5.14 MINES & MINERALS

There are no mines or minerals found in the district of Bahawalpur.

SECTION 6

ANALYSIS OF PROJECT ALTERNATIVES

6 ANALYSIS OF PROJECT ALTERNATIVES

Setting up of a solar power project involves selection of environmentally and techno economically suitable site, land characteristics, meteorology, infrastructure, grid availability, water availability, rail and road connectivity, accessibility and shading aspects etc. This chapter elaborates analysis of project alternatives which can be considered in the project area.

6.1 WITH OR WITHOUT PROJECT

Pakistan's major electricity sources are thermal and hydro generation, meeting approximately 70% and 28% (respectively) of the country's annual electricity demand. The primary thermal generation fuels employed are furnace oil and gas. While both are produced domestically, demand already outstrips supply by a considerable amount. Oil import is a significant burden on the national exchequer and the increasing import bill continues to exert further pressure on the foreign exchange reserves.

Alternatives to further fuel imports for electricity generation are the use of domestic coal, or generation from hydro-electric or other renewable sources, such as wind and solar power. These options will assist in reducing Pakistan's reliance on imported oil, and consequent vulnerability to changes in global oil prices which will in turn have a positive effect on the current trade deficit and inflating import bill. As with gas, securing future supplies of coal and hydro-electric power would rely on significant spending on infrastructure. Pakistan has domestic reserves of coal. However, coal currently makes up a very small proportion of total generation, largely the result of most of the reserves being located in one area, the Thar Desert. Exploiting the reserves would require huge and costly upfront investment in local infrastructure (including provision of water supplies), development of mines, housing and related infrastructure, and investment in transmission lines before power plant development could commence. Hydroelectric power already supplies almost 30% of electricity, and numerous sites for future investment exist, but due to their locations, this would also require significant

investment in transmission to meet the expected power needs. Moreover, there are varying political stands on hydro-electric power options.

Looking at how the country's future electricity needs might be met in a way that supports the environmental objectives of the Government of Pakistan; solar power generation has the potential of being a strong contributor. The development of solar power generation projects could reduce dependence on fuels for thermal power generation, increase diversity in Pakistan's electricity generation mix, and reduce greenhouse gas (GHG) emissions avoiding thermal power generation. The project will also add to the power generation from Renewable energy resources and help in meeting target of Government.

In view of the above, the "Without Project" option is not a preferred alternative.

6.2 ALTERNATIVE FUEL

The only viable generating options for energy production to meet the supply-demand gap in project region are fossil fuel energy. Pakistan is already facing huge short fall in fulfilling the coal requirement for already existing thermal power plant. The quality of coal is also low to medium in Punjab region resulting in fly ash, carbon footprints and sulphur fume emission when it's burnt. So, it is imperative to look for alternatives to fossil fuel based power generation to achieve long term power solution of the country.

SECTION 7

ANTICIPATED IMPACTS AND MITIGATION MEASURES

7 ANTICIPATED IMPACTS AND MITIGATION MEASURES

The proposed project may have impact on the environment during construction & operation phases. During the construction phase, the impacts may be regarded as temporary or short-term; while long term impacts may be observed during the operation stage. Spatially the impacts have been assessed over the study area of 5 km radius of the project site.

The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of Solar PV power. It will certainly meet the ever increasing Demand of Power and to bridge the Gap between Demand and Supply of Power.

7.1 POTENTIAL IMPACT GENERATION ACTIVITIES

The construction and operation phase of the proposed project comprises various activities each of which may have an impact on environmental parameters. The impacts of the project are envisaged during the design and planning, during pre-construction phase, construction phase.

During the construction phase, the following activities may have impacts on environment:

- Site preparation
- Minor excavation and leveling
- Hauling of earth materials and wastes
- Cutting and drilling
- Erection of concrete and steel structures
- Road construction
- Painting and finishing
- Clean up operations
- Landscaping and afforestation

The activities can be divided into two categories, viz. sub-structural and super-structural work. Moreover, construction work will involve cutting of trenches, excavation, concreting etc. All these activities attribute to dust pollution. The super-structural work will involve steel work, concrete work, masonry work etc. and will involve operation of large construction equipment like cranes, concrete mixers, hoists, welding sets etc. There may be emission of dust and gases as well as noise pollution from these activities.

Mechanical erection work involves extensive use of mechanical equipment for storage, transportation, erection and on-site fabrication work. These activities may generate some air contaminants and noise pollution. The electrical activities are less polluting in general. Potential Impacts and Mitigation Measures (for construction and operation phase) is given in Annexure-I

7.2 IMPACTS DURING PLANNING AND DESIGN PHASE

The potential adverse environment impacts associated with project have been avoided or minimized through careful route selection. The site is located 2-5 kilometers away fromnearby villages/settlements. The project will not entail any physical or economic impact to any individual or household.

7.3 IMPACTS DURING CONSTRUCTION PHASE

The environmental impact during construction phase is localized and of short term magnitude. However, as the project land allocated for the project is vacant land or barren land, the change in land use will be minimum. Impact is primarily related to the civil works and some intensive impact due to erection of the equipment. There are no major impacts from dust emission on workers during to construction phase and mitigation measures as mentioned in the EMP of the report. The details of the activities and probable impact are brought out in **Table 7.1**:

Table 7.1: Identification of Activities and Potential Impact (Construction Phase)

Construction Activities	Environment Attribute	Probable Impact
Land Acquisition	Land	❖ No significant impact on land-use as the project site is within an existing solar park owned by the government.
	Socio-Economics	❖ No economic or physical impact anticipated in relation to land acquisition as the land which is barren and vacant is leased by the Govt. of Punjab to M/s Zorlu Solar Pakistan (Pvt) Ltd.
Site clearing and Leveling (cutting, stripping, excavation, earth movement, compaction)	Air	❖ Fugitive Dust Emissions ❖ Air Emissions from construction equipment and machinery.
	Water	❖ Run-off from Construction Area.
	Land	❖ Loss of Top Soil.
	Ecology	❖ Loss of diversity and it's a barren land or vacant land.
Transportation and Storage of Construction Material/ Equipment	Air	❖ Air Emissions from vehicles. ❖ Fugitive Dust Emissions due to traffic movement.
	Water	❖ Run-off from storage areas of construction material.
	Public Utilities	Increased flow of traffic.
Civil Construction Activities	Air	❖ Air Emissions from construction machinery. ❖ Fugitive Dust Emissions.
	Water	❖ Run-off from Construction Areas.
Mech. and Elec. Erection Activities	Air	❖ Air Emissions from Machinery /activities
Influx of Labor and construction of temporary houses Transportation and Disposal of Construction Debris	Socio-economics	❖ Employment opportunities shall increase - Workers accommodation should comply with IFC standards - Zorlu Energy, its contractors and subcontractors should comply with national labor law
	Land	❖ Change in land use pattern of the area.
	Water	❖ Sanitary effluents from labor colonies.

Transportation and Disposal of Construction Debris	Air	❖ Air Emissions from Transport Vehicles. ❖ Fugitive Dust Emissions due to Movement of Traffic. ❖ Spillage and fugitive emissions of debris.
	Water	Run-off from disposal areas.
	Soil	No impact

7.3.1 Impact on Land Use

The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labor camps for human resource to avoid environmental impact and public inconvenience. These locations shall comply with the local laws and regulations and need approval from authorities to utilize these facilities (access roads, telecommunication, and pipe borne water supply). The selection of temporary lands shall be made in such a way that it is at least 500 meters away from nearby populated areas, water bodies, natural flow paths, agricultural lands, important ecological habitats and residential areas.
The total land allocated for the Project is 500 acres. At the Project site, there has been an absence of the following since the past few decades:

- Any agricultural activity on the land
- Any commercial activity on the land to support the livelihood of local residents nearby
- Any green field, wetland or protected area.

There are no settlements or Katchi Abadis found near the project area nor its surroundings, the nearest settlements found in the area is approximately 2 to 5 kms away from the project boundary. Chak # 40-DB, the nearest village, has a population of approx. 200-300 persons. Chak # 41-DB, has a population of approx. 300-400 persons. There are about 50 - 60 houses scattered around the project site but not near enough to be affected by construction and operation activities. . The closest household is at least 5 kilometers away from the project site.

Therefore, there is no threat to the existing land use or degradation, and there is no net impact on the land use.

The construction activities attract a sizeable population and the influx of population is likely to be associated with construction of temporary hutments for construction work force, having an effect on land use pattern of the areas surrounding the project.

Extent of displacement of existing land use or other environmental resources	 Low Impact

 =High

 =Medium

 =Low

 =No Impact

 =Locally Favorable

 =Regionally Favorable

7.3.2 Impact on Soil Cover

As the construction activities for the main plant units of project would be confined in the land, the impact on soil will be minimal and confined. Only cutting and filling is required during construction. No adverse impact on soil in the surrounding area is anticipated as the area.

Impact on Soil Cover	 Low Impact

 =High

 =Medium

 =Low

 =No Impact

 =Locally Favorable

 =Regionally Favorable

7.3.3 Impact on Solid Waste

Solid waste during the construction phase consists primarily of scrapped building materials, excess concrete and cement, rejected components and materials, packing and shipping materials (pallets, crates, Styrofoam, plastics etc.) and human waste. During the construction there will be generation of garbage, for which designated practices of solid waste disposal shall be followed.

Solid waste disposal will be done as follows;

- A waste inventory of various waste generated will be prepared and periodically updated.
- The excavated material generated will be reused for site filling and leveling operation to the maximum extent possible.
- The scrap metal waste generated from erection of structures and related construction activities will be collected and stored separately in a stack yard and sold to local recyclers.
- Food waste and recyclables viz. paper, plastic, glass etc will be stored in designated waste bins/containers. The recyclables will be periodically sold to local recyclers while food waste will be disposed through waste handling agency.
- Hazardous waste viz. waste oil etc will be collected and stored in paved and bounded area and subsequently sold to authorized recyclers.

The complete details of scrap metal details will be given as; scrap metal waste generated from erection of structures and related construction activities will be collected and stored separately in a stack yard and sold to local recyclers as per to manage the solid waste handling team. A separate yard area will be allocated for storing the waste material as per the required industrial practice. Also approved contractor will be hired for the recycling of waste appropriately during construction phase. Waste handling agency will be hired at the start of project construction to manage the waste generating during the construction and operational phase of the plant and the practices used for handling the waste disposal to manage proper waste management through different mechanisms like, make a proper dumping site for the disposal of waste, handling of waste or discharge water through point sources. The wastes which are recyclable are sold to the external contractors and the non-hazardous waste will be dumped through

municipal waste collection system and services. The solid waste will be dumped away from the project site and where nearby no settlements or any other affected environment is present. It may the proper dumping site that is used for local municipality. Although the PV cells will not be disposed but sent back under as warranty is for 25 years.

There are some solid wastes in the project site, including the packing material for the equipment, like the wooden pallets and carton boxes. Solid waste management plan will be followed third party EPA certified contractor will be hired for disposal of solid waste (No Impact).

Impact on Solid Waste	 Medium Impact

 =High

 =Medium

 =Low

 =No Impact

 =Locally Favorable

 =Regionally Favorable

7.3.4 Air Impacts

As the proposed project is Solar PV Project, the impact during construction of is expected to be minimal as a Greenfield Project plant. Particulate matter in the form of dust would be the predominant pollutant affecting the air quality during the construction phase. Dust will be generated mainly during excavation, back filling and hauling operations along with transportation activities. However, a high boundary wall of green dust control cloth will prevent the dust generated due to construction activities going outside the project area. The main source of gaseous emission during the construction phase is movement of equipment and vehicles at site. Equipment deployed during the construction phase is also likely to result in marginal increase in the levels of SO2, NOX, and particulate matter. The impact is reversible,

marginal and temporary in nature. Also the project company has conducted the Ambient Air Monitory before the construction of the project by the third party (SGS). The report of analysis are attached in the **Annexures VIII.**

Impact on Air Quality	Low Impact


=High


=Medium


=Low


=No Impact


=Locally Favorable


=Regionally Favorable

7.3.5 Noise Impacts

The major noise generating sources during the construction phase are vehicular traffic, construction equipment like dozer, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, vibrators etc. The operation of this equipment will generate noise ranging between 75 – 90 dB (A).

To minimize the impact on nearby communities, construction schedules have been optimized and vehicular traffic will be routed away from the nearest settlement, Chak # 40-DB and 41-DB, which is approximately 03 to 05 kilometers away from the boundary of power plant site. Also the noise level is substantially lower near the plant boundary due to attenuation caused over the distance. Overall, the impact of generated noise on the environment during construction period is insignificant, reversible and localized in nature. The noise monitoring has been conducted for the baseline studies as per the guidelines of IFC standards in different points with different time durations. The reports are attached in the **Annexure VIII.**

Impact on Noise Quality during Construction	No Impact


=High


=Medium


=Low


=No Impact


=Locally Favorable


=Regionally Favorable

7.3.6 Impact on Water Environment

The construction personnel would be housed in temporary settlements. These settlements would discharge considerable amount of domestic wastewater. Stagnant pools of water would increase breeding of mosquitoes and generally create insanitary conditions. Contractor will provide Soak pit with a depth of 2 meter to dispose liquid water so that such water do not form stagnant pools nor aggravate soil erosion. The main pollutants are organic components and microorganisms with the potential to cause contamination of water quality. To address potential impacts on water quality, disinfected washroom (e.g., through regular liming) will be used as main component of the sanitation system. Construction processes include fabrication of concrete and related water usage. Wastewater from construction activities would mostly contain suspended impurities. The waste water will be arrested before discharge, to prevent solids buildup in the existing drains. Thus, the construction site wastewater would be led to sedimentation basins, allowing a hydraulic retention time of 1 ½ to 2 hours, where excess suspended solids would be settled out and relatively clear supernatant would be discharged to the plant drain.

Impact on Water Environment	 No Impact


=High


=Medium


=Low


=No Impact


=Locally Favorable


=Regionally Favorable

7.3.7 Ecological Impact

The project site is barren land leased by the government of Punjab for the installation of 100MW solar power project to the project sponsors therefore no impact on project site. The small bushes on the site may be cleared during the project construction activity, but it will be ensured that as soon as the project is operational, plantation is re-grown in and around the plant. Also the project company make a plantation plan for the project after completion of the construction. Thus, the site development works would not lead to any significant loss of important species or ecosystems.

Ecological Impact	 Low Impact


=High


=Medium


=Low


=No Impact


=Locally Favorable


=Regionally Favorable

7.3.8 Impact due to Transmission Lines during Construction Phase

The project activities during construction phase will involve clearing of area along the route alignment wherever required, excavation for civil works related to transmission line and line stringing.

Impact on Topography: During the construction of the transmission line, the topography will change due to excavation and fill and cut for leveling the tower erection place.

Impact on Climate: The Transmission lines area consists of uncultivated lands. Also, there will be few removals of small bushes therefore there will be no impact on the climate conditions from the transmission lines during the construction and operation phases.

Impact on Air Quality: During the construction phase, the activity would involve excavation for the tower erection, movement of vehicles carrying the construction materials along the haul road (through un-built roads, which are not maintained).

All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site. The impact will be temporary in nature and therefore is assessed as of low significance. Covering of stockpiles and sprinkling of water during excavation will reduce the dust emission to a great extent. The construction of transmission line and the substation will not have any negative impact on the air quality of the region during the operation phase.

Impact on Noise Level: During the construction phase, the major sources of noise pollution are movement of vehicles carrying the construction material and equipment to the site. Most of the access roads along the alignment are motor able and project traffic would be negligible. The major work of the construction is expected to be carried out during the day time. Apart from vehicles bringing in materials to the nearest road, construction works for the transmission line will require minimal powered equipment. As such, noise emissions will be minor. As the predominant land use along most part of the alignment is vacant, there will be no residential areas exposed to noise generated during the construction phase and the noise produced during the construction period will have negligible impact on residents.

Impact on Surface and Ground Water Quality: There are no any surface water bodies in the way of transmission line .The construction and operation of the transmission lines will not have any major impact on the surface and ground water quality in the area.

Water needs during construction of the Project would be limited to sanitary water and minimal amounts of water for construction (such as spraying for dust prevention). This would be a negligible impact on water resources. Operation of the lines would not require any water.

In Transmission line construction activity, no chemical substance or oil is used hence there is no Impact on ground water quality.

Impact on Ecological Resources: Since there is no inhabited area along the route of transmission line, there will be no displacement of people or animals. It will also not cause any disturbance to the life of people, local animals and birds' movement. In transmission there is no dynamic equipment and moving machinery causing noise pollution, water and air pollution. There is no national wildlife park, bird sanctuary, wetland in the route alignment of the proposed transmission line. None of the declared environmentally sensitive areas is located within the route alignment. It is not expected that any flora and fauna that are rare, endangered, endemic or threatened will be affected. Migratory paths of small mammals and reptiles may be affected due to construction activities. However noise, vibration and emission from construction vehicles, equipment will occur during construction and pre-construction stages in temporary manner.

The impacts related to above activities are temporary and can be mitigated through following measures:

- Strict attention on worker force regarding disturbance to surrounding habitats, flora and fauna including hunting of animals,
- Selection of approved locations for material storage yards and labor camps away from the environmental sensitive areas, and
- Avoid entering of construction waste (cement particles, rock, rubbles and waste water) and sanitary waste to the surrounding water bodies.

Disposal of Debris: As a result of construction related activities, spoil and debris will be generated during the construction stage. Proper disposal of the debris shall be ensured to minimize the impact on the surrounding ecology, public health and scenic beauty.

Impact on Human Environment: Project activities could impact the health and safety of the work force and of the general public, in particular, in terms of risk of accidents and exposure to electromagnetic fields along the alignment. The accidents may be caused due to electro-cutting, lightening, fires and explosions. Necessary training regarding safety aspects to the personnel working at the line will be provided by the contractor. Personal protective equipment

like safety gloves, helmet, harness, Goggles, mufflers will be provided during construction period and during the maintenance work. First Aid facilities will be made available during the construction and operation phase.

Land Acquisition. Transmission line will be the responsibility of the government as part of LOI and EPA, respectively. National Grid of 220/132 kV has been constructed in the solar park and this Project will be connected to that. This project have its own substation of 132kV. No individual or household will be impacted by the T/L.

Socio-Economic Impact: Construction of transmission line will generate local employment, as number of unskilled labors will be required at the time of construction activities. Local employment during this period will increase socio-economic standards.

Cultural Sites: There are no archaeological, historical or cultural important sites along the route alignment; hence no impact on these sites is envisaged.

Sanitary Waste Disposal at Construction Site and Labor Camp:
The labor camps at construction site will be temporary in nature and the human excreta will not be significant to cause contamination of ground water. Those places where most labor will be staying will be near hamlets which shall use the community services for solid waste, water and sanitation. Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of the construction workers should be provided to avoid the surface water pollution.

Provision of adequate washing and toilet facilities should be made obligatory. This should form an integral component in the planning stage before commencement of construction activity. There shall be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps. Septic tank will be used for sanitation purpose. Thus possibilities of infecting water borne diseases or vector borne diseases (Parasitic infections) will be eliminated by adopting proper solid waste disposal procedure. Unacceptable solid waste disposal practices such as open dumping of solid waste and poor sanitation facilities will lead to pollution of surrounding environment, contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives (if present) and general public inhabited in the area. Surrounding of labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases such as mosquitoes, rats and flies.

Thus following measures are needed to protect and enhance the quality of environment during the construction stage:

- A better way to overcome garbage disposal as mentioned above by reducing or avoiding the need to construct labor camps, thus the selection of the majority of skilled and unskilled workers from the project area of influence will be a proper measure in this regard.

- Contractor shall provide adequate facilities, soak pits to manage liquid waste.

- Provision of the solid waste disposal, sanitation and sewage facilities at all site of the construction/labor camps to avoid or minimize health hazards and environmental pollution.

- Contractor should handle and manage waste generated from the construction/labor camps without contamination to natural environment and it will reduce risk to general public who stay close to sites. Also contractor should be responsible to enhance the quality of environment.

- Adequate supply of water should be provided to the urinals, toilets and wash rooms of the worker's accommodation.

- Workers' accommodation should satisfy IFC standards and contractors and sub-contractors should comply with the national labor law

- Contractor shall provide garbage bins to all worker's accommodation and construction sites, for dumping wastes regularly in a hygienic manner in the area.

7.4 IMPACTS DURING OPERATION PHASE

Various activities of operation and maintenance phase and their probable impacts on various Sectors of environment are presented in table below.

Table 7.2: Identification of Activities and Potential Impact (O & M Phase)

O & M Activities	Environment Attribute	Probable Impact
Waste water	Water	❖ Generation of Waste water during cleaning of modules. ❖ Domestic waste generated by staff employed during operations.

Visual Impact		❖ Visual and reflection of solar modules impact on nearby traffic.
Socio-economic	Socio-economics	❖ Generate employment in the area. ❖ Fast Development in the area.
Air	Air	❖ No emissions from solar PV plant.
Ecology	Birds/Animals	No impact on fauna and flora.

7.4.1 Impact on Land Use

The proposed project will be set up on vacant land or barren land within an existing solar park. The site, after completion of its development, would consist of built structures, landscaped to give a pleasing outlook.

Following the construction phase, the temporarily modified land use pattern, such as construction of temporary tents to accommodate some construction personnel will be totally removed during the operation stage. Land released from the construction activities would be put to economic and aesthetic use to hasten recovery from adverse impacts.

7.4.2 O&M Labor Force.

During O&M works undertaken by the local community, individuals should be provided with decent accommodation while they stay at the site for 10-12 days to do cleaning of solar panels and gardening/weeding works. Zorlu Solar Pakistan (Pvt) Ltd, its contractors and sub-contractors should comply with the national labor law.

7.4.3 Impact on Soil Cover

Most impacts of Solar PV project on soil are restricted to the construction phase, which will get stabilized during operation phase.

The soil conditions of the project site would be allowed to stabilize during this period after the impacts of the construction phase. The topsoil in areas would be restored and such portions of the site would be replanted with appropriate plantation or afforestation inside the boundary of the project.

During operation of a project, no appreciable adverse changes in the soils are anticipated

7.4.4 Air Impacts

Plant operation would not significantly affect the air quality, as solar project is green field project & there are no any gaseous emissions during operation phase from the proposed project.

7.4.5 Noise Impact

During plant operations, there would be no significant noise generated activity expected. There might be use of machinery during maintenance of plant, but the activity will be restricted to day time. The noise generated will not exceed 65 db(A) which is the permissible limit for residential areas as per NEQs for noise. Also the IFC EHS Guidelines for Noise will be implemented which is 55 db(A) at day time and 45 db (A) at night time. The noise monitoring has been done as per the IFC guidelines at different timings. The report has been attached in annxures as well.

However, noise analysis have been done to make the baseline data which ranges between 36-40 dB (A), close noise monitoring will be performed during construction and operation phases to keep in permissible limits.

7.4.6 Impact on Water Environment and Cleaning Mechanism of PV Panels

Ground water due to plant operation will be drawn during operation phase for any purpose.
There shall be minimal discharge of wastewater from cleaning of Solar PV modules. The wastewater emanating from cleaning operations shall be recycled for plantation around the plant. For 01 MW, one vehicle of water is required for the cleaning and duration of the cleaning for 100 MW is required approximately 10 days. For 01 MW, approximately 15000 liters of water is required for washing of panels and on monthly basis, 300,000 litres of water will be required for cleaning of panels and the process will be done on bimonthly basis.

During the operation & maintenance period, natural underground water can be used for cleaning the modules with manual washing. The water for cleaning the module doesn't include any chemical agents, so the untreated underground water will be used for cleaning. Based on our project circumstances, modules shall be cleaned twice in every month. The water supply system will be installed along the solar panel array and will be used by the cleaning staff to use the tap water for manual cleaning.

There are two advantages:

1. Water consumption is very less, this can conserve water.
2. The cost is low, and can create the job opportunities for local people.
The following is the pictures of cleaning method and cleaning equipment as shown below:

(1) (Cleaning method)




(2) cleaning equipment.

(mop)

(Tap water)

7.4.7 Ecology

There is no sensitive ecological area / protected forest area such as national wildlife park, bird Sanctuary near the project area. The area is vacant land and removal of small bushes during initial period of construction will be minimal and will be reversed through re-plantation. There will be no impact on the ecology of the area during operation phase.

7.4.8 Visual Impact

The site, after completion of its development, would consist of built structures, landscaped to give a pleasing outlook.

The potential impacts could be visual and reflection. However, as the project site and the surrounding areas provide no significant aesthetic value, the sights of a large area covered with solar PV panels will have no visual impact. With the old design of solar PV arrays, reflected sunlight may cause problems if the system is close to a road and is facing in a direction which the reflected sunlight may cause problems. This problem will not occur in this Project as its surface of solar PV panels is designed to absorb sunlight and minimize sunlight reflections. The panels which are being used have a negligible silicon inhalation and from that the workers are used to wear masks during working hours in the project area. The panels have more efficiency to absorb heat and there is very low chances of reflection.

7.4.9 Impact of Transmission Lines during Operation Phase

Electric Shock: This may lead to death or injury to the workers and public in the area. This shall be minimized or avoided by;

- Security fences around substation
- Establishment of warning signs
- Careful design using appropriate technologies to minimize hazards.

Noise Generation: Nuisance to the community around the substation site can occur during the project operation stage. Provision of appropriate noise barriers at substations shall be made in this regard.

Maintenance of Transmission Line and Substation: Possible exposure to electromagnetic inter phase could occur during these activities. Design of transmission line shall comply with the limits of electromagnetic interference from overhead power lines.

Oil Spillage: Contamination of water on land by the transformer oil can occur during operation due to leakage or accident. Substation transformers are normally located within secure and impervious areas with a storage capacity of 110% spare oil. Also proper drainage facilities will be constructed during the construction stage to avoid overflow or contamination with natural flow paths especially during the rainy season.

7.5 IMPACTS DURING DECOMMISSIONING PHASE

Dismantling operation however will have impact on environment due to noise and dust arising out of it. During de-installation, a specific strategy shall be adopted in order to handle the each type of item to keep the impact during the actual activity low. The decommissioning will also have social impact. The decommissioning of the power house which was a part of the local social fabric for many years will certainly create vacuum in the lives of the people directly and indirectly connected with it. The impact due to decommissioning on power, social and environmental scenario will be guided by applicable laws and guidelines. These will be addressed appropriately.

Impacts during decommissioning phase are mentioned below;

7.5.1 Acoustic (Noise):

Sources of noise during decommissioning would be similar to those during construction, and would include equipment (rollers, bulldozers, and diesel engines) and vehicular traffic. If near a residential area, noise levels from some equipment operation could exceed the EPA guideline, but would be intermittent and occur for a limited time.

7.5.2 Air Quality:

Emissions from decommissioning activities include vehicle emissions; diesel emissions from large construction equipment and generators; and fugitive dust from many sources such as land clearing, structure removal, backfilling, dumping, restoration of disturbed areas (grading, seeding, planting), and truck and equipment traffic. Permitting would be required (as during construction), and therefore these emissions would not likely exceed air quality standards or impacts.

7.5.3 Ecological Impacts:

Impacts to biological resources from decommissioning activities would be similar in nature to impacts from construction, but of a reduced magnitude.

7.5.4 Waste Management:

Substantial amounts of solid waste would be generated during the decommissioning and dismantling of the facility. Much of the solid material (e.g., concrete and masonry, steel, power cable etc) could be recycled and sold as scrap or the remaining nonhazardous waste would be sent to permit disposal facilities.

The separate numeric figures for plant decommissioning waste. i.e. Concrete waste is approx.. 10 Ton and the way of Disposal is at Landfill Site shall be made within project premises of 1.2m X 0.6m (Length x Width), Steel 5 Ton and way of Disposal is Reuse and selling out as scrap, Cables 40 Kg and the way of Disposal is Reuse and Selling out. PV for Solar 12 Kg weight and the way of Disposal is to dispose off as per standard industrial practice and the implementation of international protocols (Referred in Section 3.16); Basal Convention and the Trans boundary movement of hazardous wastes and their disposal May 5, 1992 would be preferred for the decommissioning of PV Plant. Since the disposal of solar PV panels shall be carried out at decommissioning at the end of PV Solar Panel lives that is probably 2O years of

age. This is further extendable owing to condition of solar panels. These panels shall be segregated into reusable, recyclable and non-recyclable waste. For the non-recyclable, it will be further disintegrated into hazardous and non-hazardous waste. The categories for hazardous and non-hazardous waste shall be dealt accordingly as per standard operating procedure for disposal of waste. For that, a reputable 3rd party shall be hired for handling such waste would be having certification or approval from environmental protection agency of that area as well as basal convention act 1992.

7.6 SOCIAL IMPACTS

7.6.1 Employment Generation

The project will generate employment opportunities for the local population. Even indirect job opportunities will be created outside the project boundary. The project through its CSR activities can implement small projects or activities to help improve the basic infrastructure in the area. Zorlu Solar Pakistan (Pvt) Ltd is in the process of hiring a local contractor for small scale jobs like water supply, hiring of earth moving equipments, boring and material supply etc

Zorlu Energy will give priority to the skilled and unskilled labor in the nearby villages. Overall, it is anticipated that the project including those existing solar farms significantly provides steady income source to local villagers during construction and O&M. Project impactsare mostly positive.

7.6.3 Land Acquisition. The project will not entail any physical or economic displacement. The solar farm will be located within a solar park which has been leased to the project company for a period of 25 years.

7.6.4 Development of Infrastructure

The job opportunities in non-agricultural sector are likely to increase. The installation of the power plant is expected to further increase the prospects by bringing in direct and indirect employment opportunities. As the project and consequent activities are expected to generate additional employment and income opportunities for the local population, market expansion supported by infrastructural development will foster economic growth in the area. Flow of reliable and adequate power from the proposed plant will not only enhance growth in the region, but will also bring about a change in energy consumption pattern by switching over from other sources of energy.

7.6.5 Indigenous Peoples

There are no indigenous peoples living on the project site, thus, no IPs will be impacted by the project.

7.6.2 Contribute to Economic Growth and Poverty Reduction

The project's impact will result from the demonstration effect and sustainability of a large-scale private sector solar farm, a model that can be replicated by other private sector investors in Pakistan. Through the project itself, as well as through the anticipated replication, Pakistan's energy mix will be diversified by adding renewable energy capacity, thereby contributing the country to meet its target of 5% of energy coming from renewable energy by 2020. The project will improve the country economic growth and also decrease poverty level.

7.6.3 Private Sector Development

Solar energy holds the most potential of all renewable energy sources in Pakistan, possibly offering at a rate of 1000 watts per square meter. The project will be the first to demonstrate this unrealized potential for large-scale solar projects to meet power needs in the region. The project will establish the commercial viability of large-scale solar farms connected to the grid and set off the necessary growth in the sector by advancing a model that can be replicated by other private sector investors throughout the region.

7.7 Cumulative Impact Assessment

Cumulative impacts are the result of effects that act together (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the project under consideration (e.g. the combined effect of other similar projects in the general area). An effect to a resource in itself may not be considered significant, but may become significant when added to the existing and potential effects eventuating from similar or diverse developments in the area.
Cumulative impacts have been defined as "changes to the environment that are caused by an action in combination with other past, present and future human actions" (Hegmann et al 1999).

7.7.1 General Information on Planned Developments

All reasonable effort has been made to review the currently proposed position of the Project, in relation to other existing or proposed solar power plants in the surrounding area. There are four operational solar power plant of 400 MW refers as Qaid-e-azam Solar of 100 MW and Zonergy 300MW. One solar power plant of 100 MW is being developed by Zorlu energy. The total planned solar projects in the area are of 1000 MW.

7.7.2 Assessment of Cumulative Impacts

It is important to note that the assessment of cumulative impacts throughout this section is rather a high level assessment – this is due to the fact that limited information is available at this stage to the 'ESIA Team' on other PV developers within the Solar Park. This mainly includes limited information available to Zorlu Consult from the other PV developers in the Solar Park which Zorlu Consult is also undertaking the ESIA study, as well as broad assumptions which were made regarding the other developers; where those have been clearly stated throughout this section. The main cumulative impacts investigated include the following, each of which is discussed in details below:

- Landscape and visual;
- Land use;
- Geology, hydrogeology, and hydrology;
- Biodiversity;
- Archeology;
- Air Quality and noise;
- Discrete requirement for facilities; and
  - ✓ Water requirement
  - ✓ Road Network for transportation
- Socio-economic development.

The current and planned activities which will take place within the Industrial Park are not considered to be of a nature or type which would result in combination effects with this Project of a significant nature. This is due to the fact that generally, the nature of the operating activities (current and planned) within the Industrial Park and the nature of interaction of those activities with the surrounding environment differ significantly when compared to those from the Project as well as the various PV developments within the Solar Park.

7.7.3 Landscape and Visual

The most important cumulative impacts to be investigated are those anticipated impacts during the operation phase in relation to visual interaction with the surrounding landscapes and potential for glare. However, it is important to note that within the surrounding areas of the Solar Park there are no key sensitive visual receptors. There are no unique landforms, sites of particular importance, visual or scenic features, environmental reserves or parks, or nearby sensitive receptors which would interfere with the proposed development. In fact, the closes receptor is an industrial area. Thus, the receiving area can be classified as having a low sensitivity. To this extent, such cumulative impacts are likely to be considered not significant. Another issue associated with such projects collectively is the potential for glare caused by sunlight reflected off the PV panels from the various developments over an area. However, it is important reiterate that PV Panels work on the concept of absorbing sunlight rather than reflecting it – however some minimal reflections for the panels are inevitable and could be associated with potential for glare in certain circumstances. Nevertheless, putting things into perspective standard solar glass reflects much less light and has lower potential for glare when compared to other materials widely used in other developments (such as steel, standard glass, plastic, etc). Therefore, such an issue is highly unlikely to be of concern and specially that there are no key sensitive receptors which could be affected from such glare.

7.7.4 Land Use

Improper selection and planning for the Solar Park site could entail conflicts with assigned formal land uses set by various governmental agencies and/or land areas which are of value to the local communities. However, the Solar Park area in general is the land leased by the Govt. of Punjab to the IPPs and other developers observing no conflict for the land use.

7.7.5 Geology, Hydrogeology, and Hydrology

The most important cumulative impact in relation to geology, hydrogeology, and hydrology would be that related to flood risks within the Solar Park area. As discussed earlier, the solar park is developed in the region having no such identification for flood risk.

7.7.6 Biodiversity

It is expected that the PV development which are to take place within the Solar Park area will entail construction activities that would mainly include site preparation activities such as land clearing activities, leveling, excavation, grading, etc. Such construction activities collectively will

result in the alteration of the area's habitat and disturb existing habitats (flora, fauna, and avi-fauna), which could result in the displacement or exclusion of species particularly threatened, endemic, or endangered species which might be present in such habitats As concluded throughout this ESIA, the site's habitat in general is considered barren and of low ecological significance due to its natural setting. So, it is anticipated to be the low or no disturbance would cause on existing habitats. However, the potential impacts during the operation phase from the PV Panels and in particular to avi-fauna are highly unlikely to be of any concern. Finally, it is assumed that the ESIA's conducted for surrounding various project developments would emphasize on the importance of implementing similar mitigation measures highlighted within this ESIA in relation to prevent any damage to the biodiversity of the site. Those mainly include proper management measures such as establishing a proper code of conduct and awareness rising with respect to prohibiting hunting, good housekeeping practices, etc.

7.7.7 Archeology and Cultural Heritage

It is expected that the PV development which is to take place within the Solar Park area will entail construction activities that would mainly include site preparation activities such as land clearing activities, leveling, excavation, grading, etc.
Such activities could damage or disturb the archaeological location within the Solar Park area. However, it is defined in ESIA that there is no archaeological site exist within or nearby the project territory.

7.7.8 Air Quality and Noise

Construction activities will likely results in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. In addition, the use of machinery and equipment are expected to be a source of noise and vibration within the Project site and its surrounding. However, such impacts are temporary and of short-term nature as they are limited to the construction period only and are reversible as baseline conditions will be restored upon completion of construction work. More importantly, it is highlight unlikely that other nearby surrounding receptors (such as chuck 40, 41) will be affected given the distance and the fact that such receptors are located far from the Solar Park area. Finally, it is assumed that the ESIA's conducted for the project development would emphasize on the implementation of the general dust control/suppression measures and noise suppression measures to control such impacts.

7.7.9 Discrete Requirement for facilities

The various PV Project developments within the Solar Park area are expected to need the facilities within the project area in general throughout the construction and operation phase as highlighted below.

a) Water Requirements

The water requirements of the various PV development Projects within the Solar Park is most significant for construction activities and washing of panels for operational activities, nevertheless the water requirements during the construction phase are temporary and of short term duration as they are limited to the construction phase only.
During the operation phase will outsource a separate water supply for the Industrial Park to cater for the water requirements. It has been decided that the water requirements will be supplied through the local water network in addition to water wells. It is important to ensure that the water requirements of the Project would not affect the water resources and water supply of the area

b) Road Networks

Transportation activities will likely involve a significant number of trucks to transport the various Project components of the various developers within the Solar Park - and mainly the PV panels. Increase traffic volume and movement on the highways and to some extent a reduction of roadway capacities. However a transport study will be developed to ensure the appropriate road selection with specific hours and day to move in order to avoid traffic burden on the local road networks.

7.7.10 Socio-economic

Looking at the socio-economic aspect of the projects, the most straight forward benefit that the various projects will bring to the local communities is job creation. The various projects within the Solar Park are expected, at a minimum, to provide job opportunities during the construction and operations phases.

The developers are expected to commit to their social responsibility by aiming to hire the largest possible number of local community members throughout the construction and operation phases. In addition, they are expected to consider other aspects of their social responsibility toward the local community. Therefore it is vitally recommended that the various PV developers collaborate and collectively develop and adopt a holistic Action Plan for the social development of the area. Such collaboration is favored over individual planning and implementation by each developer because it is more likely to bring a greater and more

sustainable benefit to the local community Thereby the Action Plan must firstly, acknowledge the importance of building a strong relationship with the local community; secondly clearly state its commitment to its social responsibility towards this community; thirdly adopt a participatory approach whereby the local community is given voice to express its needs, preferences, fears and concerns.
Manage expectations so that local communities are realistic about opportunities from the Project and clearly identify commitments by developers related to social development;

- Identify the number of skilled and unskilled job opportunities targeted to the local community throughout the construction and operation phases. The developers are expected to provide in details the qualifications and skills required for each job opportunities as well as the limitations and constraints of local community members and how and to which extent those could be addressed through training and capacity building;

- Present transparent recruitment procedures for the local community, to be adopted and implemented in the various construction and operation contracting arrangements. Such procedures must provide equal opportunities for all, including females;

- Given the local community past experiences, it is highly recommended that the developers be directly involved and contribute to the training and capacity building program to ensure that local community that is to be recruited are equipped with the required skills and qualifications.

- Detail additional areas where local community members can benefit or be involved besides job opportunities provided they have the required skills and expertise needed to meet the development standards. For example, during construction the Project shall consider the appointment of local contractors, local sourcing of materials and supplies, etc; and

- Ensure timely and continuous communication and dissemination of information between the developers and the local community members to alleviate potential sense of social marginalization and improve their understanding and perception of the benefits associated with development. Communication should also include information and updates on the projects development, number of employment opportunities, the bidding process for project components, construction plans, etc.

- In addition to the above, it is recommended that as part of the Action Plan, each developer allocate funds for social responsibility programs to be implemented for the local communities. Such funds could be used for the following amongst other options:

- Provide scholarship programs for students;

- Support local academic institutions in developing & upgrading academic programs

- Provide educational benefits and attracting visits by local schools, universities and colleges, etc.

- Provide health unit in the area for the collective benefits for locals etc.

However, it is highly recommended that such funds be managed in coordination with other entities that have the expertise in working with the local community and have an understanding and awareness on their needs and the socio-economic challenges that they face. Such collaboration would allow for a transparent and systematic method for allocating funds which in turn would ensure maximum benefit to those local communities.

The objective of this Fund includes the following:

- Support local community activities and institutions;
- Support cultural and educational initiatives;
- Support small and medium enterprises;
- Support training and skills development programs; and
- Support initiatives aimed to provide job opportunities.

SECTION 8

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

8 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

The field studies were conducted for preliminary scoping, survey and assessment activities and coordinate the field survey and analysis.

A questionnaire was developed to assess the general concerns of the local resident of nearby villages about this project. Mr. Irfan Parvez of RE2 team himself filled the questionnaires based on the respondent's response to the questions. Filled up questionnaires are attached in **Annexure-VIII** and snapshots of consultative meeting are also attached in **Annexure IX.**

A community consultation consisted of formal and informal meetings at nearest residential area, and project vicinity. The consultation exercise was conducted in both Punjabi and Urdu languages. A non-technical oral description of the project was given providing an overview of all likely positive and negative impacts. Following which, an open discussion was held so that the participants could voice their concerns and opinions. All participants were encouraged to voice their concerns and opinions. Participants were also asked to suggest alternatives where they had particular concerns.

Feedback obtained from the stakeholders was documented like WWF Pakistan, Bahawalpur Wildlife Department, Bahawalpur Forest department, Lal-Sohanra Forest Department, District Office Environment Department, Bahawalpur, and all issues and suggestions raised were recorded in survey forms. Both social and environmental issues were raised. Mr. Irfan and our team has performed the consultations with different departments and officials.

The people interviewed (Table 8-2) had worries /concerns related to basic needs and generally agreed that most of the effects would be temporary only during construction. Some common concerns regarding the lack of educational facility, shortage of clean drinking water, lack of basic health unit, lack of waste disposal, lack of electricity, poor roads condition and minimal employment opportunities issues were raised. None of these issues related specifically to

proposed solar power project but were general complaints. Most of the participants appreciated the project and said that it would boost the local employment opportunities, while some said that business and economic situation in the area will also improve.

During construction phase, Residents of the local; area, elected representatives, local councilors and informal community leaders including members of NGO's will be asked to state their current perceptions of priorities for improvements to the urban environmental infrastructure in their areas and about the likely impacts of the Project during construction and operation phases.

The stakeholder consultation is a continued process, and should be maintained throughout the project. The consultations carried out during the present IEE and reported in this Chapter are essentially a first step in this process.

During the present IEE, the stakeholder analysis was carried out to identify relevant stakeholders on the basis of their ability to influence the project or their vulnerability to be negatively impacted from it. This approach ensured that no relevant groups were excluded from the consultations, and appropriate engagement strategies were developed for each stakeholder.

Since the project would not directly affect them, the villagers generally did not have any apprehension or reservation about the project. On the contrary, they expected that the project would bring employment and small business/trade opportunities for the local population.

A matrix of concerns by community members was prepared as given in Table 8.1. The register of attendance is provided as Table 8.2. A pictorial record of the meetings is included as **Annexure X.**

Table 8.1: Summary of Concerns Raised during Stakeholder Consultation

Issues	Concerns raised by community	Remarks
Health Care Facilities	Healthcare centers particularly for women and children Schools	Basic health unit is available in the area with very little facilities, A dispensary may be provided.
Employment	Provision of semi-skilled and unskilled jobs for local labor in the project construction period.	Unskilled jobs will be given to locals people where possible. Training will be provided.
Safety of Community	Comply with the traffic management rules.	Proper traffic management will be resorted to during the construction period.
Drinking water	Community member rated Safe drinking water at highest priority during our survey.	As part of the Social development program Zorlu Solar shall provide the safe drinking water through RO filter plant to nearby communities
Educational Facility	Unavailability of Teachers, and School (Primary and Secondary) Vocational training	NGO working in social sector and proponent shall provide the required facilities for the local peoples.

Table 8.2: General Public Interviewed during Public Consultation at project Surrounding

The detailed social survey is conducted to the nearby villages, i.e, Chak 40DB and Chak 41DB and Chak 9-BC (12.6 km from project boundary) with a total of 16 respondents. During the visit, the issues and concerns of the local peoples were discussed and both individual and group consultations were conducted in which the local peoples expressed that the installation of project is acceptable to them. They also expressed concerns related to the employment during the project construction phase. Below is the summary of individuals who served as respondents during the questionnaire survey. Snapshots of consultation is attached in annexures.

Most of the peoples are doing farming, some of them are doing job in QASP as a labor as well, the female members of household's area doing work in green fields during wheat and cotton season. Some of them are doing embroidery and stitiching to earn some money.

S.NO	NAME	OCCUPATION	LOCATION
1	Abdul Majeed	Labour	Chak # 41-DB
2	Muhammad Mushtaq	Labour	Chak # 41-DB
3	Akhtar Hussain	Labour	Chak # 40-DB
4	Muammad Maqbool	Labour	Chak # 40-DB
5	Amir Hussain	Labour	Chak # 40-DB
6	Muneer Ahmed	Farmer	Basti Naseerabad, Chak 9-BC
7	Muhammad Imran	Farmer	Basti Naseerabad, Chak 9-BC

Summary of Respondents

Location	Number of Respondents			Occupation
	Male	Female	Total	
Chak 40-DB	16	0	16	Labor/ Farmer
Chak 41-DB	15	3	18	Labor/ Farmer
Chak 9-BC	2	0	2	Labor/ Farmer
Indicate other villages included in the survey				
Total	33	3	36	

8.1.1 Government Agencies

Stakeholders including provincial government officials, NGOs, and related stakeholders were consulted at their offices. All the stakeholders were given maximum project information and were shown a detailed map of the area. Their concerns and suggestions are reproduced below. Attendance lists of the stakeholders consulted in the proposed project was collated and reproduced in Table 8.3. Pictures of the meetings are provided in **Annexure- X.**

The project team also conducted the survey in the Quaid-e-Azam Solar Park and met higher officials of existing Power Plants regarding the plant information, concerns and overall perception about it. The staff who we met there had shown positive gesture and welcomed the new development in this. They had further described the land utilization and security condition in that area and referred no any serious thread and concerns about Power Plant development. The QASP team also briefed about the area, ongoing maintenance of the PV Plant, and about their facilities that were provided to the locals and also the staff of QASP. The compliance of all those parameters are being efficiently managed as per EHS requirement and national & international code of standard

a) Bahawalpur Wild Life Department (Deputy Director)

A consultation meeting was held on February, 2017 with Mr. Anwar Maan Deputy Director Wildlife Department & also regional Head of Bahawalpur Division at his Bahawalpur office along with his team. The project team provided information about the proposed project site with the help of the project area map and requested the officers to identify any protected wildlife sanctuary or other concerns of the Department. During the meeting the Deputy Director expressed his views regarding the project and overall appreciated project activities. Their views and concerns / suggestions are re-produced as follows;

- Mr. Anwar Maan along his team identified the desert area that are already allotted by the government to the foreigners for the recreational purposes and he briefed about its importance but the Quaid-e-Azam Solar Park is under the Energy department, Government of Punjab.
- He also proposed that to provide the basic facilitates to the communities like jobs opportunities, clean drinking water and sanitation etc.
- Solar panels will occupy very large area of the natural habitat for animals and plants. Care may be taken to avoid the principal of main wildlife habitats in the project area.

b) Lal Sohanra and Bahawalpur Forest Department (Bahawalpur Office)

A consultation meeting was held on February, 2017 with Divisional Forest Officer of both the regions. Mr. Tajamal Husain, Divisional Forest Officer, Bahawalpur and Mr. Syed Jawad Hassan, Divisional Forest Officer of Lal-Sohanra at his Bahawalpur offices along with his teams. The project team provided information about the proposed project site with the help of the project area map and requested the officers to identify any protected wildlife sanctuary or other concerns of the Department. During the meeting the forest officers expressed his views regarding the project and overall appreciated project activities. They do not have any issue / objection with the project in Solar Park. As they know that this is the barren land and there is very rare vegetation or even no vegetation. Only the concern was, Frash, Kareer and Jand (Tree species) is very common in that area, so be careful with the removal.

8.1.2 Non-Governmental Organizations

A number of NGO's, other than the government sector were consulted for the proposed projects who are highly involved in protection of wildlife and nature conservation.

WWF (World Wide Fund)

A consultation meeting was held on February, 2017 with Senior Manager WWF-Pakistan Mr. Asad Imran and Manager WWF Mr. Liaqat Ali Khan. The team provided information about the proposed project site with the help of the project area map and requested the experts to share their views / concerns /suggestions as the expert conservationist. Mr. Liaqat and his team supported and appreciated the project activities; they do not have any objection / issue even they are well satisfied with the green energy project and the way the consultant (RE2) making consultation with all concern departments. They also gave the briefing of their projects in Bahawalpur Area like; Better Cotton Projects of WWF-Pakistan, Promotion of Water Management at Irrigation Source Level in Cotton Growing Areas of Punjab, Pakistan (Sustainable Agriculture Program) and Indus River Dolphin Conservation Project.

a) List of Public and NGO Sector Stakeholder Consulted

A number of stakeholders, other than the general public, who are likely benefitted be involved during the project execution phase, were also consulted (Table- 8.3)

Table 8.3 List of Public and NGO Sector Stakeholders

Name of Stakeholder Representative	Type of Stakeholder	Department / Occupation/ Designation
Mr. Muhammad Amir Irshad	District Office EPA-Bahawalpur	District Government, Assistant Director EPA, Bahawalpur
Mr. Ansar Abbas	District Office EPA-Bahawalpur	Environment Inspector, EPA, Bahawalpur
Mr. Nadeem	District Office EPA-Bahawalpur	Environment Inspector, EPA, Bahawalpur
Rasheed Ahmed	District Office EPA-Bahawalpur	Field Assistant, EPA, Bahawalpur
Mr. Anwar Maan	Wildlife Department Bahawalpur	Deputy Director/ Regional Head Wildlife Department, Bahawalpur
Mr. Khursheed Azam	Wildlife Department Bahawalpur	Assistant Director/ Wildlife Department, Bahawalpur
Mr. Tajamal Hussain	Bahawalpur Forest department	Divisional Forest Officer, Bahawalpur
Mr. Syed Jawad Hassan	Lal-Sohanra Forest department	Divisional Forest Officer, Lal-Sohanra
Mr. Asad Imran	WWF, Pakistan	Senior Manager WWF, Bahawalpur
Mr. Liaqat Ali Khan	WWF, Pakistan	Manager WWF, Bahawalpur

Conclusion

The Project activities will not affect the wildlife of the area as only the barren land Project Area will be utilized for establishing solar panels, which do not pose any threat to the species except loss of land of the barren habitat.

SECTION 9

ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

9 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

9.1 PURPOSE AND OBJECTIVE OF EMP

This Environmental and Social Management Plan (ESMP) provides the delivery mechanism to address the adverse environmental as well as social impacts of the proposed project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works.

The purpose of Environmental and Social Management Plan (ESMP) is to provide a summary of the predicted impacts associated, mitigating measures and monitoring actions so as to minimize potential negative impacts and enhance positive impacts from the Project. The ESMP will provide a guide (almost checklist) for the main stakeholders, namely the owner, contractor and operator of the Solar Power Project, on what mitigating actions need to be taken and where and when they are needed. It will thus help to improve the likelihood that adverse impacts are mitigated, project benefits are showcased, and an environmentally beneficial standards of best practice is provided to all those involved. In particular, the ESMP:
The specific objectives of the ESMP are to:

- Define the roles and a responsibility for those involved in the implementation of the ESMP and identifies areas where these roles and responsibilities can be shared with other stakeholders.
- Define the implementation mechanism for the mitigation measures identified during the present study.

- Provides concise instructions to project personnel and contractors regarding procedures for protecting the environment and minimizing environmental impact, making these legally binding through their inclusion in contract specifications.
- Define the monitoring mechanism and identify monitoring parameters in order to:
    - Ensure the complete implementation of all mitigation measures, and
    - Ensure the effectiveness of the mitigation measures.
- Provide the mechanism for taking timely action in the face of unanticipated environmental or social situations,
- Identify environmental as well as social training requirements at various levels.

9.2 COMPONENT OF ESMP

The EMP consists of the following:

- Institutional Arrangements
- Mitigation and Monitoring plan
- Grievance Redressing Mechanism
- Reports and Documentation
- Environmental and social trainings,
- Public disclosure requirements
- Budgetary estimates for EMP implementation.

All the components of EMP are discussed from Section 8.3 to 8.9.

9.3 INSTITUTIONAL ARRANGEMENT

Zorlu Solar Pakistan (Pvt) Ltd will establish an Environment & Social Management Cell (ESMC) at Corporate and Site level, headed by a Project Director to be responsible for day-to-day implementation of the Project. Zorlu Solar Power is responsible for undertaking the project in accordance with the Initial Environment Examination (IEE) and implementing the Environmental and Social Management Plan as per ADB's Safeguard Policy Statement (2009) which will be consistent with the standards set by IFC and World Bank Group.

The ESMC is responsible for coordinating and implementing all environmental and social activities. During project implementation, the ESMC will be responsible for reflecting the occurrence of new and significant impacts resulting from project activities and integrating sound mitigation measures into the ESMP. The ESMC includes a safeguard specialist and supporting staff, together forming the Environmental and Social Unit, appointed by Zorlu Energy Solar Pakistan (Pvt) Ltd to look after environmental, social and safety issues. The ESMC will be empowered to implement safeguards planning and monitor implementation.

The safeguards specialist gives guidance to the Project Manager and his staff to adopt the environmental good practice while implementing the project. The safeguard specialist is responsible for implementing safeguard issues associated with the project through a site team composed of Zorlu Solar Pakistan (Pvt) Ltd site staff and contractor's staff, to be assigned by the ESMC as necessary.

The duties of the Environmental and Social Unit of the ESMC at corporate level are to:

- Monitor the implementation of mitigation measures during construction and operation phases of the project.
- Prepare suitable environmental management reports at various sites.
- Advise and coordinate field unit's activity towards effective environment management.
- Prepare environment health and safety manual for the operation of transmission lines/substations.
- Advice during project planning/design cells on environmental and social issues while route selection of the alignment at the planning/design stage to avoid negative environmental impact.
- Provide training and awareness rising on environmental and social issues related to power transmission projects to the project/contract staff.

The duties of the Environmental and Social Unit at site level are to:

- Implement the environment policy guidelines and environmental good practices at the sites.

- Advise and coordinate the contractor(s) activity towards effective environment management.

- Implement environment health and safety manual.
- Carry out environmental and social survey in conjunction with project planning cell while route selection of the alignment at the planning stage to avoid negative environmental impact.

- Make the contractor staff aware of environmental and social issues so that EMP could be managed effectively.

9.3.1 Supervision Consultant (RE)

The supervision consultant / Project Monitoring Consultant (PMC) (RE) has qualified environment health and safety staff on board to which will be responsible for overseeing the implementation of the EMP during the construction.

9.3.2 Lead Contractor

The contractor will be responsible for the following:

- Overall construction programme, project delivery and quality control for the construction for the solar project.
- Overseeing compliance with the Health, Safety and Environmental Responsibilities specific to the project management related to project construction.
- Promoting total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment.
- Ensuring that each subcontractor employ an Environmental Officer to monitor and report on the daily activities on-site during the construction period.
- Ensuring that safe, environmentally acceptable working methods and best practices are implemented and that sufficient plant and equipment is made available properly operated and maintained, to facilitate proper access and enable any operation to be carried out safely.
- Meeting on site with the Environmental Officer prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Ensuring that all appointed contractors and sub-contractors are aware of this

- Environmental and Social Management Plan and their responsibilities in relation to the plan;
- Ensuring that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the Environmental Management Plan, to the satisfaction of the Environmental Officer.
- Ensure compliance of its subcontractors with the national labor laws

At the time of preparing this draft ESMP, the appointment of a lead contractor has not been made and will depend on the project proceeding to the construction phase.

The Framework of Environment and Social Management Cell are shown in **Figure 9.1** and Key responsibilities of ESMC are summarized in **Table 9.1**

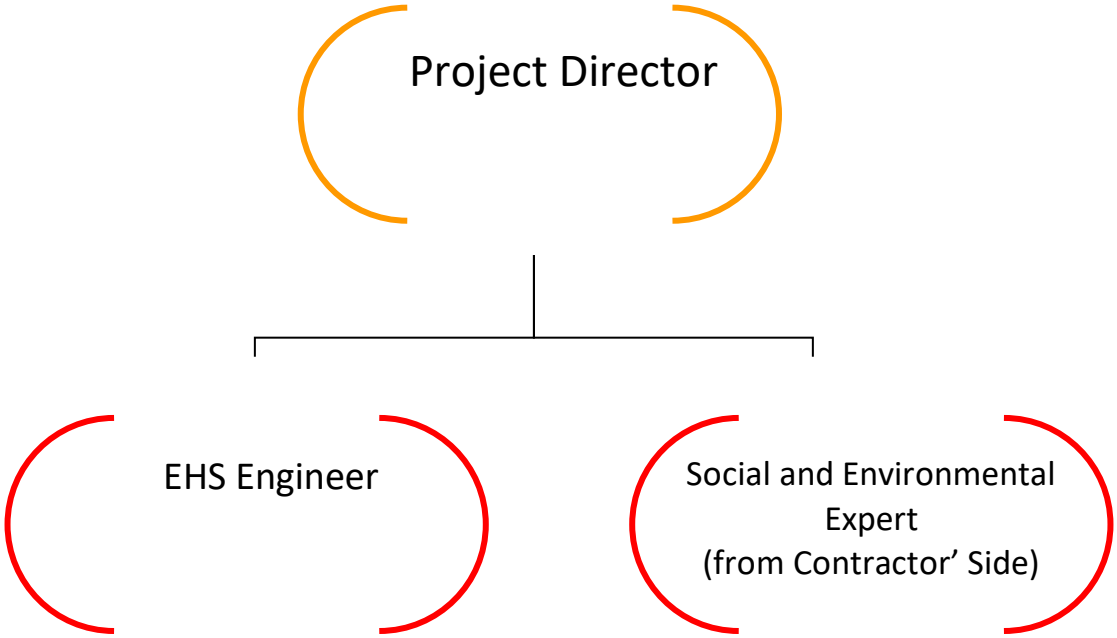


Figure 9.1: Framework of Environment and Social Management Cell (ESMC)

Table 9.1: Identification of Activities and Potential Impact (O & M Phase)

S. No	Designation	Responsibility
1	Project Director (01)	❖ Environment and Social Policy and Directions
2	EHS Engineer (01)	❖ Overall in-charge of operation of environment & social management facilities ❖ Ensuring legal compliance by properly undertaking activities as laid down by regulatory agencies from time to time and interacting with the same
3	Social and Environmental Monitoring Expert (01) (from contractor side)	❖ Secondary responsibility for environment & social management and decision making for all environmental issues including Safety and Occupational Health ❖ Ensure environmental monitoring and social issues related to project as per appropriate procedures

9.4 MITIGATION & MONITORING PLAN

The mitigation plan is a key component of the ESMP. It lists all the potential effects of each activity of the project and their associated mitigation measures identified in the IEE.

For each project activity, the following information is presented in the plan:

- ❖ A listing of the potential impact associated with that project activity
- ❖ A comprehensive listing of mitigation measures (actions)
- ❖ The person(s) responsible for ensuring the full implementation of the action
- ❖ The person(s) responsible for monitoring the action
- ❖ The timing of the implementation of the action to ensure that the objectives of mitigation are fully met.

- ❖ It should be emphasized that the mitigation measures will have to be translated into environmental as well as social requirements and specifications to be made part of the contracts for the construction activities, with legal binding.

The objective of environmental and social monitoring during the various phases of the Proposed project will be as follows:

- ❖ Ensuring that the mitigation measures included in the IEE are being implemented completely.

- ❖ Ensuring the effectiveness of the mitigation measures in minimizing the project's impacts on social and environmental resources.

To achieve these objectives, the Environmental and Social Management Plan (ESMP) for construction and operation phase is given in **Annexure-I.**

9.5 GRIEVANCE REDRESSAL MECHANISM

Environmental and social grievances will be handled in accordance to the project grievance redress mechanism. Open and transparent dialogue will be maintained with project affected persons as and when needed, in compliance with ADB safeguard policy requirements. The Grievance Redress Mechanism (GRM) for the project provides an effective approach for complaints and resolution of issues made by the affected community in reliable way. This mechanism will remain active throughout the life cycle of the project.

Zorlu Solar Power Pakistan shall have a standard mechanism to

i. inform the affected people (AP) about GRM and its functions,
ii. set the procedures and mechanisms adopted for making the complaints,
iii. support the complainants in communicating their grievance and attending the GRM meetings and
iv. Implement compliance with a GRMs' decision, its monitoring and communication to the people.

Under the GRM, the ESMC will maintain the Social Complaint Register (SCR) at the sites to document all complaints received from the local communities or any other stakeholder. The information recorded in the Register will include date of the complaint, particulars of the

complainant, description of the grievance, actions to be taken, the person responsible to take the action, follow up requirements and the target date for the implementation of the mitigation measure. The register will also record the actual measures taken to mitigate these concerns.

As soon as a complaint is received, the ESMC will determine the remedial action. If required, consultations will also be undertaken with the contractor's site manager. Once the remedial action is decided, implementation responsibility as well as schedule will be determined.

The proposed remedial action will be documented in the SCR, with complete details (by whom and by when). The proposed remedial action will be shared with the complainant. Similarly, the actual action taken will also be documented in the Register and shared with the complainant. The complainant's views on the remedial action taken will also be documented in the Register.

The SCR will be reviewed during the fortnightly meetings at the site during the project, and the action items discussed. The progress on the remedial actions will also be reviewed during the meetings.

Types of Grievances

There are two types of grievances to be considered,

1. Internal Grievance
   This includes employees hired specifically for the site.
   Complaints pertaining to amount of wage, salary, other remuneration or benefits, disbursement of remuneration, Working condition, health and safety of the employees etc

2. External Grievance
   Contractor and Labor related Grievances: Community Grievances including those on land and resettlement issues, project activities, CSR, intervention, employee / worker-community conflicts, and other project related issues.

Internal Grievance Redressal Process

Stage 1: First level of grievance addressal

The aggrieved employee may take up the grievance in writing with his/her reporting officer. If the matter itself concerns the employee's line manager then the grievance should be escalated to the Head of the Department.

Stage 2: Second level of grievance addressal

In case employee is not satisfied with the decision communicated to him/her at Stage-I, or if she/he fails to receive the reply within stipulated period, he/she may submit the grievance in the prescribed form to Head- HR

Stage 3: Third level of grievance addressal

If the employee remains aggrieved and not satisfied with the decision of the Head-HR, will have an option to appeal to the President of company.

Redressal Process for External Grievances

Step 1: Publicizing Grievance Management Procedures

Contractor is required to ensure suitable public disclosure of its grievance handling and redressal process to its external stakeholders such as the community or the local administration. Since local community are supposed to be working at the site for a duration ranging from six months to nine months tentatively, the Grievance Redressal Mechanism for the community can simultaneously be used for the workers

Step 2: Receiving and Keeping Track of Grievances

This receipt and tracking of grievances primarily involves the following stages:

- ✓ Collecting and recording grievances;
- ✓ Registering them in a suitable manner; and
- ✓ Tracking them to reflect their status

Designated personnel from the grievance body with collection of grievances writes down complaints at group or individual meetings, during field visits, or at designated locations. These grievances are to include:

- ✓ Complaints received through third parties such as community persons, contractors, contract workers, etc.;
- ✓ Complaints received by project staff directly/indirectly involved in handling grievances;

- ✓ Tracking of grievances can be undertaken with keeping of records in the registrar

Step 3: Reviewing and Investigating Grievances

The designated personnel from the grievance body responsible for grievance handling will organize the process to validate the complaint's legitimacy and arrange for investigation of details as per the applicability. All grievances shall undergo some degree of review and investigation

Step 4: Developing Resolution Options and Preparing a Response

The person having grievance will come on the scheduled time and lodge the complaint in person or through other recognized person/forum identified by the company. The grievance will be processed and concerned person will be informed through a suitable communication by person or through company recognized person/forum within mutually agreed stipulated period

Step 5: If the complainant is still not satisfied with the resolution of issues or complaints, he/she can go to local judicial proceedings.

Step 6: Monitoring, Reporting, Evaluating and recording of Grievance Mechanism

- ✓ Periodic review of internal and external grievances has to be carried out at the appropriate forum of Zorlu.
- ✓ Based on all grievances received, registered, documented and tracked through database reports shall be prepared for reporting to the appropriate Forum
- ✓ Monitoring and reporting will create a base level of information that can be used by the company to report back to communities as per the applicability and requirement

Disclosure of GRM

The disclosure for GRM will be done with the appropriate community, employees and stakeholders to fulfil the specific purpose based on the requirement through suitable communication.

Role and Responsibilities

- ✓ At the corporate level, handling of grievances is required to be directly handled by the HR department under the responsibility of the designated officer

- ✓ A grievance Body, leaded by designated Grievance officer is proposed for effective implementation of GRM and coordinating day to day functions. The grievance Body would be reporting back to the appropriate authority including functional areas such as HR, Project, CSR, EHS etc. as per requirement. The mandate of this cell would be managed as part of the ESMS forum.

Training

Workers and appropriate stakeholders shall be appropriately trained on GRM system and the company policy against stakeholder engagement. The training shall be conducted periodically.

9.6 REPORTS AND DOCUMENTATION

The ESMC will produce periodic reports based on the information collected. These will include reports for:

- ❖ Project initiation meetings with each contractor,
- ❖ Non-compliances,
- ❖ Effects monitoring
- ❖ Summary of CSR under GRM

The reports will also be made available for review, to the external monitoring teams, and to any other stakeholders who visit the site. In addition, the Social and Environmental Monitoring expert will prepare report for each monitoring visit.

At the end of the construction phase, a final report will also be prepared.

An Annual E&S Report will be submitted to ADB and IFC.

9.7 ENVIRONMENTAL AND SOCIAL TRAININGS

Environmental and social trainings will help to ensure that the requirements of the IEE and EMP are clearly understood and followed by all project personnel throughout the project period. The primary responsibility for providing training to all project personnel will be that of the ESMC.

The environmental and social training program will be finalized before the commencement of the project, during the detailed design phase. The training will be provided to the Zorlu Solar Power Pakistan staff, the construction contractors, and other staff engaged for the project. Training will cover all staff levels, ranging from the management and supervisory to the skilled and unskilled personnel. The scope of the trainings will cover general environmental awareness and the requirements of the IEE and the EMP, with special emphasis on sensitizing the project staff to the environmental and social aspects of the area.

During the O&M phase of the project, these trainings will continue to be conducted by ESMC for all relevant staff of the Company.

9.8 PUBLIC DISCLOSURE REQUIREMENTS

Zorlu Solar Power Pakistan will disclose this IEE and ESMP to all the stakeholders before the commencement of the proposed project. The IEE report will be made available to the stakeholders at the sites designated by the EPA, in accordance with the national legislation (PEPA 1997). In addition, the executive summary of the IEE will be translated into Urdu language (if necessary), and made available to the affected communities (and also kept at the project sites). This will ensure that the local communities are aware of the project, its key impacts, the mitigation measures and the implementation mechanism. In addition, the Executive Summary will be disclosed through the Zorlu Solar Power Pakistan official website.

9.9 BUDGETARY ESTIMATES FOR ESMP IMPLEMENTATION

The primary component of the environmental and social management cost pertains to the personnel dedicated for ESMP implementation. The overall estimated cost of EMP implementation amounts to PKR 3,245,000, details of which are provided in **Annexure-II.**

SECTION 10

CONCLUSION AND RECOMMENDATION

10 CONCLUSION AND RECOMMENDATION

Prime benefit of the Project will be the replacement of conventional power generation with renewable energy. Solar energy will replace fossil fuel powered generation, and therefore reduce suspended particulate matter and greenhouse gas emissions into the atmosphere.

Impacts are manageable and can be managed cost effectively - Environmental impacts are likely to result from the proposed Power project. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes. Since proposed land is covered with shrubs, thus there is no need for removal for the construction of the Solar PV project.

- The proposed project will have number of positive impacts and negligible negative impacts to the existing environment as follows:
- Significantly improvement in the economic activities in the surrounding areas due to generation of direct and indirect employment opportunities.
- The Project Area does not fall under any sensitive, protected area.
- No threatened / Near-Threatened species of wildlife was recorded in the Project Area.
- There is negligible removal of trees for the project, which is the main positive impact to the proposed project area.
- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, nuisance from dust, noise, vehicle fumes, black smoke, vibration are the short term negative impacts due to proposed project with mitigations being properly taken care.

- ❖ The project will not entail physical or economic displacement and no Indigenous Peoples will be affected.

Proper GRM will have to be implemented by Zorlu Solar Power Paistan to overcome public inconvenience during the proposed project activities.

Based on the environmental and social assessment and surveys conducted for the Project, the potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified in the EMP. Adequate provisions are being made in the Project to cover the environmental mitigation and monitoring requirements, and their associated costs. Adequate provisions are being made by Zorlu Solar Power Pakistan to cover the environmental mitigation and monitoring requirements, and their associated costs.

An environment and social analysis has been carried out looking at various criteria such as topology, air, noise, water resources and water quality, ecology, demography of the area, climate and natural habitat, community and employee health and safety etc. The impact analysis, found that due to careful consideration of environmental and social aspects during route and site selection by Zorlu Solar Power Pakistan, no major adverse impacts are expected. There is no adverse impact on the migration of habitat, any natural existing land resources and effect in the regular life of people.

The environment and social impact associated with project is limited to the extent of construction phase and can be mitigated through a set of recommended measures and adequate provision for environment and social impacts which cover monitoring, measuring and mitigation.

EMP has been prepared. Most impacts are expected to occur during the construction phase and are considered to be of a temporary nature. The transmission corridor was carefully selected after undergoing an options assessment. This enabled the right of way alignment to bypass villages and important water supplies and resources. The main project impacts are associated with clearing of shrub vegetation, waste management and excavation and movement of soils.

From this perspective, the project is expected to have a small "environmental footprint". No endangered or protected species of flora or fauna are reported near project sites.

Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts, along with their associated costs. Adverse impacts if noticed during implementation will be mitigated using appropriate design and management measures. The

potential cumulative and residual impacts of the project as a whole indicate the project classifies as a category "B", in accordance with ADB Safeguard Policy Statement 2009. The Project is not considered highly sensitive or complex. Mitigation measures related to construction, as specified in the ESMP, will be incorporated into civil works contracts, and their implementation will be primarily the responsibility of the contractors. Hence, the proposed project has limited adverse environmental and social impact which can be mitigated following the ESMP & shall be pollution free Renewable source of Power.