JHIMPIR POWER (PVT.) LIMITED

WIND POWER PROJECT

JHIMPIR, DISTRICT THATTA, SINDH

INITIAL ENVIRONMENTAL EXAMINATION (IEE) FINAL MAIN REPORT

SUBMITTED BY

AFTEC (PVT.) LIMITED

20, Gulberg-5, Lahore

February , 2016

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Executive Summary

Jhimpir Power (Pvt.) Limited, [hereinafter referred as **JPL**] are in the process of installing 49.3 MW Wind Power Plant at Jhimpir, District Thatta. In compliance with the legal requirements of the Pakistan Environmental Protection Act-1997 **(**PEPA-1997), Section 12; before starting any construction activity at the project site; No Objection Certificate (NOC)/Environmental Approval (EA), is required from Environmental Protection Agency (EPA), Government of Sindh, Karachi.

According to the "Guidelines for the preparation and review of Environmental Reports, November 1997" revised in Year 2000, the project falls under **Category "B"** therefore, this Initial Environmental Examination (IEE) has been prepared for submission to the EPA Sindh for the grant of No Objection Certificate (NOC)/Environmental Approval (EA).

Pakistan is energy deficient. The total installed power generation capacity of Pakistan is 22,000 MW. Projection for the demand in year 2030 is forecast to be 100,000 MW. The growth in energy supply continues to lag behind the growth in energy demand.

Fossil fuels are already in short supply, and their local availability is fast depleting along with price hike taking place during very short intervals of time. At the same time they are causing serious environmental concerns. Import bills of fossil fuels are swelling at a very fast rate. The fragile economy of Pakistan cannot afford to continue with the present situation.

Consequently, the present state demands to utilize other sources which could at least partially replace the fossil fuels presently in use. Wind is one among other non-

conventional energy sources which provides one of the most promising alternatives for generation of grid quality power.

According to Wind Map (WM) of the country; developed by National Renewable Energy Laboratory (NREL) USA with active collaboration of USAID, Pakistan Meteorological Department (PMD) and Alternative Energy Development Board (AEDB) utilizing the data from PMD and satellite images; the Gharo – Keti Bandar Wind Corridor stretching 60 KM along the cost line of Sindh and deeper than 170 KM toward the land has a potential for generation of more than 60,000 MW of electricity. Whereas the total wind energy potential of the country, as estimated by NREL, USA stands at 346,000MW.

JPL are aiming to install a wind power Plant of 49.3 MW at Jhimpir. The Alternative Energy Development Board (AEDB), Government of Pakistan, issued to JPL, the Letter of Intent (LOI) on November 13, 2013 and Letter of Sanction (LOS) on December 23, 2014. Land was allotted to JPL via Letter No. 01-12-2015/SO-VI/03 dated January 14, 2016. Land has been leased for JPL Project by Government of Sindh for 30 years.
This Initial Environmental Examination (IEE) report has been prepared as legal requirement under the Pakistan Environmental Protection Act (PEPA), 1997, Section 12.

This IEE report gives a comprehensive account of the policy, legal and administrative framework as applicable in the perspective of Pakistan.

The proposed project is not likely to have significant adverse environmental impacts which could be irreversible, affect sensitive eco-system, involuntary resettlement, etc., or un-precedented impact. The project is not to be located in the vicinity of sensitive location of national or regional importance. Under this situation according to “Pakistan Environmental Protection Agency, Review of IEE & EIA Regulations 1997/2000 (revised)” the project falls under Category B.

The JPL Project will be located at about 10 km distance south-west from Nooriabad Industrial Estate located on M-9 (Karachi - Hyderabad Motorway), and north of Jhimpir Town.

Coordinates of JPL Wind Farm are shown in Table – E.1 and graphically presented in Figures E.1 and E.2.

Table – E.1

Proposed Wind Farm Coordinates

Points	Coordinates	
	Latitude	**Longitude**
J-1	25° 9'49.88"N	68° 0'26.29"E
J-2	25°10'2.75"N	68° 0'40.31"E
J-3	25° 9'12.63"N	68° 0'58.11"E
J-4	25° 9'21.83"N	68° 1'16.40"E
J-5	25° 9'15.35"N	68° 1'3.47"E
J-6	25° 9'18.23"N	68° 1'9.43"E
J-7	25° 6'33.66"N	68° 5'50.34"E
J-8	25° 6'27.78"N	68° 5'47.64"E

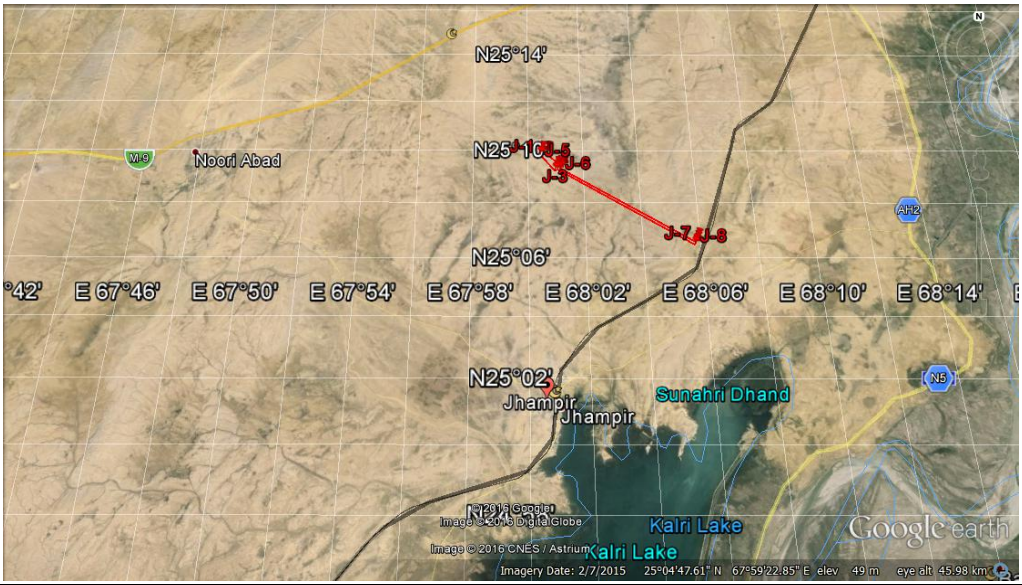

Figure – E.1: JPL Wind Farm-1 [Courtesy: Google Earth]

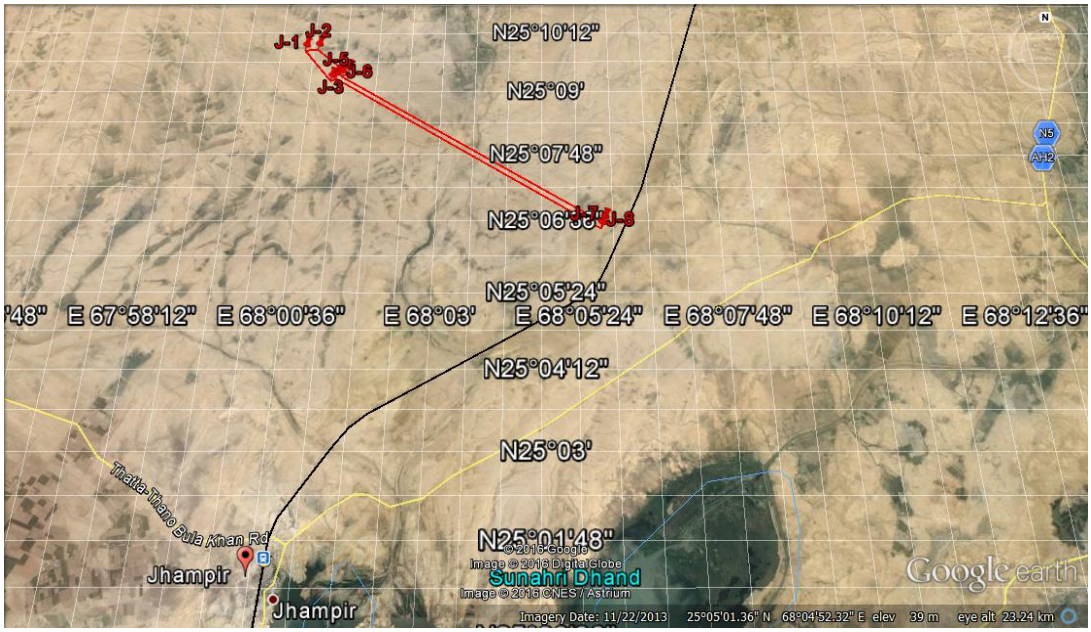

Figure – E.2: JPL Wind Farm-2 [Courtesy: Google Earth

JPL has proposed to install Nos. 29 (twenty nine) General Electric Type-3 Turbines of 1.7 MW each. Total capacity works out at 49.3 MW. The relevant details about the turbines are given here under:

- Class: IEC TC IIIs
- Hub Height: 80 meters
- Tip Height: 130 meters
- 50 Hz
- Blades: 48.7 meters
- Technology: Model based controls, low noise trailing edge, vortex generators.

The environmental aspects, of the project site at the Jhimpir, have also been taken into consideration. According to the findings, there will be No Impact on the flora and fauna of the area since there is no establishment grazing land, national park, protected wildlife zones or birds sanctuary present near the wind farm. The study has also under taken noise, shadow flickering and visualization impact. The findings show that there will not be any adverse impact because of these factors.

The wind farmland has 5 (five) temporary settlements outside the wind farm boundary, which will not require any displacement or resettlement. Other villages are further away from the Project site. The land has been leased to the project.

Since the wind farm requires no fuel burning process in the entire project life cycle for its operation, it will be a 100% Green Power Generation Plant without emitting a single gram of Green House Gases. Further, no environmentally dangerous liquid/solid waste will be produced by the wind farm. So, the wind farm will not be polluting any element of the environment to the surroundings as well as health.

The other issues during equipment transportation and plant construction are of minute and temporary nature and will not cause any environmental concern. However, JPL, with its vast experience in controlling environmental issues, will ensure through its contractors that it will be minimized for the extent possible.

According to the findings, it is worth noting that all the wetlands including Mancher Lake, Keenjhar (Kalri) Lake, Drig Lake, Haleji Lake , Jubho Lagoon, Nurri Lagoon, and Deh Akro, are situated far beyond the area of influence of the proposed project site, therefore, the project siting at the proposed location has absolutely no influence on these wetlands.

The site is barren where some small bushes are found. There are not any endangered habitat, park, forest, wildlife, and estuary, historical or cultural resource within the area of influence of the project. There is no industry or any other commercial activity around the project site, except for other wind farm projects in the area.

Potential (Unmitigated) Environmental, Health and Safety Impacts have been reported in this IEE report. Summarily, methodology for anticipating environmental impacts, during construction and operational phases, have been discussed in this report. Severity of each impact has been described. According to the evaluation, the intensity of all possible impacts varies between minor to medium.

During construction and regular operation phases, there will be some environmental pollution. Specific environmental pollutants that will be generated during construction and operational phases of this project and mitigation measures have been given in this report to address the environmental issues so as to keep all the pollutants in line with applicable National Environmental Quality Standards (NEQs) and National Environmental Quality Standards for Ambient Air (NEQSAA) 2010: National Environmental Quality Standards for Drinking Water Quality (NEQSDW) 2010: National Environmental Quality Standards for Noise (NEQSN) 2010.

During site clearing activities some bushes have to be removed and they will be used as fuel for cooking by the people of the villages as they use them in routine due to shortage of fuel for cooking. During excavation, a lot of top soil and sub- soil will be piled up and dust will also be generated. Dust will be taken care of by restraining the activities to the designated areas and sprinkling water at sites of dust generation. A lot of solid wastes and sewage will also be generated especially from construction camps. These have to be disposed off in environmentally sustainable manner.

The adverse environmental impacts during the functional phase of the proposed project under normal operating conditions are from bird mortality/avian impact, noise and solid waste generation.

In order to address the scientific disposal of the waste to be generated during construction and regular operation phases, Environment Management Plan (EMP) and Environmental Monitoring Program (EMtP) are given in this report.

The EMP will cover all aspects of waste and wastewater management and staffing during construction, including implementation of best practice standards such as reduce, re-use and recycle.

Monitoring recommendations are presented in this report for documenting the compliance of the project to the NEQS Pakistan.

The project will save a lot of Green House Gases emissions as compared to power plants based on fossil fuels.

Public Consultations/Disclosure were held. Summarily, the people of the study area perceive overall positive impacts as a result of installation of the plant. The people

believe that installation of the power plant in the area, especially during construction phase will open up employment opportunities which in turn follow a chain of indirect socio-economic benefits.

They also perceive accelerated economic activity due to the business opportunities likely to emerge in the area. Directly or indirectly, some reasonable number of the local people will get employment and business from the installation of the plant, e.g. shop keepers, traders, suppliers, contractors, transporters, technicians etc

Formal and informal grievance redressing mechanisms for compensations on account of damages due project mal-operations have included in this report.

On the basis of the IEE report, it is concluded that the project by all means merits for implementation at the designated site.

1.0 INTRODUCTION

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Jhimpir Power (Pvt.) Limited, (hereinafter referred as **JPL**) is in the process of installing 49.3 MW Wind Power Plant at Jhimpir, District Thatta. In compliance with the legal requirements of the Pakistan Environmental Protection Act-1997 **(**PEPA-1997), Section 12; before starting any construction activity at the project site; No Objection Certificate (NOC)/Environmental Approval (EA), is required from Environmental Protection Agency (EPA), Government of Sindh, Karachi.

According to the "Guidelines for the preparation and review of Environmental Reports, November 1997" revised in Year 2000, the project falls under **Category "B"** therefore, this Initial Environmental Examination (IEE) has been prepared for submission to the EPA Sindh for the grant of No Objection Certificate (NOC)/Environmental Approval (EA).

Briefly, this IEE Report describes environmental, social, physical and other aspects associated with the project and also explains necessary measures to be put into practice for mitigating environmental impacts on any segment of the environment around the project site both during construction and normal operation. The IEE report also provides information as desired under the format used to help decision makers, EPA Sindh in the present case, before issuing the desired NOC/EA.

1.1 Project Proponent & Consultants Who Prepared the Report:

Project Proponent

The project proponent is:

Jhimpir Power (Pvt.) Ltd
2nd Floor Building No 36-C Bukhari Commercial Lane 7 DHA Phase 6, Karachi
Phone no: +92 334 3077630
Email address: saleem.zaman@burjcap.com

Mr. Saad Zaman (CEO/Director)
Mr. Zafar Masud (Director)

Contact Person:

Mr. Saleem Zaman
Email: saleem.zaman@burjcap.com
Phone No: +92 334 3077630

2nd Floor Building No 36-C Bukhari Commercial Lane 7 DHA Phase 6, Karachi
Consultants Who Prepared the IEE Report:

Aftec (Pvt.) Limited,

20, Gulberg-5, Lahore

Phone: 042-35755614

Email: aftec_ltd@yahoo.com

1.2 Project Background

Considering the strong correlation between economic growth and energy demand, there is an imperative need for sustained increase in energy supply not only to maintain the growth momentum but also to protect the economy from disruptions, caused by energy deficiency over the last five to six years. The Government of Pakistan (GOP) is making concerted efforts to ensure development of energy resources by encouraging private sector to meet energy demand and has

liberalized investment policies. The policy has resulted not only in investments in power production sector from local resources, but also foreign investments are pouring in large amounts.

As a result of serious power shortage, load sheddings are so frequent. The gap between power supply and demand is further on the increase. Consequently, all walks of life are being adversely affected. Pakistan has an installed electric generating capacity of about 22,000 MW. Projection for the demand in year 2030 is forecast to be 100,000 MW.

Pakistan is energy deficient. Fossil fuels are already in short supply, and their local availability is rapidly depleting along with price hike taking place during very short intervals of time and also causing serious environmental concerns side by side creating alarming circumstances for the future. Import bills of the fossil fuels are swelling at a very fast rate due to their increasing demand in the country. Fragile economy of Pakistan cannot afford to continue with the present situation. Consequently, the present state demands to find/explore other sources which could fully or partially replace the fossil fuels presently in use.

Wind Power Potential

Power is backbone of any development activity. It is provided by conventional and non-conventional sources. Wind is one among other non-conventional energy sources, which provides one of the most promising alternatives for generation of grid quality power.

Wind power is becoming more and more cost effective in comparison to thermal and nuclear power, besides virtually none of the environmental or social costs like in case of the conventional sources.

Pakistan is gifted with vast wind resource. National Renewable Energy Laboratory (NREL) USA developed wind Map (WM) of the country with active collaboration of USAID, Pakistan Meteorological Department (PMD) and Alternative Energy Development Board (AEDB) utilizing the data from PMD and satellite images. . Whereas the total wind energy potential of the country, as estimated by NREL, USA stands at 346,000 MW; according to this data, the coastal belt of Pakistan is blessed with a wind corridor that is 60 km wide (Gharo ~ Keti Bandar) and 180 km long (up to Hyderabad). This corridor has the exploitable potential of 50,000 MW of electricity generation through wind energy (Figure-1.1 – below).

Figure – 1.1: Gharo-Keti Bandar Wind Corridor

Pakistan's first commercial-scale wind power generation began in April 2009 from the 6 MW first phase of what is to be 55 MW wind farm in Jhimpir, Thatta District, Sindh, within the 60 by 180 km Gharo-Keti Bandar "wind corridor" . Since the national target for renewable energy generation is 9,700 MW by year

2030, it is clear that wind power projects could play a significant role in the country future energy development.

The Alternative Energy Development Board (AEDB) was established in 2004 to assess, promote, and facilitate the development of alternative or renewable energy resource such as wind power. The AEDB actively assists in the development and implementation of plans and projects, working with potential developers and with concerned authorities and provincial Governments.

1.3 The Proposed Project:

JPL are aiming to install a wind power Plant of 49.3 MW at Jhimpir. The Alternative Energy Development Board (AEDB), Government of Pakistan, issued to JPL, the Letter of Intent (LOI) on November 13, 2013 and Letter of Support(LOS) on December 23, 2014. Land was allotted to JPL via Letter No. 01-12-2015/SO-VI/03 dated January 14, 2016. Land has been leased for JPL Project by Government of Sindh for 30 years.

The Project will be installed for establishing 49.3 MW Wind Power Generation Project in Gharo-Keti Bandar Wind Corridor [Figure-1.2, below]. The National Transmission and Dispatch Company (NTDC) will provide connection to JPL from nearest grid station.

Figure-1.2: showing the project site. Courtesy: Google Earth

Coordinates of JPL Wind Farm are shown in Table – 1.1 and graphically presented in Figures 1.3 and 1.4.

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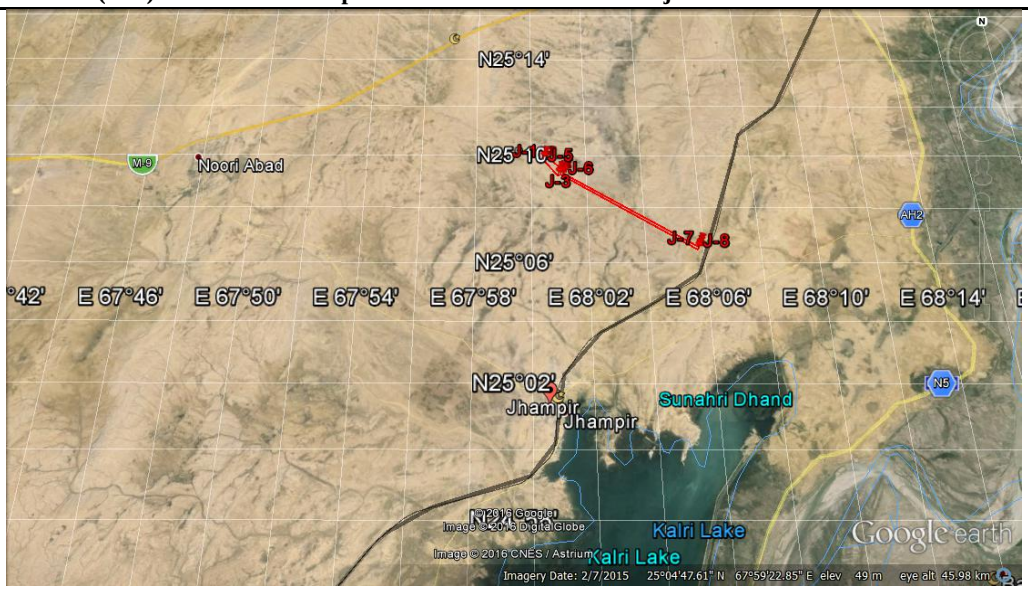

Figure – 1.3: JPL Wind Farm-1 [Courtesy: Google Earth]

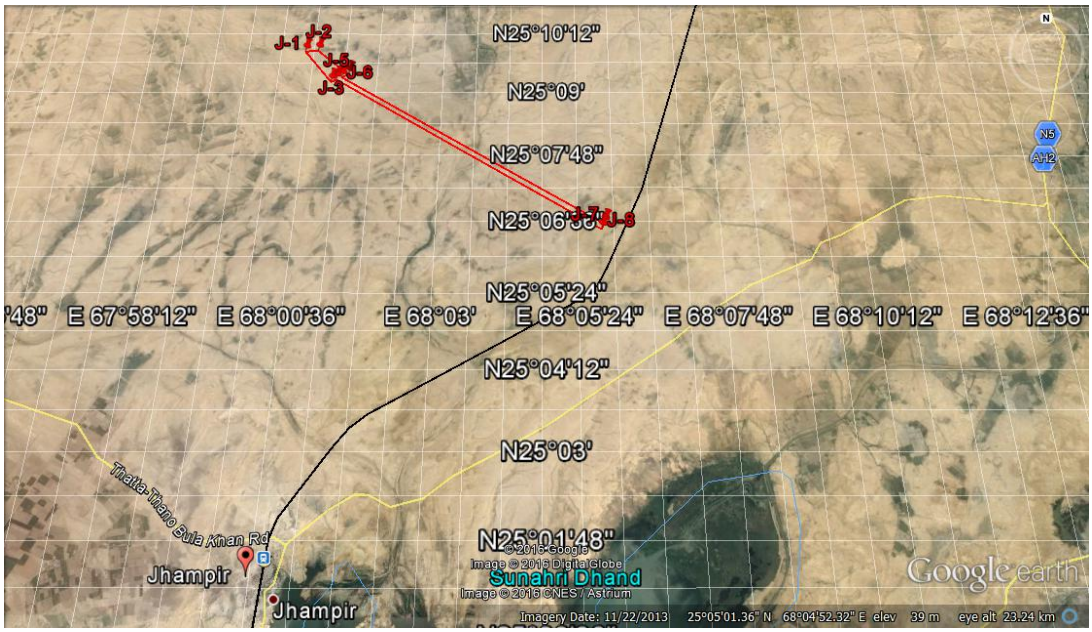

Figure – 1.4: JPL Wind Farm-2 [Courtesy: Google Earth]

1.4 Brief Description of Environmental Aspects

The environmental aspects, of the project site at the Jhimpir, have also been taken into consideration. According to the findings, there will be No Impact on the flora and fauna of the area since there is no establishment grazing land, national park, protected wildlife zones or birds sanctuary present near the wind farm. The study has also under taken noise, shadow flickering and visualization impact. The findings show that there will not be any adverse impact because of these factors.

The wind farmland has 5 (five) small temporary settlements outside the wind farm boundary, which will not require any displacement or resettlement. Other villages are further away from the Project site. The land has been leased to the project.

Since the wind farm requires no fuel burning process in the entire project life cycle for its operation, it will be a 100% Green Power Generation Plant without emitting a single gram of Green House Gases. Further, no environmentally dangerous liquid/solid waste will be produced by the wind farm. So, the wind farm will not be polluting any element of the environment to the surroundings as well as health.

The other issues during equipment transportation and plant construction are of minute and temporary nature and will not cause any environmental concern. However, JPL, with its vast experience in controlling environmental issues, will ensure through its contractors that it will be minimized for the extent possible.

Keeping in view the above environment related studies and findings thereof; it is obvious that installation of wind Power Project in Jhimpir by JPL will not have any adverse Environmental Impact and that the project can be regarded as Environmental Friendly Green Project. Additionally, the project will save

substantial amount of Green House Gases emissions as compared to fossil fuel based the power plant.

1.5 Extent of the IEE Study:

As describe at the start of this Section, in compliance with the legal requirements of the Pakistan Environmental Protection Act-1997 **(**PEPA-1997), Section 12; before starting any construction activity at the project site; No Objection Certificate (NOC)/Environmental Approval (EA) is required from Environmental Protection Agency (EPA), Government of Sindh, Karachi. Accordingly, following the "Guidelines for the Preparation and Review of Environmental Reports, November 1997" revised Year 2000, since the project falls under category "B" therefore, this Initial Environmental Examination (IEE) has been prepared for submission to the EPA, Sindh for the grant of No Objection Certificate (NOC)/Environmental Approval (EA).

1.6 Key Persons Who Performed This Study:

Aftab Ahmad: M.Sc. Hons (Chemical Technology)

- Provision of Consultancy Services for a complete Hazop, Safety and Environmental Audit for Chaudhry Dairies Limited, Lahore, Milk Processing Plant.
- Was involved in execution of Environmental Audit of textile finishing and dyeing plant of Ammar Textiles (Private) Limited, Lahore. Also designed a Waste Water Treatment Plant.
- Undertook a complete EIA, hazop and environmental audit of the A.M. Sons, Mirpur, Azad Kashmir Chemical Manufacturing Facility.
- Was involved in hazop and environmental audit of Nimir Chemicals Plant near Sheikhupura.

- EIA of Margalla Cable-Car Project for CDA, Islamabad

- Carried out EIA & SEIA of following plants:

  - Asian Precious Minerals Limited – prepared a complete EIA and SEIA assignment for their cement plant near Choa Sadian Shah.

  - EIA & SEIA for a cement in Tajikistan.

- As associate of ECTECH and team leader carried out following assignments:

  - Installing 49.5 MW Wind Power Plant At Jhimpir, District Thatta
  - Burj Wind Energy (Pvt.) Limited (BWEPL), Installing 13.5 MW Wind Power Plant at Gujju, Taluka (Tehsil) and District Thatta
  - 1200 MW MMPAK Power Plant Coal Fired, Coastal to be installed in Pakistan. This assignment was carried out on behalf of M/S Sargent and Lundy, Chicago, U.S.A.Two i.e. one SEIA report according to IFC requirement and the other EIA according to the National Environment Quality Standards Pakistan were prepared2008.
  - DHA Cogen Limited Power and Desalination Unit, Karachi, Pakistan:
  - Balloki 2x660MWCoal Fired Power Plant, China Gezhouba Group Company Limited
  - Installation of 440 MW Combined Cycle Power Plant, **U.A.E Gifted Plant, Faisalabad, GENCO – III, Faisalabad.**
  - 80 MW JDW Bagasse fired Power Plant, District Yar Khan
  - 357.2 MW Korangi Thermal Power Station, Karachi –Capacity Enhancement January 2007.
  - Bin Qasim Thermal Power Station 574.612MW –Capacity Enhancement Project, January 2, 2007.
  - Green Electrical Power Private Limited, 188 MW, Dadu, 2010.
  - Bulleh Shah Paper and Board Mills Limited, District Kasur, A sister concern of Packages Limited, Chauki Amar Siddu, Lahore.
  - Fatima Fertilizer Company Limited, Mukhtar Garh, Susgar Mill Road, 10 Km Sadiq Abad, District Rahim Yar Khan.
  - Pak Arab Fertilizers Pvt. Limited, Multan.
  - SEIA Report for setting up cement plant in Democratic Republic of Congo-“NYUMBA YA AKIBA Sarl”.

Mr. Muhammad Mujahid

M.Sc. (Env. Sciences), University of the Punjab, Lahore

M.Phil (Env. Sciences), University of the Punjab, Lahore

Senior Environmentalist & Monitoring Engineer

- Environmental monitoring of over 25 projects for EIA reports plus help in writing these reports.
- Also participated in SEIA Report (According to OPIC Environmental Handbook Format) for 10 projects.
- IEE reports of 15 projects.

1.7 IEE Report Structure:

Briefly, this IEE Report describes environmental, social, physical, relevant legal framework applicable to the project and other aspects associated with the project and also explains necessary measures to be put into practice for mitigating environmental impacts on any segment of the environment around the project site both during construction and normal operation. The report also includes the baseline environmental conditions prevailing at the project site. Public Consultations were held with all possible Stakeholders and their written views are also included in this IEE report. The report also describes the way the project activity will add to economic, social, agricultural, cultural development and welfare of the people of the area. The report also provides a table regarding the names of the expertise their qualifications and experience, who carried out this study and prepared the IEE report.

2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

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2.1 Land Use

The site falls within the barren and grazing land. Villagers around the site area keep small cattle herds of poultry, sheep, goats, buffalos and cows to supplement their income.

2.2 Regulatory Framework

Government of Pakistan is facilitating investment, both local and foreign, in industrial and renewable energy sectors. Energy development and energy related projects are among the Government's top priorities. Liberalization and industrialization in the country, as a policy of the Government are well reflected from its following initiatives:

2.2.1 Deregulation of the Economy

Deregulation is one of the prioritized policy of the Government of Pakistan. Through this policy a systematic movement towards deregulation of the economy and privatization of the state owned companies is in progress.

2.2.2 Import Policy

Import policy has been largely liberalized to a great extent through the provision of various incentives and is being further liberalized at a quicker pace. There is an increased reliance on development of the industrial sector and enhancement of international trade.

2.2.3 Infrastructure Facilities

Infrastructure facilities like roads network, fuel, water and power supply, means of transportation and communications etc. are being improved/developed speedily.

2.2.4 Incentives

To keep Pakistan competitive in international markets and support the viability of investments in the country, the following incentives are available to both foreign and local investors:

a- Initial depreciation allowance (IDA),
b- Amortization and
c- Normal tax rates.

2.3 Legal Framework

The capability of regulatory institutions for environmental management ensures that developing projects are environmentally sound and sustainable. For decision-making and policy formulation in the environmental and conservation issues, the institutional framework, as it exists in Pakistan, is described below.

2.3.1 National Environmental Regulatory/Legal Requirements:

After the 18th Amendment to the Constitution of The Islamic Republic of Pakistan-1973, the regulation & management of environment has largely been delegated to the Provinces. The Federal Ministry of Climate Change has been created which is controlling: Pakistan Environmental Protection Council; Pakistan Environmental Protection Agency; Pakistan Environmental Planning and Architectural Consultants Limited; Global Environmental Impact Study Centre; and federal policy, legislation, plans, strategies and programmes with regard to environmental protection and preservation, coordination, monitoring and

implementation of environmental agreements with other countries, international agencies and forums.

The Pakistan Environmental Protection Agency (Pak EPA) looks after the environment related issues for the federally controlled areas and territories. Lacking laws at the provincial levels; the laws, rules, regulations etc., those already available at the federal level and operational at the provincial levels will continue as such.

2.3.2 National Conservation Strategy (NCS) - Pakistan

The National Conservation Strategy (NCS) – Pakistan, as approved by the Federal Cabinet in March 1992 is the guiding document on the environmental issues in the country (Ref. EUAD/IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources.

The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed project are:

- pollution prevention and abatement;
- restoration of rangelands;
- increasing energy efficiency;
- conserving biodiversity;
- supporting forestry and plantations; and
- preservation of the cultural heritage.

The Government of Pakistan promulgated "Pakistan Environmental Protection Act" in 1977. Two organizations, the Pakistan Environmental Protection Council (Pak-EPC) and the Pakistan Environmental Protection Agency (Pak-EPA), are primarily responsible for administering the provisions of the Act. The Pak-EPC oversees the functioning of the Pak-EPA. Major members include representatives of the Federal and Provincial Governments especially the Provincial

Environmental Protection Agencies, industry, non-governmental organizations, academia, environment experts, Federation of Chamber of Commerce and Industry and the private sector.

The Pak-EPA, through the Provincial EPAs, is required to ensure compliance with the National Environmental Quality Standards (NEQS) and establish monitoring and evaluation systems. As a primary implementing agency in the hierarchy, it is responsible for identifying the need for, as well as, initiating legislation whenever necessary. Pak-EPA is also authorized to delegate powers to its provincial counterparts, the provincial EPAs. One of the functions delegated by the Pak-EPA to provincial EPA is the review and approval of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) reports of the projects undertaken in their respective jurisdictions.

The Pakistan Environmental Protection Act (PEPA), 1997 is the legal controlling instrument. The Sindh Environmental Protection Council (SEPC) and the Sindh Environmental Protection Agency (SEPA) are responsible for administering the provisions of the Act.

Members of the SEPC include representatives of the Provincial Government especially the Sindh Environmental Protection Agency (SEPA), industry, non-governmental organizations, academia, environment experts, The Sindh Chamber of Commerce and Industry and the private sector, NGOs, etc. SEPA ensures the compliance with the National Environmental Quality Standards (NEQS) and establish monitoring and evaluation systems. As a primary implementing agency in the hierarchy, it is responsible for identifying the need for, as well as initiating legislation whereever necessary. SEPA is also authorized to delegate powers to its lower staff. One of the functions of the SEPA is the review and approval of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) reports of the projects undertaken in their respective jurisdictions.

2.3.3 Pakistan Penal Code (1860)

The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared by Lord Macaulay in 1860 on behalf of the Government of British India as the Indian Penal Code. After the partition of British India in 1947, Pakistan inherited the same code and subsequently after several amendments [e.g. Protection of Women (Criminal Laws Amendment) Act, 2006, Criminal Laws (Amendment) Act, 2004 (I of 2005), Criminal Law (Amendment) Ordinance (LXXXV of 2002), Criminal Laws (Reforms) Ordinance (LXXXVI of 2002), etc.] it is now a combination of Islamic and English Laws.

Pakistan Penal Code is in general a criminal law, applies all over the country, and contains specific provisions on the subject. Thus it prohibits mischief by killing or maiming animals, or damaging works of irrigation or a river or a road or a bridge or drain or firing explosive substances with intent to cause damage. The Code also prohibits public nuisance by acting negligently to spread the infection of disease or disobeying quarantine rule or causing adulteration of food or drink or drug, or fouling water or making the atmosphere noxious to health etc.

2.3.4 Pakistan Environmental Protection Act, 1997

The promulgation of the **Environmental Protection Ordinance, 1983** was the first codifying legislation on the issue of environmental protection. Later, the Government passed the **Pakistan Environmental Protection Act (PEPA), 1997**, which is the basis of IEE/EIA studies carried out for the projects in Pakistan.

PEPA,1997 is a fairly comprehensive legislation and provides protection, conservation, rehabilitation and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development. The salient features of the law are:

- It covers the air, water, soil, marine and noise pollution including pollution caused by motor vehicles.

- The Act provides National Environmental Quality Standards (NEQS) for wastewater, air emissions and noise.
- Law provides clear guidelines for IEE/EIA for various projects as per their magnitude and anticipated impacts.
- Law also empowers Federal Government to issue notices and to enforce them for the protection of the environment.

For the effective implementation of the provisions of PEPA, 1997, Pakistan Environmental Protection Agency, headed by a Director General was constituted. On the same pattern, Provincial Environmental Protection Agencies (EPA's) were created in all the provinces. Environmental Tribunals were also constituted according to PEPA, 1997.

2.3.5 The Sindh Environmental Protection Act 2014 covers aspects related to the protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development.

Through Notification NO.EPA/TECH/739/2014**,** the Sindh Environmental Protection Agency, with the approval of Sindh Government, made the following regulations, namely the **Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014**. A proponent of a project falling in any category listed in Schedule-I shall file an IEE with the Agency, and the provisions of section 17 shall apply to such projects.

2.3.6 Policy and Procedures for the Filing, Review and Approval of Environmental Assessments

This section sets out the key policies and procedural requirements. It contains a brief policy statement on the purpose of environmental assessment and the goal of sustainable development and requires that environmental assessment is integrated with feasibility studies. It also defines the jurisdiction of the Federal and Provincial EPA's. It lists down the responsibilities of the proponent and states the

duties of responsible authorities. It provides schedules of reports that require either an IEE or EIA.

2.3.7 Guidelines for the Preparation and Review of Environmental Reports (November 1997/2000)

These guidelines are descriptive documents regarding the format and content of IEE/EIA reports to be submitted to EPA for "No-Objection Certificate (NOC)/Environmental Approval (EA)". Following are the major areas, which are covered by these guidelines:

- The IEE report (scope, alternatives, site selection, format of IEE report)
- Assessing impacts (identification, analysis and production, baseline data, significance)
- Mitigation and impact management (and preparing an environmental management plan)
- Reporting (drafting style, main features, shortcomings, other forms of presentation)
- Review and decision making (role, steps, remedial options, checks and balances)
- Monitoring and auditing (systematic follow up, purpose, effective data management)
- Project Management (inter-disciplinary teams, programming and budgeting)

2.3.8 Guidelines for Public Consultations

These guidelines deal with possible approaches to public consultation (PC) and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their legitimate concerns in any impact assessment study. These guidelines cover:

- Consultation, involvement and participation of Stakeholders
- Techniques for public consultation (principles, levels of involvements, tools, building trust)

- Effective public consultation (planning, stages of EIA where consultation is appropriate)
- Consensus building and dispute resolution
- Facilitation involvement (including the poor, women, building community and NGO capacity

2.3.9 National Environmental Quality Standards (NEQS)-1993, Amended August 2000

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in August, 2000.

The following standards are specified therein:

- Maximum allowable concentrations of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers)
- Maximum allowable concentrations of pollutants (16 parameters) in gaseous emissions from the industrial sources

The Guidelines for "Self-Monitoring and Reporting" (SMART) for the industry as approved by the Pakistan Environmental Protection Council (PEPC).

A copy of the Government of Pakistan, Gazette Notification dated August 10, 2000 regarding NEQS is attached as.

2.3.10 National Environmental Quality Standards for Ambient Air - November-2010

The Ministry of Environment, Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O. 102 (1)/2010 established standards which provide the maximum allowable limits, in the ambient air, of Sulphur Dioxide (SO_2), Oxides of Nitrogen as (NO_x) and as (NO), Suspended Particulate Matter-(SPM), Respirable Particulate Matter - $PM_{10,}$ Respirable Particulate Matter-$PM_{2.5,}$ Lead and Carbon Monoxide (CO)**.**

2.3.11 National Standards for Drinking Water Quality - November, 2010

The Ministry of Climate Change (formally Ministry of Environment) , Government of Pakistan vide its Notification of 18th October, 2010 under S.R.O. 102(1)/2010 established standards for Drinking Water Quality. The major quality parameters fixed depend upon Bacterial, Physical and Chemical ones.

2.3.12 National Environmental Quality Standards for Noise - November, 2010

The Ministry of Climate Change (formally Ministry of Environment), Government of Pakistan vide its Notification on 18th October, 2010 under S.R.O. 102(1)/2010 established standards for Noise . These standards are based on Category/zone i.e. Residential area, Commercial area, Industrial area and Silence zone. The limiting values for day and night have also been fixed for all categories/zones**.**

2.3.13 Sectorial Guidelines for Environmental Reports

These guidelines identify the key environmental issues that need to be assessed as well as mitigation measures and project alternatives to be considered in the actual EIA. These guidelines include:

Sector overview of the industry and the processes

- Potential impacts on the environment
- Mitigation measures
- Monitoring and reporting
- Management and training
- Checklist of likely environmental impacts and mitigation measures

2.3.14 Sectorial Guidelines for Environmental Reports – Wind Power Projects

These guidelines deal with wind power plants, also known as wind farms, which will be defined as those producing electrical energy from wind primarily for commercial power generation. Wind power also has significant potential in Pakistan for providing power at the household and community or enterprise level

– generally in units of 50 kW or less. There is currently no reason for these small wind developments to be subject to the national environmental assessment regulations.

The guidelines will assist proponents to identify the key environmental issues that need to be assessed as well as mitigation measures and alternatives that need to be considered in the actual environmental assessment.

The environmental issues discussed in these guidelines are typical of the issues that a wind power plant developer should address. The degree and relevance of the issues will vary from proposal to proposal. Environmental assessments for a given wind power project should only deal with issues relevant to the particular proposal and focus on key environmental issues.

2.3.15 Guidelines for Sensitive and Critical Areas

These guidelines identify sensitive and critical areas in Pakistan, in relation to both the natural environment and the cultural aspects.

2.3.16 National Resettlement Policy and Ordinance

At this point, the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. Following a national consultative process, a national resettlement policy and a related ordinance were drafted. The draft policy and the ordinance are presently being reviewed by the provinces, and have yet to be approved and notified by the government. The salient applicable features of the Draft Resettlement Policy are given below:

- The Pak-EPA will be responsible for both environment-related as well as resettlement-related matters,
- The responsibilities for implementation at a provincial level are to be delegated to the concerned provincial EPAs with overall control of the provincial Planning and Development (P&D) Departments.
- All categories of 'loss' arising from development projects that entail resettlement, need to be addressed: these include not only loss of land,

built-up property, other infrastructure, and crops and trees, but also loss of income, job opportunities, and access to natural resources, etc.

- Vulnerable groups whose issues need to be addressed in particular include: women, children, destitute persons, tribal communities, squatters, those with usurper rights, and landless groups.
- There should be a special emphasis on consultation with affected groups when preparing a Resettlement Action Plan (RAP).

The provisions of the Draft Resettlement Policy are consistent with the requirements of the World Bank OD 4.30 on involuntary resettlement.

2.3.17 The National Forest Policy 2001 of Pakistan

This policy covers the Renewable Natural Resources (RNR) of Pakistan i.e. Forests, Watersheds, Rangelands, Wildlife, Biodiversity and their habitats. The policy seeks to launch a process for eliminating the fundamental causes of the depletion of RNR through the active participation of all the concerned agencies and stakeholders, to realize the sustainable development of the resources. It is an umbrella policy providing guidelines to the Federal Government, Provincial Governments and territories for the management of their RNR. In consonance with it, the Provincial and District Governments may devise their own policies in accordance with their circumstances.

The goal of this policy is to foster the sustainable development of RNR of Pakistan, for the maintenance and rehabilitation of its environment and the enhancement of the sustainable livelihoods of its rural masses especially women, children and other deprived groups.

The elements of the policy are as follow:

- Population planning in critical eco-systems.
- Providing substitutes to firewood in the wooded mountains.
- Reducing the impact of socio-economic causes.
- Reducing poverty, poverty of opportunity, and powerlessness.

- Reducing political interference in the Forestry and Wildlife Departments.
- Renovating and invigorating the institutions of RNR.
- Supporting Local Governments in the sustainable development of their RNR.
- Policies for fragile natural Eco-systems.
- Riverine forests.
- Irrigated Plantations.
- Preservation of relict and unique forests.
- Wildlife.
- Rangelands and desert eco-systems.
- Planting of trees and fodders on farmlands.

2.3.18 Forest Act, 1927

All India Forest Act, 1927 was adopted by the Government of Pakistan, which was subsequently implemented by the respective provinces. Basically, the law was enacted to conserve and protect the forest resources of the country for sustainable development. It lays down Rules and Regulations for exploitation of various categories of forests such as reserved, protected or unclassified. Further, the Act spells out the licensing method for timber cutting, grazing, hunting etc. It also gives the details of magisterial powers of Forest Department officers and penalties for offences committed with regard to forest resources and products.

2.3.19 Industrial Relation Ordinance, 2002

The ordinance has been promulgated to amend, consolidate and rationalize the law relating to formation of trade unions, regulation and improvement of relations between employers and workmen and avoidance and settlement of any differences or disputes arising between them Pakistan's labour laws trace their origination to legislation inherited from India at the time of partition of the Indo-Pak subcontinent. The laws have evolved through a continuous process of trial to meet the socio-economic conditions, state of industrial development, population and labour force explosion, growth of trade unions, level of literacy, Government's

commitment to development and social welfare. To meet the above named objectives, the government of the Islamic Republic of Pakistan has introduced a number of labour policies, since its independence to mirror the shifts in governance from martial law to democratic governance.

While Article 18 of the Constitution affords every citizen with the right to enter upon any lawful profession or occupation, and to conduct any lawful trade or business, the Industrial and Commercial Employment (Standing Orders) Ordinance was enacted in 1968 to address the relationship between employer and employee and the contract of employment. The Ordinance applies to all industrial and commercial establishments throughout the country employing 20 or more workers and provides for security of employment. In case of the workers in other establishments, domestic servants, farm workers or casual labour engaged by contractors, their labour contracts are generally unwritten and can be enforced through the courts on the basis of oral evidence or past practice.

The Constitution of Pakistan contains a range of provisions with regards to labour rights found in Part II: Fundamental Rights and Principles of Policy.

- **Article 11** of the Constitution prohibits all forms of slavery, forced labour and child labour;
- **Article 17** provides for a fundamental right to exercise the freedom of association and the right to form unions;
- **Article 18** proscribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business;
- **Article 25** lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone;
- **Article 37(e)** makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

2.3.20 Industrial Relations Ordinance 2011 Promulgation

The Government has promulgated Industrial Relations Ordinance 2011. The Ordinance has been approved by the President on the Advice of the Prime Minister. The Government has promulgated Industrial Relations Ordinance, 2011 in view of the current legal vacuum created due to deletion of the concurrent Legislative List through the 18th Constitutional Amendment. The Industrial Relations have also been transferred to the Provinces which have promulgated provincial laws to regulate industrial relations. However, there is no law in place to deal with Industrial Relations in the Islamabad Capital Territory or in respect of national level trade federations and for resolutions of trans-provincial industrial issues. The Parliament is yet to promulgate the Ordinance as law.

2.3.21 Pakistan Explosive Act, 1884 [updated December 6, 2014]

Under the Explosives Act, the project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.

2.3.22 National Electric Power Regulatory Authority (NEPRA) Act 1997

The NEPRA Act was approved by Parliament and signed into law in December 1997. It seeks to create an autonomous, independent regulatory authority, which will be solely responsible for the power sector. It will be responsible for the oversight of the power sector and will exercise control through its power to license power generation, transmission and distribution. It will regulate tariffs for all these activities. It will perform its functions through transparent processes to be enshrined in rules that are being framed in a transparent manner through appropriate rules.

2.3.23 Power Policy 1998

The revised power policy was implemented in 1998. The objective and intentions of the Government of Pakistan (GOP) to new policy is to move towards the creation of a competitive power market in Pakistan. It proposes to do so by restructuring and privatizing the existing thermal power generation, the power

transmission and distribution functions and assets of existing public sector utilities (WAPDA/KESC), by the creation of a fully autonomous regulatory authority, the National Electric Power Regulatory Authority (NEPRA), and through its future IPP policy.

The salient features of the Policy are;

- The basis for selection of private power project will be minimum levelized tariff through International Competitive Bidding. Variable tariffs over the life of the project will be permitted under terms specified prior to bidding. The process of selection will involve pre-qualification, issuance of a Request for Reports (RFP), bidding and evaluation of bids against bid criteria clearly laid out in the RFP.
- It is recognized that without a proper feasibility study for a particular site-specific hydel or indigenous coal based project, it will not be possible to invite competitive bids and receive firm offers. Thus, detailed feasibility studies for such projects will be prepared before bids are invited.
- Hydel projects will be implemented on a Build-Own-Operate-Transfer (BOOT) basis; to be transferred to the province in which it is situated at the end of the concession period, and thermal projects on a Build-Own-Operate (BOO) basis.
- Competitive Tariffs will comprise an Energy Purchase price and a Capacity Purchase Price with adequate provisions for escalation.

2.3.24 Provincial Local Government Ordinances, 2001

These ordinances, issued following the devolution process, establish regulations for land use, the conservation of natural vegetation, air, water, and land pollution, the disposal of solid waste and wastewater effluents, as well as matters related to public health and safety.

2.3.25 Factories Act, 1934

There is no independent legislation on occupational safety and health issues in Pakistan. The main law, which governs these issues, is the Chapter 3 of Factories

Act, 1934. All the provinces, under this act, have devised Factories Rules. The Hazardous Occupations Rules, 1963 under the authority of Factories Act is another relevant legislation. These rules not only specify some hazardous occupations but also authorize the Chief Inspector of Factories to declare any other process as hazardous.

The other related laws are:

- Workmen Compensation Act, 1923
- Provincial Employees Social Security Ordinance, 1965
- West Pakistan Shops and Establishments Ordinance, 1969
- Boilers and Pressure Vessels Ordinance, 2002

Chapter 3 of the Act has general provisions on health and safety at the workplace. Provincial governments are allowed to make rules under this Act and inspectors under this Act also have discretion in defining the rules. Chapter 3 talks about various safety arrangements. This list is being provided just to show how meticulously labor law covers these issues.

- Cleanliness
- Disposal of wastes and effluents
- Ventilation and temperature
- Dust and fume
- Artificial humidification.
- Overcrowding
- Lighting
- Drinking water
- Latrines and urinals
- Spittoons
- Precautions against contagious or infectious disease
- Compulsory vaccination and inoculation
- Power to make rules for the provision of canteens
- Welfare officer
- Precautions in case of fire

- Fencing of machinery
- Work on or near machinery in motion
- Employment of young persons on dangerous machines
- Striking gear and devices for cutting off power
- Self-acting machines
- Casing of new machinery
- Prohibition of employment of women and children near cotton openers
- Cranes and other lifting machinery
- Hoists and lifts
- Revolving machinery
- Pressure plant
- Floors, stairs and means of access
- Pits, sumps, opening in floors, etc.
- Excessive weights
- Protection of eyes
- Power to require specifications of defective parts or tests of stability
- Safety of building, machinery and manufacturing process
- Precautions against dangerous fumes
- Explosive or inflammable dust, gas, etc.
- Notice of certain accidents

2.3.26 Other Relevant Laws

Some of the other relevant laws and legislations are listed below:

- Canal and Drainage Act, 1873
- The Explosives Act, 1884
- The Fire Wood and Charcoal (Restriction) Act, 1964
- Motor Vehicles Ordinance, 1965
- The West Pakistan Regulation and Control of Loudspeaker and Sound Amplifier Ordinance, 1965
- Agriculture Pesticides Ordinance, 1971
- The Antiquities Act, 1975

2.4 Applicable International Environmental and Occupational Safety and Health Laws and Regulations

2.4.1 International and National Non-Governmental Organizations

International and national Non-Government Organizations (NGOs), such as the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wide Fund for Nature (WWF), have been active in Pakistan for some time. Both of these NGOs have worked closely with the governments at the federal as well as provincial levels and have positively contributed to the cause of environment. They have played significant role with regard to the formulation of environmental and conservation policies. Besides another the prominent NGO namely "Sustainable Development Policy Institute (SDPI) has also played very significant role in upholding the cause of environmental protection in Pakistan.

Environmental NGOs have been particularly active in the advocacy for promoting sustainable development approaches. Most of the government's environmental and conservation policies, even at the provincial and federal levels, has been formulated in consultation with these leading NGOs, who have also been involved in drafting new legislation on conservation.

2.4.2 International Framework

For the assessment of the environmental impacts of the proposed project on air, water and noise according to the international legal framework, this report has also incorporated the requirements of the "Pollution Prevention and Abatement Handbook" by the World Bank Group- effective July 1998 and IFC EHS Guidelines.

Within this handbook, different guidelines are mentioned for the purpose of assessing industrial facilities with respect to their environmental compliance. In the present case, the guidelines for new thermal power plants are applicable for the preparation of the environmental impact assessment.

2.4.3 Environment Related Relevant International Agreements in Pakistan's context

Pakistan is a party to the following treaties and agreements in furtherance of its environmental goals and programme.

Treaty	**Pakistan Status**
Convention on the Protection of Ozone Layer on Dec 18, 1992.	Ratified
The Amendment to Montreal Protocol on Substance that Depleting Ozone layer	Signed
UN Framework Convention on Climate Change on June 13, 1992	Signed
Convention on the Continental Shelf on October 31, 1958	Signed
The Convention on High Seas on October 31, 1958	Signed
Convention on the Fishing and Conservation of the living Resources of the High Seas on October 1958.	Signed
The UN Convention on Law of the Sea on December 10, 1982	Signed
The Convention on Territorial Sea and the Contagious Zone and the Agreement for the establishment of Network of Aquaculture Centers in Asia and the Pacific	Signed
The Convention on Wetlands of the International Importance on July 23, 1976	Ratified
The Convention on protection of the World Cultural and Natural Heritage on July 23, 1976	Ratified
The Convention on International Trade in Endangers Spice of Wild Fauna and Flora	Signed
The Convention on Conservation of Migratory Species of Wild Animal on Dec 01, 1987	Signed
The Convention on Biological Diversity in 1994 and became party to the CBD, Convention duly recognizes the intrinsic value of biological diversity, genetic, social, economic, cultural, educationist, recreational and esthetic values of biodiversity and its components	Ratified
The International Plant Protection Convention.	Signed

The Plant Protection Agreement for Area & pacific region	Signed
The Agreement for the establishment of a convention for controlling the desert lost in eastern region of its Distribution Area in South East Asia	Signed
The Treaty Banning Nuclear Weapon Test in the Atmosphere, in Outer Space and under Water on March 3, 1988	Signed
The International Convention on Oil Pollution Preparedness Response and Corporation	Signed
The Convention on prohibition of Military or any other Hostile Use of Environmental Modification Techniques and Accession of Feb 27, 1986	Acceded
Pakistan became a party to Montreal Protocol by Ratifying the protocol and its London amendment on Dec 18, 1982.the subsequent amendments known as Copenhagen Amendment which, accelerate the phase out for rectified in Jan 1995.	Signed
Convention of International trade Endangerous Species (CITS)	Signed
World heritage Convention Ramsar Convention	Signed
United Nation Convention to Combat Ozone Depletion (CCD). The convention signed and ratified in 1996	Signed
Stockholm Convention for Phasing out Parenting Organic pollutants (POPs) in 2001.	Signed

3- DESCRIPTION OF THE PROJECT

3.0 DESCRIPTION OF THE PROJECT:

This section takes into account description of the following components of the project:

- Type and category of the project.
- Objectives of the project.
- Alternatives considered, and reasons for their rejection.
- Location plan.
- Size or magnitude of the operation, including capital cost, and associated activities:
- Proposed schedule for implementation (tentative).
- Details of restoration and rehabilitation at the end of the project life**.**

3.1 Type and category of the project.

Wind is one among other non-conventional energy sources which provides one of the most promising alternative for generation of grid quality power besides being its more cost effective in comparison to thermal and nuclear power in addition to its being environmental safe.

Pakistan's first commercial-scale wind power generation began in April 2009 from the 6 MW first phase of what is to be 55 MW wind farm in Jhimpir, Thatta District, Sindh. The national target for renewable energy generation is 9,700 MW by year 2030. It is clear that wind power projects are to play significant role in energy development.

The Alternative Energy Development Board (AEDB), established in 2004, actively assists in the development and implementation of plans and projects, working with potential developers and with concerned authorities and provincial governments.

It is with this background that JPL are in the process of installing 49.3 MW Wind Power Plant at Jhimpir, District Thatta. A total land of 430 acres, on 30 years lease, has been allotted by the Government of Sindh. A sketch of the site showing tentative layout of the wind turbines siting with the coordinates is shown in the Table – 1.1 & Figures 1.3 & 1.4, Chapter-1. The Project will be located at about 10 km distance south-west from Nooriabad Industrial Estate located on M-9 (Karachi - Hyderabad Motorway), and north of Jhimpir Town.

A 300 KVA diesel generator will be installed for emergency power requirement.

The project estimated cost is US$ 120.0 Million .

3.2 Wind Power Project Capacity & Description

Capacity

JPL has proposed to install Nos. 29 (twenty nine) General Electric Type-3 Turbines of 1.7 MW each. Total capacity works out at 49.3 MW. The relevant details about the turbines are given here under:

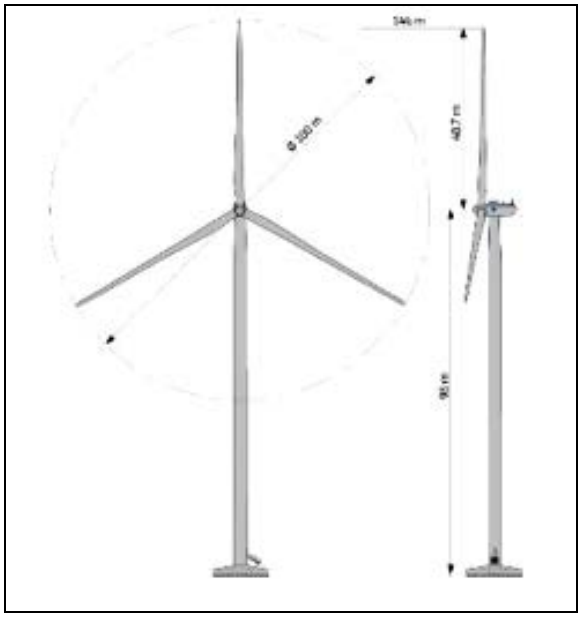

Figure – 3.1: GE Turbine Type-3, 1.7-100

- Class: IEC TC IIIs
- Hub Height: 80 meters
- Tip Height: 130 meters
- 50 Hz
- Blades: 48.7 meters
- Technology: Model based controls, low noise trailing edge, vortex generators.

The GE 1.7 MW wind turbines are active yaw and pitch regulated with power/torque control capability and an asynchronous generator. The yaw system is electro-mechanically driven with wind direction sensor and automatic cable unwinding. Power is varied using active blade pitch control. The blade pitch angle is continually adjusted for optimum rotational speed and maximum lift-to-drag at each wind speed.

The variable speed operation ensures the turbines work at high efficiency, and variable speed operation absorbs the loads from the gust and converts them to electric power. Cut-in and cut-out wind speeds are 3 m/s and 25 m/s respectively.

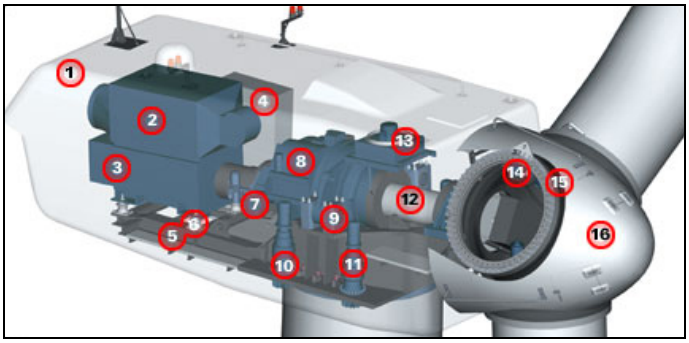

Figure-3.2: Typical GE Wind Turbine Details

Nacelle (1), Heat Exchanger (2), Generator (3), Control Panel (4), Main Frame (5), Impact Noise Reduction (6), Hydraulic Parking Brake (7), Gearbox (8), Impact Noise Reduction (9), Yaw Drive (10 and 11), Main Shaft (12), Oil Cooler (13), Pitch Drive (14), Rotor Hub (15) and Nose Cone (16).

Generator torque in the turbines is controlled by the frequency converter. The turbine rotor can over speed in strong, gusty winds to reduce torque loads in the drive train. GE's turbines store the energy in gusts by accelerating the rotor. Operating speed range is notably wider than the slip range used by some other wind generators, which produce heat rather than electric power when regulating power in strong, gusty winds.

The conversion system generates reactive power or current leading voltage to improve transmission efficiencies and voltage stability, particularly useful in weak grid applications. It automatically maintains defined grid voltage levels and power quality in fractions of a second.

The wind generator's fail-safe braking system has electromechanical pitch control for each blade with three self-contained systems and a hydraulic parking brake. Lightning receptors are installed on blade tips, with surge protection for the electrical components.

The turbines can remain on-line and feed reactive power to the electric grid right through major system disturbances. A Low Voltage Ride Thru (LVRT) feature enables wind turbines to meet transmission reliability standards similar to those demanded of thermal generators.

The project does not require any water for its operation.

Each wind turbine will have step up transformers, mounted at the bottom of each tower. Underground electrical collection cabling system will be provided within the wind farm, which will lead to the project substation.

Project operations and control building, which will also house the substation and grid connection to NTDC system.

The National Transmission and Dispatch Company (NTDC) will purchase the power to be produced from the project. The Project will be connected through 132KV Transmission line to 220/132KV New Jhimpir Substation.

Wind energy projects are "green energy projects" because there are no environmental issues related to their operation. There is no sensitivity of environment on or around the project site. The land is barren. The size of the project is 49.3 MW and as such it is small project. Therefore, according to the "Pakistan Environmental Protection Agency, Review of IEE & EIA" the project falls in Category B.

3.3 Objectives of the project

As mentioned above the project aims at production of 49.3 MW wind energy for commercial purpose. The power to be produced will be sold to The National Transmission and Dispatch Company (NTDC).

3.4 Alternatives Considered, and Reasons for Their Rejection

The following reasons were of importance for siting the project at the proposed site:

3.4.1 Need for Energy and No Alternative

Due to ever widening gap in energy production and demand load shedding is frequent and prolonging day by day. Resultantly, all works including industry, commercial, social, education, domestic, etc., are badly affected. Drastic decrease in industrial productivity has resulted in heavy reduction in exports. Resultantly, very fast shortfall in foreign exchange earnings has taken place and this trend is further increasing.

Therefore it is necessary that every possible mean of production of electricity should be explored. Under suchcircumstances, there is no question of project alternative.

3.4.2 Cheaper Energy Production Option

Fossil fuels are not only in short supply from within the country but they are also very costly for power generation. The wind power is one among other renewable energy sources, cheaper and environment friendly source for power production. The proposed area has been declared by the Government of Pakistan as wind corridor therefore, Siting of the project at Jhimpir is the best option. Also many other similar projects are coming at the site to exploit the big wind potential available in the wind corridor area.

3.4.3 Grid Availability

The project site is located in Hyderabad Electric Supply Company (HESCO) distribution area, which has the capacity to take additional supply from the project.

3.4.4 Raw Materials Availability

The only raw material required during the project operation is wind which is available to harness its potential for power generation. Therefore, the Jhimpir site for the project is quite suited.

3.4.5 Conflicts

The entire land mass belongs to the Government of Sindh, which is already encouraging siting of the wind power projects at Jhimpir. There are no settlements or villages within the boundary of the proposed project. Five settlements are outside the boundary of the Project and remaining villages/settlements are further away. These is no issue of relocation or resettlement for the Project.

3.4.6 Basic Infrastructure

The required basic infrastructure like roads, railway, and telecommunication grid for evacuation of power from the project are available. They can be further developed as and when required. The site is located close to Karachi through Karachi – Hyderabad Motorway (M-9) and National Highway. These facilities also strongly support the site at Jhimpir for the project.

3.4.7 Air Traffic

The Jhimpir site is clear of any restriction from all type of air traffic. This is another plus point for the suitability of Jhimpir site.

3.4.8 Telecommunication

The site has no interference whatsoever from telecommunication point of view. This is another point in favor of the Jhimpir site for the project.

3.4.9 Topographic Features

There are no topographic barriers or features located on or around the proposed project site which may cause interference in air movement.

3.4.10 Indigenous People

There are no indigenous people in the project area which are required to be resettled.

3.4.11 Environmental Sensitivity

In the first place, during regular operation of the project there will not be any air pollutants, or solid or liquid wastes or else in the form of waste. As such, the project is "environmentally green". On other hand, there is no wetland, watercourses, forest of any type, wild life, agriculture land, flora or faunal, archeological site, no nesting habitats, etc., in the vicinity of the proposed project site. The nearest water body –The Kalri Lake is situated at a distance of about 8 Km.

It means that there is no sensitivity of environment around project site. The project area is flat, stony and barren. All the above factors strongly support the Jhimpir site for the project.

3.5 Size or Magnitude of the Operation, including Capital Cost, and Associated Activities

The maximum rated capacity of the wind power plant is 49.3 MW. The estimated project cost is US$ 120.0 Million. The project will only produce electricity from wind energy.

3.6 Proposed schedule for implementation (tentative)

The proposed Project is expected to be completed in 18 months.

3.7 Details of Restoration and Rehabilitation at the End of the Project Life.

At the end of the present life of the project, adequate repair and maintenance of the plant will be done. Attached basic infrastructure will be updated. Even, wherever required, new machinery will be installed and old one to be sold in the market. This will provide a new life for the plant to be run for its new lifetime.

All activities will be carried out in accordance with strict environmental management and controls so as to avoid any damage to any segment of environment or human health.

4.0 BASELINE CONDITIONS IN AREA POTENTIALLY AFFECTED BY PROJECT

4.0 BASELINE CONDITIONS IN AREA POTENTIALLY AFFECTED BY PROJECT

4.1 Spatial and Temporal Boundaries Adopted for the Various Aspects of the Study

The state of the environmental settings on and around the project site along with future trends of any likely development with related possible changes to occur in the land use pattern, especially industrialization trends, were the main considerations for spatial and temporal boundaries while keeping in view of the existing and future envisaged conditions.

4.2 Existing (baseline) condition of the biophysical and socio-economic environment, trends and anticipated future environmental conditions should the project not go ahead.

The total land mass of Thatta District, in which the project site is situated, is 17,355 square kilometers. Regarding its physical aspects, the Thatta District has varied features ranging from coastal swamps to fresh water marshes and lakes and from river islands to coastal deltas. Due to lack of water in the Indus River, this wide variation has diminished. The current terrain of the district consists of the Makli Hills (32 kilometers in length) close by the Thatta Town, are well known because of the ancient tombs, which are located here. The northwestern part of the district consists of bare and mostly composed of limestone. The hilly tracts are known as Kohistan. The valleys are covered with grass or brushwood. Southwards, the area degenerates into sandy wastes, uncultivated and almost devoid of vegetation.

The project site is a barren tract of land with small scanty bushes scattered here and there. The under ground water aquifer is somewhere 150 feet which is saline in taste. There are some underground aquifers of sweet water present in the project area. One seasonal canal is located at a distance of about 0.5 km from the project site named as Sorh (Sodh) which is fed by Thana Bulla Khan and ends up in Keenjhar Lake in Jhimpir. Human settlements in the form of small temporary

villages (goths) are situated outside ofthe project site. Jhimpir town is located at a distance of about 15 km from the project site.

There is no industry near or around the project site. However, a number of wind farms are springing up.

Since the present project is clean from environment point of view, therefore, the environment will remain virtually pollution free. Implementation of the proposed EMMP further guarantees protection of the environmental settings, as they exist now. Because the project is to operate in compliance with the requirements of the National Environment Quality Standards (NEQS), Pakistan; under the Pakistan Environmental Protection Act-1997 therefore, this also provides safeguard against pollution from the project activity.

With operation of the project, it will provide job opportunities especially to the people of the area around the project site; Government will get large volumes of earnings in the form of taxes and duties on recurring basis. Poverty alleviation, though at minor scale, will be yet another benefit besides meeting power shortage in Pakistan and its downstream benefits in industrial sector and other socio economic fields.

As a result of serious power shortage, load sheddings are so frequent in Pakistan. The gap between power supply and demand is further on the increase. Consequently, all walks of life are being adversely affected. Pakistan has an installed electric generating capacity of about 20,000 MW. Projection for the demand in year 2030 is 100,000 MW.

To sustain growth, Pakistan needs an integrated National Energy Plan. The Government of Pakistan (GoP) is making concerted efforts to ensure development of all type of energy resources. The government has encouraged the private sector to meet this additional demand. In order to bridge the gap between power demand and supply, Pakistan Government liberalized its investment policies.

The policy has resulted in not only investments in power production sector from local resources, but also foreign investments are pouring in large amounts.

Evidently, in case the project is not installed, there will be no change in the existing status of the environment or a status quo will be maintained with regard to all environmental, social, and economic factors.

4.3 Physical Geography (Climate, Geology, Topography)

(Physical resources of the project area: Topography and Geology; Soils and Climate; Water; Ecological Resources: Fisheries and Aquatic Biology, Biodiversity, Forestry, Wildlife, Scientific Institutions, Socio-economic and Cultural and other Heritage)

A data collection survey that included geology, meteorology, hydrology, ambient air quality, water quality, soil characteristics, noise levels, flora and fauna, land use pattern, and socioeconomic conditions was undertaken, based on available secondary information or data collected in the field. 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.

4.3.1 Physical Resources of the Project Area

Physical resources of the project area are described hereunder.

4.3.1.1 Topography and Geology

Pakistan lying in the northwestern part of the Southern Asian Subcontinent, occupies the western end of the Indo-Genetic Plain, which is bounded in the north by mountain wall of the Great Himalayas and their offshoots.

Physiology of the earth is description of the behavior of the upper crust. Accordingly, some knowledge of the geology is desirable. From physical environment, topography, and geological point of view, the proposed project site is situated in the Indus Basin. The Indus Basin essentially forms the western extension of Indo-Gangetic Plain, and has been made up of the silt brought by the Indus and its numerous tributaries, like Jhelum, Chenab, Ravi and Sutlej on the east bank, and Kabul, Kurram, Tochi, and others on the west bank. The Plain is known for its agricultural fertility and cultural development throughout history. Based on hydrology and

landform, the Indus Plain can be divided into the Upper and Lower Indus Plains. The Upper Indus Plain differs from the Lower Indus Plain (where the project area is located) primarily because of the major tributaries (Jhelum, Chenab, Ravi, and Sutlej) divide the land surface into several interfluves or 'doabs'. The two plains are separated by a narrow corridor near Mithankot where the Sulaiman range approaches the Indus River. The Lower Indus Plain is very flat, generally sloping to the south with an average gradient of 95 mm per km (6 inches per mile). The Lower Indus Plain can be divided in five distinct micro-relief landforms: active flood plain; meander flood plain; cover flood plain; scalloped interfluves; and the Indus delta. The proposed project site is located in the last of the micro-relief forms listed above.

Topographically, Sindh can be divided into four distinct parts with the dry and barren Kirthar Range in the west, a central alluvial plain bisected by the Indus River, a desert belt in the east, and the Indus delta in the south. Based on this classification, the project area is located in the Indus delta.

4.3.1.2 Geological Setting:

The prevailing geologic conditions in the region are the results of extensive inundation, depositions, coastal movements, and erosions over a long period in the geological ages. The geology of the region is closely related to the formation process of Himalayan Ranges resulting in intense deformation with complex folding, high angle strike-slip faults and crust thickening expressed in a series of thrust faults. The important tectonic changes which have had so much influence in the region are feebly visible particularly in the Indus Plain, and it is only by considering the geology on a broader regional scale, as well as in site specific detail, that the effects can be appreciated

Most parts of Sindh are covered either by recent alluvium or by wind-borne sand. The principal features of geological significance are to be found in the hilly portions of the province, towards the west of the Indus. Outlying extensions of this hilly tract occur east of the Indus as well, near Sukkur, Hyderabad, and Jerruck. The isolated hills of Nagarparkar on the

northern border of the Rann of Kutch belong to quite a different system both geographically and geologically.

The geological studies of the proposed site have not been conducted in detail. However, the studies carried out in the vicinity of Port Qasim area which is not far away from the proposed site reveal that Port Qasim and its adjoining areas have been formed in the middle and upper Tertiary and the soil formation found in the area are fresh and slightly weathered with recent and sub-recent shoreline deposits. These formations are derived from Gaj / Manchar formation of lower Miocene to middle Miocene to Pliocene age. Similar deposits are found all along the coastal belt of Karachi and adjoining areas.

References

(1) Atlas of Pakistan, Government of Pakistan, 1997. Sindh State of Environment and Development, IUCN, 2004.

(2) Socioeconomic Study of Badin/Thatta-A document of World Bank

4.3.1.3 Seismicity of the Project area:

According to the seismic zoning map of Pakistan, the Jhimpir region falls in ZONE II-B with moderate to severe damage area probability. Earthquake records indicate that this region has experienced several earthquake tremors in the past, as well as in recent times.

The earthquake hazard in the Indus Delta and the estuaries on the passive continental margin is mainly from intra-plate active faults particularly Rann of Katch Fault also known as the Karachi-Jati-Allah Bund Fault. It has three other segments namely Jhimpir Fault, Pab Fault, and Surjani Fault. The main faults between Karachi and Rann of Kutch are generally oriented easterly and slightly concave to the north. Two severe earthquakes occurred in the vicinity of Karachi, one in the year 1050 at Bhambore in which 0.15 million casualties were reported and the other in the year 1668 at Pipri near Steel Mill which is only 60 km away from Karachi. **Figure 4.1** shows the Earthquake Zone Map of Pakistan.

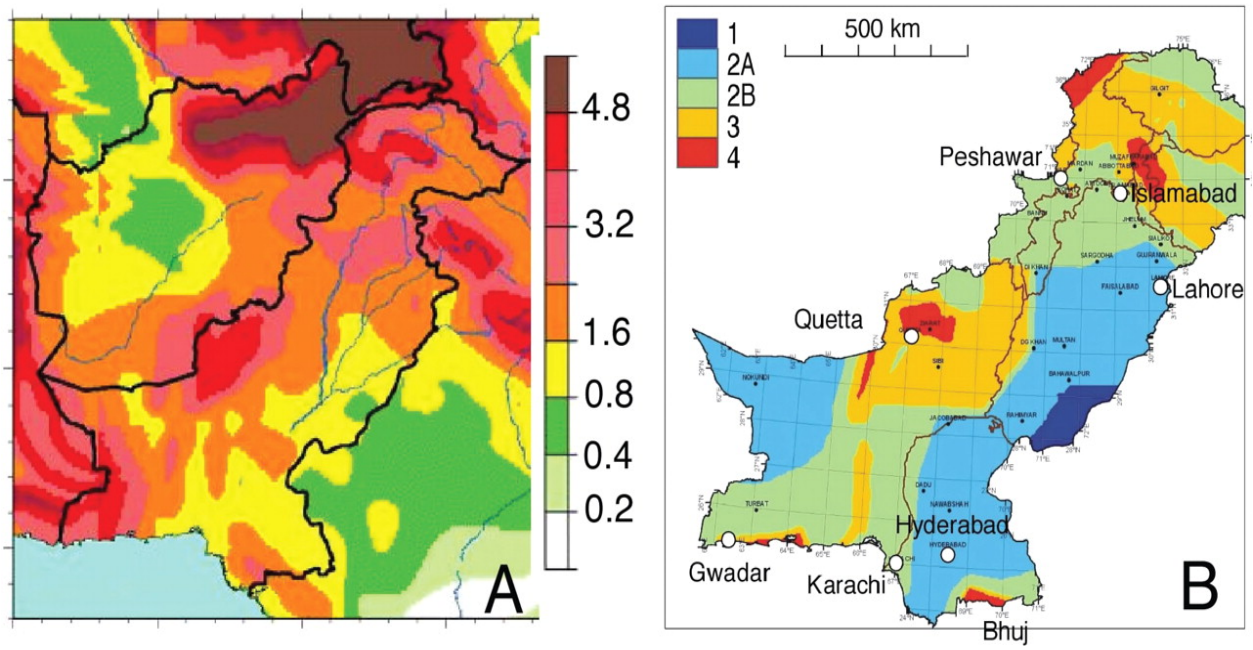

Figure 4.1: Earthquake Zones of Pakistan

Tectonic map of Pakistan is presented as Figure – 4.2.

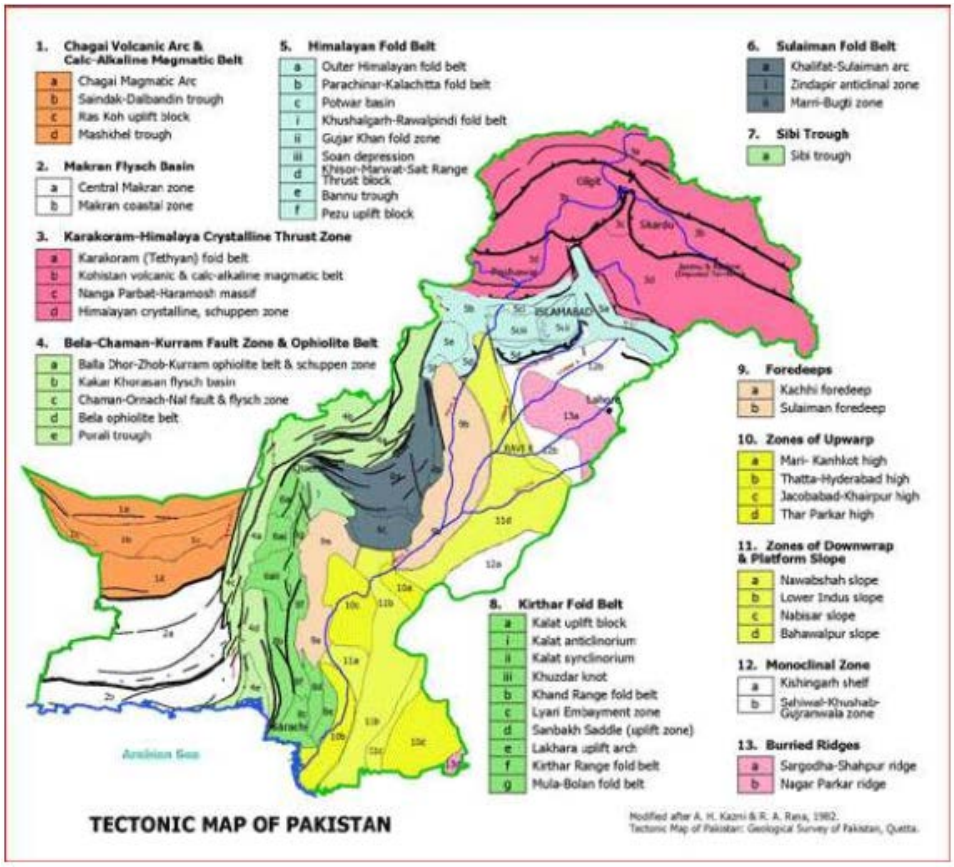

Figure 4.2: Tectonic Map of Pakistan

4.3.1.4 Soils [1]

The land in this area consists of the alluvial soil deposited by the waters of the river Indus, so it is naturally very fertile. Combined with water it develops into rich mould and in the absence of water it degenerates into desert. Water generally contains a lot of silt.

4.3.1.5 Land use [1]

Agriculture, followed by forestry, is the main land use in the central alluvial plain. Although more than 50 percent of the total geographical area is cultivable, only 26 percent of it is actually located in the central plain. The land inside the Indus embankments is almost equally employed by agriculture and forestry, while that outside the embankments is more extensively utilized for agriculture in the form of sparsely distributed irrigated plantations. The land use in Sindh is given in the table hereunder:

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(1): Atlas of Pakistan, Government of Pakistan, 1997. Sindh State of Environment and Development, IUCN, 2004.

Table – 4.1 shows the land use in Sindh

Table – 4.1, Sindh Land Use

Land Use	Area (Million Ha)	Percentage
Not Sown	3.022	21.446
Current Fallow	1.439	18.935
Cultivable Waste	2.688	10.212
Total Available for Cultivation	7.149	50.593
Not Available for Cultivation	5.830	41.374
Forest	1.125	7.984
Unreported	0.007	0.049
Total	**14.091**	**100.000**

Source: Sindh State of Environment and Development, IUCN, 2004.

The project site is mainly occupied by traces of desert shrubs and bushes.

4.3.1.6 Meteorology and Climate

Meteorology

Generally, the climate of most parts of the Sindh is arid with four distinct seasons in a year:

- winter from Mid-November to February,
- spring during March and April
- summer from May to Mid-September and
- autumn from Mid-September to Mid-November

The climate of this area is characterized by fluctuating temperatures and sparse rainfall. The summers are hot and humid with average temperature ranging between 33 ºC to 37 ºC. The temperature in summers may reach up to 45 ºC. The winters are pleasant with average temperature in the range of 15ºC to 25 ºC. The months of July and August generally observe the annual monsoon rainfalls.

There exist several meteorological stations in Sindh; data recorded at some of these stations is given in the following sections.

Temperatures

The province of Sindh is situated in a subtropical region; it is hot in the summer and cold in winter. Temperatures frequently rise above 46 °C (115 °F) between May and August, and the minimum average temperature of 2 °C (36 °F) occurs during December and January.

Sindh is divided into three climatic regions: Siro (the upper region, centered on Jacobabad), Wicholo (the middle region, centered on Hyderabad), and Lar (the lower region, centered on Karachi).

The thermal equator passes through upper Sindh. The highest temperature ever recorded in Mohenjo-daro (Sindh) on 26 May 2010 was 53.5 °C (128.3 °F). It was not only the hottest temperature ever recorded in Pakistan but also the hottest reliably measured temperature ever recorded in the continent of Asia and the fourth highest temperature ever recorded on earth. The previous record for Sindh, Pakistan, and for all of Asia, had been 52.8 °C (127.0 °F) on 12 June 1919.

Mean monthly maximum temperatures and mean monthly minimum temperatures are in the following tables:

Table – 4.2: Mean Monthly Maximum Temperatures

Degree Celsius

Month	Hyderabad[a]	Umerkot[b]	Sanghar[c]	Badin[d]	Jacobabad[e]
January	25.04	26.49	24.31	25.78	22.60
February	28.15	29.6	27.06	28.59	25.24
March	33.38	34.52	33.29	34.02	31.28
April	38.87	39.12	39.25	38.40	38.0
May	41.62	41.49	43.53	39.85	43.08
June	40.15	39.72	43.23	38.02	44.33
July	37.40	36.19	40.37	35.11	40.56
August	36.30	34.51	38.60	33.61	38.24
September	36.84	35.70	38.14	34.36	37.00
October	37.19	37.12	37.14	35.80	35.32
November	31.95	32.98	31.59	31.87	30.06
December	26.27	27.95	25.53	26.68	24.11

Annual	34.47	34.52	35.19	33.48	34.15

Source: Data Processing Centre, Pakistan Meteorological Department, Karachi

[a] measured at Hyderabad. [b] measured at Umerkot, [c] measured at Sanghar,, [d] measured at Badin, [e] measured at Jacobabad,

Table – 4.3: Mean Monthly Minimum Temperatures

Degree Celsius

Month	Hyderabad[a]	Umerkot[b]	Sanghar[c]	Badin[d]	Jcobabad[e]
January	11.08	5.42	5.92	8.73	7.68
February	13.62	8.71	8.72	11.60	10.48
March	18.50	14.29	14.22	16.80	16.30
April	22.98	20.12	19.71	21.80	22.33
May	26.16	24.50	24.59	25.47	26.74
June	28.07	27.17	27.67	27.46	29.38
July	27.81	26.82	27.60	27.04	29.22
August	26.71	25.73	26.33	26.06	28.25
September	25.34	23.88	23.77	24.87	25.85
October	22.27	18.54	18.18	21.70	20.29
November	17.29	11.89	12.28	15.86	14.08
December	12.50	6.62	7.39	10.10	8.74
Annual	21.03	17.84	18.00	19.76	19.95

Source: Data Processing Centre, Pakistan Meteorological Department, Karachi

[a] measured at Hyderabad. [b] measured at Umerkot, [c] measured at Sanghar, [d] measured at Badin, [e] measured at Jacobabad

Table – 4.4: Climate Data for Hyderabad, Pakistan

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	33.3 (91.9)	38.2 (100.8)	43.4 (110.1)	46.0 (114.8)	48.4 (119.1)	48.5 (119.3)	45.5 (113.9)	43.9 (111.0)	45.0 (113.0)	44.0 (111.2)	41.0 (105.8)	36.0 (96.8)	48.5 (119.3)
Average high °C (°F)	24.7 (76.5)	28.1 (82.6)	33.8 (92.8)	38.8 (101.8)	41.4 (106.5)	40.1 (104.2)	37.3 (99.1)	36.0 (96.8)	36.5 (97.7)	36.9 (98.4)	31.0 (87.8)	26.0 (78.8)	34.2 (93.6)
Average low °C (°F)	11.1 (52.0)	13.8 (56.8)	18.6 (65.5)	22.9 (73.2)	26.1 (79.0)	28.0 (82.4)	27.7 (81.9)	26.6 (79.9)	25.3 (77.5)	22.4 (72.3)	17.3 (63.1)	12.8 (55.0)	21.1 (70.0)
Record low °C (°F)	3.3 (37.9)	4.0 (39.2)	9.0 (48.2)	12.0 (53.6)	19.0 (66.2)	20.0 (68.0)	21.4 (70.5)	22.8 (73.0)	20.6 (69.1)	15.0 (59.0)	6.0 (42.8)	3.0 (37.4)	3.3 (37.9)
Rainfall mm (inches)	1.5 (0.059)	5.4 (0.213)	4.8 (0.189)	6.0 (0.236)	3.6 (0.142)	9.6 (0.378)	53.0 (2.087)	62.3 (2.453)	19.4 (0.764)	4.2 (0.165)	1.9 (0.075)	2.5 (0.098)	174.2 (6.858)
Mean monthly sunshine hours	272.8	257.1	288.3	288.0	313.1	279.0	235.6	251.1	285.0	306.9	279.0	272.8	3,328.7

June is the hottest month in most parts of Sindh, with mean daily maximum temperature recorded as 44.33 ^{o}C. January is the coldest month in the project area, with mean daily minimum temperature as 5.42 ^{0}C.

Wind

Gharo is one of the sites in Sindh where the wind data have been recorded by Pakistan Meteorological, Department (PMD). According to the study, the annual mean wind speed, estimated is 6.86 m/s at 50 meter above ground level and the annual power density of area is 408.6 W/m^2. This means that the site falls in good category of power potential and that the area is suitable for large economically viable wind farm.

Table – 4.5: Monthly Average Wind Speeds for Gharo

Monthly Benchmark Wind Speed

	30m	50m	60m	67m	80m
January	4.7	5.1	5.2	5.3	5.4
February	5.1	5.4	5.5	5.6	5.7
March	5.3	5.7	5.8	5.9	5.9
April	7.0	7.3	7.4	7.6	7.6
May	8.9	9.4	9.6	9.7	9.8
June	10.3	10.9	11.1	11.2	11.3
July	8.4	8.9	9.0	9.2	9.2
August	9.3	9.8	10.0	10.2	10.3
September	7.6	8.1	8.2	8.3	8.4
October	4.3	4.6	4.7	4.7	4.8
November	3.8	4.1	4.2	4.3	4.4
December	4.6	4.9	5.1	5.2	5.3
Annual Average	**6.6**	**7.0**	**7.1**	**7.2**	**7.3**

Courtesy: Pakistan Meteorological Department.

Based on analysis of the data recorded by Pakistan Meteorological Department it was revealed that desert areas of Sindh Province, have been recorded with much higher than the wind speeds in South Western Zone.

Humidity

July, August, and September are the most humid months in the area, whereas May and June are the least humid months. Average monthly

relative humidity (RH) values at various locations in the project area are provided in the following table:

Table – 4.6: Meteorological Data – Relative \Humidity

%

Month	Hyderabad[a]	Umerkot[b]	Sanghar[c]	Badin[d]	Jacobabad[e]
January	47.90	45.52	59.98	50.38	50.88
February	45.38	44.45	56.00	48.81	48.23
March	42.40	42.55	50.62	48.36	42.76
April	41.88	42.73	44.66	48.97	33.01
May	46.96	46.81	42.63	53.10	30.93
June	56.35	56.40	51.81	60.70	41.16
July	63.42	67.23	62.10	69.61	56.18
August	65.26	70.15	66.06	72.55	62.20
September	61.37	64.73	62.38	69.78	59.38
October	47.65	50.78	55.16	59.15	48.87
November	46.40	44.58	59.48	53.88	45.75
December	49.26	46.84	62.74	52.46	52.73
Annual	51.19	52.11	56.03	57.56	47.70

Source: Data Processing Centre, Pakistan Meteorological Department, Karachi

Rainfall

Average annual rainfall in the areas adjacent to the project ranges between 110 mm (Jacobabad) and 222 mm (Badin). Maximum rainfall (about 60% of the total annual) occurs during the Monsoon season (July, August and September), while the period of minimum rainfall or drier period is October and November.

Climate [(i)]

Pakistan's latitudinal and longitudinal extents and its northern rim of lofty mountains are the two factors, which have a great bearing not only on the temperature and rainfall patterns, but also on the general circulation of the atmosphere on the southern Asia.

Climate of Pakistan according to Koppen's classification [(1)] falls under the following five types:

Tropical Semi-arid with Dry Winter: This climate type prevails in Karachi, Hyderabad, and Southern Khairpur Division. The mean annual temperature is above 18 °C.

Tropical Arid: This is characterized by average annual temperature of about 18 °C with dry winters. This includes southern Kalat and whole of the Indus Plain.

Cold Semi-arid With Dry Summer: This climate type covers central Kashmir, Peshawar, D.I. Khan, Quetta and northern half of Kalat Division.

Snow Forest Climate: This climate type is characterized by average temperature of coldest month below 0 °C. Mean temperature of the warmest month is between 10 and 22 °C. It includes northern mountainous areas and parts of Kashmir.

Extreme Cold: This climate type is characterized by average temperature of the warmest months between 10 and 0 °C. It comprises eastern and northern parts of Kashmir, Chitral, Gilgit and Laddakh.

Based upon the above classification, most parts of the proposed project area are included in the Tropical Arid climate zone, while some southern parts of Sindh are located in the Tropical-arid with Dry Winter climate zone.

(i): Atlas of Pakistan, Government of Pakistan, 1997. Sindh State of Environment and Development, IUCN, 2004.

4.3.1.7 Ambient Air Quality on the Project Site

On site ambient environmental monitoring was carried out to know about the state of the existing environment as base line environment on the project site. The monitoring was carried out for gases including Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x) and Carbon Monoxide (CO); Particulate Matter (PM) and Noise levels. Monitoring was carried out at selected locations.

Gaseous Monitoring:

Since there are no sources of common air pollutants including mainly Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x) and Carbon Monoxide (CO) therefore there was no possibility of the pollutants to be present in the ambient air. On actual measurements made on the project site using the following methods:

Sulphur Dioxide (SO_2):

- "Colorimetric Method 42401-01-69T, Tentative method of analysis of sulphur dioxide contents of the atmosphere"(Minimum detection limit 10 **µg/m^3**);

Nitrogen Oxides (NO_x):

- "Intersociety Committee. Tentative Method of Analysis for Nitrogen Oxides content of the Atmosphere H.L.S 6: 106, 1996(Minimum detection limit 6.0 **µg/m^3**)".

Carbon Monoxide (CO):

- Tentative method of analysis of Carbon Monoxide contents of the atmosphere, Ciuhandu, G. Colorimetric Determination of Carbon Monoxide in Air. Z. Anal. Chem., 155:321-327, 1957(Detection Range 0-20 **µg/m^3**), none of these gases were detected in the ambient air.

Particulate Matter (PM)

The onsite monitored concentrations of PM in the ambient air are given below:

Table – 4.7: Baseline Ambient Particulate Matter

Reference Point *	Ambient Particulate Matter (µg/m^3) 24 hours Average
Near Metro Wind Power Plant	62.7
Near Jammari Village	71.3
Near Dhani Baksh Brohi Village	65.9

Near Khaskhali Village	59.3
Near Muhammad Siddique Brohi Village	76.1
JPL Project site	61.8
NEQS Limiting Value	**550**

4.3.1.8 Noise

Noise Levels:

Values of the noise levels as measured on the project site are given below:

Table – 4.8: Baseline Noise Levels Monitored Data

Reference Point # 1: Near Metro Wind Mill Corridor

Date	dB(A)										Leq
23-1-2016	54	53	53.5	54	54	54	55	53	55	56	54.1

Reference Point # 2: Near Jammari Village

Date	dB(A)										Leq
23-1-2016	46.5	46	46	47	46.5	48	49	47	46	47	46.9

Reference Point # 3: Near Dhani Baksh Brohi Village

Date	dB(A)										Leq
23-1-2016	48	44	48	49	47	48	47.5	47.5	48	47	47.4

Reference Point # 4: Near Village Khaskhali

Date	dB(A)										Leq
23-1-2016	51	51	51	51	52	52	52	52	53	53	51.86

Reference Point # 5: Near Muhamad Siddique Brohi Village

Date	dB(A)										Average
23-1-2016	51	52	51	51	50	50	51	51	52	51	51.0

Reference Point # 6: JPL Project site (middle)

Date	dB(A)										Average
23-1-2016	48	46	47	48	48	48	47	47	46	47	47.2

4.3.1.9 Surface Water Resources [(i)]

The Major surface water body in the project area is Sorh (Sodh) canal which is fed from Thana Bulla Khan and ends up in Keenjhar Lake in Tehsil Jhimpir. This lake is seasonal and only flow in the rainy season. One small, man-made water pond in located on the northern side of the project site at a distance of about 2 Km. This pond is used for rain water collection which, later on is used for drinking and other purposes. The name of the pond is Ali Babbar Water pond based on the name of its constructor.

The River Indus is the major surface water resource of not only the project area but also throughout the Sindh province and so also Pakistan. Over 60% of the total area of the Indus basin is in Pakistan and Azad Jammu and Kashmir. The river rises in Tibet, at an altitude of around 18,000 feet (5,486 m) amsl, The total catchment area of the river is 654,329 km2 and its length flowing through the country is about 2,750 km. The five major rivers joining the River Indus include Sutlej, Beas, Ravi, Chenab and Jhelum besides the other two minor rivers - Soan and Harrow also drain into the Indus. On the western side, a number of small rivers join Indus, the biggest of which is River Kabul with its main tributaries i.e. Swat, Panjkora and Kunar. Several small streams such as Kurram, Gomal, Kohat, Tai and Tank, also join the Indus on the right side.

The Indus River exhibits great seasonal variations, with more than 80% of the total annual flow occurring during the summer months, peaking in June, July and August. The Indus River and its tributaries on an average bring about 154 MAF of water annually.

This includes 144.9 MAF from the three western rivers and 9.14 MAF from the eastern rivers.

Most of this, about 104.7 MAF is diverted for irrigation, 39.4 MAF flows to the sea and about 9.9 MAF is consumed by the system losses which include evaporation, seepage and spills during floods. The flows of the Indus and its tributaries vary widely from year to year and within the year. As is the case with the water availability there is significant variation in annual flows into sea.

The Indus Delta: Historically, the Indus Delta has formed in an arid climate under conditions of high river discharge to the proportion of 4 billion tons of sediment per year. In the past, this has contributed to a protruding seaward of the delta as a result of interaction of fluvial and marine processes and a moderate tide range of approximately 2.6 meters.

During the past six decades, the construction of dams and barrages and extensive engineering works upstream has reduced the sediment load to 100-650 million tons per year (based on different studies).

What makes Indus delta unique is the fact that it experiences the highest wave energy of any river in the world. During the monsoon season, from May-September, the delta front receives more wave energy in a single day than the Mississippi delta receives in the entire year.

The Indus delta is triangular in shape and occupies a large part of the province of Sindh, covering about 30,000 km^2. It is about 240 km in length along the axis of the river and 220 km at its widest, from Karachi to the great Rann of Kutch.

River Water Quality [(i)]:

The water quality of Indus River is generally considered excellent for irrigation purposes. The total dissolved solids (TDS) range from 60 mg/l in the upper reaches to 375 mg/l in the lower reaches of the Indus, which are reasonable levels for irrigated agriculture and also as raw water for domestic use. The disposal of saline drainage from various irrigation projects has been a major factor in the increased TDS in the lower reaches

of the rivers in the Indus Plain. There is progressive deterioration downstream and the salinity is at its maximum at the confluence of the Chenab and Ravi rivers, where the TDS ranges from 207 to 907 mg/l. A slight improvement in water quality is noted further downstream at Panjnad due to dilution from the inflow from Sutlej River. The quality of the Indus water at Guddu, however, is within acceptable limits for agriculture; TDS being in the range of 164-270 mg/l.

In the upper reaches of the Indus River, the Dissolved Oxygen (DO) content remains above 8.5 mg/l which is well above the acceptable levels of 4 mg/l. The Biochemical Oxygen Demand (BOD) downstream of Attock has been recorded as 2.9 mg/l. At Kotri, it has a suspended solid (SS) content of 10 to 200 mg/l. Indus River water quality has been studied at the Dadu - Moro Bridge and Kotri Barrage, with nitrate levels at 1.1 and 7.5 mg/l, phosphate at 0.02 and 0.3 mg/l, BOD at 2.4 and 4.1 mg/l, feacal coliforms at 50 and 400 per ml, and aluminum at 1.8 and 0.2 mg/l respectively. Due to industrial waste discharges from Punjab and Sindh, a high content of heavy metals such as nickel, lead, zinc and cadmium have also been found in Indus water.

Lakes:

Several fresh and brackish water lakes exist in the Thatta district. These include the Kalri and Haleji lakes and Jhuddo lagoon.

Kalri Lake (also called Keenjhar) is a large freshwater lake providing drinking water to Karachi. Keenjhar Lake is at a distance of about 11.0 km from the project site. The sweet water Lake Keenjhar, is situated in the dry and stony desert at a distance of about 20 km north and north-west of Thatta. It is 24 km long and 6 km wide and has an area of 14000 ha.

The Kalri Bagar feeder canal feeds the lake from the north-west as well as by small seasonal streams entering it from the north and the west. The feeder is also the conduit for the industrial wastes of Kotri town. The only outlet is the Jam Branch canal in the southeast end of the lake.

It was declared a Ramsar site in 1976 and later became a wildlife sanctuary under the Sindh Wildlife Protection Ordinance.

Jhimpir town, on the North West of the lake, is the main town on Keenjhar besides twelve large and twenty small villages scattered around it. About 50,000 people are dependent on the lake and in 2005-06, about 800 boats of different size are said to be operating in it (declining from 2200 in 1988-89 and 1710 in 1998-99). There are four fish landing centres at Chilya, Sonahri, Jhimpir and Khumbo [(ii)]

Haleji Lake is an artificial freshwater lake with marshes and a brackish seepage lagoon. Considered a game reserve in 1971, this lake was declared a wildlife sanctuary and in 1976, the lake proceeded to become a Ramsar site. Haleji serves as an important source of water for Karachi besides being a popular recreational destination.

Jubho Lagoon is a shallow, small brackish water lagoon with mudflats and marshes that support a large concentration of migratory birds including flamingos and endangered *Dalmation pelicans*, a rare species in the world. This was declared a Ramsar site in 2001 because of the efforts made by IUCN Pakistan.

4.3.1.10 Groundwater Resources

Alluvial deposits carried by the Indus and its tributaries formed the Indus Basin. It is underlain by an unconfined aquifer covering about 15 million acres (60,700 km^2) in surface area. In Sindh, about 28% of the area is underlain by fresh groundwater. This is mostly used as supplemental irrigation water and pumped through tube-wells. Some groundwater is saline. Water from the saline tube-wells is generally put into drains and, where this is not possible, it is discharged into large canals for use in irrigation, after diluting with the fresh canal water.

Before the introduction of widespread irrigation, the groundwater table in the Indus Basin varied from about 12 m in depth in Sindh and Bahawalpur areas to about 30 m in Rechna Doab (the area between Ravi and Chenab Rivers). After the introduction of weir-controlled irrigation, the groundwater table started rising due to poor irrigation management, lack

of drainage facilities and the resulting additional recharge from the canals, distributaries, minors, water courses and irrigation fields. At some locations, the water table rose to the ground surface or very close to the surface causing waterlogging and soil salinity, reducing productivity.

Ground water table on the project site varies from 20 meter to 100 meters at different locations. Mostly the ground water in project area is saline. However, there are some small aquifers of sweet water in the same area. The thin layer of sweet water that exists over the brackish aquifer is under serious stress

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(i) Sindh State of Environment and Development, IUCN, 2004.

(ii) Preliminary Socio Economic Baseline Assessment by Shirkat Gah, WWF-Indus for All, March 2007.

4.4 Biological Environment/Resources

This section presents a brief overview of the Eco zones, wild flora and fauna, and the habitat conditions as it exists at the proposed project site. The information reported here is based upon relevant literature, knowledge gathered through actual visits of the experts to the project site, reports of the IUCN, WWF special literature and books and other relevant documents.

4.4.1 Original Ecozones of Project Area [(1)]

Tropical Thorn Forest Eco zone

The habitat, the most extensive eco zone of the Indus plain, presently exists only in places where human interventions not converted into habitation or for agriculture. This habitat encompasses low forests of thorny and hard-wooded tree species and dominated by Acacia spp.

The dominant trees and shrubs are hubul (acacia arabica), kaneli (pr osopis spicegra) Pi (salvadora olioides), Karil (capparis aphylla), rhaz ya stricta, daemia extensa and many others. The dominant trees, shru bs and under shrubs of sand dunes are represented by ak (calotropis procer ra), lai (tamerix diocia) besides babul, kandi and karil, etc. The plants foun d cultivated or wild near villages in the alluvial Tracts

are: neem (azadirachta indica), ber (zizyphus jujube), serrel (albizzia lebbeck) etc.

Among major **wildlife** mammal species include Desert Hare, Long-eared Hedgehog, Porcupine, Jackal, Bengal Fox, Desert Fox, Desert Wolf, Indian Desert Cat, Caracal, Jungle Cat, Wild Boar, Honey Badger, Small Indian Civet, Grey Mongoose, Small Indian Mongoose, Striped Hyena, Nilgai, Blackbuck and Chinkara Gazelle.

Birds of this eco zone comprises of Peafowl, Common Quail, Grey Partridge, Ring Dove, Red Turtle Dove, Little Brown Dove, Green Pigeon, Hoopoe, Spotted Owlet, Barn Owl, Dusky

Horned Owl, Pied Woodpecker, Wood Shrike, Indian Nightjar, Wryneck, Golden-backed woodpecker, Great Grey Shrike, Rufous-backed shrike, Fantail Flycatcher, Common babbler, Jungle babbler, Houbara Bustard, Great Indian Bustard and a number of many other species of passerine birds are found.

Riverine Tract Habitats

Originally, the riverine habitats used to have heavy, seasonal floods. Since forecasting and prior warning were not available to the rural people, these habitats were not occupied for agriculture and habitation. Natural resource exploitation was also not extensive. As a result, this natural flora flourished along the Indus River. These included: Tamarix, Saccharum, populus and Acacia. Typha growth was common wherever the water was stagnant or slow moving.

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(1)-Climatic Regions of West Pakistan, Pakistan Geographical Review. Kazi, S. A.,1952.

4.4.2 Modified Nature of Habitat

Major parts of the original habitats described above have been modified into new habitats, primarily as a result of extensive cultivation and expanding rural settlements. These new habitat types are briefly discussed below.

Agricultural Habitats

Most parts of Sindh are under very intensive irrigated cultivation. In addition, livestock rearing is also practiced extensively, and milk animals are common. The use of the chemical fertilizers and pesticides is very common. Several species of wildlife have adapted to the changed habitat. These include Jackal; Jungle Cat, Bengal Fox, Small Indian Mongoose, Shrew, Rodent pests including Porcupine, Fruit Bats and Wild Boar. The avifauna which survived the modified habitat include Doves, Black Partridge, Cuckoos, Koel, Woodpeckers, Parakeets, Bulbuls, Babblers, Black Drongo, Bee-eaters, Finches and House Sparrow. The reptilian species of this modified habitat include Krait, Cobra, Saw-scaled Viper, Rat Snake and Monitor Lizard.. The project site is situated in this type of the habitat.

Rural and Urban Habitats

These include human habitations within agriculture areas, as well as the urban centers. Jackals search their food from garbage dumps, human feces, house sparrows live in the houses, Bank Mynas, and Cattle Egrets feed on grasshoppers, whereas Banyan and Peepal trees continue to grow in villages upon which Green Pigeons and barbets feed.

Migratory Birds

Out of the checklist of a total of 660 birds species found in Pakistan, 30 % of the birds are species which visit the country for a sizeable period yearly, while 43 % of the total checklist are either Palearctic or Oriental Species which come to Pakistan only for breeding, 28 % of the total numbers of species are regular winter visitors which breed extortionate and mainly in trans-Himalayan northern regions.

4.4.3 Wetlands [(1)]

Wetlands are among the most productive ecosystems all over the world. Since Pakistan is situated on the flyway to Central Asia and South Asia, the birds breeding in Central and Northern Asia, migrate through Afghanistan to the Indus Valley, particularly to the wetlands across Sindh, which are major wintering grounds of migratory water birds. Hereunder, some of the important wetlands are briefly described below:

The Indus Dolphin Reserve extends from Sukkur upstream to the Guddu Barrage spreading over 135 km. The entire area was declared as home of the endangered Blind Dolphin in 1974, the major threats it faces include Split populations of the dolphins due to dams and barrages visitors which breed extortionate. The number of dolphins at the site has increased from 150 in 1974 to 620 in 2001.

(1) Sindh State of Environment and Development, IUCN, 2004.

Manchar Lake, Located about 12 miles west of Sehwan Sharif, Mancher Lake spread over an area of 100 square miles. The lake was once renowned for its beauty and the large population of migratory birds and wild fowl. It was considered the largest freshwater lake in Asia,

The water supply to Lake depends upon the water flows from River Indus via Aral Wah and Danistar Wah, storm water and hill torrents from Kirthar Hills and effluents from drainage units via Main Nara Valley Drain. Due to saline and toxic effluents discharged into the Lake, during the last two decades, the fresh water intake of the lake has declined.

Keenjhar (Kalri) Lake Keenjhar also known as Kalri Lake is one of the largest freshwater lakes in Pakistan. The lake spreads over a length of about 24 km, width 6 km and capacity of 0.53 million acre feet. It is about 122 km east from Karachi and 19 km northeast of Thatta town. The lake was created in 1930s from the two smaller lakes Keenjhar and Kalri by the construction of a dam at Chilya and a 12 km embankment on the eastern side. Indus provides Keenjhar, the required water through Kalri Baghar (KB) Feeder. KB Feeder starts from Kotri Barrage. Since the area is arid and receives less than 200 mm annual rainfall, hence Indus is the only source of water for the lake. The lake serves as a major source of drinking water for Karachi. The lake has extensive reed-beds, particularly in the shallow western and northern parts and rich submerged and floating vegetation. The natural vegetation of the surrounding area is tropical thorn forest. The climate is dry subtropical monsoonal.

The lake is internationally important for a wide variety of breeding, staging, passage, and wintering water birds including shorebirds, flamingos, ducks and geese, cormorants, herons and egrets, ibises, coots,

gulls, terns etc. The breeding birds reported include Cotton Teal, Night Heron; Pheasant tailed Jacana and Purple Moorehen.

This lake is rich in submerged and floating aquatic vegetation. The natural vegetation of the surrounding area is tropical thorn forest. The Lake is rich in fish fauna and supports the livelihood of about 50,000 local people.

Main activities at the site are commercial fishing, nature conservation, and public recreation. Keenjhar Lake was declared a Game Sanctuary in 1971 and designated as a Wildlife Sanctuary in 1977.

Drigh Lake: Situated at a distance of about 18 km west of Larkana, Drigh is a small, slightly brackish lake, with extensive marshes, situated in the Indus floodplain. The lake is fed by water from the nearby canal system and by local run-off from monsoon rains. The lake is surrounded by cultivated plains It is a semi-natural wetland, supporting rich and diverse aquatic vegetation.

The site regularly hosts over 20,000 water birds, mostly ducks, geese, and coot in winter. It is a breeding and wintering area for a wide variety of water birds and an important roosting site for night heron. The wintering birds also include shorebirds, cormorants, pelicans, flamingos, jacanas, gulls, and terns. This lake was designated as a Wildlife Sanctuary in 1972.

Haleji Lake, The Lake located in Thatta district on 24° 47 N, 067°46’E coordinates, is a perennial freshwater lake with marshes and a brackish seepage lagoon. While this lake in 1971 was considered a game reserve and further declared a wildlife sanctuary, in 1976 the lake proceeded to become a Ramsar site. Haleji serves as an important source of water for Karachi besides being a popular recreational destination.

Jubho Lagoon The lagoon is located in Thatta district on 24° 20 N, 068°40’E coordinates. It is a shallow, small brackish water lagoon with mudflats and marshes that support a large concentration of migratory birds including flamingos and endangered Dalmation pelicans, a rare species in the world. Because of the efforts made by IUCN Pakistan, it was declared a Ramsar site in 2001.

Nurri Lagoon, The lagoon located in Badin district 24° 30 N, 068°47'E on coordinates. is also a brackish, privately owned lagoon with barren mudflats that is visited by large concentrations of migratory water birds. It was also declared a Ramsar site in 2001. Increased salinity, sea intrusion, population pressures, agricultural and industrial pollution are major threats to this site.

Deh Akro located in Nawabshah district, is a wildlife sanctuary consisting of four major habitats; desert, wetland, marsh, and agricultural. It is a natural inland wetland ecosystem, which supports a variety of rare and endangered wildlife species. This area hosts a considerable number of rare fauna. Many indigenous fish species are also found here.

Water scarcity during a persistent dry spell is adversely affecting this area.

Other lakes of the province include Badin and Kadhan Lagoons, Charwo Lake, Ghauspur Jheel, Hadiero Lake, Hamal Katchri Lake, Khango Lake, Khipro Lakes, Langh Lake, Mahboob Lake, Phoosna Lakes, Pugri Lake, Sadhori Lake, Sanghriaro Lake, Shahbuder and Jaffri Lake, Soonhari Lake and Tando Bago Lake.

It is worth noting that since all of the wetlands described above are far too beyond the area of influence of the proposed project site, therefore, the project siting at the declared location has absolutely no influence on these wetlands.

Sorh (Sodh) Drain:

Sorh drain also pronounced as Sodh drain is a seasonal drain, which flows during the rainy season. This drain curtails the overflow of Thana Bulla Khan Canal and ends up in Keenjhar Lake. During heavy rainy seasons, the drain cause floods in the project area. This is the only fresh water body in near vicinity of the project area.

4.5 Socioeconomic Description of the Project Area

This section presents Administrative Setup, Demographic Features of the Area; Culture, Ethnicity, Quality of life and Aesthetic Values; socioeconomic status, Ethnicity and Culture, Physical Infrastructure, Education and Literacy, Health and

Diseases, Agriculture Agro-ecological Zones, Fishing, Developmental Activities in the Area, Sites of Archeological, Historical, Cultural, or Religious Significance.

4.5.1 Administrative Setup

The project site is in District Thatta, Province of Sindh. The District is divided in talukas sub-division of a district (also called tehsil) namely Thatta, Sujawal, Mirpur Bathoro, Jati, Mirpur Sakro, Ghorabari, Keti Bunder, Kharo Chann and Shah Bunder. These talukas include 55 union councils, 7,200 villages, and 185,477 households with the average size of 6 individuals per household.

The wind power plant site is situated in union council Jhimpir of the Thatta Taluka. Like rest of the country, the local government system operates in Sindh Province as well. This system consists of the elected representatives as well as government functionaries. Under the system, each district is governed by the district government, which is headed by the District Nazim - an elected representative, and the District Coordination Officer (DCO) - a government official. Each district comprises several talukas (or tehsils), which are governed by their respective Taluka/Tehsil Municipal Administration (TMA). In turn, each tehsil or taluka comprises several unions, which is governed by the Union Administration (UA).

4.5.2 Demographic Features of the Area

The Thatta District covers an area of 17,355 square kilometers (about 4.3 million acres), and according to the 1998 census, had a population of 1,113,194 individuals living in 185,477 households. This population constituted 589,343 males and 523,853 females, with a growth rate of 2.26 percent, and having a density of 67 individuals per square kilometer.

The Thatta Taluka, where the proposed site is located, is distributed in 15 unions' councils, 61 revenue villages, 1,106 villages, and 41,408 households. The total population according to the 1998 census was 253748 individuals.

Villages, which will be impacted by this project, are given in Table - 4.9. Nearly all the listed villages and hutments are constructed of mud walls with straw thatched roofs. Fences made of thorny bushes protect each of these villages/hutments.

Table -4.9: Demographic Survey of the Project Area

Sr. No.	Name of the Villages	Approximate Population	Distance from the project site	Schools	Medical Facility	Electricity	Road	Water Supply
1.	Muhammad Siddique Brohi Hutment	15-20	Adjacent	---	---	---	---	---
2.	Khan Village Babbar Hutment	20-25	Adjacent	---	---	---	---	---
3.	Dhani Baksh Brohi Village	35-40	1 KM	Primary (Male & Female)	---	---	---	---
4.	Haji Shafi Jammari Hutment	40-45	1-1.5 KM	---	---	---	---	---
5.	Noor Muhammad Khaskhali Village	30-35	Adjacent	---	---	---	---	---

4.5.3 Culture, Ethnicity, Quality of life and aesthetic values:

Culture

The project area has rich culture, customs and traditions similar to the entire province of Sindh. There is a significant influence of the Arabian culture on the local population, though the traces of ancient Sindhi culture as well as Hindu, Buddhism and other religious thoughts are also present in the attitudes and approaches of the local communities.

The Pirs and Murshids (religious leaders, saints) are held in high esteem amongst the particularly in the uneducated and poor class of the villages. Shrine of Baksh Shah is located on the eastern boundary of the project site along with graveyard. Shrine of Jillani is located at Bullah Khan at a distance of about 7-8 km from the project site.

Every village in and around the project site has its own graveyard which is mostly adjacent to the respective village.

Annual festivals at the shrines of saints are regularly held in which the people take part enthusiastically. Similarly, the Hindus also hold great confidence and reverence in Thakurs and Brahmans (the higher castes). The Brahmans usually perform spiritual rites of Hindus.

Ethnicity:

Strong bradari (communal) system especially in the rural areas defines the inter- and intra-community hierarchy and allegiance. The system plays important role in conflict resolution at the local levels. Every social group has its own Sardar (Chief), who represents the entire community. Most of the disputes are resolved at village level by the Sardar. Major communal around the project site are;

i. Brohi
ii. Jammari
iii. Khaskhali
iv. Babbar

Language

Sindhi is the common language in the project area whereas Urdu is also spoken in some urban parts of the district.

Religions

Majority of the population in the project area is Muslims. Most of the population in Thatta district belongs to Sayed, Samma, Jokhio, Palejo, Baloch, Rind, Khaskheli, Khawaja, Memon, Mallah, Mirbahar, Jat and Lashari castes. The Thatta Taluka, particularly the area near the project site, is dominated by Rinds, Brohis, Jammaris, Khaskhelis, Jats, Katiars, Mallahs, Hadyas, Sammas, Lasharis. and Sathyas

Quality of life:

The land around the project area is arid. Average land holdings are very small. The people also supplement their income also by rearing of goats, sheep and cows on a limited scale. The people of the area are generally poor.

Since the area is not industrialized, therefore, job opportunities are very low. People mostly follow old traditions in almost all walks of their life. Elders are very much respected and play vital role in decision-making. Old people are mostly illiterate. Old customs are being practiced. Arranged marriage system is

followed and it is quite successful. People are proud of their traditions and customs. Guests are welcome as a tradition from the old past. Life style is simple.

Cultural and aesthetic values:

Old traditional cultural and aesthetic values prevail among most of the people. A large number of the people are living life below poverty levels. Financial and religious factors influence aesthetic and culture values of a society. People religiously have commitment to Islam. This relation contributes to good aesthetic and cultural values among the people.

People cannot sustain life on single agriculture source. Resultantly, aesthetic and cultural practices of a poor and medium type of society are dominant among a large cross section of the society. On the over all basis, century old traditions of typical villages of Sindh are prevalent in culture and aesthetic sense of life. Most of the old people are illiterate.

4.5.4 Physical Infrastructure:

The area is connected to the entire country through the National Highway passing through Thatta and Karachi – Hyderabad Super Highway (M-9) in the north of project site at a distance of about 8 km. The main Karachi-Lahore-Peshawar railway line also passes through the eastern parts of the project site at a distance of around 3 km from eastern boundary of project site.

Electricity is generally available in the area but there is no electrical supply line for the small villages of project area. The water supply system is non-existence in communities in the project area. Government of Pakistan has initiated the Clean Drinking Water Program, under which each UC will have water purification system.

Where the telecommunication link is also available in the area, the recent development of mobile phones system has expanded the service coverage to even remote areas which were not connected to the land lines.

Several industrial organizations exist in the Thatta District. Sugar mills, textile mills, cement industry, rice and flour mills are operating in District Thatta whereas no major industry is sited near the project site.

4.5.5 Education and Literacy:

A large number of educational institutes exist in the Thatta District, however many of the schools in the rural areas, are either partially functional, or altogether non-functional for mostly for lack of teachers.

Girls' enrollment is very low in the few schools. For higher education, students have to rely upon institutes in the urban areas such as Gharo and Mirpur Sakro town.

The literacy rate in the area is quite low. The literacy in the Thatta district at 22.14% is far below the overall literacy of 45.29% in the Sindh Province. The literacy in the urban areas is higher than the rural areas. Male literacy is generally higher than the female literacy.

There are only two primary schools present for more than 10 villages. Details of the schools is given in Table - 4.9

4.5.6 Health and Diseases:

Many health care facilities exist in the Thatta district. They include one district hospital, four Taluka hospitals, 46 Basic Health Units (BHUs) and eight Rural Health Centers (RHCs). One Taluka hospital, nine BHUs and one RHC are located within the Mirpur Sakro Taluka. These health facilities are not only quite inadequate to, but most of these are poorly equipped and under staffed. Resultantly, the local population is forced to go to the larger towns and cities in case of serious diseases. There is no health facilities present in the project site. Basic health facilities are present in Jhimpir which is around 12 km from the project site.

Among the common diseases in the area include tuberculosis, skin infections, malaria, eye infections, diarrhea, and hepatitis. Lacking suitable water for drinking, majority of rural population is victim of water borne diseases.

4.5.7 Agriculture:

Land use is governed by several interacting factors like physical, biological, social and economic in nature. A clear vision of these factors is essential for increased agricultural productivity. According to this zonation, the project area falls under the Zone I, which is characterized by moderate temperatures, low

rainfall, saline soils and poor drainage. Accordingly, the proposed site does not support any agricultural activities such as cultivation or grazing.

Cultivation:

Cultivation is one of the main livelihood activities of the people of the Thatta District in general. The cultivation mainly depends on the rain fall. Almost all the households possess some piece of land for cultivation. Rice, wheat, sugarcane and tomato are major cash crops of the area. During Rabi (winter) season, mostly wheat and vegetables are grown, whereas during kharif (summer) season, mostly rice, sugarcane, and vegetables are grown.

Mostly cultivation methods are traditional therefore crop yield is very low. The agricultural produce is usually sold out to the local wholesale dealers at the rate which is typically lower than the market rate. This is primarily because the villagers do not have much exposure of and access to the open markets in larger towns and cities, and they find it convenient to sell their produce to the whole sale dealers at lower-than-market rates.

Irrigation:

The Indus River is the main source of irrigation water in Thatta Taluka, the Baghar, Ladhya and Jam Sakro canals originating from Indus and Keenjhar Lake provide the irrigation water. Because of the areas in the Union Council located at the tail of the canal it do not receive enough irrigation water. The availability of sweet groundwater in the area is quite limited, therefore, usage of groundwater for the irrigation purposes is quite limited.

Livestock:

Livestock is also one of the key livelihood means for the rural population of the area. Traditionally, the farmers rear a few heads of livestock, ranging from bullocks for draught to cows and buffalos for milk, and poultry for eggs and meat. Traditionally, many communities in the area are exclusively dependent on livestock for their livelihood, several commercial livestock and dairy farms also exist in the Mirpur Sakro Taluka, some of them along the road leading to the site. Produce from these farms is usually transported to cities like Karachi, Hyderabad and Thatta.

4.5.8 Fishing

Fishing is one of the important livelihood means of the population in Thatta District, particularly along the coastal belt. In these areas, almost every household possesses one to two fishing boats. In the Mirpur Sakro Taluka, the union councils Bhuhara and Haji Girano are located in the coastal belt hence fishing is the key occupation in these areas. In the south-east of proposed project site, the Kalri Lake is an important fishing area for the people living in area.

The only source of natural run off water is Sodh drain passing near the project site. During rainy season small fishing activities occurred in the project area.

4.5.9 Developmental Activities in the Area

No major development projects are reported under implementation in the project area. The project area, being a natural wind corridor is housing many similar wind power projects. Details of the projects is given in the **Figure - 4.3.**

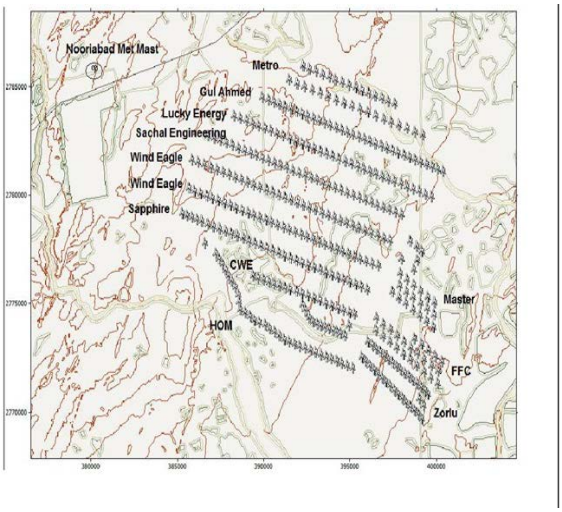

Figure - 4.3: Wind Power Projects near the Proposed Project Site.

4.5.10 Sites of Archeological, Historical, Cultural or Religious Significance

A large number of archeological, cultural, historical and religious sites exist in whole of Sindh of which the majors include the archeological remains at Moen-Jo-Dero, one of the most important Indus Civilization sites, and the Makli Hills graveyard in the Thatta District. None of these sites is located at or near the proposed wind power plant site.

5- SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5-0 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES:

This section of the report deals with following parts of the IEE report:

- Categorization of environmental threats
- Collective impacts on the environment of the area
- Most likely impacts of the project on the area
- Possible out break of any emergency situation at wind farm site

While preparing this section, conformity with the guidelines for IEE, were taken into account .This process is described hereunder to ensure that:

- Most likely impacts can be identified and properly assessed
- The interaction between the project components and environment are adequately Described

Possible project activities that can lead to an environmental disturbance are identified separately and described along with the level of intensity.

5.1 Environmental Assessment Methodology

This environmental assessment was carried out in line with the requirement of national regulations. The assessment comprised of review of the project information, meeting with the people of the project area. The criteria, used for the assessment of the intensity of the impacts, is as below:

Classification of the Residual Impacts

Level	Classification Explanation
High	The impact has the potential to threaten sustainability of the resource therefore it should be taken as management concern for which monitoring and / or recovery efforts need to be considered for research.
Medium	The impact has the potential to affect the resource to decline for lowering than initial but stable stage in the study area after project closure and even to the fore seeable features. Therefore regional management actions such as research, monitoring and/or recovery initiatives may be required.
Low	The impact has the potential to decline slightly in resource in study area during the project life. Therefore research, monitoring and/or recovery initiatives would not normally be required.
Minimal	Potential impact may result in slight decline in resource in study area during construction phase, but should return to baseline levels.

This environmental assessment was performed with a view to determine the prospective adverse environmental effects of the project so as to ensure that these are given due consideration in minimizing their effect on the physical, ecological/biological and socioeconomic environments. These activities have been are for construction, regular operation and decommissioning phases of the project.

5.2 Summary of the findings of the Environmental Assessment

As a result of the study, it has been found that none of the project activity can cause environmental damage that can cause potential environmental degradation in the project area. Even some of the project components that have the potential of causing moderate environmental degradation, their magnitude can also be

minimized or stepwise avoided in due course of time. The following section provides a detailed account of them in the following order:

- Major Environmental Issues Identified for the Total Project Activity and Mitigations
- Mitigation Measures during Construction Phase/(issues to arise during construction)
- Mitigation Measures during Operational Phase/ (issues during operation)
- Other Issues Mitigation Measures

5.3 Major Environmental Issues Identified for the Total Project Activity and Mitigations

The key environmental relevant issues identified for detailed evaluation are:

- Collisions of Migratory Birds /Avian Impact
- Noise
- Health and Safety
- Shadow
- Visibility
- Atmospheric Emissions
- Clearing of Land for Road and Building Construction
- Delivery of Equipments at Site
- Foundations of Tower and Cranes Construction
- Tower Assembly and Installation
- Wild Life Disturbance
- Maintenance Activities at later stages
- Global Environment Issues

- Historical Heritage
- Solid Waste Management

5.3.1 Collisions of Migratory Birds /Avian Impact

Background

In the context of the project, migratory birds' mortalities, through their collision with the wind turbines and associated infrastructure, is the most significant environmental issue. Site avoidance and disruption of migratory behavior of the birds could also be significant issue.

According to a survey, conducted by WWF in 2009, indicated that number of birds in and around Keenjhar Lake have reduced drastically in recent years and these birds have tendency to fly at an altitude of 400 to 500 meters, therefore, there is no chance of collision with wind towers at this specific site.

Though in Pakistan Wind Farm technology is being introduced quite recently, yet this technology was developed and being practiced in European countries for the last over one decade.

The US Government Accountability Office (GAO) Study Report (Sept. 2005), on the effects of wind energy development on wildlife, determined several hundred utility-scale wind farms currently operating across the (US). According to this report such problems appear to be limited to two project areas. In the context of other sources of avian mortality, it does not appear that wind power is responsible for a significant number of bird deaths," the report states in its conclusion [(1)].

[Source: [(1)] American Wind Energy Association: Facts about Wind Energy & Birds, 5pp.-Internet Article]

According to another study in the United States, the following sources of avian collision mortality have been estimated [(2)]:

- Vehicles: 60 – 80 million
- Building and Windows: 98 – 980 million
- Power lines: tens of thousands – 174 million
- Communication Towers: 4 – 50 million
- Wind Generation Facilities: 10,000 – 40,000

[Source: [(2)] Wally Erickson, WEST Inc., Bird and Wildlife Monitoring: presentation at National Wind Power and EA Workshop, Environment Canada: May 12, 2004, Moncton, New Brunswick.]

Yet according to another study carried out by the European Wind Energy Association shows that the risk of bird deaths through collision with wind turbines is low. For example, it is estimated that 33,000 birds are killed annually by wind turbines operating in the USA, an average of 2.2 fatalities for each of the 15,000 turbines [(3)]. A study in Spain shows 0.13 dead birds per year per turbine.

[Source: [(3)] http://www.windpower-monthly.com]

By comparison, in the USA, over 100 million birds, are estimated to die each year, from colliding with vehicles, buildings, power lines and other structures, with wind power responsible for just 1 out of every 5,000 - 10,000 avian fatalities.

The above facts and figures show that there will be very little effect of proposed wind farm on the avian mortality and migratory birds.

Mitigation /Management Measures to Avoid Avian Collision

Following mitigation measures are recommended to be adopted to avoid avian collision:

- To provide the birds a safe access to the project site for avoiding avian collision, a wider corridor measuring a distance of about 300 meters between two consecutive wind towers needs to be provided.
- In order to avoid nesting facility of any of the birds; checking of the vacuums or holes in the towers should be carried out regularly.
- In order to further reduce chances of avian collision, all power and communication cables to the extent possible, should be placed under ground.
- Data of bird mortality in the immediate vicinity needs to be recorded for at least two to three years from the start of the project. This will help to establish a realistically strong link between the wind turbines and the birds mortality.
- Wind towers need to be painted identically and white flashing lamp to avoid avian collision at night.
- The project management representative is require to establish regular contact with the WWF office and Wildlife Department at Thatta, for time to time exchange of views for any further possible measures to be adopted for achieving the goals of minimizing avian mortality.

Intensity of Environmental Threat from the Proposed Project

- The wind farm project is not going to impose any worth mentioning impact on birds of area.

5.3.2 Noise

Background

Noise to be made by the wind turbines can be controlled to the required limits of the National Environmental Quality Standards for Noise (NEQSN), 2010 by carefully designing rotor blades with low rotational speed along with good noise insulation generator to help limit noise emission.

According to GE Wind Turbine data, following noise levels are observed;

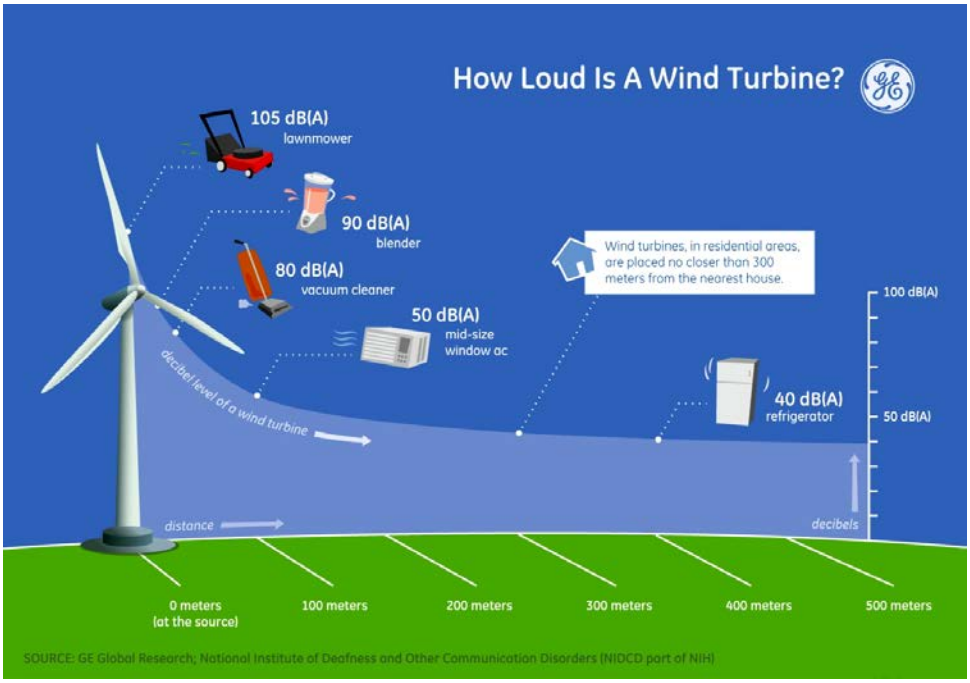

Figure – 5.1

Specifically, at 200m the sound from a modern, medium-sized wind turbine will produce noise to the tune of about 45 dBA, quieter than a typical living room. At 400m, the sound would be no louder than leaves rustling in a gentle breeze. By keeping enough distance from built-up or other noise sensitive areas, noise pollution is avoided.

Wind turbine noise typically increases with increasing wind speed, as does the background noise levels. The critical period for noise impacts is likely to be at low wind speeds when turbines cut-in and when background noise levels are still relatively low.

Noise generation from wind farm can be separated into the construction and operation phases of the project.

Construction activities generating noise:

- Excavation activities for turbine and building footings including drill and blasting;
- Excavation of cable trenches;
- Crane activities associated with tower erection.
- Transportation movements associated with delivery of machine and construction material
- Concrete batch plant;
- Construction of access roads, including use of rock breakers and blasting;

Operational phase noises include:

- Wind turbine generator and blade movement;
- Substation transformers; and
- Maintenance equipment noise

Management Measures/Mitigation Measures

The noise produced by the wind turbine is mainly because of the gearboxes and its auxiliaries. When there is no gearbox; so there is no excessive noise that crosses the permissible limits. But even then, care has to be observed to ensure that all turbines are configured so as to be at the maximum possible distance from residences.

Intensity of Environmental Threat from the Subject

Noise generation from most wind turbines (running at full swing) is estimated to be 95 to 105 dBA. With increasing distance the source and receptor the noise also decreases and is to ambient outdoor noise. No potential threat is established. For comparison sake, refer to the following figure:

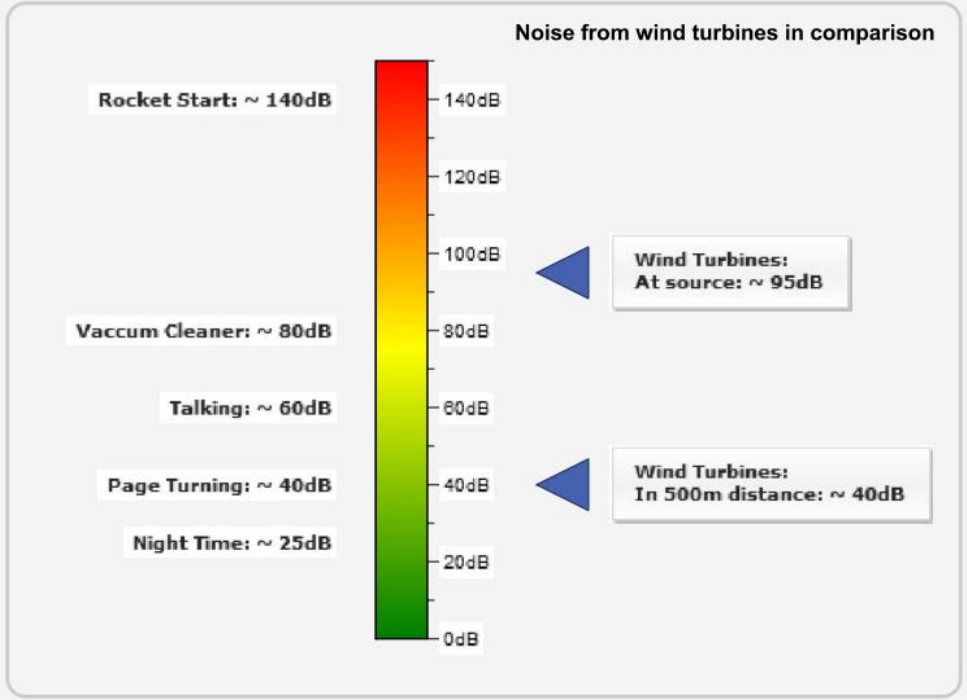

Figure – 5.2 [Noise Emission Level and Comparison]

Typical noise levels of various devices are presented in Table – 5.1

Table – 5.1: Typical Noise Levels

Device	dBA
Quiet basement without mechanical equipment	20
Quiet Room	28-33
Computer	37-45
Refrigerator	40-43
Typical Living Room	40

Radio Playing in Background	45-50
Background Music	50
Normal Conversation	55-65
Printer	58-65
Alarm Clock	60-80
Phone	66-75
Push Reel Mower	68-72
Inside Car, Windows Closed, 30 MPH	68-73
Inside Car, Windows Open, 30 MPH	72-76
Air Compressor	90-93
¼" Drill Machine	92-95
Maximum Output of Stereo	100-110

Source: http://www.nonoise.org/library/household/index.htm.

5.3.3 Health and Safety Background

In wind farm, health and safety hazards may be experienced at any time during construction and operational phases of wind farm. Although there are very remote chances of hazards, yet some of hazards that can take place include:

- Accidental or controlled fires;
- Falling turbine blade or damaged turbine;
- Damage to turbine components due to high winds;
- Turbine blade failure;
- Vehicle accident;
- Exposure to high voltage
- Accidents while accessing area;
- Public access;
- Accidental access of public inside the turbine or on the turbine tower;
- Construction accidents during access and foundations preparation.

Management Measures/Mitigation Measures

The proposed JPL Wind Farm is situated quite far off the scattered population in small villages (Goths), except for five (5) temporary settlements which are outside the project site and will not be impacted with the construction of this wind farm.

The wind farm will have adequate safety alarm that can alert the safety personnel of any irregularity at the site. Every turbine will be connected to the latest type of a network of safety instruments and communication devices through which remote monitoring will be done.

Control systems will continuously keep on monitoring of the key operating parameters, and thus ensure that in the event of a problem within the turbine array or within the utility system or anywhere else, the turbines are safely disconnected.

The monitoring staff on the wind farm will be equipped with the latest communication devices thus enabling them to transmit, to concerned agencies, the information regarding any emergency without any delay.

Neither access to general public to the wind farm can be denied nor can grazing rights of the people be negated. Since no fencing is possible due to the open nature of wind projects all over the world, hence there will no installation of fence around the wind farm site but fencing will be done around each turbine and turbine step up transformer. Migration of the people to the land under the wind farm is not possible because the land has been allotted to the project by the competent authority. In addition, the project company will keep its check through their security personnel to be deputed on site.

A large volume of transport is expected to visit the project site during construction phase. To avoid stampede, the transport engagement will be controlled under a plan. Consequently, vehicular emissions will be minimized on the project site. Further, only the transport meeting the required emissions levels as set under the NEQS Pakistan will be engaged. Hazardous chemicals or spill on the projects site will be carefully controlled according to a well-planed programme.

The wind turbine tower will be properly insulated and every possible care be taken while connecting the tower to proposed sub station and with remaining turbine towers.

During the assembling and installation phase of sub station transformers and wind turbine generators, fire extinguishers (both powder and liquid type) will be available.

A well-equipped and trained Hazards Response Brigade (HRB) with adequate supply of spill prevention and emergency response equipment will be kept on site during the construction phase and when maintenance of turbines is to be performed during operation phase. The HRB will have staff trained in hazardous materials handling and emergency response procedures.

An adequate supply of spill prevention and emergency response equipment will be kept onsite all times during the construction phase, as well as when

maintenance is performed on the turbines. Site personnel will be trained in hazardous materials handling and emergency response procedures.

Used oil, filter and grease cartridges, lubrication containers and other equipment maintenance waste products will be collected and disposed of at the nearest scenically secured waste disposal facility according to international best practices.

Mechanical safety will be made available on priority basis. The staff to work above ground level will be provided with fall restraint equipment.

Severity of Environmental Threat from the Subject

Strict monitoring and compliance of "Work place health and safety regulations" will be the order of the day.

5.3.4 Shadow/Flickering Effect

Background

Rotating rotor blades make moving shadows during sunshine. While normally this effect is visible only very close to the turbine, whereas, on sunny winter days, when the sun is low in the sky, shadow may spread over long distance, and in case this shadow is cast onto a house window, it may be inconvenient. Correct positioning of wind turbines, and a minimum distance from dwellings will suffice to avoid this problem.

Shadow flicker takes place where the blades of a wind turbine cast a moving shadow over a window in a nearby house. The effect is not longer lasting but for a short period and occurs only under very specific and rare conditions. Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker. In case shadow flicker is a problem, quantify the effect and where appropriate, measures be adopted to prevent or ameliorate the potential effect like turning off a particular turbine for a certain duration.

Management Measures/Mitigation Measures

Even otherwise, if shadows cause inconvenience for only a short time in a year, the wind turbine can be put off its operation during such interval and it will not result in too much loss of production. Larger wind turbines rotate more slowly and reduce further any potential shadow flicker effects.

Severity of Environmental Threat

The distance between the proposed wind farm site and the nearest population in form of temporary settlements (goths) will not require any special attention.

5.3.5 Visibility

Background

Wind turbines comprise of large structure machines. Human beings over the period have reshaped the countryside. Surveys conducted indicate that by and large, majority of the people are favorable to wind energy and favor development of wind energy. Therefore, they see wind turbines attractive and interesting.

The proposed wind farm will give new look to the area. The wind turbines, particularly, with the Topographic situation of the project site, will be visible from a distance of around 6-8 km. The residents of the small villages (Goths) scattered remotely around the project site usually cross by un-noticed, the erected mast data towers in the same area. Therefore, they are used to the visibility of the towers. Therefore, the new wind farm will not be unpleasant or odd situation for them.

Management Measures/Mitigation

The proposed projects site is located in area, which is all a barren tract of land without any feature of scenic beauty. Small-scattered bushes are the salient feature of the land. So project need not to provide any mitigation measures.

Severity of Environmental Threat

Under the given situation, severity of this issue is categorized as low.

5.3.6 Atmospheric emissions

Background

Of the most significant change is air emissions during construction phase is increase in particulate emissions from construction phase vehicle movements and disturbance of soil during civil construction work including road and foundation construction. These emissions will not add to the Particulate Matter (PM), if dust suppression methods are implemented as required during the construction phase, Therefore, air emissions are not going to pose any danger to the environment.

Management Measures/Mitigation

Fugitive dust suppression can be controlled largely by sprinkling of water on the unpaved sites confined to the site of civil works. Limiting speed of the vehicles visiting the project will also help to keep the dust emissions under control.

Burning of the cleared vegetation, for developmental purposes, should be the last option if no other environmentally safe method is available.

Severity.

Severity of this factor can be categorized as low.

5.3.7 Land Clearing for roads and building construction

Background

Clearing of the site from bushes and shrubs will be restricted to foundation sites, work areas and along the surveyed right-of–way.

The existing available road/track may need broadening in order to accommodate heavy traffic that is expected for delivery of equipment. This may lead to a potential destruction of flora mostly shrubs and bushes to be cleared for the purpose.

Management Measures/Mitigation

Indiscriminate removal of bushes and shrubs should be avoided. This may only be restricted to areas where civil work is to be done. Areas requiring vegetation removal may be earmarked after survey of the site. Construction activities may be strictly restricted to the site area.

Severity of Environmental Threat

The severity of this issue can be categorized as low.

5.3.8 Transportation Route of Equipment at Site

Background

The equipment from abroad will be transported from Port Qasim to the project site.

Of the two different modes of transporting the equipment from Port Qasim, the road route will be preferable because of technical limitations. Available roads presently have the infrastructure in place to accommodate the expected traffic. Even then, limited upgrading of existing roads and bridges may be required along the designated route. This upgrading is likely to involve road widening and realignment in some sections. During construction phase of the project, there will be an increase in vehicle movements on public roads.

Management Measures/Mitigation

For main trunk road to the site and a series of spur-ways to individual turbines it is suggested to regulate the traffic and minimize the operational loss to environment. It is highly advisable to install temporary reduced speed limits marks on the sides of the roads to minimize the chances of any fatal accident.

Severity of Environmental Threat

The severity of this issue can be categorized as moderate to low.

5.3.9 Tower and Cranes Plate form Foundations' Construction

Background

Approximately 20m x 30m area is required to be duly leveled and compacted for the cranes at each site where wind turbine is to be installed. Accordingly, in total an area of around 19800 m^2 is required for crane and parking places.

Excavation for wind turbines foundations shall be carried out. The topsoil will be striped off and stored separately and the subsoil will be kept separately. After completion of the installation of wind turbine, the subsoil will be used as backfill of the site of its excavation and then stripped off top soil will be put on this and thus the rehabilitation work regarding backfilling of the site will be completed.

Heavy-duty cranes will be used to lift the approximately 40-45 tons wind turbine generator up to a maximum height of 80 meters. During the construction of the foundation for tower and crane plate-form, there will be soil disturbance and relocation, admixing of top soil with subsoil. There would be some damage to vegetation and increase in heavy traffic like heavy-duty trucks and heavy earth moving machines.

Management Measures/Mitigation

The best use of the displaced soil will be for its reuse as road surfacing material. Soil admixing can be minimized by storing the soils separately. Damage to vegetation could be minimized by restricting the earth-based activity to the minimum possible area. In order to maintain maximum safety at work, best management practices are to be strictly adhered to.

Severity of Environmental Threat

The severity can be categorized as moderate to minimal.

5.4 Tower assembly and installation

Background

Turbines will be assembled on site, at temporary marked and isolated site on project area, very near to site where it is to be erected. Heavy duty sophisticated cranes would be engaged to carry out mounting the wind turbines for placement on the towers.

Management Measures/Mitigation

Since construction activity is for very short duration, therefore, potential threat to environment can be minimized by restricting access to working area. During the entire work, safety will be the order of the day. All possible safety and precautionary measures are to be adopted to maintain working safety.

Severity of Environmental Threat

The severity of the issue is categorized as moderate to minimal.

5.4.1 Wildlife Disturbance

Background

Wind turbines may interfere with birds' natural behavior thus resulting in increased fatalities. As explained earlier, since there are no known wild reserves or game area within area of influence of the project therefore the factor will be of very limited intensity. The proponent will be conducting mortality figure until the time second phase of the project comes to commissioning.

Generally, wind turbines do not pose hazard to wildlife. Cattle can safely and conveniently graze around. Reasonable clearance between the blades and ground minimizes to the maximum extent chances of injury to cattle and other animals.

In a few areas of the world where large numbers of wind turbines are concentrated, there have been reports of bird kills. On the other hand, where there are single installations or small clusters of wind turbines, little evidence is available of birds kill in significant numbers. By nature, local birds avoid wind turbines by flying around them, and migrating birds tend to fly well above wind

turbine height. Some concerns may be warranted in areas where birds concentrate, such as in wildlife refuges or shoreline feeding and nesting areas.

Management Measures/Mitigation

No special status bird species or nests are reported in the project area. Tubular towers use associated with elimination of any perching/nesting locations will minimize the risk of bird mortality. However, mortality monitoring program up to the start of the second phase of the project area will help to ascertain the real status of the environmental concern on this account. As also recommended in the earlier part of this report, a close liaison will be maintained between the project proponent, the WWF and the Wildlife Department, District Thatta, Govt. of Sindh.

Severity of Environmental Threat from the Subject

The severity is categorized as low.

5.4.2 Maintenance activities at later stages

Background

Regular maintenance and vigilance will ensure safe and reliable operation of the turbines. Half yearly all over inspection and maintenance on regular basis will be the salient feature.

Management Measures/Mitigation

Maintenance staff will be equipped with and trained in the use of fall-restraint equipment and proper handling and storage of hazardous materials.

Severity of Environmental Threat from the Subject

The severity of this issue can be categorized as low.

5.4.3 Global Environment Issues

Background

The availability of fossil fuels in Pakistan is not only becoming difficult, but also their price is going exuberantly high in very short intervals of time. The week economy of Pakistan cannot take up the pressure of importing these fuels. There is therefore, dire need to look for other cheaper & cleaner sources of energy.

Today, wind energy is the vanguard of clean energy technologies. It is the most viable energy option if we are to meet our future electricity needs as well as without causing global warming and climate change. Wind energy can save environmental degradation from the damage-taking place by the use of conventional fossil fuels, such as natural gas, coal, and oil.

Global climate change is among the most serious environmental threats faced by human race. The globally averaged surface temperature is projected to increase by between 1.4 and 5.8 °C by the end of this century.

Global mean sea level is projected to rise by 0.09 to 0.88 meters between 1990 and 2100, causing flooding to low-lying coasts and islands.

Development of renewable energy, including wind energy, is one of the major source of mitigating climate change.

1 MW Wind Turbine can provide enough electricity for 650 homes and will avoid 175 tonnes of slag and ash and the emission of 2,700 tonnes of the greenhouse gas [CO_2], 30 tonnes of Sulphur Dioxide and 10 tonnes of Nitrous Oxide per year, helping to meet our Kyoto Protocol targets and to preserve our environment.

Wind farms are supposed to be one of the environmentally safe sources of electricity generation.

Management Measures/Mitigation

It is evident that project will yield substantial reduction in greenhouse gas emissions compared to generating an equivalent amount of energy from fossil fuels. The project has the potential to make a significant contribution to providing an alternative energy source to fossil-fuel derived electricity.

Severity of Environmental Threat

Severity of this issue is categorized as low.

5.4.4 Historical Heritage

Background

No heritage site has been reported that has any historical importance in the project area.

Management Measures/Mitigation

Since there is no such site, therefore there is no need for any mitigation measure.

Severity of Environmental

Not applicable.

5.5 Mitigation Measures during Construction Phase/(issues to arise during construction)

These are presented in **Table – 5.2 below**

Mitigation Measures During Construction Phase

Table - 5.2

Potential Impact	Mitigation Action
Contaminated Soil	1. In the event contaminated areas are identified during construction, the following measures need to be followed: (a) Suspend all work in the immediate area. The area is to be secured by covering the area with plasticized tarp. Place berms round the tarp to isolate it from other areas. (b) Notify the JPL Site Engineer immediately. (c) The contaminated soil should be stored away from any watercourse, crops, etc. (d) Contaminated area is to be cleaned up as per environmental and standard procedures.
Vegetation Clearing	1. Clearing of project area should be minimized where possible. 2. All clearing activities should be confined to JPL approved areas. 3. Larger bushes & woody materials should be considered for salvage and reuse rather than to burn them.
Erosion Control	1. Areas where soil or sub-soil has been exposed should be stabilized by grading to a slope and/or applying appropriate erosion and sediment control measures. 2. Erosion and sediment control structure should be installed prior to site disturbance.

POL Handling/Storage	1. Fueling & lubrication of equipment and machinery should be carried out at designation and approved location. 2. Washing, servicing and fueling of mobile equipment should not be allowed within 30 meters of any waterway or drainage systems. 3. Waste oils and lubricants should be retained in a tank or closed container and disposed of in an approved manner. 4. Greasy or oily rags or materials subject to spontaneous combustion should be deposited and stored in an appropriate receptacle. This material should be removed from the work site on a regular basis and should be disposed of in an approved existing waste disposal facility. 5. All hazardous materials should be stored with in secondary containment and properly signed and record to be maintained.
Hazardous Spills	1. Any hazardous material spill should be immediately reported to JPL and Sindh EPA. 2. Adequate measures should be taken to contain the spill and reduce the spread or impact. 3. Clean-up activities should be undertaken to recover as much spill as possible. Disposal of the recovered materials should be undertaken to the satisfaction of JPL and Sindh EPA and properly disposed.
Site Layout	1. The Contractor's construction site and camp should be established in the manner that it does not adversely affect the environment.

2. The construction and camp area should be kept to the minimum.
3. The site and camp layout should take cognizance of access for deliveries and services. Likely disturbance to neighbors as well as security implications should be considered.
4. The Contractor should restrict all his activities, materials, equipment, and personnel to within the area specified. The Contractor should ensure that the approved construction area would be adequate to cover the project without further space adjustments being required later.
5. All private property outside of the construction areas (including any bypass routes) as set out in the site layout plan should be considered no-go areas.
6. The Contractor should erect temporary fencing along the perimeter of designated no-go areas.
7. **Ablution facilities:** The Contractor is responsible for the erection and maintenance of adequate ablution facilities and for enforcing the use of these facilities. The Contractor should be responsible for ensuring that all ablution facilities are maintained in a clean and sanitary condition to the satisfaction of the JPL. Adequate Ablution facilities must be provided at all construction camp areas where there will be a concentration of labour.
8. **Eating areas:** the Contractor should provide adequate temporary shade within the construction areas to ensure that site personnel do not move off site to eat. The Contractor should provide adequate refuse bins at all eating areas to the satisfaction of the JPL. If deemed necessary by the GEPL, the

Contractor should demarcate designated eating areas. No feeding of wild animals should be allowed.

9. **Domestic solid waste:** The Contractor should provide metal refuse bins or equivalent plastic refuse bins, all with lids, for all buildings. Refuse should be collected and removed from all facilities at least twice per week. Domestic waste should be transported to the approved refuse disposal site in covered containers or trucks.

10. **Wastewater:** Water from kitchens, showers, toilets, laboratories, sinks etc. shall be discharged into a conservancy tank for removal from the site after adequate treatment. Runoff from fuel depots / workshops / machinery washing areas and concrete batching areas shall be collected into a conservancy tank, adequately treated and disposed off at a site approved by the JPL

11. **Waste Management:** Waste management on site should be strictly controlled and monitored. Only approved waste disposal methods should be allowed. The Contractor should ensure that all site personnel are instructed in the proper disposal of all waste.

12. Communicable diseases (sexually transmitted disease), in order to prevent the STD among the worker regular medical check up should be carried out. In case any such occurrence it should be duly treated.

Air Quality

1. Vehicles transporting loose construction material (clay, sand etc.) to be covered with tarpaulins.

2. Limit on speed and movement of vehicles, where considered appropriate speed-breakers should be installed.
3. Use low emissions trucks for material transport where possible (e.g. use of diesel particulate filter).
4. Routine service and maintenance of vehicles and machines to reduce vehicular emissions.
5. During periods with abnormal wind speeds, in particular during dry weather conditions, workers on the construction site should be provided with adequate inhalation and eyes protection gears. In case particulates in air hamper a clear view over the site completely, so that safety is impaired, the construction should be interrupted until weather conditions improve.
6. To reduce generation of dust in the construction process, onsite roads and parking areas, as far as possible, would be constructed with asphalt over a compacted sub base.
7. Spraying exposed soil with water to reduce PM_{10} emissions and particulate matter deposition. Water to be applied at a rate to maintain a moist surface, but not create surface water runoff or erosion conditions.
8. Provide wheel washers for vehicles to remove particulate matter that would otherwise be carried offsite by vehicles that would decrease deposition of particulate matter on area roads and subsequent entrainment from those roads.
9. Routing and scheduling construction trucks to reduce delays to traffic during peak travel times would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.

	10. As far as possible planting vegetative cover (matching the local climate)**,** as soon as possible after grading**,** would reduce windblown particulate matter in the area.
Surface Water	1. All liquid materials and lubricants (e.g. sanitary wastewater, etc.) that accumulates during construction phase shall be stored in closed septic tanks, and in containers or barrels stored in specifically identified areas at the construction site. 2. Packaging material like bags of cement etc. shall be stored in containers to avoid leaching out of any remaining particles in the event of rainfall, etc.
Water Supply	1. During construction, trucks to provide dust control would supply non-potable water. 2. Potable drinking water for construction workers would be provided by a water service to be contracted by the site contractor.
Ground Water	1. Any liquid material and lubricants (e.g. hydrostatic testing water and wastewater) that accumulate during the construction phase should not infiltrate into the soil. Septic tanks shall be used for any wastewater collection. Each tank, when filled and closed, should be brought to the closest wastewater treatment plant for further treatment. 2. Closed tanks should be removed from the site as soon as possible and should not be allowed to remain on the

construction site as an interim storage until the end of the construction phase.

3. Monitoring of the characteristic of wastewater collected in the septic or other tanks should be carried out on routine basis.
4. Maintenance and washing of all heavy mobile machinery & vehicles should be carried out at adequate service stations. Good and regular maintenance of all vehicles and machines used on site is mandatory and untreated wastewater should not be allowed to drain into nearest drains.
5. Maintenance and re-fueling (if necessary) of any construction equipment shall be done at a decent distance from the excavation area and only be undertaken on sealed area. Any re-fuelling must be handled carefully taking particular attention to not spilling any fuel.
6. On site storage of fuel, engine oil and lubricants (if any) shall be in locked tanks, sealed and shadow-roofed area.
7. On site storage of fuel, engine oil and lubricants that might be stored shall be collected at the end of construction phase and brought to either a disposal point for hazardous waste or be brought back for re-use to the place it was rented for the purpose of this construction.

Solid Waste

1. All solid wastes shall be disposed off according to a set procedure and record of sales will be kept to track at any time when it is required.
2. The contractors to whom any waste is to be sold shall be fully made aware of the environmental impacts and health effects of the waste to be sold to him. He shall be provided instructions

	for reuse/handling of such wastes in environmentally sustainable way.
Soil	1. Construction activities must be limited to the designated areas. 2. Refilling of excavated soil should be done as far as possible. Where possible reuse of excavated soil should be done. 3. Prevention measures should be developed in the event of an accident or threat (e.g. massive, uncontrolled leakage of wastewater into unsealed soil on-site).
Fauna and flora	1. Planting of indigenous vegetation in the site should be carried out. If not earlier practical, such measures should be implemented after the completion of all construction activities.
Noise	1. Power mechanical equipment like bulldozers, air compressors, concrete pumps, excavators, concrete mixers etc. shall only be used with low sound power, whenever possible. 2. Optimize transportation management to avoid needless truck trips; avoidance of truck movements in residential areas at least during nighttime. 3. The construction machinery equipment shall be well maintained and serviced regularly during construction phase. 4. Construction activities shall be scheduled in such a way that noise intensive operations side by side with an increased net noise level will be avoided.

5. Workers on the construction site should be equipped with ear protection in particular those directly exposed to higher noise levels.

5.5 Mitigation Measures During Operation Phase/ issues to arise during operation

Mitigation measures during operation phase are presented in **Table – 5.3 below.**

Operation and Maintenance activities will not be very extensive. The normal greasing and cleaning activities will be done, except for the annual shutdown of the turbine for maintenance. Even during this time, it is not expected that any major work will be required each year.

Mitigation Measures During Operation Phase/ issues to arise during operation

Table 5.3

Potential Impact	Mitigation Action
Ground Water	1. Regular inspection of facilities for intercepting leaking and spilled liquids. 2. During O & M operation hazardous chemicals shall be handled only in appropriate segregated, sealed and bundled areas at site.
Solid Waste	1. During O & M operation, all solid wastes shall be disposed-off according to a set procedure and record of sales will be kept to track at any time when it is required. 2. The contractors to whom any waste is to be sold shall be fully made aware of the environmental impacts and health effects of the waste to be sold to him. He shall be provided instructions for reuse/handling of such wastes in environmentally sustainable way.
Noise	1. Noise measures are not proposed as the wind turbines used will have noise impact within regulatory requirement. Equipment will be acoustically shielded and /or lagged as far as possible. 2. A noise measurement campaign during full operation as operation start should be implemented to verify the real noise levels are in line with the standards under International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines for Wind Energy (April 30, 2007).

	3. Workers should be obliged to use ear protection in areas within the plant and for specific work that exceed the tolerable maximum noise limits.
Avian Collision	1. Regular checking of vacuum or holes in the towers should be carried out to avoid nesting facilities of birds. 2. Bird mortality count, in the immediate vicinity of the wind farm, should be carried out after commissioning of the wind turbines.

5.6 Other Issues and Mitigation Measures:

A) Economic Environment

The Project could have, both positive and negative, impacts on the economic environment.

Whilst there is significant potential for positive economic benefits of the Project, the extent to which it is likely to lead to economic development and or inflation depends on the Project approach to providing services to its workers, which has not yet been finalized.

Mitigation: The Company needs to consider the Socio-economic baseline context and consult community leaders and civil society when making economic development agreements.

B) Employment, Livelihoods and Income Generating Activities

Access to Project Employment is a key priority for local stakeholders, which is not surprising given the levels of poverty and unemployment in affected communities.

During both construction and operational phases there is an opportunity for maximizing positive impacts of the Company on local employment through involving unskilled (and where possible skilled) labour from all Project communities. However, although the generations of employment opportunities, resulting from Project activities, are expected as a positive impact, there is a risk that conflicts could arise between local inhabitants and new comers or outsiders over such employment opportunities. Furthermore there is high risk that, unless Project employment by the Company and contractors is managed appropriately, nepotism would influence the recruitment procedure, meaning that people without connections would not get access to Project opportunities – namely employment and other livelihood benefits. This could lead to a moderate risk of social conflict.

Mitigation Measures:

- The Company should work actively to promote local access to Project employment in both the construction and the operations phases.
- The Company needs to identify the skills that it needs for its construction and operations phases that could be provided as part of a community skills development program providing basic vocational training in the communities.

C) Hazard Prevention & Emergency Response

Definition

A major emergency in a works is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the works. It would normally require the

assistance of emergency services to handle it effectively. The overall objectives of the emergency plan will be:

- To localize the emergency and, eliminate it; and
- To minimize the effects of the accident on people and property.

Elimination will require prompt action by operations and works emergency staff using, for example, fire–fighting equipment, water sprays etc. Minimizing the effects may include rescue, first aid, evacuation, rehabilitation and giving information promptly to people living nearby.

Emergency Planning

Emergency Response or Disaster Management Plan for a Wind Farm is necessarily a combination of various actions which are to be taken in a very short time but in a present sequence to deal effectively and efficiently with any disaster, emergency or major accident with an aim to keep the loss of men, material, plant/machinery etc. to the minimum.

The main functions of the Disaster Management Cell are to prepare a detailed Disaster Management Plan, which includes:

- Identification of various types of expected disaster depending upon the type of the power plant.
- Identification of various groups, agencies, departments etc. necessary for dealing with a specific disaster effectively.
- Preparation – by intensive training of relevant teams/groups within the organization to deal with a specific disaster and keep them in readiness.
- Establishment of an early detection system for the disaster.
- Development of a reliable instant information/communication system.
- Organization and mobilization of all the concerned departments/ organizations /groups and agencies instantly when needed.
- A major disaster that can be expected in this proposed project be due to fire.

6-0 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN [EMMP]

6.0 ENVIRONMENTAL MANAGEMENT PLAN

This section of the report presents a draft outline of Environmental & Social Management Plan (ESMP) setting out the management framework for how the environmental and social elements of the Project will be managed from construction to operation's phase.

The Environmental Management Plan (EMP) will be used to ensure that the proposed Wind Farm is operated with minimum environmental impact as permissible under the National Environmental Quality Standards Pakistan (NEQS). In order to accomplish this objective, the environmental management systems described will comprise the following:

- Environmental Management Plan,
- Environmental Monitoring Plan (EMtP), and
- Resources Implementation and Training Program.

This EMP will serve as a guideline for the minimum requirements of the detailed procedure to be developed, updated and revised as needed throughout the construction and operation phases of the Project. The construction vendor will be responsible for preparing and implementing a detailed worker health and safety plan, a copy of which should be provided to project proponent prior to start up of construction activities.

It should be stated that full-time monitoring will be required both during the construction phase and operations phase of the project. The EMP task will likely be administered by the "Environment, Health and Safety (EHS) Department",

who will have the authority where necessary to "stop the job" if an environmentally detrimental activity is being conducted.

The EMP operation/implementation will be the responsibility of the "EHS Officer", who will be coordinating, arranging the collection and reporting of the results of all emissions, ambient air quality, noise and water quality monitoring. Environmental Management Plan includes the protection, mitigation and environmental enhancement measures to be implemented to reduce to the minimum the adverse impact on the environment. The adverse environmental impacts during the functional phase of the proposed project under normal operating conditions are from bird mortality/ avian impact, noise and solid waste generation.

Environmental Management Plan (EMP) is presented in this section. Mitigation measures to address the environmental issues during construction of the project are discussed in Chapter-5. The mitigation measures essential to meet the requirement during operation of the proposed project are described in Chapter-5. Monitoring recommendations are presented in this report for documenting the compliance of the project to the NEQS Pakistan.

The EPC Contractor will be required to establish a team of environmental and social (E&S) professionals that will operate the Environmental Management System (EMS) and undertake all additional studies that will be required during construction. This E&S team will be supervised by the Company Project Team, and will be subject to regular monitoring and auditing, whilst the Project Team as a whole will be monitored by the Lenders' environmental/social advisors.

At this stage many of the detailed requirements have not been finalized, but it will be necessary for the proponent to specify the key deliverables and targets for both themselves (proponent issues) and for the Contractor.

In recent years for projects such as this, the aspect of delivery of project E&S commitments has come to the fore and good practice includes development of control plans in a transparent manner as part of the Environmental Action/Management Plan. Such plans are visible and auditable by any of the Project management stakeholders, including the Client and Lender representatives. Whilst at this stage they may be viewed as onerous, they should prove to be an effective tool for efficient delivery and compliant performance.
In simple terms they present the 'how' and 'when' of activities that have potential E&S implications and should be supported by a range of approaches to remedy any problems encountered. These approaches include for example 'Toolbox Talks', which is an industry-wide accepted mechanism for delivering ongoing training during construction. It is expected that the Contractor will develop a series of 'Toolbox Talks' on various technical issues, for example approved traffic route adherence, cleaning up of oil and fuel spillages, following the chain of custody for all waste leaving work sites and so on.

An important mechanism for commencing work with due recognition of E&S standards complying with International Lender requirements is a Project Induction. It is expected that the Contractor will put all Project staff through an initial Project induction, covering health and safety standards and an overview of E&S Project values, requirements, standards and approaches.

6.2 Waste Management Plan (WMP)

This plan will cover all aspects of waste and wastewater management and staffing during construction, including implementation of practice standards such as reduce, re-use and recycle. The WMP will include details of temporary waste storage, waste transfer and pre-treatment prior to final disposal or recycling. Licensed/approved facilities for solid and liquid waste disposal must be used and a duty of care and chain of custody for all waste leaving the site will be followed. As part of the plan, the Contractor will be expected to produce waste handling forms for chain of custody, which will be used to control waste leaving site. Thus the waste controller will keep a copy of the form and the driver will always carry a copy and will ensure that the load is signed for at the final disposal site. All records will be kept by the Contractor for audit purposes and to demonstrate that the Project is complying with good international industry practice and applicable legislation.

6.3 Oil and Fuel Storage Management Plan (OFMP)

This plan will cover all storage, transportation and usage of lube-oils and fuel (LPG/Diesel). All oils and fuels will be required to be stored within secondary containment of 110 % capacity and all spillages shall be cleaned up immediately. All categories of spillage will be reported in accordance with the Plan to be developed by the Company. 'Toolbox Talks' would be expected to be delivered on an ongoing basis as 'continued training' and following any significant incident.

6.4 Construction Related Management Plan

This plan will set out the management of construction related effects, in particular covering dust and noise management to reduce disruption to local communities. The plan will provide details of the overall approach to noise and dust management and will link to the social management function, such that residents may contact the Contractor with grievances for their redress.

6.5 Emergency Response Plan

The emergency procedures state the site contingency plans that cover all potential accidents and incidents during both construction and operation. Specific emergency procedures will be developed by the Contractor (during construction) and the project proponent (during operation) which will define the control mechanisms, operational requirements and other controls during such events. These procedures will determine the response to incidents on the Company's Project sites such as spills, fires, or personnel injury or rescues. Training programmes will be required for workers to ensure an appropriate response in case of accidental events. The Emergency Response Procedures should be developed by the EPC Contractor shortly after mobilization.

6.6 Environmental Monitoring Plan

A preliminary monitoring plan will be required to allow a comparison with baseline sampling protocols and locations. However, as is often the case when a contractor mobilizes, there is expected to be a discussion on monitoring locations, parameters and frequencies. This is due to the fact that monitoring for many parameters is expensive and time consuming and the contractor will always want to conduct monitoring of features for which there is a reasonable linkage i.e. source-pathway-receptor. Thus it is anticipated that this discussion to establish

the final monitoring programme will be held shortly after mobilization and involve the Company and the Contractor.

6.6.1 Noise

An ambient noise measurement program should be instituted upon initiation of the construction of the project. The monitoring program should consider the noise limits during day-time and night-time at the closest point of public contact.

A noise survey both within operational areas and at the site boundary should be undertaken at regular intervals during the construction and operation phases not less than once every 12 months (during operation). Additional monitoring may be required at various times in response to public complaints (if any), in order to verify that noise emission limits are being met.

In the initial stages of Wind Electric Power Plant (WEPP) operation, immediately following commissioning of the wind farm, noise monitoring will be undertaken both within the site, at the site boundaries and at selected receptor locations up to a distance of approximately 0.5 miles from the proposed site. These monitoring results will be compared with the baseline noise levels monitored at the same positions prior to the commencement of plant construction activities.

The monitoring will therefore verify whether the WEPP is operating to the levels specified. The monitoring results will also act as a valuable database of baseline noise levels achieved during normal operation of the plant, for different meteorological and station conditions. This baseline will help determine the need for any subsequent design changes or for mitigation of noise levels in the power station area.

6.6.2 Maintenance

The plant will be maintained to ensure that noise impacts to the environment are minimized. Records will be kept to show what maintenance has been carried out.

6.6.3 Avian Mortality

A regular record of the avian/migratory bird's mortality should maintained and shared with local organizations like World Wildlife Fund.

6.6.4 Assigning responsibility for implementation (by name or position)

The WEPP operational workforce will include the Environment Officer (EO). This officer will be suitably trained and be responsible for the following:

- Ensuring that environmental protection procedures are followed;
- Coordinating environmental monitoring;
- Acting as a contact person for liaison with the public, local organizations and Government;
- Ensuring that data on all environmental aspects of plant operation is continuously updated, and available in a form suitable for immediate inspection by authorized personnel of the concerned Environmental Protection Agency (EPA) and internal authority of the plant ;
- Monitoring hazardous substances on-site to ensure that the possibility of accidental release is minimized;
- Promoting on-site environmental awareness, and;
- Liaison with the concerned Environmental Protection Agency (EPA) and other local industry.

In order to ensure implementation and effective operation of the EMP, it is of utmost importance that responsibilities be fixed to specific persons so that each

one of them should be answerable in case of lapse or mishap. Accordingly, hereunder the same responsibilities have been described:

Official Concerned	Responsibility
1- WEPP Manger	i-Ultimate in-charge and responsible for all the operations of Environmental Management Plan (EMP) set up. ii- He will be responsible to ensure smooth functioning of the EMP system iii-Daily progress on the state of the environmental status will be reported to him in writing by the Shift Engineer/In - charge. iv- He will work as bridge between the Government concerned authorities and the senior most management of the project. v- He will be answerable to the higher management in all matters relating to E.M.P. and report at least monthly about the state of the E.M.P. operations.
2- Environment Officer	i – Responsible for implementation of EMP. ii – Coordination with other departments/sections with respect to EMP. iii – Arranging, collection & reporting of environmental monitoring data and publishing of report.

6.6.5 Reporting and reviewing procedures

Environmental monitoring program, as described above, will be the guiding principle and reporting will be done regularly on monthly basis according to the formats of the Self Monitoring and Reporting by Industry (SMART)**.**

All monitored data will be reviewed and scrutinized on monthly basis at the WEPP Manager level. The same review of the data will be done twice at the level

of the Project Director or Chief Executive. The data will be documented according to appropriate format at the project level. Discrepancies will be duly addressed to.

6.7 Training needs

In order to effectively operate the EMP all the staff to be engaged in this activity should be trained extensively.

The designated Environment Officer will be incharge for the ongoing program of environmental training. This will include:

- General promotion of environmental awareness;
- Specific training for staff working in sensitive areas;
- Updating staff on changes to environmental standards; and
- Reporting to staff on the station's environmental performance.

6.8 Social Management Plan

Recommendations and Mitigation Measures

Based on the initial benchmark study following recommendations are made:

- The management of the Project can capitalize on the positive attitude of the people of area towards proposed Project by offering them maximum employment opportunities at the construction stage and of operational phase of the power plant.
- Insufficient and inadequate socio-economic structure of the community of the area also provides ample opportunities to Company management to

win sympathies of local people in their favor, by introducing meaningful and manageable plan of community development.

- Sustainable development approach through conservation of natural resources would be the best strategy to compensate negative socio-environmental impacts.
- Plant management should offer technical training opportunities to the local youth, if possible, to remove relative sense of deprivation.
- Social responsible attitude and stewardship of company management towards local people and resources can make project people friendly.
- Prior to action of the Project installation a comprehensive awareness campaign may be launched at masses level to avoid any conflict.
- To avoid any political, ethnic and value conflict**,** the administration of the plant may win the confidence of local powerful elites, authorities, leaders and interest groups by adopting informal confidence building measures.

6.9 Auditing and Management Review

An auditing programme is a key component of many EMPs. The primary purposes of the audit programme are:

- To verify continued conformance with respect to all applicable laws and regulations and to the Company's internal policy and procedures;
- To confirm the continued existence and efficacy of management systems to ensure compliance and performance; and
- To assist in the identification of actual and/or potential risks.

The benefits of the audit programme are:

- Assistance to management in identifying and prioritizing activities and/or practices that have opportunities for improvement;
- Reduction in risk through identification of areas of concern and triggering of appropriate corrective action; and
- Assistance with benchmarking and measuring improvement in management system performance.

The benefits of the review process are detailed below:

- Assess whether company personnel have complied with policy and procedures using audit reports;
- Review targets, objectives and environmental performance indicators to establish their continued correctness in the light of changing environmental impacts and concerns, regulatory developments, concerns among interested parties, market pressures, internal changes/organizational activity changes and changes in the environment;
- Determine if targets and objectives are being met;
- Review regulatory compliance and whether EMP requirements have been achieved.
- Determine root causes of systemic non-conformances;
- Determine if the operational controls, procedures, corrective actions, preventative measures and continuous improvement efforts have resulted in enhanced environmental performance;
- Determine if energy efficiencies, accounting practices and information management systems are adequate;
- Determine areas of improvement in organizational structure, staff training, work instructions, processes, pollution prevention programmes, energy

utilization and accounting practices, which may lead to environmental opportunities and increased profit margins;

- Formulate corrective actions and preventative measures as a result of the review of system non-conformance and verify corrective actions are effective and appropriate.

7.0 PUBLIC INVOLVEMENT AND CONSULTATION

7.0 PUBLIC INVOLVEMENT & CONSULTATION

While conducting Public Consultations/Disclosure, as special Performa was used and the data collected through them have been used for all calculations as appearing in this Section:

- Moderators Guidelines
- Interview Schedule– Part I (Baseline Conditions of the Area)
- Interview Schedule– Part II (Community Awareness and Perceptions)
- Public Consultation Performa-Views

On- site Public Meetings (PM) / Dialogues (D) were held. The participants include farmers, agriculturists, workers/labors, leaders of the villagers etc., the participants were fully apprised of the project details. Free and frank discussions were held among the participants about the various aspects of the project. Questions by the participants were replied in due details. Thereafter, written comments of the individuals and group leaders of the participants were recorded. The group leaders represented a large number of the people under their influence.

7.1 Community Awareness and Perception about the Project

During Public Consultations/Disclosure, it was revealed that a large majority of the people of the study area follow the basic professions like agriculture and labour. A large number of the people from the area also work, mostly as labor in other cities like Thatta, Hyderabad and Karachi.

The human settlements in the study area are in the form of very small villages (goths) and hutments. The people are traditionally conservative. Social cohesiveness, solidarity, religious and political harmony are the major characteristics of the villages and hutments.

Community Awareness and Perception about the Project as experienced during Public Consultations/Disclosures are summarized as below:

- By and large, the people of the project area are aware of siting of the project.
- The people have clear perception that the installation of the power plant in the area is beneficial for the community especially and the area in general.
- However, very few of them have concerns about the environmental aspects of the project.
- Public invasion by the outsiders to take place due to the project has also very minor concern for the people.
- Because of the absence of electricity in their area, the people appreciate that the Wind Power Plant will be a blessing to provide the electricity and reduce the big gap between energy demand and supply.

- Study findings depict that the people of the study area perceive overall positive impacts as a result of installation of the plant. Therefore, their attitude towards the project installation is quite positive.

- As far as the Initial Environmental Examination (IEE) is concerned, positive social impacts are dominant and hardly any negative social impacts were observed during the study.

- Being cleaner way of energy production, this project will add more energy to the system without degrading the environment.

- They correlate their positive attitude towards the plant with many direct and indirect socio-economic opportunities and benefits.

- The people believe that installation of the power plant in the area, especially during construction phase will open up employment opportunities which in turn follow a chain of indirect socio-economic benefits.

- They also perceive accelerated economic activity due to the business opportunities likely to emerge in the area. Directly or indirectly, some reasonable number of the local people will get employment and business from the installation of the plant e.g. shop keepers, traders, suppliers, contractors, transporters, technicians etc.

- People foresee many socio-cultural and psychological positive impacts on their lives and the community.

- They feel that the plant and its related activities will provide a strong base for social and economic change.

- They reckon that influx of the people and technology in the area will improve the quality of life of the people. It will also improve the level of general awareness of the people about different aspects of life.

A critical analysis of the findings of the Public Involvement/Consultations is presented hereunder:

7.1.1 Geographical representation of the study

Geographical representation of the study area comprises of localities situated in the area of influence of the project as presented in Table – 4.9 of Chapter-4.

Major topographic characteristics, socio-economic indicators, socio-cultural practices and environmental conditions of all the localities are very much similar.

Most of the people of all the referred localities are directly or indirectly aware about the installation of the power plant. The people perceive many positive impacts during the construction and operational phase of the plant with regard to the job opportunities. They believe that the project will have direct positive impact on their employment.

This shows that people directly co-relate their benefits with the installation of the plant. People consider that this economic activity will also be beneficial for the economic development of Pakistan.

7.1.2 Awareness Level Regarding the Project

Table – 7.1:- Showing the Level of Awareness

Name of Village	Level of Awareness (%)		
	High +ve	Medium +ve	Low +ve
Muhammad Siddique Brohi Village/Hutment	82	10	6
Khan Babbar Village/Hutment	79	15	6
Dhani Baksh Brohi Village/Hutment	80	15	5
Haji Shafi Jammari Village/Hutment	77	12	11
Haji Usman Brohi Village	83	9	8
Noor Muhammad Khaskhali Village	81	11	8
Jumo Khaskhali	76	18	6
Jan Muhammad Khaskhali	84	12	4
Lari Village	81	17	2
Malook Burfat Village	78	13	9

Note: +ve means positive

OVERALL SCENARIO

Level of Awareness	Percentage (%) [rounded off]
High	80
Medium	13
Low	7

7.1.3 People's Perception Level Regarding the Project

Name of Village	Level of Awareness (%)		
	High +ve	Medium +ve	Low +ve
Muhammad Siddique Brohi Village	81	11	8
Khan Babbar Village	76	18	6
Dhani Baksh Brohi Village	79	12	9
Haji Shafi Jammari Village	83	11	6
Haji Usman Brohi Village	80	15	5
Noor Muhammad Khaskhali Village	78	12	10
Jumo Khaskhali	85	7	8
Jan Muhammad Khaskhali	80	15	5
Lari Village	77	15	8
Malook Burfat Village	82	12	6

Note: +ve means positive

OVERALL SCENARIO

Level of Perception	Percentage (%)
High	80
Medium	13
Low	7

It is evident from the figures in the above table under the caption "Overall Scenario" a vast majority (80 %) of the people of all localities of the area show high level of positive perception and attitude towards the plant installation. They perceive that the plant will help to improve the socio-economic conditions of the community and the area.

7.2 Social-Economic Impacts Perceived by the People of the Study Area

The locality-wise assessment of the perceived socio-economic impacts of construction and operation of the power plant is as below:

7.2.1 Perceived Positive Impacts During Construction Phase

Positive Impacts During Construction	Name of Village									
	Muhammad Siddique Brohi	Khan Babbar	Dhani Baksh Brohi	Haji Shafi Jammari	Haji Usman Brohi	Noor Muhammad Khaskhali	Jumo Khaskhali	Jan Muhammad Khaskhali	Lari	Maloo k Burfat
Employment Opportunities %	60	55	62	64	72	57	61	59	63	58
Business Development %	40	45	38	36	28	43	39	41	37	42

Note:Perception of people interviewed.

From the table, it is obvious that the majority of the people perceived that the employment and business development would be the positive impacts on the community especially during the construction phase of the plant.

7.2.2 Perceived Negative Impacts During Construction Phase

Perceived Negetive Impacts During Construction	Name of Village									
	Muhammad Siddique Brohi	Khan Babbar	Dhani Baksh Brohi	Haji Shafi Jammari	Haji Usman Brohi	Noor Muhammad Khaskhali	Jumo Khaskhali	Jan Muhammad Khaskhali	Lari	Maloo k Burfat
Road deterioration/ blockade %	14	19	21	16	23	18	25	28	17	24
Noise %	38	38	32	40	22	35	32	25	28	21
Dust %	35	29	31	33	35	28	26	30	25	22
Heavy Traffic %	13	24	16	11	20	19	17	17	30	33

Note: Perception of people interviewed

OVERALL SCENARIO

Perceived Negative Impacts During Construction	Percentage (%)
Road deterioration	21
Noise	31
Dust	29
Heavy Traffic	19

People of Haji Shafi Jammari village perceived noise as the most dominant negative impacts of the plant during the construction phase. Overall on an average noise has the highest negative impact followed by dust

7.2.2 Perceived Positive Social Impacts during Operation Phase

Perceived Positive Social Impacts During Operation	Name of Village									
	Muhammad Siddique Brohi	Khan Babbar	Dhani Baksh Brohi	Haji Shafi Jammari	Haji Usman Brohi	Noor Muhammad Khaskhali	Jumo Khaskhali	Jan Muhammad Khaskhali	Lari	Maloo k Burfat
Employment Opportunity %	44	47	39	36	31	33	40	29	32	35
Business Development %	32	29	33	35	38	39	36	39	37	38
Road Development %	12	10	15	11	16	14	13	17	19	16
Health Facailities %	8	7	6	8	11	8	7	8	7	6
Education Facilities %	4	7	7	10	4	6	4	7	5	5

OVERALL SCENARIO

Perceived Positive Impacts	Percentage (%)
Employment opportunity	37
Business development	36
Road Development	14
Health Facilities	8
Educational Facilities	5

By and large, a large majority of the people of the localities in the study area are favorable to the siting of the power plant in the area. They expect many positive, conducive and constructive impacts on their economic life and community, regarding employment and business opportunity.

7.2.4 Perceived Negative Social Impacts during Operation Phase

Perceived Negative Social Impacts During Operation	Name of Village									
	Muhammad Siddique Brohi	Khan Babbar	Dhani Baksh Brohi	Haji Shafi Jammari	Haji Usman Brohi	Noor Muhammad Khaskhali	Jumo Khaskhali	Jan Muhammad Khaskhali	Lari	Maloo k Burfat
Environmental pollution %	20	18	19	15	17	18	13	15	12	10
Fear from the people invasion %	32	38	36	33	30	31	34	32	35	30
Fear to cultural values %	13	8	10	16	13	9	10	12	19	24
Employment fear from outsiders %	10	12	8	10	17	20	24	22	19	22
Noise %	9	11	8	9	7	8	6	8	6	5
Water Shortage %	6	5	5	6	9	7	8	6	5	6
Deterioration of grazing land %	10	8	14	11	7	6	5	5	4	3

OVERALL SCENARIO

Perceived Negative Impacts	Impact (%)
Environmental pollution n	16
Fear from the people invasion	33
Fear to cultural values	13
Employment fear from outsiders	16
Noise	8
Water Shortage	6
Deterioration of grazing land	8

Greatest fear is from outsiders' invasion. Some people apprehend that pollution may cause problems to them and the community.

Due to job opportunities for males, there will be improvement in the income status of their family which in turn will improve living standards including food, clothing and chances of getting education especially the women.

The Pakistan society follows Islamic values in all walks of life including sociocultural values where free intermixing of male and female is not permitted and neither liked nor practiced. Therefore, influx of mainly male workers and camp followers will not change the gender balance in the areas of construction sites and workers camps. So also there will not be any danger of sexual exploitation. Consequently, no chance of spread of alcohol and drug abuse and health risks.

From the above facts one can conclude that many positive economic and social impacts will appear in the quality of lives of the people of Study Area due to the wind power plant installation. These positive impacts include improvement in employment and business opportunities, infrastructure development, generating income resources and improving quality of life.

8.0 GRIEVANCES REDRESSING MECHANISM

8.0 GRIEVANCES REDRESSING MECHANISM-FORMAL AND INFORMAL CHANNELS

8.1 Formal Channel

8.1.1 Environmental Legislation

The Pakistan Environmental Act (PEPA) -1997 provides a complete code of conduct for addressing grievances stemming from damages to any sector of the environment from the project activities.

The project is required to operate at least 95 % of its operational period in strict compliance with the required emission standards of Pakistan as provided in the Pakistan Environmental Protection Act 1997 and the National Environmental Quality Standards. This ensures that the project proponent is legally bound to observe all legal requirements to avoid damaging the environment around the project.

8.1.2 Pakistan Environmental Act and Environmental Management

The Pakistan Environmental Protection Act (PEPA)-1997, covers aspects related to the protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development. Being the prime environmental law, Pakistan Environmental Protection Act-1997 establishes complete regulatory and monitoring bodies, policies, rules, regulations and national environmental quality standards. To ensure enforcement, the act establishes regulating bodies i.e. Pakistan Environmental Protection Council (PEPC) and responsible bodies i.e. Pakistan Environmental Protection Agency (Pak EPA) at Federal level and Environment Protection Agencies at Provincial level. The act extends to the whole of Pakistan including its territorial waters.

EPA Sindh, in which jurisdiction the proposed project falls, has the power to arrest without warrant any person against whom reasonable suspicion exists of his having been involved in an offence under the PEPA-1997, and enter, inspect and search without warrant any premises, vehicle or vessel. It also provides for seizing any plant, machinery, equipment, vehicle or substance, record or document. Pak-EPA also provides the power to summon and enforce the attendance of any person and issuance of Environmental Protection Order 16 (EPO 16) in relation to a person who is contravening a provision of the PEPA-1997.

8.1.3 Enforcement of PEPA and Liability

The Government of Pakistan is bound to protect the environment in accordance with its international commitments under various conventions and treaties it has signed or ratified. The PEPA-1997 translates these commitments into a compliance programme for the industrial establishments. Non-compliance to these commitments may result in loss of credibility, popularity and even financial aid from the international forums.

The EPA Sindh is directly responsible for enforcement of rules and regulation relating to environmental management/ protection in the Sindh province.

The PEPA- 1997 requires:

- That no person (including companies) under its purview will discharge or emit any effluent or noise in contravention of the National Environmental Quality Standards.

- That no proponent of a project shall commence construction or operation unless he has filed with the Pak-EPA or provincial EPA in whose jurisdiction the project falls, an Environmental Assessment report according to the sensitivity of the project or where the project is likely to cause an adverse environmental impact.

- That no person may dispose of waste on public land or on highway on or a land owned or administrated by a local council, unless done in accordance with the provisions of the Pakistan Environmental Protection Act-1997.

The following section of the PEPA -1997 further clarifies the mechanism of Environmental Management and Grievance Redress Mechanism.

Section 11:

Prohibition of certain discharges or emissions.—(1) Subject to the provisions of this Act and the rules and regulations no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards or, where applicable, the standards established under sub-clause (I) of clause (g) of sub-section (1) of section 6."

(2) The Federal Government or the Provincial Government, in case the project falls in the later's provincial jurisdiction, may levy a pollution charge on any person who contravenes or fails to comply with the provisions of sub-section (1), to be calculated at such rate, and collected in accordance with such procedure as may be prescribed.

Section 12:

Initial environmental examination and environmental impact assessment.—(1) No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection Agency or Provincial Environmental Protection Agencies, as the case may be, or, where the project is likely to cause an adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof".

Section 16:

Environmental protection order.---(1) Where the Federal Agency or a Provincial Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous

substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act, rules or regulations or of the conditions of a license, and is likely to cause, or is causing or has caused an adverse environmental effect, the Federal Agency or, as the case may be, the Provincial Agency may, after giving the person responsible for such discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures that the Federal Agency or Provincial Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include;

(a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, act or omission, or to minimize or remedy the adverse environmental effect;

(b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, act or omission;

(c) action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances; and

(d) action to restore the environment to the condition existing prior to such discharge, disposal, handling, act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfaction of the Federal Agency or, Provincial Agency.

Section 17:

Penalties.—(1) Whoever contravenes or fails to comply with the provisions of sections 11, 12, 13 or section 16 or any order issued there under shall be punishable with fine which may extend to one million rupees, and in the case of a continuing contravention or failure, with an additional fine which may extend to

one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if contravention of the provisions of section 11 also constitutes contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2) only.

(2) Whoever contravenes or fails to comply with the provisions of section 14 or 15 or any rule or regulation or conditions of any license, any order or direction, issued by the Council or the Federal Agency or Provincial Agency, shall be punishable with fine which may extend to one hundred thousand rupees, and in case of continuing contravention or failure with an additional fine which extend to one thousand rupees for every day during which such contravention or failure continues.

Contraventions of the provisions of the PEPA-1997 is punishable with impressments extending up to five years, or with fine extending up to one million or with both. Where an offence is committed by a company every Chief Executive Officer (CEO) and the company shall be deem guilty of the offence. Action can even be taken against Government Agencies and Local Authorities.

Government may also constitute an Environmental Tribunal to hear cases relating to the PEPA-1997. The tribunal may only hear cases when the complaint is made in writing by Pak-EPA, or Local Council or any aggrieved person who has given at least thirty days notice to Pak-EPA of the offence and of his intension to make a complaint to the Tribunal. The Tribunal may also hear appeals from the Agencies. Appeals from the tribunal shall go to the High Court.

In order to resolve the disputes relating to the environment issues, Environmental Tribunal Rules 1999 has been promulgated. In trying the offences, the tribunal has to follow the Code of Criminal Procedures 1898. The tribunal shall send the copies of his orders to the parties concerned and the Director General of the Federal EPA and Provincial EPAs. The Tribunal shall dispose of its proceedings within 60 days. An appeal to the Tribunal, accompanying a copy of the impugned

order, copies of the documents relied and prescribed fees, shall be sent to the Registrar by the appellant. Generally the proceedings of the Tribunal shall be open.

8.2 Grievance Redress Mechanism- Informal

8.2.1 Compensation for Environmental Damages

Since the project is to follow the World Bank (WB) & IFC emission standards, therefore, it is required to operate at least 95 % of its operational time in compliance with the required emission standards of the WB. This ensures that the project operation is legally bound to observe all legal requirements to avoid damaging the environment around the project.

Secondly, as described under Section 8.1.1 under the Pakistan Environmental Protection Act-(PEPA), 1997, the likely damages to be caused to any sector of the environment or property or else will be paid to the affected parties.

Thirdly, under the PEPA -1997, the EPA of the concerned province and the Environment Tribunal can legally prosecute the project proponent for the damages to occur from the pollution generation from the project.

There is complete legal cover to address issues related to compensation for any environmental damage arising out of project activity. However, to address any such issues more expeditiously, the project administration will have a local committee as an Informal Mechanism (IM).

This Informal Mechanism will provide convenient, quick and cost effective decisions for compensation against any environmental damages that occur from the project activity. This informal mechanism will also build confidence between the project administration and public and safeguard the interests of both the project and the public at large.

The project administration, therefore, proposes the following committee at the local level for amicable and speedy resolution of cases pertaining to any

environmental damages that likely occur from the project activity. The decision of the committee will be executed in letter and spirit.

8.2.2 Constitution of the Committee:

- Chief Executive of the Company or his nominee: Chairman
- Head of the District Government, Thatta — Ex-officio Member
- Head of the District Local Self Government — Ex-officio Member
- A dignitary of the project area — Member
- Head HSE Department of the project — Member
- Representative of a NGO — Member
- Representative of the aggrieved person — Member
- An Environmentalist — Member

8.2.3 Time Schedule for Redressing the Grievance

- The committee will be under obligation to decide the grievance within four weeks of the complaint by the aggrieved party.
- Compensation as decided by the committee will be paid to the aggrieved party within one week from the date of decision of the committee.
- The decision of the committee will be binding on both parties, i.e., the project administration as well as the aggrieved party.

9-0 CONCLUSIONS:

9.0 CONLUSIONS:

The project embarks upon generation of power by installing a Wind Power Plant with installed capacity of 49.3 MW. The proposed Project falls in B category requiring IEE Report for obtaining Environmental Approval **(EA)** from the EPA Government of Sind, Karachi.

It has been observed after completion of this IEE report that:

1- The project has no gaseous and PM emissions.

2- Sewerage will be treated and reused at the project site for sprinkling on the unpaved site to reduce fugitive dust.

3- There are no sensitive elements / segments of environment around the project site,

4- EMP and EMtP, as recommended in this IEE Report, are to be put in place both during construction and operation phases of the project,

5- Biannual all out environmental monitoring by a third party also certifies that the project will run in accordance with legal requirements,

On the basis of the IEE report, the project by all means, merits for installation, operation and for issuance of NOC from Sindh Environmental Protection Agency.