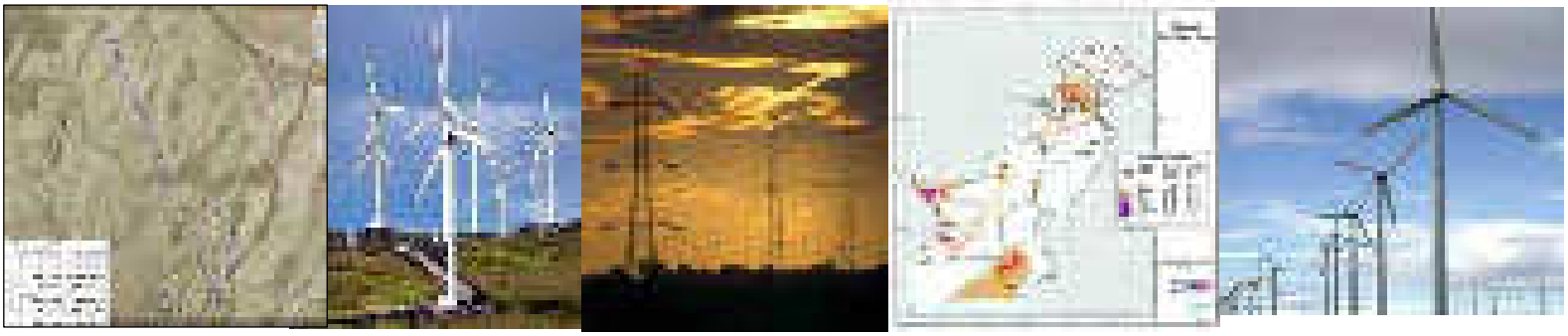
Draft Initial Environmental Examination

Project Number: 50200-001
November 2016

Triconboston Wind Power Project (Pakistan)

Prepared by Tricon Boston Consulting Corp. Pvt. Ltd. for the Asian Development Bank.



TRICON BOSTON CONSULTING CORP PVT LTD

150 MW WINDFARM PROJECT

(3 x 50 MW Project A, B & C)

AT

JHIMPIR, THATTA, SINDH

INTEGRATED INITIAL ENVIRONMENTAL EXAMINATION
&
CUMULATIVE ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT
(CESIA)
REPORT
2016

Table of Contents

Abbreviations

ADB	Asian Development Bank
AEDB	Alternate Energy & Development Board
BOD	Biological Oxygen Demand
CDM	Clean Development Mechanism
CESIA	Cumulative Environmental and Social Impact Assessment
COD	Chemical Oxygen Demand
EBRD	European Bank for Reconstruction and Development
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
EP	Equator Principle
EPA	Energy Purchase Agreement
EPC	Engineering, Procurement & Construction
ESRP	Environment & Social Review Procedure
EWEA	European Wind Energy Association
IEE	Initial Environmental Examination
IFC	International Finance Corporation (World Bank Group)
IIEE	Integrated Initial Environmental Examination
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standard
NTDC	National Transmission & Dispatch Company
O&M	Operation and Maintenance
OPIC	Overseas Private Investment Corporation
PEPA	Pakistan Environmental Protection Agency
PEPC	Pakistan Environmental Protection Council
SDPI	Sustainable Development Policy Institute
SEPA	Sindh Environmental Protection Agency
SS	Suspended Solids
TBCCPL	Tricon Boston Consulting Corporation Pvt Ltd
VEC	Valued Environmental and Social Component
WWF	World Wide Fund

Definitions

Act means the Pakistan Environmental Protection Act, 1997 and Sindh Environmental Protection Agency Act 2014

Aesthetic Value/Aesthetic Quality beauty or landscape (of an area)

Anthropogenic - Made or generated by a human or caused by human activity. The term is used in the context of global climate change to refer to gaseous emissions that are the result of human activities, as well as other potentially climate-altering activities, such as deforestation.

Carbon Dioxide - A colorless, odorless noncombustible gas with the formula CO2 that is present in the atmosphere. It is formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass) and by respiration, which is a slow combustion in animals and plants, and by the gradual oxidation of organic matter in the soil

Chemical Energy - Energy stored in a substance and released during a chemical reaction such as burning wood, coal, or oil.

Cumulative Effects - A project's effect on the environment combined with the effects of projects and activities (past, existing or imminent). These may occur over a certain period of time or distance.

Contamination introduction of impurities in the environment

Deforestation - The net removal of trees from forested land.

Electricity Generation - The process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, commonly expressed in kilowatt-hours (kWh) or megawatt hours (MWh).

Emission - A discharge or something that is given off; generally used in regard to discharges into the air; or, releases of gases to the atmosphere from some type of human activity (cooking, driving a car, etc). In the context of global climate change, they consist of greenhouse gases (e.g., the release of carbon dioxide during fuel combustion

Environment- The components of the earth including

(a) Land, water and air, including all layers of the atmosphere;

(b) All organic and inorganic matter and living organisms; and

(c) The interacting natural systems that include components referred to in (a) and (b).

Environmental Component - A fundamental element of the natural and human environment, such as air, water, soil, terrain, vegetation, wildlife, fish, avifauna and land use.

Environmental Effect - With respect to a project, any change that the project may cause in the environment, including any changes to health and socio-economic conditions, physical and cultural heritage, and current land and resources used for traditional purposes by Aboriginal persons. Also included are changes to any structure or site that is of historical, archaeological, paleontological or architectural significance, and any change to the project that may be caused by the environment

Environmental Assessment a technique and a process by which information about the environmental effects of a project is collected, both by the developer and from other sources, and taken into account by the planning authority in forming their judgments on whether the development should go ahead.

Environmental Management to carry out the developmental activities in sustainable manner

Global Warming - An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is today most often used to refer to the warming some scientists predict will occur as a result of increased anthropogenic emissions of greenhouse gases.

Greenhouse Effect - The effect of the Earth's atmosphere, due to certain gases, in trapping heat from the sun; the atmosphere acts like a greenhouse.

Greenhouse Emissions - Waste gases given off by industrial and power plants, automobiles and other processes.

Greenhouse Gases - Gases that trap the heat of the sun in the Earth's atmosphere, producing the greenhouse effect. The two major greenhouse gases are water vapor and carbon dioxide. Lesser greenhouse gases include methane, ozone, chlorofluorocarbons, and nitrogen oxides.

Grid - The layout of an electrical distribution system.

Habitat the general place or physical environment in which a population lives

Impact on Environment means any effect on land, water, air or any other component of the environment, as well as on wildlife harvesting, and includes any effect on the social and cultural environment or on heritage resources.

Megawatt - A unit of electrical power equal to 1000 kilowatts or one million watts.

Methane -A colorless, flammable, odorless hydrocarbon gas (CH4) which is the major component of natural gas. It is also an important source of hydrogen in various industrial processes. Methane is a greenhouse gas.

Mitigation - With respect to a project, the elimination, reduction or control of adverse environmental effects, including restitution through replacement, restoration, compensation or any other means for any damage to the environment caused by such effects.

Monitoring - A continuing assessment of conditions at and surrounding the action taken with respect to a project. Monitoring determines whether effects occur as predicted, operations remain within acceptable limits and if mitigation measures are as effective as expected.

Offshore - The geographic area that lies seaward of the coastline. In general, the coastline is the line of ordinary low water along with that portion of the coast that is in direct contact with the open sea or the line marking the seaward limit of inland water.

Organic Waste - Waste material of animal or plant origin

Power - The rate at which energy is transferred. Electrical energy is usually measured in watts. Also used for a measurement of capacity.

Power Degradation - The loss of power when electricity is sent over long distances.

Power-Generating Efficiency - The percentage of the total energy content of a power plant's fuel which is converted into electric energy. The remaining energy is lost to the environment as heat.

Power Plant - A facility where power, especially electricity, is generated.

Recycling - The process of converting materials that are no longer useful as designed or intended into a new product.

Residual effects - Effects that remain after mitigation measures have been applied.

Soil Erosion - physical removal of soil either by wind or by running water

Siltation - accumulation of silt in a water body

Subsidence - the sudden collapse of land into a hollow beneath it

Transformer - A device which converts the generator's low-voltage electricity to higher-voltage levels for transmission to the load center, such as a city or factory.

Transmission (Electric) - The movement or transfer of electric energy over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end when the energy is transformed for distribution to the consumer.

Transmission Line - A set of conductors, insulators, supporting structures, and associated equipment used to move large quantities of power at high voltage, usually over long distances between a generating or receiving point and major substations or delivery points.

Transmission System (Electric) - An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers or is delivered to other electric systems.

Wetland, a lowland area such as a marsh or swamp that is saturated with moisture, especially when regarded as the natural habitat of wildlif

Wind - The term given to any natural movement of air in the atmosphere. A renewable source of energy used to turn turbines to generate electricity.

Wind Machine - Devices powered by the wind that produce mechanical or electrical power.

Wind Tower - Devices, some as tall as 120 feet, which lift wind turbine blades high above the ground to catch stronger wind currents.

1

Executive Summary

Arch Associates---*Management Consultants & Trainers conducted Integrated Initial Environmental Examination (IEE) including the Cumulative Environmental and Social Impact Assessment (CESIA) study for the 3 x 50 MW Wind farms (Projects A, B & C proposed by Tricon Boston Consulting Corporation Private Limited (TBCCPL)

This report which is developed to comply with the requirements of International Lenders mainly IFC and ADB predominantly documents the environment and social impact assessment with respect to the following parameters in two ways

Since all three projects of TBCCPL i.e. Project A, B & C will be constructed simultaneously, therefore for Integrated Initial Environmental Examination (IEE) all those aspects particularly related to construction phase which has high probability of creating amplified positive and negative impact are considered in this report.

- Site Selection for Wind Farm (Project proponent has very negligible role and influence in site selection as it's the government land and leased by the government)
- Project Design w.r.t. Micrositing, Wind farm Layout, Hub height, Rotor diameter, Flickering effect, Noise impact etc
- Construction Phase w.r.t. emissions to air, water discharge, spillage, stress on resources, noise, health & safety, transportation, employment etc
- Operational Phase w.r.t. health & safety, WTG noise mainly aerodynamic noise, spillage, water discharge, shadow effect,
- Decommissioning Phase w.r.t. emissions to air, spillage, noise etc

The projects pre-construction phase is near its completion stage with financial close expected by October 2016.

The IIEE study process for this wind farm project (TBCCPL Project A, B & C) makes use of all International and National guidelines related to Wind Farm Projects Design, Construction and Operation. The initial project development phase of this project forms the basis of including broader range of lender regulatory framework.

Most common International lenders regulatory framework are from IFC/World Bank, OPIC, EWEA, ADB, Bank of China, ICBC and National regulatory framework is published by the Pakistan Environmental Protection Agency (Pak EPA), Sindh Environmental Protection Agency (SEPA).

Similarly Equator Principles (EP) is focused during the environmental assessment of this project as EP is the tool used by International lender for risk assessment.

The land for the proposed wind farms are located in Jhimpir, District Thatta, Sindh and is spread in three parcels of 1,284 Acres of government land totaling 3,852 Acres .

Currently two wind mast has been installed since April 2015 and micrositing data collection and topographic survey including geological testing has been completed. Based on the micrositing data, available technologies, financial considerations and experience of existing operational wind farms with existing turbines, General Electric (GE) has been selected as turbine manufacturer selected along with selection of EPC Contractor.

The project is in the process of negotiating Energy Purchase Agreement and Implementation Agreement and awaiting Generation License from NEPRA.

Once the Generation License is received, the project will apply for Letter of Support and proceed to Project Financing and Financial Close.

TBCCPL is likely to follow the same arrangement of O&M under EPC for two year warranty period followed by eight years under direct O&M arrangement with General Electric local resource.

Tricon Boston Consulting Corp Pvt Ltd (TBCCPL) will have 25% of equity (Sapphire Group 18% and Bank AL Falah 8%) while for the remaining 75% financing, debt arrangements are explored from International Lenders or a consortium of International lenders (IFC 75% and ADB 25%) and the selection of financing source, mode and mechanism will be based on financial models.

Currently the total project cost for the three projects TBCCPL Project A, B & C is estimated to be around USD 331 million (Project A & C USD 110 million and Project B USD 111 million). The project is expected to produce minimum of 453.5 GWh (Project A, B & C each producing 151 GWh) of electricity and the electrical power produced by this farm will be purchased by CPPA (G)/NTDC and distributed on national grid by NTDC.

The environmental impacts were assessed in compliance with relevant Pakistan and international environmental legislations and guidelines related

to wind farm projects development and operations.

Since the project is located in an area which was historically reported during 1970's and earlier as the major and significant migratory bird's route during winter, therefore the environmental impact related to birds flight pattern, birds species and count, flight height and direction, birds activities (roasting, perching, feeding etc) and probability of mortality of birds due to collision with wind turbines towers and blades is also evaluated along with any human resettlement and loss of habitat. The results of the Birds Monitoring activity indicates that due to loss of habitat and pollution in Keenjhar lake, the area has lost its attraction for the migratory birds and a shift in the migratory birds fly zone has taken place.

Based on the site evaluation and wind data measurement done by National Renewable Energy Laboratories (USA) under the USAID assistance program in 2007, the project locations within this Jhimpir area falls among the best wind corridors w.r.t. wind power generation.

Data on the pre-existing environmental baselines were collected with a site visit and through literature survey.

The wind farm will be developed in an area which is not under intensive agriculture use. There is no sensitive habitats with a high ecological value were found during the field survey on the proposed lands and no impacts caused by the human settlement is expected. The same assessment is made regarding the possible impacts on soil.

Environmental Impacts and Mitigation

An environmental impact is assessed by first identifying the potential impact, followed by evaluating and quantifying (where possible) the impact before interpreting its significance. Environmental screening is a process through which the range of potential effects is evaluated to identify those that merit detailed assessment.

For the proposed wind farms, the impacts that were screened out as not requiring a detailed assessment at IIEE and CESIA archeological disturbance (no archeological sites in the vicinity of the wind farm); hydrological interference (no natural water courses in the vicinity of the wind farm public safety (no dwellings or regular human activity in the vicinity of the wind farm); and, cultural conflict (very short-term duration, that is, during the construction phase).

A more detailed and thorough assessment was, however, carried out for the impacts described below.

Loss of Habitat

The proposed projects will acquire three parcels of 1,284 Acres of land totaling 3,852 Acres for the 87 turbine towers (29 WTGs for each project) and right of way for the access road. No rare or threatened vegetation species grow along the proposed sites or access road. Most of the plants found here have a wide ecological aptitude and populations large enough to ensure their genetic diversity. The removal of a small portion of vegetation will not harm the overall diversity of plant communities in the area.
Burrowing taxa, such as rodents and reptiles, will face some loss of habitat because of site preparation and access road construction.

The disturbance to wildlife will be minimized through management controls, such as reducing the size of the fenced area to the extent possible; training project staff to avoid killing or chasing wild animals; and minimizing noise generated by project activities.

Disturbance to Birds

Though not a significant impact, wind turbines affect birds' staging or roosting because of the noise they create, or because their location forces birds to change their flight paths. Studies indicate that wind turbines affect staging or roosting birds up to a distance of 500 m. Raptors are the only birds to roost in the desert portion of the proposed site. Recent studies have established the decrease in birds count, change in flight pattern in Jhimpir due to environmental degradation of Keenjhar and other lakes besides the low availability of food

Avian Collisions

Based on the Birds Monitoring Study conducted for Tricon Boston projects, the expected risk with respect to collision is very low under the current habitat condition including stresses at Keenjhar Lake. Using the Band Model as recommended by Scottish Natural Heritage for calculation of Birds Collision Analysis, the average collision probability is less than 6.8 %.

Waste Disposal

The main types of waste that will be generated during the construction phase of the project are waste oil, camp waste, medical waste, steel and wooden waste, packing waste, and excess construction material. Every effort will be made to minimize the waste generated while construction is in progress, and a special waste-minimization program will be initiated. In addition, project management will be responsible for all waste generated by the project until its final disposal. A waste collection site will be developed near the Temporary Site

Facility and from there waste will be collected at regular intervals by contractors for disposal at government approved landfill sites located in Hyderabad i.e. Qasimabad, Ganju Takar and Cattle Colony. Furthermore, an inventory of all waste generated during the project will be maintained.

Aircraft Safety

Although wind turbines can pose a safety hazard for low-flying aircraft, the Civil Aviation Authority (CAA) has a detailed code that specifies the maximum height of 170 meters of structures that are allowed in the vicinity (within 15 km) of commercial airports. The proposed wind turbines will meet CAA safety standards and will not interfere with aircraft.

Also upcoming Bolari Airforce base is approximately 50 Km from the TBCCPL project sites

Interference with Telecommunication Systems

The moving blades of a wind turbine can distort electromagnetic signals. In the Jhimpir area, four different sources of electromagnetic signals may be affected: the microwave communication link between Jhimpir and other towns of Sind, the television rebroadcast tower in Nooriabad, the VHF omni-directional radio (VOR) communication link, and the military radar. The wind turbines are not expected to interfere with any of these sources of electromagnetic signals because they are situated too far away from these facilities around more than 25 kms.

Land Use

Since Independence of Pakistan in 1947, the project area and its surroundings is the Government owned land. Since the government was not using this land for any activity, therefore many nomadic tribes constructed their hamlets when they move away from other areas during the time of floods. The Revenue Department of Government of Sindh does not have any record of any village or community and government started lease of land for wind farm projects in 2006.

During the initial days of wind farm project development (2008-2009), local communities residing in this area felt that the development activities may force them to relocate to another place.

Nevertheless, the project's footprint is only a small fraction of the total area of the leased for windfarm and it involves no relocation or resettlement.

The establishments of Tricon Boston three projects totaling 150 MW in line with the power generation policy of Government of Pakistan for private sector and the existing land access for grazing and cultivation will not be hampered by the wind projects

It is, therefore, feasible for the wind farm and the project proponent intends to support the nearby community / population living in hamlets to cultivate herbs/shrubs of medicinal value and this cultivated land will become the source of income for the local community.

Employment Opportunities

There is a high expectation among the population of Jhimpir that the project will generate significant local employment opportunities. Skilled or unskilled labor brought in from outside Jhimpir is, therefore, likely to cause resentment in the local community, reducing opportunities for human capital development and creating tension between non-local labor and resident communities.

If suitably skilled labor is not available in Jhimpir itself, then residents of the Thatta district will be given preference, followed by residents of the rest of Sind, and then the rest of the country. Wherever feasible, local laborers will be trained to enhance their skills. No person under the age of 18 will be employed on the project.

Due to parallel construction of project A, B & C, workforce requirements will be high and more employment opportunities will be created compared to isolated construction of each project.
The peak period employment will be around 600 persons for all the three projects and during normal construction, installation and commissioning activities around 200 persons will be employed. The project is expected to offer employment to around 120 persons during operational phase.

Tourism Potential

At present, apart from a few occasional, local visitors, recreational visits to the proposed wind farm site are rare. The installation of the wind farm is likely to increase visitors to the area.

Environmental Benefits

Given that wind power is a 'clean' source of energy, its key environmental benefit is in terms of the emission offsets it provides. All three wind farms will offset between 118227-261795 tCO2 equivalents per year (Each project will offset 39,409 to 87,265 tCO2 equivalent per year) depending on the efficiency of the power plant that it will replace (Source http://cdm.unfccc.int/Projects/DB/BVQI1356084326.32/view).

Over a twenty year time horizon, i.e. the assumed life of this project, the wind farm has the potential to offset 2.7 to 5.2 million tons of CO_2 equivalents.
It will also offset between 435 to 969 tons of sulfur dioxide. The local benefits of this are obvious in the sense that the ingestion of SO_2 and particulates is harmful for human health. Sulfur dioxide also contributes to acid rain. Therefore, if a thermal power station option was exercised as opposed to the wind farm, the additional cost of mitigating the SO_2 and particulate emissions would have to be borne.

The elimination of the need for fuel for generating electricity, such as high speed diesel (HSD), by switching to wind power will result in the elimination of the hazards associated with the transport and storage of flammable HSD and hydrocarbon contamination risks from spills.
Another important benefit is in terms of the elimination of cooling water requirements for the baseline case of diesel-based generation. It is estimated that nearly 318,000 m^3 of water (equivalent to 8.4 million gallons) per year for one project (25.2 million gallon for three projects) will be conserved on this account in this water-deficient region if the wind farm is developed instead.

Conclusions and Recommendations

Resulting from the IIEE and CESIA investigation of the baseline conditions, current status of VEC's and the site evaluation and the mitigation measures planned in EMP by TBCCPL, we are of the opinion that the three projects will not create any adverse impact during the simultaneous construction of all three projects as well as during their operational life cycle as except for the visual and landscape change, no other change is permanent and damaging the local environmental conditions.

Therefore we recommend that all three wind farm should be developed, constructed and operated simultaneously without any significant and permanent environment impacts if the recommendations of the environmental management plan are followed.

2

Introduction and Purpose of Study

Introduction

Report Background

Sapphire Group, one of the leading industrial conglomerate in Pakistan acquired Tricon Boston Consulting Corporation Pvt Ltd (TBCCPL) three projects i.e. Project A, B & C each of 50 MW in 2015.

The IEE report for individual projects i.e. Project A, B & C was done by the previous project owner in 2014 and No Objection Certificate (NOC) was received from SEPA. Letter of Intent (LOI) from AEDB was issued in 2013. A representative IEE for Project A is attached as Annex 21D.

This Integrated Initial Environmental Examination including Cumulative Environmental and Social Impact Assessment study of three projects is a result of IFC and ADB requirements communicated before and during the due-diligence meetings by IFC and ADB team in June 2016.

The rationale of conducting IIEE and CESIA is due to following facts

- TBCCPL will be constructing Project A, B & C, totaling 150 MW in parallel.
- The Jhimpir wind corridor area is undergoing rapid transformation with four projects (200 MW approx.) already in operation, six projects (260 MW approx.) achieving commercial operation by end of 2016, five projects (300 MW approx.) commencing construction by 4th quarter of 2016 and sixteen projects (approx. 950 MW) which are under design phase have been leased land lease by Government of Sindh and commence construction in 2018.

Since IIEE and CESIA report is developed to comply with the requirements of lenders mainly IFC and ADB, therefore no submission to SEPA is required nor any regulatory approval tied with this report.

Wind Energy development Background

Pakistan is facing severe energy shortages since 2006. The main reasons include inadequate capacity addition, limited exploration of oil and gas, ineffective exploitation of hydro and coal, renewable potential and inefficient use of energy resources. The situation leads to a demand supply gap resulting in load-shedding of electricity and gas. Pakistan continues to suffer from the power crisis as nearly one-third of demand for electricity, during 2013-14 could not be met due to the supply constraints.

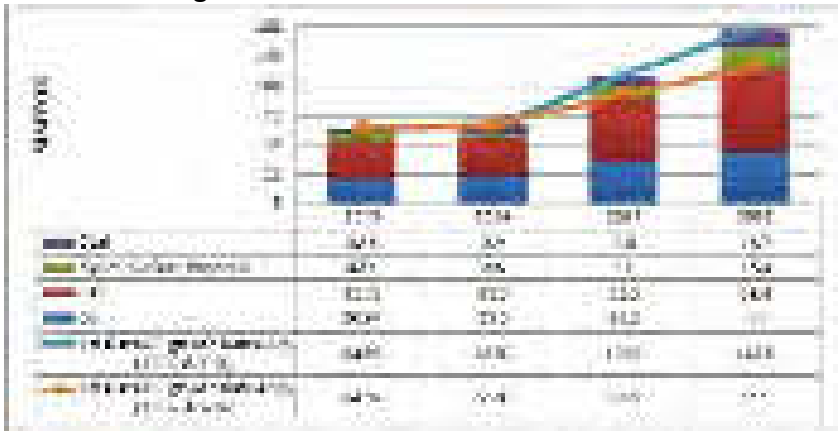
On average, the supply deficit of around 5,000 Megawatt (MW) was experienced, while it touched the peak of over 7,000 MW in July 2014

The energy demand in Pakistan has largely increased during the last decades, with an increment in the number of consumers by 83% between 1992 and 2006. The expected electricity supply-demand gap is illustrated below

Electricity Supply Vs Demand								
	2010	2011	2012	2013	2014	2015	2016	2017
Expected Available Generation	18503	20814	21167	23368	23538	24408	25630	27481
Demand (Summer Peak)	19352	20874	22460	24126	25919	28029	30223	35504
Deficit	-849	-60	-1293	-758	-2381	-3621	-4593	-8023

Note : Electricity Demand Increasing@ 8 % per Annum
Source : Private Power & Infrastructure Board - Govt of Pakistan

Based on the above electrical power supply-demand deficit and the expected power generation, below table illustrates the primary energy demand to cater the expected available generation.

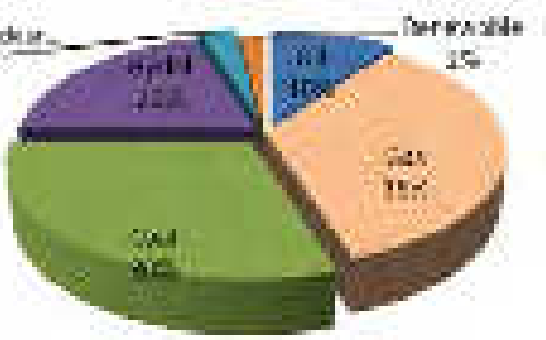


Data Source: Petroleum Institute of Pakistan-Energy Outlook 2007-22 FY 2013 & 14 actual figures
Source: HDIP Energy Year Book 2014

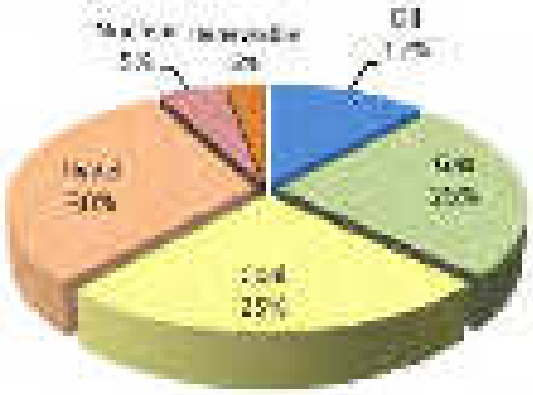
There is rising need for alternate and renewable sources of energy, especially in Pakistan whose progress and economic growth is strongly be indexed to its development. With the finalization of China-Pakistan Economic Corridor (CPEC), renewable energy projects in Sindh have been marked as the high priority projects.

Based on this Pakistan revisited its energy mix model and the future energy mix and electricity generation by renewable source is depicted below

PRIMARY ENERGY MIX PLAN 2030



ELECTRICITY GENERATION BY SOURCE PLAN 2030



At the same time, according to the World Bank Report of 2013 *(Ref: Reducing Poverty by Closing South Asia's Infrastructure Gap)* only 67 % of the population in Pakistan has access to electric power. The remaining 33 % of the population without electricity lives in rural and mountainous areas. Due to the remoteness of rough terrain, the extension of the national grid to these areas is uneconomical. Development of renewable energy sources would provide electricity to the remote areas and less-developed regions of the country.

Small-scale applications could provide power in remote and backward areas, facilitating development of these areas, providing job opportunities to rural poor and enhancing children's welfare, health and education. In this sense, 14 micro wind turbines were installed in 2002 for demonstration purposes in the regions of Sindh and Baluchistan; they proved that small-scale wind farms are viable, in both economic and technologic senses, for the electrification of remote communities living far from the national grid. At the same time, large applications, connected to the national grid, could help alleviate power shortages in the country (Mirza et al., 2007). Therefore, renewable energies are a suitable option for reducing the national energy deficit and at the same time encourage the development of remote areas without access to electricity.

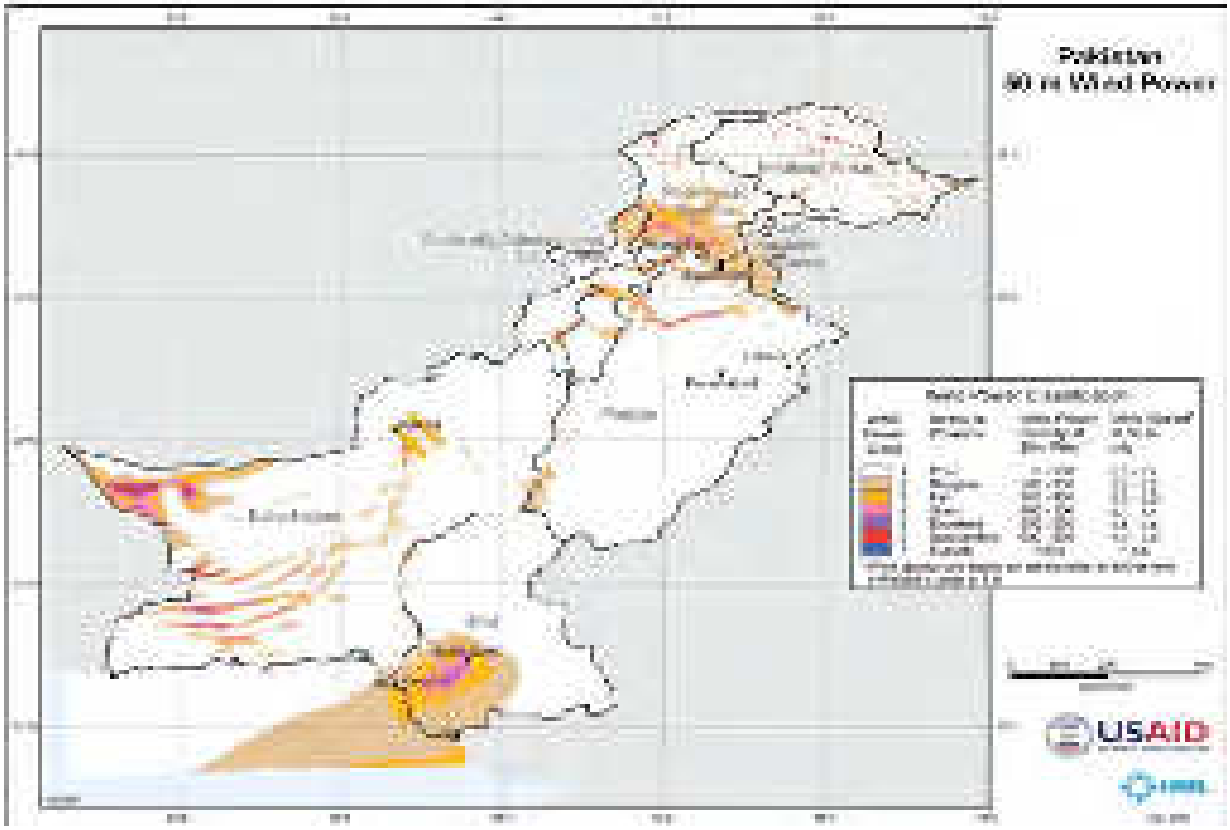
Pakistan Wind Resource Mapping by USAID

In Pakistan major wind resource areas are

- – Southeastern Pakistan especially
  - • Hyderabad to Gharo region in southern Indus Valley
  - • Coastal areas south of Karachi
  - • Hills and ridges between Karachi and Hyderabad
- – Northern Indus Valley especially
  - • Hills and ridges in northern Punjab
  - • Ridges and wind corridors near Mardan and Islamabad
- – Southwestern Pakistan especially
  - • Near Nokkundi and hills and ridges in the Chagai area
  - • Makran area hills and ridges
- – Central Pakistan especially
  - • Wind corridors and ridges near Quetta
  - • Hills near Gendari
- – Elevated mountain summits and ridge crests especially in northern Pakistan

Windy land area and theoretical wind potential estimates indicates

- – Class 4+ (good-to-excellent for utility-scale applications)
  - • 26,400 sq. km, about 3% of Pakistan's total land area (800,000 sq. km)
  - • 132,000 MW of potential installed wind capacity (assumes 5 MW/sq. km)
- – Good potential for many wind/diesel and off-grid applications
  - • Almost 9% of Pakistan's land area has Class 3 or better wind resource



PAKISTAN - WIND ELECTRIC POTENTIAL

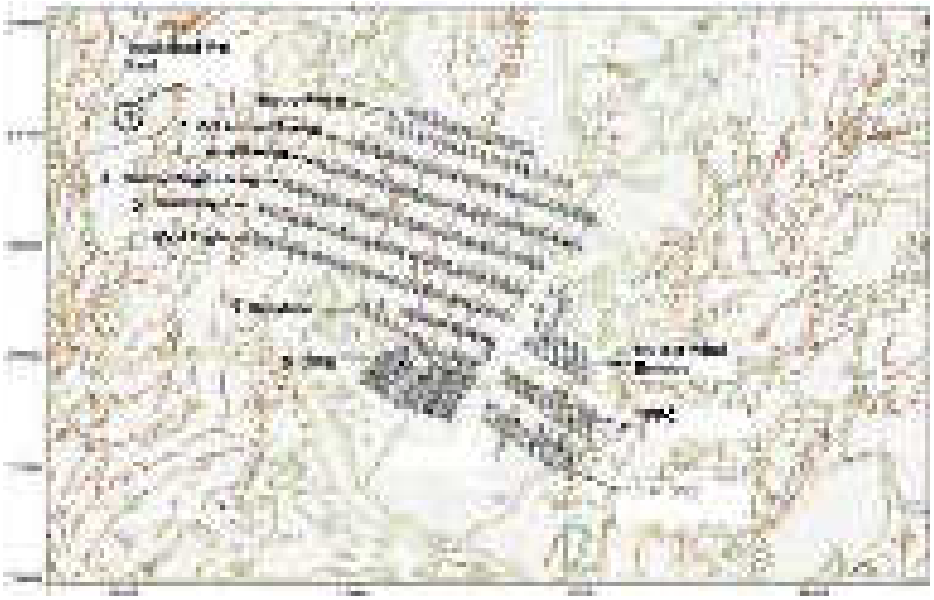
Good-to-Excellent Wind Resources at 50 m (Utility Scale)

Wind Resource Utility Scale	Wind Class	Wind Power W/m^2	Wind Speed m/s	Land Area km^2	Percent Windy Land	Total Capacity Installed MW
Good	4	400 - 500	6.9 – 7.4	18,106	2.1	90,530
Excellent	5	500 - 600	7.4 – 7.8	5,710	0.6	28,550
Excellent	6	600 - 800	7.8 – 8.6	2,495	0.3	12,480
Excellent	7	> 800	> 8.6	543	0.1	2,720
Total				26,302	3.0	131,800

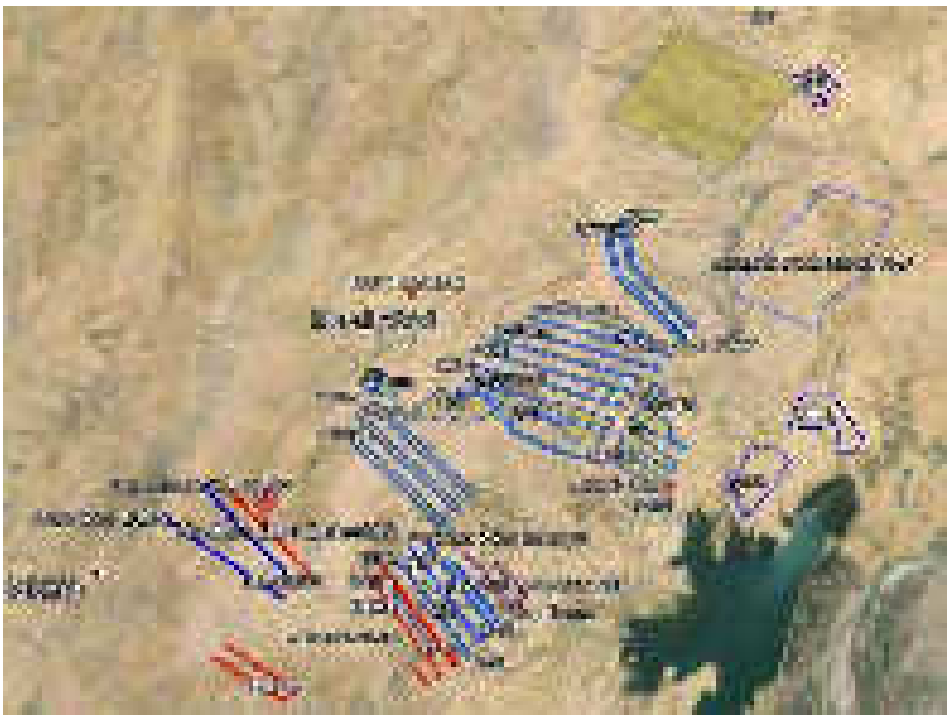
Assumptions:
Installed capacity per km ^{2} = 5 MW
Total land area of Pakistan = 877,525 km^2
Only land areas not excluded are considered

The Gharo –Keti Bundar and Jhimpir-Jamshoro Wind Corridor

According to studies of the Pakistan Meteorological Department (PMD) and National Renewable Energy Laboratories (NREL-USA) under the USAID assistance program in 2007, the Gharo-Jhimpir corridor (Sindh region, Pakistan), with a length of 180 km and width of 60km having average monthly wind speed of 7-8 m/s is identified among the best wind corridors in world having the potential to generate 60,000 MW of electricity by means of wind power (Alternative Energy Development Board). Detailed studies have been carried out by the government of Pakistan in order to assess the wind power potential of Gharo, it being considered suitable for the development of commercial wind energy plans. As a result, in Jhimpir area currently four wind farms 200 MW are operational while five wind farms totaling 250 MW are under construction phase as a first phase plan to produce 700 MW of wind power in two areas of the region (Gharo Coastal and Inland Jhimpir Wind Farm sites) by means of 14 wind farms of 50 MW, whose location is shown in the cartography of this report, and some investors have already been allotted land for developing their wind farms.



CURRENT UNDER CONSTRUCTION AND OPERATIONAL WIND FARMS IN JHIMPIR



PROPOSED PROJECTS UNDER DESIGN PHASE IN JHIMPIR

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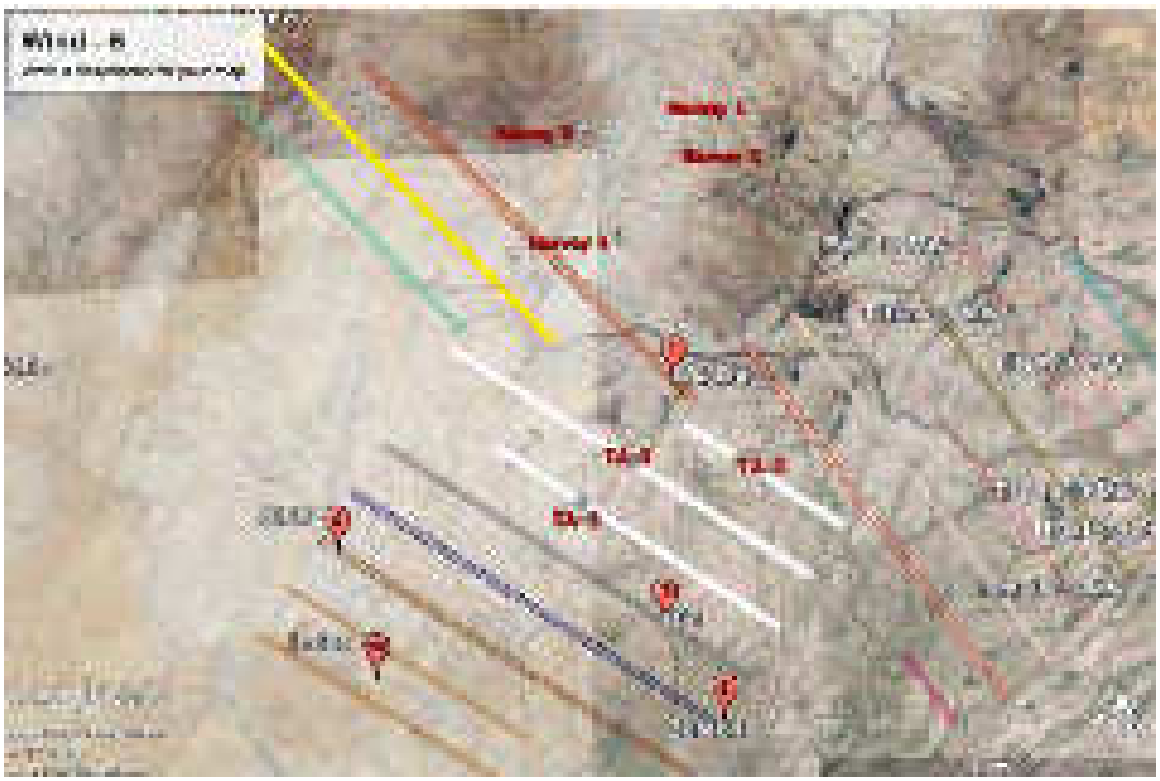


PROPOSED PROJECTS UNDER DESIGN PHASE IN JHIMPIR

Government of Sindh has allotted land to 33 project proponents of wind and solar projects in January and March 2016 out of which more than 20 wind farm projects are located in Jhimpir.

Alternate Energy Development Board (AEDB)

Alternative Energy Development Board (AEDB) was established in 12th May 2003 for development, promotion and facilitation of renewable energy technologies, formulation of plans, policies and development of technological base for manufacturing of renewable energy equipment in Pakistan.

AEDB has been tasked to ensure 5% of total national power generation capacity (i.e. 9700 MW) to be generated through renewable energy technologies by the year 2030.

Since then, AEDB has remained engaged in establishing national and international linkages, foster sustainable development and use of alternative / renewable energy through initiation of policies, projects, and enhancement of technical skills in the alternative energy fields. All these initiatives are directed towards creating a market-based environment that is conducive to private sector investment and participation.

2.1 Project Proponent

Tricon Boston Consulting Corp Pvt Ltd (TBCCPL) which is the subsidiary of Sapphire Group, is the project proponent for establishing a wind farm in Jhimpir. TBCCPL will develop, own and operate three projects each of 50 MW wind farm as independent power project (IPP) in Sindh. All three projects (totaling 150 MW) will be constructed in parallel

2.2 Project Overview

TBCCPL has received the LOI from AEDB and land allocation from Government of Sindh. Currently TBCCPL projects are at the final stages of financial closure and initial design phase and wind data collection and geological survey has been completed.

Based on the micrositing data, soil testing, geological survey, grid interconnectivity study, among different turbine manufacturers and turbine make & model, GE 1.7-103 have been selected along with selection of HydroChina as EPC and GE as O&M contractor.
The projects will have 15 months of construction phase and expected to come in operation in 2018

TBCCPL will develop three 50 MW projects as integrated wind farm having three sub-stations (one at each project) while CPPA/NTDC will be the purchaser of power and NTDC will evacuate the power from project door step. The provision of infrastructure w.r.t power transmission on the main Grid and to conduct the detailed initial environmental examination (IEE) for the 7 km transmission line will be the responsibility of NTDC.

The environmental factors in this report related to WTGs mainly flickering effect, noise etc were considered based on the GE 1.7-103 specifications related to noise, rotor diameter, hub height and the calculation of results from tools provided by Danish Wind Energy.

2.2.1 Lifespan of the Wind Farm

It is envisaged that the three wind farm will be in operation for up to 20 years. At the end of this period the wind farms will either be

decommissioned or new wind turbines will be installed. Once the wind farm has reached the end of its lifespan, the decommissioning process will include removal of the turbines and the return of the site to its condition prior to the construction of the wind farm.

2.3. Purpose of Study and Introduction of IIEE and CESIA

2.3.1 Purpose of Study

IFC and ADB requires TBCCPL to perform the Integrated Initial Environmental Examination (IIEE) and Cumulative Environmental and Social Impact Assessment (CESIA) as TBCCPL will be constructing three 50 MW wind farms as a single integrated wind farm in an environment where Jhimpir area in general and specifically area in neighborhood of TBCCPL Project A, B & C will be undergoing a rapid change due to upcoming projects (16 new projects are expected to be operational in next three years) in order to meet Government target of generating 3500 MW in next five years.

The purpose of this study is to identify those environmental and social aspects which will have significant impacts due to simultaneous construction of three wind farm projects and to identify the VEC's as a result of cumulative impact of TBCCPL 150 MW wind farm and current operational, under construction and future wind farm projects in next 3-5 years

The outcome of IIEE and CESIA should be reflected in the EMP developed for construction and operational phase.

2.3.2. Objectives of IIEE and CESIA

- To evaluate the TBCCPL IPP development, operational and decommissioning activities in line with Sindh Environmental Protection Agency standards, and applicable international environmental guidelines during the phase of design phase, pre-construction activities e.g. land development, layout planning, infrastructure and amenities development, construction activities e.g. wind turbine foundations construction, equipment transportation, Turbines installation, sub-station construction, operation and decommissioning of wind farm.

- To highlight existing environmental conditions of the project area along-with the identification of environmentally sensitive area and stake holders

- To address and assess the various activities (such as planning, infrastructure, construction, installation and operation of turbines etc).

- To identify environmental aspects associated with all phases of

wind farm life cycle, their potential impacts on environment, evaluate these impacts, determine their significance and determine mitigation measures to reduce/control the impacts.

- To identify the VEC's as a result of CESIA and integrate the mitigation measures in the EMP if the environmental aspect is dependent on TBCCPL.

- **To propose**
  - appropriate mitigation measures that can incorporated in construction phase into the wind farm layout (TSF layout, wind turbines location, access road layout, sub-station layout etc)
  - operational controls for environmental aspect including occupational health & safety
  - activities that minimize hazardous effects.

- To identify the consequences identified on the basis of environmental assessment in IIEE and CESIA.

- To monitor aspects in line with NEQS – Pakistan, ADB and IFC standards.

2.3.2 **Scope of IIEE and CESIA**

The TBCCPL 150 MW IPP IIEE and CESIA study covers the following:-

- For IIEE description of physical, environmental, and socio-economic condition in and around the site of project location within 5 km. of radius.
- Impact identification and significance at all stages of planning, implementation, and operation.
- Identification and assessment of the workability of operational controls to mitigate or minimize negative project impacts on environment
- For CESIA, existing operational and under construction wind farms besides the upcoming wind farms located upto 32 km are considered

2.4 **Approach and Methodology**

IIEE study for TBCCPL 150 MW (3 x 50 MW) IPP confines to four main phases comprising of scoping, baseline study, impact assessment and necessary documentations, as per following details.

CESIA study is done on the basis of IFC Good Practice Handbook for Cumulative Impact Assessment.

2.4.1 Scoping

Project data compilation for generic description of the proposed activities, within the project area relevant to environmental assessment.

Data on weather, soil, water resources, wildlife and vegetation within and around 5 km. radius of the project was reviewed and compiled.
Survey was conducted by Mr. Nooruddin Jehangir Durranee and Mr. Kamal Palari. Both have the working experience with WWF on many projects and studies

- Methods used for the baseline survey w.r.t. flora, fauna including birds are as follows
    - Vantage Point method for Birds Monitoring as per Scottish Natural Heritage Guidelines for Wind farm projects
    - Plant list and photo points for flora including vegetation
    - Spotlight surveys for fauna

3 Information on applicable legislation, regulations, guidelines and standards was reviewed and compiled.

4 Identification of aspect and their potential impacts were reviewed in considering the data of the above steps.

2.4.2 **Baseline Data Collection**

Sufficient baseline information on the project area was available from existing literature and studies at site and locations close to the project area were conducted. A field visit was conducted in September -October 2015 to collect primary data on the proposed site.

2.4.3 **Impact Assessment**

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

- Geomorphology;
- Groundwater and surface water quality, with particular reference to the coast.
- Ambient air quality and ambient noise levels;
- The ecology of the area, including flora and fauna
- Local communities;
- Baseline Noise Assessment
- Flickering Effect
- Birds Collision Risk Analysis

2.4.4 **Vegetation Survey**

The vegetation survey was carried out to find out the plant species in the proposed premises and within 5 km radius of project site. A large quantity of wild bushes, herbs, shrubs, different types of grass, different types of trees, parasitic plants were found. Plenty of floral species of several types are also exists.

2.4.5 **Wildlife Study**

Wildlife survey was carried out to find faunal species in the proposed premises and within 10 km. radius of mill site. Mammals, dogs, flies, reptiles, birds exist in the surrounding area of the project.

2.4.6 **Physical Environment:** Physical Environmental study was carried out for potable water, surface water, ground water and soil of the area. Test results of potable water, surface water, ground water and soil are placed at Annexure.

2.4.7 **Socioeconomic Study:**

Social assessment was conducted for livelihood, culture, leadership, gender issues, spiritual and temporal leadership, demographic information, existing use of land resources, community structure, employment, distribution of income, goods and services, public health, local religious and cultural values, and local customs, aspirations, and attitudes.

2.4.8 **Archeological Study**

Team also visited an archeological site outside the project area. The study included field survey. During the survey, no sites of archeological or historical significance were identified and documented.

2.4.9 **Impact Assessment**

Potential impacts were studied with respect to:

- Geomorphology ;
- Groundwater and surface water quality ;
- Ambient air quality;
- Ecology of the area, including flora and fauna;
- Local communities;
- Identification of potential impacts;
- Likelihood and significance of potential impacts;
- Mitigation measures to reduce impacts to as low as possible;
  Prediction of impacts, including all long-term and short-term, direct and indirect and adverse impacts ;
- Evaluation of the importance or significance of impacts ;
- Implementation of mitigation measures (i.e. environmental management) ;
- Determination of residual impacts :
- Identification of controls and monitoring of residual impacts.

2.4.11 **Documentation**

Documentation includes environmental impacts assessment reports in line guidelines of the Pakistan Environmental Protection Agency, along with the

followings:

- Findings of the assessment;
- Impacts detail and
- Mitigation measures.

2.5. Method for Evaluating Impacts.

The description of baseline conditions (see Section-4) represents the basis for evaluating the impacts of the project. The description and evaluation of the environmental impacts are presented in Section 7 -11. "Impacts assessment during site selection, project design, construction, operation and decommissioning phase". Notes and proposals for measures to be taken to mitigate and compensate for any determined environmental impacts are contained in the environmental management plan (EMP) as well as a monitoring plan, including all parameters that need to be measured, and the frequency of monitoring (Section 12)

In the interest of transparent presentation and evaluation, tabulated evaluation procedures has been applied. On the basis of a point system, the severity of a particular environmental impact together with its general trends i.e. negative or positive is described. The evaluation scale applied is as follows

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

For this judgment, international and national standard like those of the World Bank, WHO, etc are used (Section 3). According to these standards, impacts are evaluated as follows

Extent of Impact	Reason
High	International and national standards are exceeded.
Medium	Between international and national standards
Low	International and national standards are met

2.6 **Organization of this report**

- Section 1 of this report briefly discusses the Executive Summary.
- Section 2 of this report discusses the introduction about the project and purpose of the IEE study.
  Section 3 of this report discusses Regulatory framework in the form of policy and guidelines for this project and resulting legislation for sustainable development and environmental protection, and then presents the legislative requirements that need to be followed while conducting an IEE.
- Section 4 of this report describes the environment of project area's Including the existing physical, biological, and socioeconomic condition, including geomorphology and soils, water resources, and air quality, flora and fauna, and demography.
- Section 5 of this report describes the project description of the proposed windfarm project.
- Section 6 of this report describes the Concept and Approach of IIEE.
- Section 7 of this report describes the environmental impacts related to site selection
- Section 8 of this report describes the environmental impacts related to Project design and layout
- Section 9 of this report describes the environmental impacts related to Construction phase of the windfarm
- Section 10 of this report describes the environmental impacts related to Operation phase of the windfarm
- Section 11 of this report describes the environmental impacts related to Decommissioning phase of the windfarm
- Section 12 of this report describes the Project Neighborhood
- Section 13 of this report describes the Cumulative Environmental and Social Impact Assessment
- Section 14 of this report describes the Environmental Management Plan
- Section 15 of this report describes the EMP Budget
- Section 16 of this report describes the CSR Budget
- Section 17 of this report presents the Public Consultation Process and the feedback from the public.
- Section 18 of this report presents the Analysis of Project Alternatives
- Section 19 of this reports presents the Grievance Management mechanism
- Section 20 of this report presents the References
- Section 21 is annexures from 21A to 21E related to WTG Noise Calculations and Shadow Calculations , Summary of Birds Monitoring Study, IEE report of Project A and Social Due Diligence Report.

3

Policy, Legal and Administrative Framework

Policy, Statutory and Institutional Framework

The study of environmental assessment is tangible means that highlight the project under discussion is environmentally sound and sustainable depends in large measure on the capability of regulatory institutions for environmental management. Sustainable development is a concept that has emerged over the past three decades to describe a new framework aimed at economic and social development whilst maintaining the long-term integrity of the ecological system. The principles of sustainable development are in the process of being incorporated into national policies and legislation in Pakistan through various statutory instruments. As in the project financing from the foreign company is involved, the assessment has been carried out to comply with both local and IFC guidelines. This chapter describes the current legal framework for assessment of the proposed project in the context of the environment and sustainable development, and the institutions that exist in Pakistan that may influence the environmental management, and the IFC including World Bank.

The Government of Pakistan has actively pursued the cause of environmental protection. It has been a party to several international declarations, agreements and conventions and has also ratified these documents.

Pakistan has also created organizational structures and enacted rules for the protection of the environment. The Constitution of Pakistan contains provisions for environment protection and resource conservation. Several laws exist for the protection of the environment, which are discussed below.

Pakistan Penal Code 1861 (adopted from British legacy), which is a general criminal law, and applies all over the country, 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.

The promulgation of the **Environmental Protection Ordinance, 1983** was the first codifying legislation to 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.

3.1 Statutory Requirements of Pakistan

3.1.1 Overview

The development of statutory and other instruments for environmental management has steadily gained priority in Pakistan since the late 1970s. The Pakistan Environmental Protection Ordinance, 1983 was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed, in 1984 by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy (NCS) in 1992. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. The enactment of the Pakistan Environmental Protection Act, 1997 (PEPA, 1997) conferred broad-based enforcement powers to the environmental protection agencies. The publication of the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000 (IEE-EIA Regulations, 2000) provided the necessary details on the preparation, submission, and review of initial environmental examinations and environmental impact assessments.

The Ministry of Environment deals with environment and wildlife issues at the federal level. Within the ministry, the Pakistan NCS unit established in 1992 is responsible for overseeing the implementation of the NCS.

Two organizations, the Pakistan Environmental Protection Council (PEPC) and the Pak-EPA, are primarily responsible for administering the provisions of the PEPA 1997. The PEPC oversees the functioning of the Pak-EPA. Its members include representatives of the government, industry, non-governmental organizations, and the private sector. The Pak-EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to, as well as initiate legislation whenever necessary. It is thus the primary implementing agency in the hierarchy. The provincial environmental protection agencies (EPA's) are the provincial arms of the federal EPA, which is authorized to delegate powers to its provincial counterparts. One of the functions delegated by the Pak-EPA to the provincial EPA's is the review and approval of environmental assessment reports.

Each provincial government has its own environmental protection institution responsible for environmental pollution control. The Sindh Environmental Protection Agency is responsible for the approval of the EIA and IEE of new developments undertaken in Sindh.

3.1.2 National Conservation Strategy

The NCS is a broad-based policy statement aimed at achieving environmentally sustainable economic and social development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources
- Sustainable development
- Improved efficiency in the use and management of resources.

Three operating principles are identified to achieve these objectives. These are:

- Greater public participation in development and environmental management
- A merging of environment and economics decision-making
- Lasting improvements in the quality of life.

The NCS was developed over a nine-year period (1983-1992) after an extensive consultation process with thousands of experts, interested individuals, communities, nongovernmental organizations (NGOs), and government agencies. The Federal Cabinet approved the documents in March 1992, as the principal policy document for environmental management in the country.

The NCS sets out the basic guidelines for an integrated effort aimed at protecting the environment and natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies, departments, private sector companies, financial institutions, and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development.

The NCS has three main parts.

Part 1, Pakistan and the Environment, provides the context of the document.

Part 2, Elements of National Conservation Strategy, contains the basic policy statement. It defines the objectives and principles of the NCS and then discusses issues and opportunities for sustainable development in various sectors and the policy measures required to address these issues.

Part 3, Implementation Arrangements, provides the action agenda and implementation strategy. It is organized into 14 program areas for priority implementation. Within the 14 program areas, 68 specific programs have been identified and long-term goals and expected outputs and physical investments have been identified for each. The implementation strategy discusses the role of the various tiers of the government as well as that of the community and private sector.

The NCS proposes policies in 14 primary, secondary, and tertiary sectors. Of these, the policies and measures proposed in nine sectors (agriculture, forest management, rangeland rehabilitation, livestock management, water resources,1 wildlife, mineral resources, energy, and human settlement) do not have direct relevance to the proposed project. The policies proposed in marine and coastal resource management, fisheries, industrial development, pollution control, and tourism are relevant to the proposed project. The policies for these sectors include the following:

i. Marine and coastal resource management: Development of alternate sources of employment for coastal communities to prevent over-exploitation of coastal resources such as mangroves; conducting research on environmental and social impact of traditional resource-use practices

ii. Fisheries: Development of sea fisheries to the sea's full sustainable yield level; protection and restoration of shrimp fishing habitat

iii. Industrial development: Development and enforcement of effective pollution controls; promotion of clean industrial processes and recycling; establishment of incentives for environmental beneficial or benign industries; development of a policy for setting of industries in areas of low environmental sensitivity; building awareness within industry.

iv. Pollution control: Promotion of domestic wastewater treatment technologies that provide for
recovery and reuse of water, nutrients, and organic matter; focusing on the regulatory approach for industrial discharge; supporting recovery and use of heavy metals from industrial effluents; promoting biological methods of wastewater treatment wherever practicable; giving priority to areas where there is a risk of groundwater contamination; promotion of proper maintenance of motor vehicles, industrial boilers, and furnaces; encouragement of higher fuel efficiency in motor vehicles; undertaking environmental impact of plant sitting; promotion of reuse and recycling; encouraging marketing assistance for effective use of scavenging systems.

v. Recreation and tourism: Supporting the 1991 Tourism Policy's top priority of protecting, conserving, and restoring the basic natural capital and heritage resources

The proposed project is consistent with the stated policies on marine and coastal resource management and on fisheries. As 97% of the fresh water consumption is in the agricultural sector, the policy focuses on increasing irrigation efficiency.

3.1.3 Statutory Framework

The key environmental laws that have implications for the proposed project are discussed as under::

i. **Sindh Environmental Protection Act, 2014** : The SEPA, 2014 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a broad range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed project relate to the requirement for an initial environmental examination (IEE) and EIA for development projects. Section 12(1) requires that: "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof." The Pak-EPA has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies. As the proposed project will be located in Sindh, it falls under the jurisdiction of the SEPA.

ii. **Sindh Environmental Protection Agency Review of IEE and EIA Regulations, 2014**

The SEPA, 2014 provides for two types of environmental assessments: IEE's and EIA's. EIA's are carried out for projects that have a potentially 'significant' environmental impact, and IEE's are conducted for relatively smaller projects with a relatively less significant impact. The IEE-EIA Regulations, 2014, prepared by the Sindh-EPA under the powers conferred upon it by the SEPA, 2014 categorizes projects for IEE and EIA. Schedules I and II, attached to the IEE-EIA Regulations, 2014, list the projects that require IEE and EIA, respectively.

The proposed project falls into the category that requires an IEE. The IEE-EIA Regulations, 2014 also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.
- An EIA or IEE is conducted as per the requirement following the Pak-EPA and guidelines.
    - The EIA or IEE is submitted to the concerned EPA— provincial EPA if the project is located in the provinces

or the Sindh-EPA if it is located in Islamabad.

- A fee, depending on the cost of the project and the type of the report is submitted along with the document.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the Regulations
- The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.
- When the EPA's accord their approval subject to certain conditions: Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the EIA.
- An Environmental Management Plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The EPA's are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The IEE approval is valid for three years from the date of accord. This IEE has been prepared following the guidelines of the Sindh-EPA. It will be submitted to the SEPA by the DEL.

A quarterly monitoring report is to be submitted to the SEPA during the construction period followed by submission of EMP Compliance report after completion of construction phase and NOC will be seeked for Operation phase. Quarterly monitoring reports will be submitted during operational phase as well.

3.1.4 National Environmental Quality Standards

The NEQS were first promulgated in 1993 and have been amended in 1995 and 2000. The NEQS specify the following standards:

i. Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers).

ii. Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.

iii. For power plant operating on oil or coal: a. Maximum allowable emission of sulfur dioxide from the power plant b. Maximum allowable increment in concentration of sulfur dioxide in ambient air due to operation of the plant c. Maximum allowable concentration of nitrogen oxides in ambient air when the plant is operating d. Maximum allowable emission of nitrogen oxide for steam generators as a function of heat input.

iv. Maximum allowable concentration of pollutants (2 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles. The complete set of NEQS is placed at the end of this report at Annexure-

3.1.5 The Sindh Wildlife Protection Ordinance 1972

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

3.1.6 The Sindh Fisheries Ordinance, 1980

The Sindh Fisheries Ordinance, 1980 regulates fishing in the public waters, including the coastal areas, of Sindh. It empowers the government of Sindh to issue licenses for fishing in public waters, put restriction on the type of equipment that can be used for fishing, restrict fishing in certain areas or of certain species of fish, regulate the onshore trade of fish catch, and regulate the fish processing industry. Article 8 of the Ordinance prohibits the discharge of wastewater to public waters without the consent of the Director Fisheries.

3.1.7 The Forest Act, 1927

The Forest Act, 1927 empowers the government to declare certain areas reserved forest. As no reserved forest exists in the vicinity of the proposed

project, the provisions of this law are not applicable to the proposed project.

3.1.8 Hazardous Substance Rules, 2003 (Draft)

Section 14 of the PEPA 1997 requires that "no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party." Pak-EPA has drafted the Hazardous Substance Rules to implement the licensing requirement. The rules are still in their draft form and are pending notification.

3.1.9 The Antiquities Act, 1975 & the Sindh Cultural Heritage (Preservation) Act, 1994

The Antiquities Act of 1975 ensures the protection of Pakistan's cultural resources. The Act defines 'antiquities' as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the project proponents are obligated to ensure that no activity is undertaken within 61 m (200 ft) of a protected antiquity, and to report to the Department of Archaeology, Government of Pakistan any archaeological discovery made during the course of the project. The Sindh Cultural Heritage (Preservation) Act, 1994 is the provincial law for the protection of cultural heritage. Its objectives are similar to those of the Antiquity Act, 1975. No antiquity protected under these two laws was identified in the vicinity of the proposed project.

2.1.10 Other Relevant Laws

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

Industrial Relations Ordinance, 1969
Canal and Drainage Act, 1873
The Explosives Act, 1884
The Ports act, 1908
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
Sind Building Control Ordinance

Sind Local Government Ordinance
Karachi Development Authority Order
Karachi Development Authority (Amendment) Order
Karachi Building and Control Authority Regulations

3.2 **Guidelines**

Key environmental guidelines are reviewed below.

i. **Pakistan Environmental Assessment Procedures**: The Federal EPA has published a set of environmental guidelines for carrying out environmental assessments and the environmental management of different types of development projects. These are general guidelines that are designed to provide information on the various methods that are available for environmental assessments. There are four general guidelines (Policy and Procedures for Filing, Review and Approval of Environmental Assessments; Guidelines for the Preparation and Review of Environmental Reports; Guidelines for Public Consultation; and Guidelines for Sensitive and Critical Areas) and nine sectorial guidelines. The relevance of the guidelines to the proposed project is briefly reviewed below:

ii. **Policy & Procedures for Filing, Review & Approval of Environmental Assessments**: These guidelines define the policy context and the administrative procedures that will govern the environmental assessment process, from the project pre-feasibility stage to the approval of the environmental report. All specific requirements given in this guideline, except the policy for handling projects with trans-province impact, have been superseded by the requirements in the IEE-EIA Regulations, 2000 (Section 2.3.2). As the proposed project is entirely in the province of Sindh and no trans-boundary impact is envisaged, this guideline will not have implications for the proposed project.

iii. **Guidelines for the Preparation & Review of Environmental Reports** : The Guidelines on the Preparation and Review of Environmental Reports is broadly divided into four parts: Chapters 1 to 5 describes the environmental assessment process, and the desired contents of the environmental assessment report; Chapter 6 provides guidelines on reviewing and decision-making; Chapter 7 discusses monitoring and auditing; and guidelines for environmental study project management are provided in the last chapter. The requirements for environmental assessment as specified in this guideline are consistent with the requirements of the World Bank (see Section 2.4.2). The IEE of the proposed project has been conducted meeting the requirements of this document.

iv. **Guidelines for Public Consultation** : These guidelines deal

with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in any impact assessment study. Public consultation has been conducted as part of the proposed project meeting the basic requirements of these guidelines.

v. **Guidelines for Sensitive and Critical Areas** : The purpose of these guidelines is to help project proponents identify sensitive and critical areas in Pakistan. The sensitive and critical areas include protected ecosystems (national parks, wildlife sanctuaries, and game reserves), and protected archeological and cultural sites. The guidelines provide a list of areas that are protected against exploitation under the various wildlife laws of Pakistan and a list of all sites and buildings that are protected under federal and provincial laws related to archeological and cultural heritage. The proposed approach to environmental assessment for development projects in sensitive and critical areas includes the proper identification of such sites and close coordination with the relevant government departments for assessment of potential environmental impact. As the project is not located in a protected ecosystem or near any protected cultural heritage, the provisions of these guidelines are not applicable to it.

3.3 **Requirement of IFC and World Bank**

The IFC and the World Bank require all projects funded by these agencies to be constructed and operated in an environmentally responsible manner. All projects that receive IFC funding must therefore comply with appropriate World Bank Group environmental policies and guidelines. As the project proponents are likely to seek funding from the IFC for the proposed expansion project, the IEE/EIA has been carried out to comply with both national and IFC guidelines. The key documents of the IFC are discussed below.

3.4 **Social and Environmental Review Procedures**

IFC's Environment and Social Review Procedure (ESRP) outlines the process through which IFC staff implement the Corporation's commitment to promoting projects that are environmentally and socially sustainable. This commitment is a fundamental part of IFC's mission and is elaborated on in IFC's Policy and Performance Standards on Social and Environment Sustainability (PPS) as well as in IFC's Policy on Disclosure of Information (the Disclosure Policy). The ESRP applies to the full range of IFC's investment activities: direct lending to private enterprises (including both corporate and project finance); lending to financial intermediaries;

minority equity/shareholding in companies, financial institutions, and other entities; structured finance products (guarantees, securitizations); and municipal finance. The ESRP also describes IFC's approach to its technical assistance and advisory activities, including both investment related work and capacity building to help support private sector development in emerging markets. The ESRP also describes the application methodology that IFC staff must follow in order to implement IFC's institutional disclosure requirements in accordance with the Disclosure Policy. The application of the PPS varies according to the nature of IFC's intervention with the client and the nature of the client's business (for example, industrial companies versus financial institutions). The ESRP covers IFC's review and supervision responsibilities for environmental and social performance throughout the project life cycle. The timing of an IFC investment in relation to a client's business activities and project implementation process varies from project to project. IFC does not control the timing of its entry into a project; IFC's engagement, more times than not, occurs well after the project is conceived, with the site selected and development started. When considering whether or not to participate in a transaction, IFC's review takes into account any project development work undertaken beforehand. IFC has a range of other tools to help staff assist its clients in improving the environment and social outcomes of their projects. Other sources of information that complement the PPS include the Guidance Notes for the Performance Standards; IFC Environmental Health and Safety Guidelines, which provide specific benchmark criteria in line with good international practice; and a diverse range of best practice material. The ESRP therefore does not provide technical support or guidance for specific environmental and social issues. Instead it is a defined and structured process that helps IFC maintain consistency and quality of its review process and ensure that policy requirements are identified and committed to. It thus helps fulfill the Corporation's commitment to sustainable outcomes in the operations it invests in or supports. Assessing and managing environmental and social impacts in a manner consistent with the PPS is the responsibility of the client. IFC's responsibility is to review the work of the client, identify opportunities to improve outcomes, and ensure consistency with policy requirements. IFC's approach is to take full advantage of any work undertaken by the client before IFC's own entry into the transaction, thus minimizing additional processing burdens where it is possible to do so while still meeting the Corporation's policy requirements. IFC's investment or advisory support is used to influence and improve performance whenever possible. The ESRP includes an amended categorization methodology, which categorizes projects according to potential adverse impacts after IFC's review rather than during initial screening.

Categorization was previously used as a determinant of certain procedural requirements for the client relating to assessment, community engagement and disclosure. The ESRP recognizes that all process requirements of the client have now been captured in the PPS and that categorization is now used only to determine IFC's institutional disclosure requirements. IFC's environmental and social specialists are essential and integral parts of the process the Corporation uses to optimize outcomes. The ESRP is not a substitute for professional judgment and expertise but provides a framework for the consideration and documentation of key issues and decisions that are made during the project cycle. It also provides staff with a process for document preparation.

3.5 IFC Performance Standards on Social and Environmental Sustainability

1. IFC applies the Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in its member countries eligible for financing. The Performance Standards may also be applied by other financial institutions electing to apply them to projects in emerging markets. Together, the eight Performance Standards establish that the clients are to meet throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Social and Environmental Assessment and Management System.
- Performance Standard 2: Labor and Working Conditions.
- Performance Standard 3: Pollution Prevention and Abatement.
- Performance Standard 4: Community Health, Safety and Security.
- Performance Standard 5: Land Acquisition and Involuntary Resettlement.
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management.
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

Performance Standard 1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's

management of social and environmental performance throughout the life of the project.

Performance Standards 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment,

Performance Standards 3 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the client is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1.

In addition to meeting the requirements under the Performance Standards, clients must comply with applicable national laws, including those laws implementing host country obligations under international law.

2. IFC will apply the Performance Standards to projects it finances, consistent with the provisions in the accompanying IFC's Policy on Social and Environmental Sustainability. IFC's institutional disclosure of information will be pursuant to IFC's Policy on Disclosure of Information.

3 The term "client" is used throughout the Performance Standards broadly to refer to the party responsible for implementing and operating the project that is being financed, or the recipient of the financing, depending on the project structure and type of financing. The term "project" is defined in Performance Standard 1.

A set of Guidance Notes, corresponding to the Performance Standards, offers helpful guidance on the requirements contained in the Performance Standards, including reference materials, and on good sustainability practices to help clients improve project performance.

3.6 **World Bank Guidelines on Environment**

The Pak-EPA recommends using World Bank (WB) environmental guidelines for areas where there may be a gap in the national guidelines. The principal World Bank publications that contain environmental guidelines are listed below.

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production.

- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectorial Issues. 5
- Environmental Assessment Sourcebook, Volume II: Sectorial Guidelines

The first two publications listed above provide general guidelines for conducting an EIA, and address the EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects in mind, and is especially relevant to impact assessments of large-scale infrastructure projects, it also contains a wealth of information useful to environmentalists and project proponents. The Sourcebook identifies a number of areas of concern that should be addressed during impact assessment. It lists activities that may have significant negative consequences for biodiversity, and mentions loss of habitat resulting from mining and mineral exploration as one such activity. It sets out guidelines for determining the project impact in such cases, provides a checklist of tools to identify possible biodiversity issues, and suggests possible mitigation measures. Possible project development effects on wild lands, wetlands, forests, etc., are also identified, and mitigation measures suggested. The Sourcebook also highlights core concerns in social impact assessment and emphasizes the need to incorporate socioeconomic issues into environmental impact assessment exercises. The Environmental Assessment Sourcebook dealing with sectorial assessment is more specific. It contains sections on dams, reservoirs, watershed development, and flood protection. In addition to these documents, several other World Bank operational policies and directives that provide guidelines for environmental assessment were used during the assessment.

4 World Bank, UNIDO, and UNEP. 1999. Pollution Prevention and Abatement and book, Towards Cleaner Production. Environment Department, The World Bank; UNIDO; UNEP.

5. World Bank. 1991. Environmental Assessment Sourcebook, Volume I, Policies, Procedures, and Cross- Sectorial Issues. World Bank Technical Paper No. 139. Environment Department, The World Bank.
6. World Bank. 1991. Environmental Assessment Sourcebook, Volume III, Sectorial Guidelines. World Bank Technical Paper No. 140. Environment Department, The World Bank

3.7 **Asian Development Bank Safeguard Policy Statement (2009)**

The goal of the SPS is to promote the environmental and social sustainability of ADB supported projects by protecting people and their environment from

potential adverse impacts and enhancing the benefits provided.

The SPS sets out the policy objectives, scope, triggers, principles and requirements for three key safeguard areas:

- environmental safeguards
- involuntary resettlement safeguards
- Indigenous Peoples safeguards

Asian Development Bank Social Protection Strategy (2001)

The 2001 Social Protection Strategy defines social protection as a set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labor markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income. It spells out the scope of ADB's commitment to develop priority interventions in supporting social assistance and welfare service programs including child protection and micro- and area based schemes to address poverty, and vulnerability; social insurance programs to cushion risks associated with unemployment, ill-health, disability, work-related injury and old age; and labor market policies and programs designed to generate employment, improve working conditions.

ADB's Gender and Development Policy 1998

ADB's policy on gender and development1 (GAD), approved in 1998, adopts gender mainstreaming as a key strategy for promoting gender equity. This requires gender concerns to be treated as a cross-cutting theme influencing all social and economic processes. ADB's Strategy 20202 identifies gender equity as one of the five drivers of change to achieve the vision and strategic agenda of inclusive economic growth and to make the greatest impact on the development challenges in Asia and the Pacific. The GAD policy provides a policy framework; introduces institutional mechanisms to address gender concerns in ADB's program of activities
The key elements include gender sensitivity, gender analysis, gender planning, gender mainstreaming,

3.8 European Bank for Reconstruction and Development Bank (EBRD) Performance Requirements

The PR's that are applicable to the proposed project are listed below

- PR 1: Environmental and Social Appraisal and Management
- PR 2: Labor and Working Conditions
- PR 3: Pollution Prevention and Abatement
- PR 4:Community, Health, Safety and Security
- PR 5:Land Acquisition, Involuntary Resettlement and Economic Displacement

- PR 6:Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PR 8: Cultural Heritage
- PR 10: Information Disclosure and Stakeholder Engagement

3.9 Non-governmental Organizations

International environmental and conservation organizations, such as the World Conservation Union (IUCN) and the World Wide Fund for Nature (WWF), have been active in Pakistan for some time. Both these organizations have worked closely with the government and have played an advisory role with regard to the formulation of environmental and conservation policies. In the 14 years since the Rio Summit, a number of national environmental NGOs have also been formed that have been engaged in advocacy and, in some cases, research. The most prominent national environmental NGOs, such as the Sustainable Development Policy Institute (SDPI) is members of the IUCN's Pakistan National Committee. All concerned agencies were consulted during the preparation of EIA.

3.8 Civil Aviation Rules (1994)

These rules apply to flight operations within Pakistan by aircrafts other than military aircrafts and, except where otherwise prescribed, to flight operations by aircrafts registered, acquired or operating under these rules, wherever they may be. The rules with relevant significance to the activities taking place in Gharo Wind Corridor are the following:

- No person shall erect any temporary or permanent structure, nor position a vehicle or other mobile object on or in the vicinity of an aerodrome (airport) that will be within the clearance area, or will protrude through an obstacle limitation surface, at that aerodrome.
- No person shall operate a light in the vicinity of an aerodrome which because of its glare is liable to dazzle pilots of aircraft taking off from or landing at that aerodrome; or which can be mistaken for an aeronautical ground light. If such a light is operated it shall be extinguished or satisfactorily screened immediately upon notice being given to the person or persons operating the light, by the Director-General or by the Manager or by a person authorized by him.
- No person or persons shall operate a radio station or electrical equipment in the vicinity of an aerodrome or of a radio aid to navigation serving an airway or an air route in Pakistan which is liable to cause interference with radio communications between aircraft and an Air Traffic Services Unit,

or which is liable to disturb the signal from a navigational radio aid.

- A captive balloon or a kite shall not be flown at a height above 200ft within 6km of an aerodrome, and a free balloon shall not be flown at any place, except with the express permission of the Director-General and in compliance with the conditions attached to such permission
- An aircraft shall not be flown over congested areas of cities, towns, or settlements or over an open air assembly of persons, except by permission of the Director-General, unless it is at such height as will permit, in the event of an emergency, a landing to be made without undue hazard to persons on the ground, and except when it is taking off or landing, shall not be flown closer than 500ft to any person, vessel, vehicle or structure.

However as the Wind Corridor is not used much by the domestic air traffic (except for a proximity to one not frequently used route/airport in Nawabshah), it is highly unlikely that wind farm construction and operation activities might be affected by any of the aforementioned rules

3.9. The Biodiversity Action Plan

The Biodiversity Action Plan (BAP), which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country. The BAP recognizes that an EIA is used as a tool at a project level to identify environmental effects of proposed projects and to plan for reducing adverse effects. The BAP further stipulates that an EIA needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

3.10 Policy for Development of Renewable Energy for Power Generation

In December 2006 the Government of Pakistan published the first national package of measures aimed at promoting renewable sources of energy. The provisions apply to hydropower plants with a capacity of up to 50MW, solar thermal, photo voltaic and wind energy. Over the short term, i.e. to mid-2008, technologies that are already in commercial use internationally are to be trialed through the mechanism of attractive power purchase contracts and partial risk coverage. In the medium term, i.e. to 2030, it is hoped to have installed at least 9700 MW of capacity for renewable electricity in this way.

3.11 Renewable Power Generation

3.11.1. Alternative Energy Development Board (AEDB)

The Alternative Energy Development Board (AEDB) was established as an autonomous body attached to the Cabinet Division on 12th May 2003. The Board was established to act as a central agency for development, promotion and facilitation of renewable energy technologies, formulation of plans, policies and development of technological base for manufacturing of renewable energy equipment in Pakistan. In Feb 2006, the administrative control of the Board was shifted from the Cabinet Division to the Ministry of Water & Power. The AEDB is also responsible for developing the national policy for promoting renewable energy sources in the medium and long term, which has been set out in a set of measures known as the Policy for Development of Renewable Energy for Power Generation. AEDB is also responsible for getting land leased from the Revenue department and lease it out to various investors/promoters for wind farms development.

3.12 1992 Climate Change Convention and Kyoto Protocol

The convention aims at stabilizing greenhouse gases (GHGs) concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the Legal and Regulatory Framework climate system. To achieve the objective of the convention, all parties are generally required to develop national inventories of emission; formulate and implement national and regional programs of mitigation measures; all developed country parties were specifically obliged to take measures to limit GHG emissions by the year 2000 at 1990 levels and the developing countries to take all measures in support of the protection of the atmosphere without any formal commitment on the quantified reduction of these gases in a time frame.

The Kyoto Protocol is an amendment to the United Nations Framework Convention on Climate Change (UNFCCC) an international treaty on global warming. Ratifying developed countries commit to reduce their combined greenhouse gas levels by 5%, including six GHGs, i.e. Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydro fluorocarbons (HFCs), Per fluorocarbons (PFCs), and Sulfur hexafluoride (SF_6).

As of November 2007, total of 174 countries have signed and ratified the agreement, with the notable exception of the United States of America. If successful, the Kyoto Protocol is expected to reduce the average global temperature between 0.02°C and 0.28°C by the year 2050. The Kyoto Protocol proposes to set up framework for (a) Joint Implementation of projects aimed at reduction of GHGs, (b) establishment of Clean Development Mechanism (CDM), and (c) Emissions Trading, which could be availed by all developing country Parties, including Pakistan. Pakistan signed the United Nations Framework Convention on Climate

Change (UNFCCC) in Rio in 1992. It was ratified in June 1994 and it became effective for Pakistan, as Party, with effect from 30th August 1994. One hundred and thirty-seven (137) developing countries have ratified the protocol. Developing countries including Pakistan have no obligation beyond monitoring and reporting emissions.

3.13.The Convention on Biological Diversity

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programmes and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.

3.14 The Convention on the Conservation of Migratory Species of Wild Animals, 1979

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), (1979), requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species.
The Convention contains two appendices. Appendix I contain the list of migratory species that are endangered according to the best scientific evidence available. For these species, the member states to the Convention are required endeavor to:

- Conserve and restore their habitats.
- Prohibit their hunting, fishing, capturing, harassing and deliberate killing.
- Remove obstacles and minimize activities that seriously hinder their migration.
- Control other factors that might endanger them, including control of introduced exotic species.

Annexure lists the migratory species, or groups of species, that have an unfavorable conservation status as well as those that would benefit significantly from the international co-operation that could be achieved through intergovernmental agreements. This Convention is of extreme importance to the Jhimpir and Gharo Wind Corridor and at short term to the Coastal Gharo Wind farm site due to its proximity to the Indus River and the actual Indus Delta. Both the river and Delta are part of the International

Migratory Bird Route Number 4, also called the Green Route or Indus Flyway, considered to be one of the busiest in the world.

3.15 The Convention on Wetlands of International Importance, Ramsar 1971

Pakistan is a signatory to the said Convention. The principal obligations of contracting parties to the Convention are:

- To designate wetlands for the List of Wetlands of International Importance.
- To formulate and implement planning so as to promote wise use of wetlands, to make EIA before transformations of wetlands, and to make national wetland inventories.
- To establish nature reserves on wetlands and provide adequately for their warden and through management to increase waterfowl populations on appropriate wetlands.
- To train personnel competent in wetland research, management and warden.
- To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system.
- To promote wetland conservation concerns with development aid agencies.
- To encourage research and exchange of data.

So far 19 sites in Pakistan have been designated as wetlands of International Importance or Ramsar Sites. A total of five Ramsar sites are located in the Gharo Wind Corridor however no Ramsar site is present directly in the Coastal Gharo and Inland Jhimpir project areas. The nearest Ramsar site to the Coastal Gharo area is the Indus Delta whereas the nearest Ramsar site to Inland Jhimpir area is the Keenjhar Lake.

3.16. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This convention came into effect on 3 March 1973 in Washington. In all 130 countries are signatory to this convention with Pakistan signing the convention in 1976.

The convention requires the signatories to impose strict regulation (including penalization, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival.

The Convention contains three appendices. Appendix I include all species threatened with extinction, which are or may be affected by trade. The Convention requires that trade in these species should be subject to strict regulation. Appendix II includes species that are not necessarily threatened presently but may become so unless trade in specimens of these species is subject to strict regulation. Appendix III includes species which any contracting party identifies as subject to regulations in trade and requires other parties to co-operate in this matter.

3.18 International Union for Conservation of Nature and Natural Resources (IUCN) Red List

The red list is published by IUCN and includes those species that are under potential threat of extinction. These species have been categorized as

- Endangered: species that are sent to be facing a very high risk of extinction in the wild in the near future, reduction of 50% or more either in the last 10 years or over the last three generations, survive only in small numbers, or have very small populations.
- Vulnerable in Decline: species that are seen to be facing a risk of extinction in the wild, having apparent reductions of 20% or more in the last 10 years or three generations.
- Vulnerable: species that are seen to be facing high risk of extinction in the wild, but not necessarily experiencing recent reductions in population size.
- Lower Risk: species that are seen to be facing a risk of extinction that is lesser in extent that for any of the above categories.
- Data Deficient: species that may be at risk of extinction in the wild but at the present time there is insufficient information available to make a firm decision about its status.

Two bird species namely Black bellied Tern (Sterna acuticauda) and Long-tailed Grass Warbler (Prinia burnesii), three mammal species including Fulvous Leaf nosed Bat (Hipposideros fulvus), Indian Fox (Vulpes bengalensis) and Trident Leaf nosed Bat (Asellia tridens) and one reptile species namely Indian Cobra (Naja naja) were identified in the inland Jhimpir wind farm site area. The black bellied Tern, Indian Fox as well as Indian Hump-backed Dolphin (Sousa plumbea/Sousa chinensis) were observed in the Coastal Gharo wind farm site. All of the above mentioned species are listed in IUCN Red List 2006. Black bellied Tern and Long-tailed Grass Warbler are categorised as Near Threatened (NT) species. The latter is also included in Appendix I and II of the CMS.

3.19 World Bank / IFC Guidelines for the Environment, Health & Safety for Wind Energy 2015

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP)1. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

4

Baseline Condition

Physical

4.1.Location

The Gharo wind corridor is located in the south western parts of Sindh province. The wind corridor is located between latitudes 23°48' - 25° 41' North and longitudes 67° 16'- 69° 25' East . The corridor is located across Thatta, Hyderabad and Badin districts of Sindh province. The southern portion of the corridor predominantly lies in the Indus Delta. The total area of the Gharo wind corridor is approximately 24,450 square kilometers (sq.km).

The potential wind farm development sites of coastal Gharo and inland Jhimpir are located in Thatta district. The Coastal Gharo wind farm sites are located between latitudes 24°44' - 24° 32' North and longitudes 67° 22' - 67° 30' East. The Inland Jhimpir wind farm site is located between latitudes 25°12' - 25° 02' North and longitudes67° 51' - 68° 01' East. The land for the development of the wind farms in coastal Gharo covers an area of approximately 102sq.km whereas for Inland Jhimpir the allocated land area is approximately 157sq.km.

4.2. Physiography

Topographically Sindh can be divided into four distinct parts: the Kirthar range in the west; a central alluvial plain bisected by the Indus River; the desert to the east; and the Indus Delta in the south. The Gharo wind corridor lies in the south western part of the Sindh province and is mostly covered in the Indus Delta covering parts of Thatta, Hyderabad and Badin districts.

Thatta district comprise of all the topographical features found in Sindh province. The north western area of the district is hilly tract known as Kohistan tract. These hills are the extension of the Kirthar Range. It has been described as succession of broad valleys lying between ranges of hills running generally north and south. The valleys are more or less level and fairly covered with grass or brushwood. The hills are bare and mostly composed of limestone. Southwards the area degenerates into sandy formations, uncultivated and almost devoid of vegetation, but much broken up by short ranges of low, stony hills, and intersected by Nais (locally called meaning torrent beds) which carry the drainage of the Kohistan to the Indus.

A major part of Thatta taluka is a mountainous area known as Kohistan touching the Kalat region. The Makli hills, close by Thatta, is an area of rocky elevation

covering an area of 32km by 6km.

Hyderabad and Badin district is the part of the lower Indus plain conformed of vast alluvial along the course of the Indus River. The Indus bifurcates the district of Dadu from Hyderabad and stretches for 110km on the western flanks of the district, and is surrounded by riverine forests. There are no mountains or hills anywhere in the districts except some small hillocks and off shoot of Kirthar lime stone (middle Eocene) range known as Ganjo Takkar located in Hyderabad district. They run parallel to the river Indus for about 22km south of Hyderabad city. The highest point in these hillocks is known as "Gaho" which is about 75m above mean sea level (msl). There are also two small hillcocks on the north of Tando M. Khan town. They are named Budhaka Takker. The rest of the district as well as whole of Badin district is a fertile plain with an elevation of about 50m above msl.

4.2.1.Inland Jhimpir

The land form of the Inland Jhimpir area is mainly flat and barren with little (in the form of grass, shrubs and scrubs) or no vegetation. The soil texture in this area is mostly rocky and gravely with the Kohistan hills which are an extension of the Kirthar range also present in the surroundings. Various water bodies including Kinjhar Lake (at a distance of more than 20km) and Haleji Dhand (at a distance of more than 32km) are also present in the project vicinity.
Various physiographic units covered in the wind corridor and proposed wind farm sites have been established using GIS technique. The procedure used to classify the Satellite imagery of the Gharo wind corridor is called "Unsupervised Classification" technique.
Initially 75 classes were developed using this standard technique and thereafter these classes were reclassified to 7 final Physiographic classes. These Physiographic units are tabulated in below Table .

Table : Main Physiographic Units within the Wind Corridor

No	Unit	Area (sq km)	Percentage (%) of the Total Area
1	Fresh Sand Deposits	430.6	1.76
2	Mangrove Forests	1431.7	5.86
3	Marshy Land	1773.7	7.25
4	Open Land	8514.9	34.83
5	Saline Area	757.2	3.10
6	Water bodies	2581.4	10.56
7	Vegetation	8960.8	36.65
	Total	24450.4	100

4.3.Geology

On the basis of the physical environment and geology, the project area falls in the Indus basin, which is briefly describe below.

The Indus basin essentially forms the western extension of Indo-Gangetic plain and consists of the silt brought by the Indus and its numerous tributaries, such as Jhelum, Chenab, Ravi and Sutleg on the east bank, and Kabul, Kurram, Tochi and other on the west bank. The Indus Plain is known for its agricultural fertility and cultural development throughout history.

The left bank tributaries of the Indus river all meet at Panjnad and flow as one large stream for about 75 Km before joining the Indus at Mithankot, and south of it, the Indus flows almost alone upto the Arabian sea without receiving any noticeable tributary.

The average annual discharge of the Indus – 92 million acre feet (MAF) at Attock khurd – is much higher than the combine discharge of its tributaries. There is a great fluctuation in their seasonal discharge, especially in the hot summer and rainy season. Almost all of its tributaries and the Indus itself have their sources in snow and glaciated area of Himalayan, Karakoram and Hindukush mountain system.

On the basis of hydrology and landforms, 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 Sutleg) divide the land surface into several interfluves of doabs. The two plains are separated by a narrow corridor near Mithan court where the Suleiman range approaches the Indus River. The lower Indus plain is very flat generally sloping to the south with an average gradient of 95 mm/Km (6 inches/mile). The lower Indus plain can be divided in 5 distinct micro-relief landforms active flood plain, meander floodplain, cover flood plain, scalloped interfluves, and the Indus delta. In the north east, the meander flood plain is more extensive, while in the central and lower Indus plain, the cover flood plain is more prominent.

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.

Inland Jhimpir

The proposed inland Jhimpir wind site area is covered under the Eocene Sedimentary and Unconsolidated Surfical Deposits of silt, sand and gravel geologic formations belonging to the Tertiary and Quaternary ages respectively. The area is also rich in coal deposits with the Meting-Jhimpir coal field being explored currently for coal reservoirs.

Coal is associated with basal part of laterite where a sequence of lateritic clay and shale with beds of arenaceous sandstone of Laki Formation, named as Sonhari Member of Early Eocene age is found. Laki formation attains a thickness of 55m near Thatta However; the latter sequence of Laki Formation is mainly composed of nodular limestone with shale and sandstone. The Sonhari coal is of poor quality lignite with high Sulphur. Sonhari member varies in thickness from 10m to 30m. The meting limestone and Shale member consists mainly of creamy white nodular limestone with subordinate sandstone in the upper part. The shale is grey, greenish yellow, weathering dark rusty brown ferruginous and gypsiferous. The limestone is thin bedded and arenaceous whereas the sandstone is commonly ferruginous. Meting Member is about 70m thick at the type locality.

Geologic Formations covered in the Wind Corridor and Wind Farm Sites

Geological Symbol	Description	Percentage (%) of Total Area
Wind Corridor Inland Jhimpir		
Q	[illegible]	[illegible]
Te	[illegible]	[illegible]

Geological Setting

The Prevailing geologic conditions in the region are the results of extensive in undation, deposition, coastal movements, and erosion over a long period of time 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 angel strike-slip fault 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 detailed, that the effect can be appreciated.

Most part of Sindh is covered either by recent alluvium or wind borne sand. The principal features of the geological significance are to be found in the hilly portion of the province, toward the west of Indus. Outline extension of this hilly track occurs east of the Indus as well near Sukkar, Hyderabad and Jerruck. The isolated hills of Nagarparker on the northern border of the Rann of Kutch belong to quite a different system both geographically and geologically.

The hilly region of western Sindh consists almost entirely of rocks belonging to the tertiary system of geological nomenclature. It is only along the Laki range and in its neighborhood that there is some exposure of rocks belonging to the next older system; the cretatious with the exceptions of some volcanic beds associated with these cretatious strata, all the rocks formation of western Sindh are the sedimentary origin. All of the more important hills messes consist of limestone. Great majorities of this limestone deposit belongs to the nummultic period and are largely built up of the accumulated shells of foraminifera principally those belonging to the genus nummulties.

Soil Classification

The texture of soils in the wind corridor ranges from loamy saline, silty and clayey in the coastal areas to gravely, mainly loamy and clayey soils in the inland areas.

The loamy soils in the coastal areas are strongly saline (hence devoid of any agriculture), moderately alkaline (pH of 7.9 to 8.4) and strongly calcareous ($CaCO_3$ content greater than 15%).

The soil in the inland areas, especially those areas covered under the lower Indus basin, consists mainly of loamy and clayey soils. These soils have little or no salinity (0 to 4dSm-1) and are moderately alkaline (pH of 7.9 to 8.4). The soils are generally non-saline, nonsodic except local saline patches in inter-dunal valleys and some parts of the alluvial plain.

The soil in the lower half of the wind corridor consists mainly of loamy fine sand saline soils. These soils have high salinity (greater than 15dSm-1) with a few patches slightly saline (salinity between 4 to 8dSm-1). These soils are neutrally to moderately alkaline (pH of 6.6 to 8.4) and moderately to strongly calcareous (CaCO3 content greater than 15%) in nature.

The soils in the remaining portion of the wind corridor consists mainly of loamy part gravely soils. The soil is similar in nature to the soils of the coastal areas of the wind corridor. However the soils in some patches may be different with a slight salinity (between 4dSm-1 to 8dSm-1). This type of soil is usually neutral (with a pH of 6.6 to 7.3), and moderately calcareous (with CaCO3 content in the range of 3% to 15%)

Inland Jhimpir

The soils of inland Jhimpir wind farm site are also classified as mainly loamy saline and part gravely. The soil is similar in nature to the soil of Gharo area. However the soils in some patches may be different with a slight salinity (between 4dSm-1 to 8dSm-1). This type of soil is usually neutral (with a pH of 6.6 to 7.3), and moderately calcareous (with CaCO3 content in the range of 3% to 15%). Properties of soil in some patches of the wind farm may be indifferent to the ones stated above with moderately alkaline (pH of 7.9 to 8.4), strongly calcareous (with a CaCO3 content of greater than 15%) with little or no salinity (between 0dSm-1 to 4dSm-1).

The soil and soil properties map is shown in Figure 3-4 and 3-5 respectively. The different soil classes covered in the wind corridor and wind farms sites is provided in Table. Whereas the properties of soil in these areas is provided in Table

Soil Classification in the Wind Corridor and Wind Farm Sites

Soil Type	Description	Percentage (%) of Total Area
Wind Corridor		
Inland Jhimpir		
23	Mixed loam, part gravely soils	100

Soil Properties in the Wind Corridor and Wind Farm Sites

Soil Nature	Alkalinity	Calcareousness	pH (range)	$CaCO_3$ Content (%)	Electrical Conductivity (dS m⁻¹)	Percentage (%) of the Total Area
Wind Corridor						
Inland Jhimpir						
Strongly calcareous	Moderate	Strong	7.9-8.4	[illegible]	[illegible]	[illegible]
Slightly alkaline	Neutral	Moderate	[illegible]	[illegible]	[illegible]	[illegible]
Strongly alkaline	Moderate	Strong	7.9-8.4	[illegible]	[illegible]	[illegible]
Rocky/barren land	ND	ND	ND	ND	ND	[illegible]

View of flat barren area in Jhimpir

View of fertile land in Jhimpir

Land Capability

The different soil regimes identified in the wind corridor and wind farm sites have different land use potentials on the basis of their characteristics or on the basis of other external limiting factors such as aridity, erosion etc. The potential land use for the soil regimes within the wind corridor has been identified in this study using the map of land capability for Sindh. This classification is expected to help in the management of soils in the area and for further planning on land use within the wind corridor and wind farm sites.

In the land capability map for Sindh, eight land capability classes are designated by Roman numerals (I to VIII). In this system classes I to IV denote arable lands with decreasing agricultural potential and classes V to VIII denote rangelands with decreasing range potential.

The wind corridor covers the land areas ranging from very good (loamy) irrigated crop land (Class I) to areas un-productive for agriculture (Class VIII).

Approximately 60% of the land area covered in the wind corridor is productive land capable of agriculture (ranging from Class-I to Class-IV). The remaining land is unproductive comprising mainly of loamy grazing, severely saline tidal flats, open water and marsh and urban areas.

The percentage wise descriptive distribution of land capability classes covered in the wind corridor is provided in Table and is shown in Figure

Inland Jhimpir

The land area covered by the wind farm site of Jhimpir consists of complex of agriculturally unproductive (rock) land and some poor grazing (gravely land) (Class VIII, VII). This area constitutes about 38.3% of the total wind farm area and is also incapable of agriculture as the soil underneath mainly consists of rock and gravel. The remaining portion (about 61.7%) of the land is a complex of poor torrent-watered crop land and poor (loamy) grazing land. Some part of this land is capable of agriculture being fed by torrent water whereas the remaining portion comprises of grazing area (capable of growing grass and shrubs).

The percentage wise descriptive distribution of land capability classes covered in the two wind farm sites is also provided in Table and is shown in Figure

Land Capability Classes in the Wind Corridor and Wind Farm Sites

Classification No.	Soil Class	Capability	Percentage (%) of Total Area
Wind Corridor			
Inland Jhimpir			
7	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]

Land Use

Agriculture, followed by the forestry, is the main land use in the central alluvial plain. Although more than 50 percent of the total geographic 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 plantation

Exhibit: Land Use in Sindh

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

Inland Jhimpir

Inland Jhimpir wind farm site consists of areas that have variable land use. The rocky and gravely soil formation devoid the major land area for any agricultural use. However the land area is also influenced by perennial grazing consisting of short grasses shrubs and scrubs. A few patches of cultivated land also exist in the close vicinity and surroundings of the wind farms site which comes under the

torrent water restricted cropping. This area is dependent on residual moisture from torrent overflows. The major crops in this area include gram, oilseeds, barley, and pulses.

The percentage wise descriptive distribution of land use areas covered in the wind farm sites of Coastal Gharo and inland Jhimpir is also shown in Figure and is tabulated in Table.

Land Use Classification in the Wind Corridor and Wind Farm Sites

Category	Source of Moisture	Important Crops	Percentage (%) of Total Area
Wind Corridor			
Inland Jhimpir			
Torrent-Watered restricted cropping	Residual moisture from torrent overflows	Grazing land with little agriculture	18.71
Perennial grazing	Rain	Sparse/short grasses, shrubs and with [illegible] drought resistant trees	27.13
Non agricultural use	Generally rocky terrain	[illegible]	54.16

Soil

The soil in the plain of Sindh is plastic clay that has been deposited for Indus. Combined with water it develops into a rich mould and without water it degenerates into a desert. Nearly the entire Indus valley has soil which is extremely friable and easily disintegrated by the flow of water. Resultantly, the water always contains a large amount of suspended silt

Water Resources

Surface Water Resources.

Indus River

The river Indus is the main source of water in the project area. The Indus rises in Tibet, at an altitude of about 18000 feet amsl, and has a total catchments area of 654,329 km2. Length of the Indus River in the country is about 2,750 km. five main rivers that join Indus from the eastern side are Jhelum, Chenab, Ravi, Sulej and Bias. Besides these, 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 month, 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 is diverted for irrigation, 39.4 MAF flows to the sea and about 9.9 MAF is consumed by the system losses which includes 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 prograding seaward of the delta as a result of interaction of fluvial and marine processes and a moderate tide range of approximately 2.6 meters. Progradation has occurred in spite of extremely high wave energies of the order of 1,400 million ergs/sec. During the past six decades, however, 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). This decrease in sediment load together with the extremely high wave energies is expected to cause rapid reworking and transgression of the Indus delta.

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 km2. 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

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, faecal 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

There exist several fresh water and brackish lakes in the Sindh Province. The salient among these includes Manchar, kenjhar and Haleji lakes. Kenjhar Lake is situated more than 20 km approx. to the proposed site.

Ground water

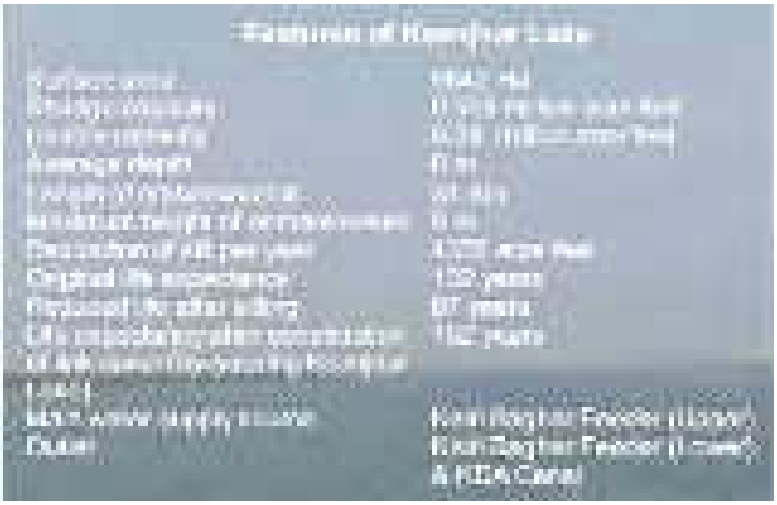
The Indus Basin was formed by alluvial deposits carried by the Indus and its tributaries. It is underlain by unconfined aquifer covering about 15 million acres (60,700 Km2) in surface area. In Sindh, about 28% of the area is underlain by fresh ground water. This is mostly used as supplemental irrigation water pumped through tube-wells. Some ground water is saline. Water from saline tube-wells is generally put into drains and, where this is not possible, it is discharge through large canals for use in irrigation, after diluting with the fresh canal water.

Before the introduction of widespread irrigation, the ground water table in the Indus basin varied from about 12 m in depth in Sindh and Bhawalpur areas to about 30 m in Rechna Doab. After the introduction of weir-controlled irrigation, the ground water 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 water-logging and soil salinity, reducing productivity.

Hydrology- Inland Jhimpir
Surface Hydrology

The only perennial water channel in the area is the Kalri Baghar (KB) Upper Feeder which feeds Kinjhar Lake with Indus water from Kotri Barrage. The KB Feeder is about 20km away from the Jhimpir wind farm site and lies on its eastern side. The KB feeder is about 61km long and its design discharge is about 258 cubic meters per second (cumecs).
Kinjhar Lake is also being fed by the hill torrents during floods from the western side. The catchment area of these hill torrents are about 1664sq km and have their outfall into the Kinjhar Lake. These hill torrents includes; Rodh Nai and Liari Nai. Baran Nai which is the principal source of flood drops into the River Indus downstream of Kotri barrage.

Kinjhar Lake is the main source of fresh water for drinking and irrigation for the areas downstream of Jhimpir including the city of Karachi. Kinjhar Lake is an artificial water storage reservoir located in Thatta district. It came into existence as a consequence of implementation of the Kotri Barrage canals Irrigation Project. This artificial reservoir has been formed out of natural depressions of Sonheri and Kinjhar Dhands. The gaps between the surrounding hills of the dhands were closed with the construction of earthen embankments having an average height of about 7.6m. The salient features of Kinjhar Lake are provided below.



Apart from KB Feeder, hill torrents and Kinjhar Lake there is no other source of surface water available in the area. The quantity of water in Kinjhar Lake is ample to fulfil the requirements of the downstream areas for irrigation and drinking purpose.

Groundwater Hydrology

Jhimpir area has meager ground water resources which are mostly saline. Scattered patches of sweet ground water do exist. In general the aquifer is

of limited thickness to poor and paucity (very limited presence of water) aquifer. The yield varies from 10m³/hr to 50m³/hr down to 150m.

The mean annual rainfall is about 200mm with maximum occurring in the monsoon season. The consolidated deposits exposed are sedimentary in nature and are the extensions of Kirthar range and southern axial belt. These sedimentary rocks consist mainly of limestone, shale, sandstone and conglomerate and have little interstitial porosity.

A few tube wells were visited during the field survey in Sep-Oct 2015 in order to collect information regarding yield, quality of water and depth of water table. Generally all the tube wells were drilled between 50m to 80m depth and have a yield of about 50m³/hr. Except for one (Sheikh Nasir which has sweet water) all the visited tube-wells have saline/brackish water, though the locals were using it for domestic, livestock, drinking and irrigation purpose. According to the locals the water quality improves as one moves north-west.

Locals usually bring drinking water in tankers from the Nooriabad area where government and private tube wells deliver sweet water on payment.

Raw water supply for construction, operation and drinking could be managed from Kinjhar lake and tube wells in the Nooriabad area if required.

Kinjhar Lake

Sweet Groundwater well

Saline /Brackish water in Jhimpir

PERAC RESEARCH & DEVELOPMENT FOUNDATION

TEST RESULT			Page 1 of 1
Customer Name Customer Address Date Sample Description	[illegible] Lahore 15-04-2006 Chemical Analysis of Water	Test Report # Reporting Date Sample Code	[illegible] 27-04-2006 5902 15-04-2006

TEST	PARAMETERS	TEST RESULTS	LIMITS
Chemical Analysis	pH	[illegible]	[illegible]
	Ammonia mg/L	[illegible]	[illegible]
	Chloride	[illegible]	<250
	Lead (Pb)	[illegible]	<0.05
	[illegible]	[illegible]	[illegible]

Prepared by	Section In-charge	Head R&D/Lab

[illegible]

Meteorology

The climate of most part of the Sindh is arid characterized for four distinct seasons in a year, that is Winter from mid-November to February, spring during March and April summer from May to Mid- September and autumn form Mid – September to Mid – November except coastal belt where mostly dry and humid conditions persists round the year. There exist several meteorological stations in Sindh; data recorded at some of these stations is provided in the following sections.

Temperature

June is the hottest month in most part of the Sindh, with mean daily maximum temperature recorded as 44.33 C. January is the coldest month in the area, with the mean daily minimum temperature recorded as 5.42 C

Exhibit: Mean Monthly Maximum Temperature Recorded at Karachi (C)

	2008	2009	2010	2011	2012	2013	2014
Jan	27.2	27	27.6	26.6	24.9	26	26.9
Feb	29.6	28.2	28.5	29.9	26.3	31.3	29.4
Mar	33.1	33.3	32.4	36.2	31.5	31.8	31.4
Apr	34.6	35.4	36.6	35.4	35.3	34	37.7
May	35.1	35.6	35.7	36.8	35.4	34.6	36
Jun	34.9	35.1	34.9	35.6	36	35.3	36.4
Jul	32.2	32.2	34.1	33.8	33.2	33.8	37
Aug	32.3	31.6	32.6	32.7	32.2	31	37.6
Sep	33.1	31.4	32.5	32.8	34.2	34.2	35
Oct	36	36.5	37	33.7	35.2	35	35.3
Nov	33.5	32.7	32.2	33.1	33.1	33.4	33
Dec	30.4	28.1	28.3	29.4	28.4	26.3	29
Annual	32.7	32.3	32.7	33	32.1	32.2	33

Source: Pakistan Meteorological Department

Exhibit: Mean Monthly Minimum Temperature Recorded at Karachi (C)

	2008	2009	2010	2011	2012	2013	2014
Jan	11.5	12.8	12.7	12.9	12.3	11.7	13
Feb	14.9	13.8	16.9	14.5	11.3	18.1	17.3
Mar	19.6	19.5	19.8	19.1	20.3	19.6	19.7
Apr	23.8	23.9	24.2	24.8	23	24.5	24.7
May	28.1	27	26.5	27.3	26.4	27.5	27.6
Jun	29	28.2	28.2	28.8	28.3	28.5	28.6
Jul	27.1	25.6	27	26.3	27.5	27.2	28.3

Aug	26.5	25.6	27	26.3	26.6	26.3	27.4
Sep	25.9	24.8	25.3	25.3	26.6	26.8	27
Oct	24.4	22.5	20.9	22.4	22.9	25.7	26.4
Nov	18.6	17.7	15.2	18	18.9	19.4	19.8
Dec	15.8	14.9	12	15.4	13	14	13.7
Annual	22.1	21.7	21	21.9	21.4	22.5	21.8

Source: Pakistan Meteorological Department

Mean daily maximum and mean daily minimum temperatures of various districts in the project area are presented in following exhibits. In view of the very small differences among these temperatures, this data can be taken as representative for the entire project area.

Exhibit: Mean Monthly Maximum Temperatures at Different Cities (°C)

Month	Nooriabad	Umerkot	Sanghar	Badin	Jacobabad
Jan	25.04	26.49	24.31	25.78	22.60
Feb	28.15	29.16	27.06	28.59	25.24
Mar	33.38	34.52	33.29	34.02	31.38
Apr	38.87	39.12	39.25	38.40	38.00
May	41.62	41.49	43.53	39.85	43.08
Jun	40.15	39.72	43.23	38.02	44.33
Jul	37.40	36.19	40.37	35.11	40.56
Aug	36.30	34.51	38.60	33.61	38.24
Sep	36.84	35.70	38.14	34.36	37.00
Oct	37.19	37.12	37.14	35.80	35.32
Nov	31.95	32.98	31.59	31.87	30.06
Dec	26.27	27.95	25.53	26.68	24.11
Annual	34.47	34.52	35.19	33.48	34.15

Source: Pakistan Meteorological Department

Exhibit: Mean Monthly Minimum Temperatures at Different Cities (°C)

Month	Nooriabad	Umerkot	Sanghar	Badin	Jacobabad
Jan	11.08	5.42	5.92	8.73	7.63
Feb	13.62	8.71	8.72	11.60	10.48
Mar	18.50	14.29	14.22	16.80	16.30
Apr	22.98	20.12	19.71	21.80	22.33
May	26.16	24.50	24.59	25.47	26.74
Jun	28.07	27.17	27.67	27.46	29.38
Jul	27.81	26.82	27.60	27.04	29.22
Aug	26.71	25.73	26.33	26.06	28.25

Sep	25.34	23.88	23.77	24.87	25.85
Oct	22.27	18.54	18.18	21.70	20.29
Nov	17.29	11.89	12.23	15.86	14.08
Dec	12.50	6.62	7.39	10.10	8.74
Annual	21.03	17.84	18.00	19.76	19.95

Source: Pakistan Meteorological Department

Precipitation

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

Exhibit: Precipitation Recorded in Karachi (mm)

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Jan	0	0	6.4	13.7	6.6	Trace	0
Feb	0	2.4	21.8	0	12.8	0	0
Mar	0	0	0	0	Trace	Trace	0
Apr	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0
Jun	10.6	Trace	16.3	Trace	Trace	Trace	11.2
Jul	73.6	Trace	270.4	3	Trace	6.2	
Aug	16.2	52.2	9.8	5.6	0.3	8.6	
Sep	Trace	Trace	Trace	Trace	54.9	21.9	
Oct	0	0	0	39.3	0	0	
Nov	0	0.5	0.2	0	0	3.1	
Dec	0	0.4	0	4.3	17.1	61.3	
Annual	100.4	55.5	324.9	65.9	91.7	301.1	156.8

Source: Pakistan Meteorological Department

Wind Data

Exhibit: Average Wind Speed Recorded at Nooriabad (meter per second or m/s)

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Jan	3	3.6	4.0	3.4	3.6	2.0	2.0
Feb	3.2	3.9	5.0	3.7	4.2	3.0	3.7
Mar	3.3	4.0	5.4	4.0	4.8	3.0	4.0
Apr	5.6	6.5	5.2	6.0	5.1	6.2	4.0
May	7.5	8.5	7.7	8.0	7.1	8.0	6.0
Jun	8.1	8.2	8.8	9.0	7.5	7.7	6.3
Jul	7.8	9.8	6.7	10.0	9.0	8.3	7.7
Aug	7.3	7.3	7.1	9.5	6.9	6.2	7.9
Sep	6.5	7.7	6.0	7.3	6.4	4.7	6.9
Oct	2.7	3.3	3.2	3.8	3.9	4.2	4.1

Nov	2.6	2.9	3.1	1.0	2.0	2.2	2.5
Dec	2.9	3.2	3.0	2.5	1.5	3.0	2.9
Annual	4.9	5.7	5.4	5.7	5.2	4.9	4.3

Source: Pakistan Meteorological Department

Climate

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 falls under following five types

Tropical Semi-arid with Dry Winter: This climate type prevails in Karachi, Hyderabad a"c 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 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 wanres: months between 10 and 0 °C. It comprises eastern and northern parts of Kashmir. ChitraJ, 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 Semi-arid with Dry Winter climate zone.

The climate of the wind corridor is broadly described as moderate. Various

meteorologists have developed classification schemes to describe local climatic features of Pakistan. Shamshad (1956) has classified the climate of Pakistan on the basis of characteristic seasons found in the country. Taking into account topography, proximity to the sea, rainfall, temperature, and winds, Shamshad has defined eleven climatic zones for Pakistan. Under his scheme, the

climate of the wind corridor is classified as 'Subtropical double season", which may further be subdivided into hot land and coast land.

The characteristic features of hot land climatic zone is low rainfall, (less than 250 millimeters per annum) absence of a well-defined rainy season, and high temperatures that increase from east to west. Whereas features of the coast land climatic zone include occurrence of afternoon sea breeze, low rainfall, (less than 250mm per annum) with moderate and high temperatures in coastal and inland areas respectively.

The meteorological stations of Badin and Hyderabad are located within the wind corridor. However, the meteorological data from Karachi station is also representative of the prevailing climatic conditions of coastal areas in the wind corridor. Interpretations of available meteorological data from the station of Hyderabad show that the upper part of the wind corridor constituting parts of Hyderabad district experiences moderate climate as a whole. The months of May and June are very hot during the day with a maximum and minimum temperature of 41°C and 26°C respectively. This follows by an abrupt fall in temperatures during the night with a pleasant breeze. December and January are the coldest months. Humidity varies, highest about the end of August which is much less in May when the air is uncomfortably dry. Fogs are common in the cold season. The district lies in the rain shadow area. Heavily laden south-west monsoon clouds rising from the Arabian Sea pass over this area without any appreciable showers except occasional showers in the month of July. In winter the district gets some rain from the cyclonic winds blowing from the Persian Gulf.

The climatic conditions of Thatta and Badin districts may be taken as moderate as a whole. The climate is tempered by the cool sea breeze which blows for eight months of the year from March to October. During the monsoon season the sky is cloudy but there is very little precipitation. The climate in summer is generally moist and humid. The cold weather in the districts start from the beginning of November when a sudden change from the moist sea breeze to the dry and cold north-east wind brings about as a natural consequence, an immediate fall in temperature. The maximum temperature in the hot weather does not usually exceed 40°C, while the minimum reading in the winter does not go below 8°C. The rainfall varies in different parts of the Thatta district. Small wind storms blow during the summer season. The annual average rainfall of the district is about 200mm. The average annual precipitation for Badin district is about 220mm.

Coastal Gharo and Inland Jhimpir

Various wind farm promoters have installed wind masts in order to record the direction and speed of wind at various heights in the proposed wind farm development sites of Jhimpir and Coastal Gharo. Records of various

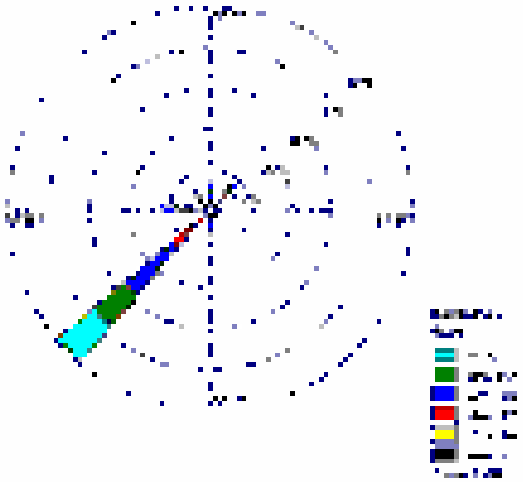
meteorological parameters including wind speed, direction and temperature from 2003 to 2007 are available from these wind masts.

Interpretation of this data has revealed that the climate in the proposed wind farm sites is moderate. The sites experience high wind speeds with an average wind speed of 5.2 meters per second (m/s) in Coastal Gharo and 6.64 m/s in inland Jhimpir. The wind rose plotted indicates that about 35% of the wind is blowing from the west direction in case of Coastal Gharo, whereas approximately 49% of the wind is blowing from the South West (SW) direction for inland Jhimpir. The western hot winds blow particularly in the months of May, June and July. Infrequent dust storms also blow during the hot season in Inland Jhimpir. The northern winds blow during winter season.

The annual average temperatures in the wind farm sites are usually moderate with an annual average of about 25°C for the two sites. April and May are among the hottest months of the year with temperatures rising close to 40°C and 43°C for Coastal Gharo and Inland Jhimpir respectively. December and January are among the coldest months of the year with temperatures in the range of 9°C and 8°C for Coastal Gharo and Inland Jhimpir respectively.

The five years of meteorological data including average wind speed, wind direction, average temperatures, maximum and minimum temperatures for the proposed development sites are shown in Table.

The wind rose of the Jhimpir wind farm sites is shown in Figure.



Summary of Average Wind Speed in Coastal Gharo and Inland Jhimpir (m/sec)

Month										

Summary of Average Wind Direction in Coastal Gharo and Inland Jhimpir

Summary of Average Temperatures in Coastal Gharo and Inland Jhimpir

Month	Coastal Gharo					Jhimpir				
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Feb	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Apr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jun	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jul	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aug	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oct	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nov	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dec	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Annual	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-

Summary of Maximum Temperatures in Coastal Gharo and Inland Jhimpir

Month	Coastal Gharo					Jhimpir				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Jul										
Aug										N.R
Sep										N.R
Oct										N.R
Nov										N.R
Dec										N.R
Annual										

Summary of Minimum Temperatures in Coastal Gharo and Inland Jhimpir

Month	Coastal Gharo					Jhimpir				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Jan						N.R				
Feb						N.R				
Mar						N.R				
Apr										
May										
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Annual						–				–

Rainfall

Average area rainfall in the project area ranges between 110 mm (Jacobabad) and 222 mm (Badin). Maximum rainfall (About 60% of the total annual) occur during the monsoon season (July, August and September), while the period of minimum rainfall or drier period is October and November.

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 following Exhibit

Exhibit: Relative Humidity in %

Month	Hyderabad	Umerkot	Sanghar	Badin	Jacobabad
Jan	47.90	45.52	59.98	50.38	50.88
Feb	45.38	44.45	56.00	48.81	48.23
Mar	42.40	42.55	50.62	48.36	42.76
Apr	41.88	42.73	44.66	48.97	33.01
May	46.96	46.81	42.63	53.10	30.93
Jun	56.35	56.40	51.81	60.70	41.16
Jul	63.42	67.23	62.10	69.61	56.18
Aug	65.26	70.15	66.06	72.55	62.20
Sep	61.37	64.76	62.38	69.78	59.38
Oct	47.65	50.78	55.16	59.15	48.87
Nov	46.40	44.58	59.48	53.88	45.75
Dec	49.26	46.84	62.47	52.46	52.73
Annual	51.19	52.11	56.03	57.56	47.70

Source: Pakistan Meteorological Department

Ambient Air Quality

Since the primary source of air pollution at the site is the vehicular emission, the key pollutants likely to be found at these locations include carbon monoxide (CO), oxides of nitrogen (NOx), sulfur dioxide (SO2), and particulate matters (PM). A typical air quality data for some urban centers in the country which can be used as a generic ambient air quality baseline for the project site.

Ecology

Flora

The flora of the area is governed by the type of soil and the amount of moisture available. The Thatta district has a wide range of soil types due to its diverse land forms which include sandy, deltaic, alluvial, gravel, coastal and mountainous. In the Kohistan region the dominant trees and shrubs are hubul (acacia arabica), kaneli (prosopis spicegra) pi (salvadora olioides), karil (capparis aphylla), rhazya stricta, deamia extensa and many other. The dominant trees, shrubs and under shrubs of sands dunes are represented by ak (calotropis procera), lai (tamerix diocia) beside babul, kandi and karil, etc. The plants found cultivated or wild near villages in the alluvial tracts are neem (azadirachta indica), ber (zizyphus jujube), and serrel (albizzia lebbeck) etc.

Fauna

The wildlife in the area has been affected by colonization of the area and many wild life species have either diminished or vanished. At present hyenas and wolves are hardly ever seen. Jackals are fairly common and foxes are seen in the rapidly contracting area of dry waste. Hog deer which were still found once seen along the bank of river Indus are uncommon and pigs though diminished are still found in small number. Hare and deer are fairly common. The Kenjhar, Haleji hadero Lakes are located on the international flying routes of the birds. Among birds both grey and black partridges are very common in the forest plantation. Most of the common kind of wild duck and water fowl are seen in the cold season. Kunj are also regular winter visitors. Sand grouse of various kinds visit the district in the cold weather, but the expansion of the cultivated area has driven them away. This also applies to the houbara which was quite common in former times. Quails are common.

The other birds are found in the area are Indian cursor, small Indian swallow plover, Asian open bill stork, black and glossy ibris, sirkeer malikoha or commonly known as cuckoo, Indian scoops owl, dusky horned owl etc. The water fowl census revealed the biggest concentration in the whole of Pakistan on Kenjhar Lake.

Biological Resources

This section provides an overview of the ecozones, wild flora and fauna, and the habitat conditions prevailing in the project area. The description in this section has been prepared on the basis of secondary literature review, and field visits carried out in the area during this ESA and earlier assignments.

Original Ecozones of Project Area

Tropical Thorn Forest Ecozone

This habitat was the most extensive ecozone of the Indus plain, and currently exists only in places where the land has not been converted for habitation or cultivation. This habitat comprises low forests of thorny and hard-wooded tree species, dominated by Acacia spp. The trees of such forests have short boles and low branching crowns. These are usually not close-growth trees hence their canopies touch each other in exceptionally favorable spots. The usual height of the trees is 20-30 feet (6-9 m). Other plants that grow mixed with Acacia include Salvadora, Prosopis, Capparis, and Tamarix. The shrubs of the ecozone included Caiotropis, Zizyphus, Suaed, while herbs of the area included Chenopodium, Cailigonum, Haloxylon and various species of grasses.

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

Birds of the ecozone included Grey Partridge, Peafowl, Common Quail, Ring Dove, Red Turtle Dove, Little Brown Dove, Green Pigeon, Hoopoe, Spotted Owlet, Barn Owl, Dusky Horned Owl Indian Nightjar, Wryneck, Golden-backed woodpecker, Pied Woodpecker, Wood Shrike, Great Grey Shrike, Rufous-backed shrike, Fantail Flycatcher, Common babbler, Jungle babbler, Houbara Bustard, Great Indian Bustard and many other species of passerine birds.

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 along the rivers flourished. These included: Tamarix, Saccharum, populus and Acacia. Typha growth was common wherever the water was stagnant or slow moving.

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 urban centers as well as 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 Wld 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.

In these modified habitats, the winter bird species from Himalayas have reduced due to the extensive use of pesticides in these areas, since these species feed on the insects. These birds play an important role in controlling insects particularly in the forests. Almost all of the project components are located in this type of habitat.

Rural and Urban Habitats

These include human habitations within agriculture areas, as well as the urban centers. Scavengers like Jackals are attracted to the garbage dumps and human feces for food. House Sparrows breed in the houses. Bank Mynas and Cattle Egrets feed on grasshoppers in the rangelands with cattle and buffalos. Banyan and Peepal trees still grow in villages. Green Pigeons and barbets feed in these trees.

Migratory Birds

There are many migratory bird species, which still visit or pass through the modified ecozones. These include geese and ducks, cranes, many waders, raptors and large variety of passerine birds such as larks, cuckoos, rooks, ravens, starlings, tits, warblers and finches. Some of these birds fly in to stay for the winter, while the rest fly through the year. For many species the province serves as a breeding ground while others procreate in other areas but have been spotted in this region.

Wetlands

Wetlands are among the most productive ecosystems in 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. Some of the important wetlands are briefly described below.

Manchar Lake, (located 253 km away from the project site) a threatened wetland dying from pollution and mismanagement, was once considered the largest freshwater lake in Asia. It is located about 12 miles west of the town of Sehwan Sharif and spread over an area of 100 square miles that was once renowned for its beauty and the large population of migratory birds and wild fowl. The water supply for Manchar Lake depends on 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. Over the last two decades, the fresh water intake of the lake has declined significantly relative to the saline and toxic effluents discharged into it.

Keenjhar (Kalri) Lake Keenjhar also known as Kalri Lake is one of the largest freshwater lakes in Pakistan. It is located on 24° 56 N, 068°03'E coordinates. It has length of about 24 km, width 6 km and capacity of 0.53 million acre feet. It is located at a distance of about 122 km east from Karachi and 19 km north-east 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 this lake.

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. The wintering birds include ducks and geese, shorebirds, flamingos, cormorants, herons and egrets, ibises, coots, gulls, terns etc. The breeding birds reported from this wetland are Cotton Teal, Night Heron; Pheasant tailed Jacana and Purple Moorehen. About 100,000 birds have been recorded from this wetland in winter (based on WWF reports 1970-1972). This lake has rich 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. The site serves as a major source of drinking water for Karachi. Keenjhar Lake was declared a Garre Sanctuary in 1971 and designated as a Wildlife Sanctuary in 1977.

Drigh Lake: (374 km away from project area) It lies 18 km west of Larkana. It is located on 27° 34 N, 068°06'E coordinates. 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 situated in an area of cultivated plains, generally divided into small fields for rice cultivation. It is a semi-natural wetland, supporting rich and diverse aquatic vegetation. The climate is arid and sub-tropical, with hot summers and cool winters.

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 (approx. more than 32 km away from project area) is a perennial 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. The Lake is located in Thatta district on 24° 47 N, 067°46'E coordinates.

Jubho Lagoon (approx. 93 km from project area) 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. The lagoon is located in Thatta district on 24° 20 N, 068°40'E coordinates.

Nurri Lagoon (approx. 200 km from project area) 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. The lagoon is located in Badin district 24° 30 N, 068°47'E on coordinates.

Deh Akro (approx. 300 km away from project area) is a wildlife sanctuary consisting of four major habitats; desert, wetland, marsh, and agricultural. Located in Nawabshah district, 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, Shahbuderand Jaffri Lake, Soonhari Lake and Tando Bago Lake.
Important Point: The project is not located in the immediate vicinity of any of these wetlands.

Historical Occurrence of migratory birds observed/reported from project areas

- RIS= Ramsar Information Sheet

Inland Jhimpir

Habitats (Information on this section is largely taken from UNEP EIA Report, 2007)

Flat Plains

This habitat occupies a major portion of the project area. The flat plains are mainly gravely in nature while in depressions (where rain water accumulates), vegetation was observed. A total of 22 plant species belonging to 16 families have been identified within the Inland Jhimpir project area. Some of these floral species include Capparis deciduas, Limeum indicum and Zizyphus nummularia. The faunal attributes found within this typical habitat were Ratel/Honey badger (Mellivora capensis), Asiatic jackal (Canis aureus), Common red fox (Vulpes vulpes pusilla), Indian fox(Vulpes bengalensis), Indian porcupine (Hystrix indica), Indian desert cat (Felis silvestris ornate), Indian grey mongoose (Herpestes edwardsi), Indian hare (Lepus nigricollis), Houbara bustard and other raptor species, etc.

Land in the Inland Jhimpir area is also allocated to Arab Sheikhs for Houbara bustard hunting. Six different types of bats were also observed in the area in 2008, two of them were fruit eating and the remaining were insectivorous species. However the recent Birds Study conducted for Tricon Boston and other projects during the period 2014-2016 have not indicated presence of Bats in the area. The reason for the extreme decline in Bats population compared to 40 years back baseline / (observations by elder locals) is that the habitat has declined , excessive use of pesticides in the surrounding areas, mining activities in coal mines of Jhimpir etc.

Dry Stream Beds

Dry stream bed is also an important habitat observed in the area. The stream beds are ephemeral in nature and are fed only through rain water. A total of 37 floral species belonging to 17 families have been identified within this habitat of which the most frequently occurring species include Acacia jacquemontii, Aerva javanica, Cressa cretica and Dactyloctenium aegyptium. A number of common wildlife species were also recorded from the habitat including Ashy crowned Finch Lark (Eremopterix grisea), Blue cheeked Beeeater (Merops

superciliosus), Common Babbler (Turdoides caudatus), Asiatic Jackal(Canis aureus), Indian Grey Mongoose (Herpestes edwardsi), Gerbils, rats and mouse species and among reptiles Bengal Monitor (Varanus bengalensis), Gecko and Agama species.

Hillocks/foot hills

Small hills are located towards the north and west sides of Inland Jhimpir proposed development site. The hillocks spans from north to south direction. A total 13 floral species belonging to 14 families has been identified from this habitat of which the most frequently occurring species include Prosopis cineraria, Salvadora oleoides and Indigofera oblongifolia. Some of wildlife species found within the habitat are Yellow bellied Prinia (Prinia flaviventris), Wood Sandpiper (Tringa glareola), Whiskered Tern (Chlidonias hybridus), Little Green Bee-eater (Merops orientalis), Common Moorhen (Gallinula chloropus), Indian Hare (Lepus nigricollis), Long-eared Desert Hedgehog (Hemiechinus collaris), Cliff Racer (Coluber rhodorachis rodorachis), Desert Monitor (Varanus griseus koniecznyi), Glossy- bellied Racer (Coluber ventromaculatus) and Indian Fringed- toed Sand Lizard (Acanthodactylus cantoris).

Flora

In the Inland Jhimpir Area, 45 plant species belonging to 21 families were identified at random locations sampled in main habitats within the project area. Out of the 45 species 24 are Perennial, 17 are Annual, 2 are herbs, 1 each is sedge and semi-perennial. The quantitative analysis of floral composition was carried out in calculating, Relative cover, Relative density, Relative frequency and important value index (IVI) of species. Four distinct plant communities were identified based on the physical features of the project area. Life forms of the identified species are as follows:

Life form	Number
Grass	9
Herb	14
Tree	5
Shrub	16
Sedge	1

Many plants of the area possess great medicinal properties. The local people use these plants in many ailments and for many other purposes.

Based on UNEP EIA report for Gharo-Jhimpir wind corridor , no endemic or rare species were identified during the field survey of Inland Jhimpir area. Most of the species identified have a wide distributional range.

Fauna

Inland Jhimpir is located north to the Indus delta on the right bank of Indus River and close to Kinjhar Lake. The lake, a freshwater reservoir, is also a wildlife sanctuary and Ramsar site. During the field work by UNEP team for REA, 69 species of birds, 27 species of mammals and 24 species of reptiles were recorded from the Inland Jhimpir area. The site is located close to a huge water body, mainly constitutes arid environment with undulating stony plains and scattered vegetation. Few patches of seasonal barani agriculture may also be seen which are cultivated during the rainy season. In comparison to the Indus Delta, this area is of less ecological significance and a lot of human activities including coal mining,

seasonal agriculture can be observed. However, stony plains are wintering habitat for many migratory birds including Sandgrouse, Houbara bustard and raptor species. The Jhimpir area is also allocated to Arab Dignitaries for Houbara bustard hunting. This area is further dissected by the communication network including main railway tracks, black top roads and high tension power lines. A huge industrial complex (Nooriabad) is also located at north-western side on the Super Highway.

Avian Fauna

The UNEP EIA report reported that in 2008 a total of 69 species of birds were observed on this site during the baseline data collection. These include 44 resident and 25 migratory species. The migrant avian fauna are expected during the winter season which winters in Kinjhar Lake or terrestrial environment of surrounding areas including the project site. Out of the 69 observed species of birds, 38 are common, 19 abundant, 7 less common and 5 are rare. While the remaining 7 are protected under the Sind Wildlife Protection Ordinance (SWPO), 2 are listed in IUCN Red List 2007 and 12 are on CMS Appendices. Recent (2015-2016) birds monitoring study for project sites that found 44 species also conforms the fact of declining birds population / movement in the area compared to 2008.

Mammalian Fauna

A total of 27 species of mammals were recorded from project site in Inland Jhimpir area. These include 19 common, 1 less common and 1 rare, i.e. Ratel/Honey badger. Ratel/Honey badger and Indian desert cat are protected under the SWPO while 5 are listed in CITES Appendix-II and III. None of the observed species were threatened, except for Indian fox which has been

categorized as Data Deficient (DD) species. This area was once a habitat for Chinkara deer which has got extinct. But together with other ungulates, Chinkara deer still survive in neighboring protected areas like Mahal Kohistan Wildlife Sanctuary and Kirthar National Park located approximately 67km at the western edge of the Inland Jhimpir proposed development site across the Super Highway. A total of 6 Bat species were also recorded
including 4 fruit eating and 2 insectivores.

Reptilian Fauna

A total of 24 species of reptiles were reported from the project site. These include 7 common, 3 abundant, 14 less common and none rare species. Out of total 24 species, 5 are protected under the SWPO and Indian cobra is categorized as data deficient (DD) species under the IUCN Red List 2007 and 6 are on CITES appendices. The recorded reptiles included 2 poisonous snakes namely Indian cobra and Saw scales viper and 4 non-poisonous snakes, Checkered keelback, Cliff racer, Glossy bellied racer and Pakistan ribbon snake. Reptiles are also captured for medicinal and trade purposes.

Inland Jhimpir-Key Faunal Species

Ratel/Honey badger and Houbara bustard (winter visitor) may be considered as key species of the project (Jhimpir) area. Moreover, fruit eating and insectivorous bats recorded from the project area have special significance.

Socio- Economic Resources

A. The Population And Human Settlements (Jimphir)

Jhimpir being in the administrative control of Thatta district is unique in terms of population sensibility and characteristic. The total area of Thatta is 17,355 sq/km. the total population consist of 1,113,194. Gender wise distribution shows a figure as 589,341 are Male and 523,853 are of Female. The population density of Thatta is 64.1 per sq/ km. the percentage of total population receding in urban setting is 11.2 %. The average house hold of size is of 5.1 persons. The average growth rate of population has remained from 1981-98 as 2.26.

Exhibit: Demographic Data of Thatta District

Taluka	Union Councils	Revenue Villages	Villages	Households	Population (1998 Census)
Thatta	13	61	1,107	41,408	253,748
Mirpur Sakro	10	92	1,526	32,099	198,852
Sujawal	06	72	687	22,665	127,299
Mirpur Bathoro	08	63	1,295	27,706	151,915
Shah Bunder	05	80	634	17,094	100,575
Jati	06	112	734	22,337	123,957
Kharo Chan	01	24	169	2,540	25,666
Ghorabari	05	59	851	15,700	105,482
Keti Bunder	01	21	197	3,928	25,700

Exhibits: Population, Income and Electricity Consumption – Sindh

Year	Population (Million)	Per Capita Income (Rs)	Energy Sale (GWh)	Per Capita Energy Consumption (kWh)
2000-01	24.40	18,000	3,722	151
2001-02	24.90	19,440	3,871	153
2002-03	25.42	20,995	4,026	156
2003-04	25.94	22,675	4,187	159
2004-05	26.47	24,489	4,354	162
2005-06	27.02	26,448	4,529	165
2006-07	27.58	28,564	4,710	169
2007-08	28.14	30,849	4,898	172
2008-09	28.72	33,317	5,094	175
2009-10	29.32	35,982	5,298	178

Other Socio Economic Indicator

Literacy rate for Thatta is amongst the lowest in Sindh. Total Literacy Rate stands at 22 %. There are marked urban and rural and male and female differential in Thatta as 46% urban and 19% rural.

The health infrastructure in Thatta is scanned in the sixth coastal talukas, 3 do not have any rural health center (RHC) or any veterinary dispensary. BHUs and dispensaries are also in small number. In Thatta district piped water is available to only about 14% of the housing unit. About 13% of rural households have hand pump inside the housing units, while 16% use outside ponds for fetching water and 6% of housing units use well water.

NGOs Working in the Area

Different national and international NGOs are working in Thatta district with the help of their local partners. Their scope of work Ranges from relief operation in coastal areas of Thatta to social welfare and livelihood improvements initiatives. Some are working on CPI (Community Physical Infrastructure). Some have found their way in providing microfinance to local communities through social collateral. Few of these are also working on awareness and advocacy.

NGOs and institution working in the area include NRSP (National Rural Support Program), Aga Khan Planning and Building Services (AKPBS), PPAF (Pakistan Poverty Alleviation Fund), IUCN, WWF, SPO and Pakistan Fisher Folk Forum.

Poverty

Historically Sindh was prosperous and rich province. However, presently Sindh is largely witnessing poverty and destitution. According to recent study (ADB: Sindh Rural Development Project, 2000), poverty level is quite high in Sindh: 37% of the population lives below the poverty line; 20% of the urban and 53% of the rural population is poor. The ADB study covering four districts – Thatta, Badin, MirpurKhas and Sanghar - claims that poverty is widespread throughout the region. Health and education indicators are very poor in these areas. According to this report a majority of households in these areas do not own land. Tenant farms alone; represent 44% of total private farms. About 20% land owners in rural areas are big land lords and they own about 68% of the private farms.

According to ADB Sindh Coastal and Inland Community Development Project interim Report, the poverty figures in Badin and Thatta district are higher as much as 70 percent. According to the Report, 54 percent of the population lies in poorest category while 44 percent were poor. According to the report poverty was highly correlated with household economic characteristic such as land ownership and employments opportunities. Land owner are usually among the not poor. The sea intrusion has badly affected the agricultural activities in these areas. According to community perception of poverty, the poorest are those who have no capital or other resources of their own. They mostly depend on land and grounds of others for their livelihood, and usually work on daily basis.

Main Occupation

Cultivation and the related businesses are the main occupations in the project area. The other key economic activities include fisheries, livestock rearing, government and private sector jobs. In the coastal areas of Thatta and badin, fisheries are among the prime livelihood activities of the majority of the people.

Livestock is also one of the key livelihood sources for the rural population of the area. The farmers, in these districts traditionally keep a few head of livestock, ranging from bullocks to plough, cows for milk and poultry for egg and meat. Good breeds of buffalos and cows are also found in these districts.

Market in Jhimpir

Gender Perspectives

Sindh has been the land of Sufism strongly believing in the equity and equality irrespective of race, religion and Gender. However, with the passage of time, the Sindhi society has accepted the impact of different cultures, traditions and customs. Presently the gender based approaches and attitudes are not favorable for women in the project areas.

Variations exist in gender perceptions, attitudes, roles and responsibilities among lower, central and upper Sindh. In this respect, the coastal districts are less conservative as compared to the upper and central Sindh areas. The tribal clans in upper Sindh, Sanghar and Mirpurkhas districts of Central Sindh are more conservative with regards to women and their status, which is a key development indicator.

The women particularly in urban area have fewer rights in all the aspects of their lives. The literacy data clearly corroborates this, and indicates that compared to men, the women are far behind the education, which is a key development indicator.

Education

The overall literacy rate in Sindh is 45.29 percent (1998 census data). The urban literacy is 63.72 percent which is substantially higher than the rural literacy which is 25.75 percent. In the project area, Hyderabad has the highest literacy (61%), whereas Jacobabad has the lowest urban literacy (44%). Larkana enjoy the highest rural literacy of almost 28 percent, whereas Jacobabad is again at the bottom of the list in the project area in terms the rural literacy. Thatta is most backward in terms of the overall literacy (22%) compared to the other districts in the project area.

Exhibit: Educational Institutes in Thatta District
(1998 Census Data)

Schools	2,282
Colleges	4
Others	4

Exhibit: Healthcare Facilities in Thatta District
(1998 Census Data)

Civil Hospital	Taluka Hospital	Basic Health Unit(s)/ Public Health Centers	Rural Health Centers
1	4	46	8

Agriculture

Agro Ecological Zones

The use of land is governed by several interacting factors, which are physical, biological, social and economic in nature. A clear vision of these factors is essential for increased agricultural production in any given region. The Pakistani agricultural research council (PARC) in 1980 divided Pakistan in 10 agro-ecological zones, based on a survey carried out by FAO and review of the available literature on Physiography, climate, soils, land use and other factors affecting agricultural production

Agricultural Production.

Agriculture is the key source of livelihood in Sindh since the majority of the population is associated with this sector. Total 14.1 million hectares land area of Sindh, represent 18% of total geographic area of Pakistan. Out of this, nearly 50 percent or 7 million ha is available for cultivation. More than 80% of rural population depends on agriculture and its allied businesses. Agriculture is the dominant economic activity in the province.

About 80% of the agriculture land of the province is cultivated through controlled irrigation system. The irrigation system of Sindh comprises of three barrages Sukkar, Guddu and Kotri, having a gross command area of 15 million acres. However, cultivation takes place on only 8 million acres. The major crop of Sindh includes rice, wheat, cotton, sugarcane and oilseeds. Sindh is also known for its orchards, mango, banana, guava and dates being some of the key fruits.

Irrigation System

Irrigated agriculture is the major user of both, surface and groundwater resources of Pakistan. The average annual river diversions for irrigation in the Indus basin are of the order of 104.7 MAF, to irrigate over 14.6 million hectares. Out this, 67.11 MAF on average is diverted during the Kharif period, while 37.63 MAF is diverted during the Rabi period.

During the Kharif period of the last ten years, Punjab used 34.3 MAF annually; while Sindh and Balochistan used m1.4 MAF and NWFP used 2.35 MAF. During the Rabi period of these last ten years, average withdrawals by Punjab, Sindh and Balochistan and NWFP were 19.8 MAF, 16.06 MAF and 1.46 MAF, respectively.

Groundwater Irrigation

An estimated 41.6 MAF of ground water is pumped annually in Pakistan. According to the UNEP EIA study, more than 90% of the extracted ground water is used for the irrigation purposes. Ground water reservoirs are recharged from the river as well as the seepage losses from the canals, watercourses, farms channels and the fields.

Salinity and Water Logging.

Before the introduction of the irrigation system, the water table was sufficiently deep. However, due to lack of drainage facilities and improper water management, the water table rose, resulting in water logging and salinity.

About 25% of the irrigated land of Pakistan is affected by Water logging and salinity/ sodicity problems. In addition to other measures like irrigation system rehabilitation, command water management and On-Farm Water Management programs taken up by different government departments, WAPDA completed 57 salinity control and reclamation projects (SCARPs). Those cover a gross area of 7.81 million hectares.

B. Population And Human Settlements (Wind Farm Area)

People of Jhimpir defined it as an old town of historical significance, rich in minerals and natural resources and a population of about 35000 – 40000 scattered in several goths/paras. Among its resources people counted Keenjhar Lake, the nearby hills that produce limestone, gypsum, dolomite stone, coal, etc. (of significance for industrial use including the steel mill). Jhimpir has variable topography e.g. Esso Manchhari is mountainous with more stones than trees and Palari is surrounded by devi forest. Dependence on natural

resources is determined, as much by available natural resources as by the occupations of the tribes/castes living in each of the paras, for instance the residents of Palari graze animals, get their firewood from the bushes and work as wage labourers in the nearby coal mines. In Haji Jumman Dars and Haji Qasim Jakhro, people depend on livestock and graze them near the Lake, do agricultural labour and rely on commercial activities. Those in Solangi and Abbas Mir Beher and Manchhari are engaged in fishing, etc.

Sources of Livelihood are Livestock, agriculture, teaching, business, fishing, laborer in coal mines, stone crushing etc

Union Council (UC) Jhimpir
Area = 2013 Square Kilometer
Population = 40,000

Education
Primary Schools (Male) = 80
Primary Schools (Female) = 6
High School (Male) = 1
High School (Female) = 1
Higher Secondary School upto Intermediate level = 1 (For Boys only)---science

Health Facilities in UC Jhimpir
BHU = 2
Family Welfare Centre= 1
Lady Health Worker= 43
Dispenser Clinic'= 4
Doctor (MBBS) Clinic = 7

The villages in the form of hamlets near the project area and neighboring wind farm locations are Dil Murad Palari Village, Karam Palari Village, Peeru Palari Village. Ibrahim Palari Village, Siddique Sarki Village, Motio Palari Village, Haji Palari village, Nawaz Palari Village, Saabo Palari Village

5

Project Description

This section briefly explains the concept of electricity generation through wind turbines and provides a simplified description of Tricon Boston Consulting Corp Pvt Ltd (TBCCPL) projects A, B & C covering entire life cycle from design phase till decommissioning with specific focus on construction and operational details mainly related to wind turbines and various components of the proposed project and their salient features, location, and phases with particular emphasis on aspects related to the environment. Also provided in this section is detail of supplies, emission and discharges as well as waste disposal arrangement during different project phases.

Wind Energy and its use for Electricity Generation

The sun heating different parts of the earth unequally causes winds. A wind turbine with the help of blades converts the wind's kinetic energy into mechanical energy, which is in turn through gearbox (pitch drive and yaw drive) amplify the mechanical output by increasing the rpm which is then turned into electrical energy by generator. While modern wind turbines are efficient the amount of energy in the wind is low so each turbine only produces a small amount of energy. Therefore a large number of wind turbines called a wind farm are needed to produce sufficient power to meet a demand needs.

Wind power has a light footprint. Its operation does not produce harmful emissions or any hazardous waste. It does not deplete natural resources in the way that fossil fuels do, nor does it cause environmental damage through resource extraction, transport and waste management.

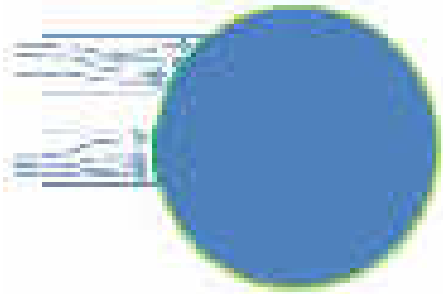
In a wind farm the wind turbine foundations take up less than 1% of the land area while wind turbines are vertical structures. Once up and running, existing activities such as agriculture, grazing etc can continue around them. Farm animals such as cows and sheep are not disturbed by the presence of wind turbine structures and their noise.

Any impacts on the local environment must be set against the much more serious effects of not developing renewable energy sources and there by aggravating the pressures of climate change on the balance of nature.

Wind

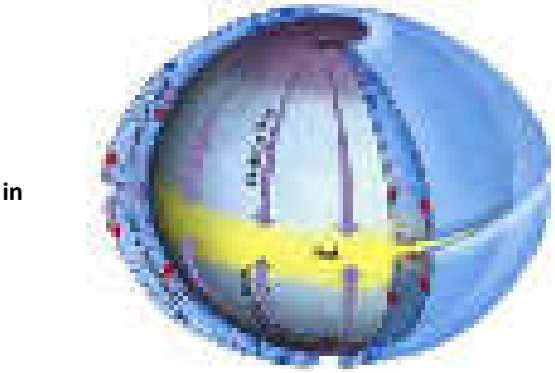
Wind Energy in fact is solar energy. Macro scale global circulation is initialized by difference in sun heating of equatorial regions with much more solar energy input than in polar regions as shown in figure below

Input for Solar Energy



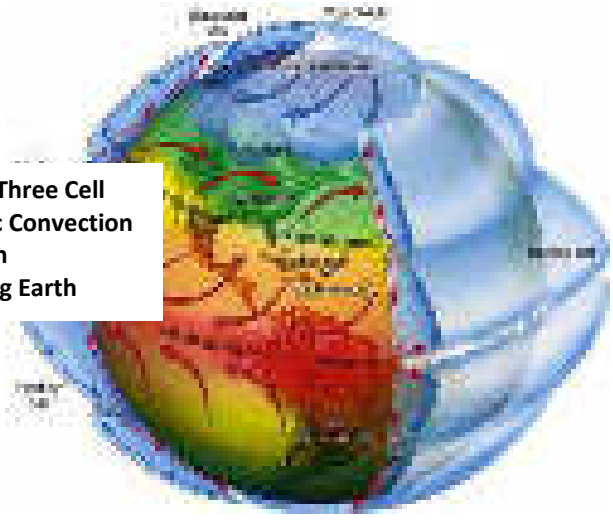
This results in the development of two huge convection cells as shown in figure below

Single Cell Atmospheric Convection in Non-Rotating Earth



Due to earth rotation and effects of land and sea masses, air masses of these convection cells are being redirected and though being the result the global atmospheric circulation. In figure below, an idealized atmospheric convection is shown.

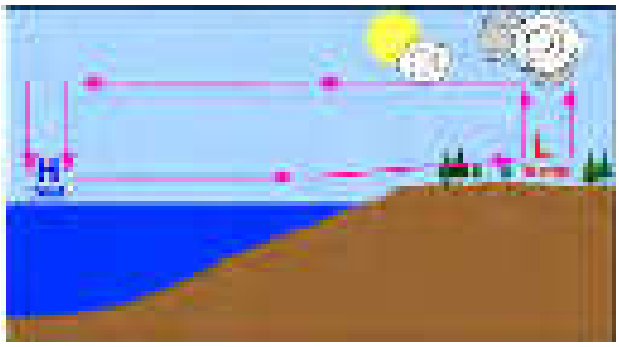
Idealized Three Cell Atmospheric Convection in Rotating Earth



Local Winds

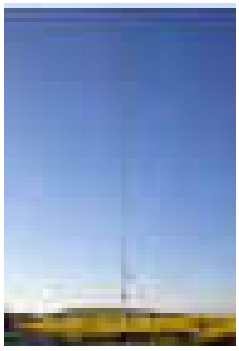
Wind is the movement of air masses to compensate differences in the atmospheric air pressure. Air masses therefore tend to move from high pressure zones to low pressure areas.

Local wind systems are determined by regional configuration of high and low pressure areas and also by thermal effects and local geographic conditions.



Wind Data and Measurement

TBCCPL has installed wind mast at 80 meter to collect the wind data required for micrositing.



Before the start of the wind measurement process, location of mast, its configuration, sensitivity of the measurement equipment and its calibration status was evaluated in order to have accurate wind potential analysis.

The wind measuring masts is recording wind parameters mainly wind speed, wind direction, wind density, turbulence intensity, temperature, energy content etc.

The data from the wind mast will be used to develop the wind distribution diagram (wind rose).

Wind speed Data and Forecast

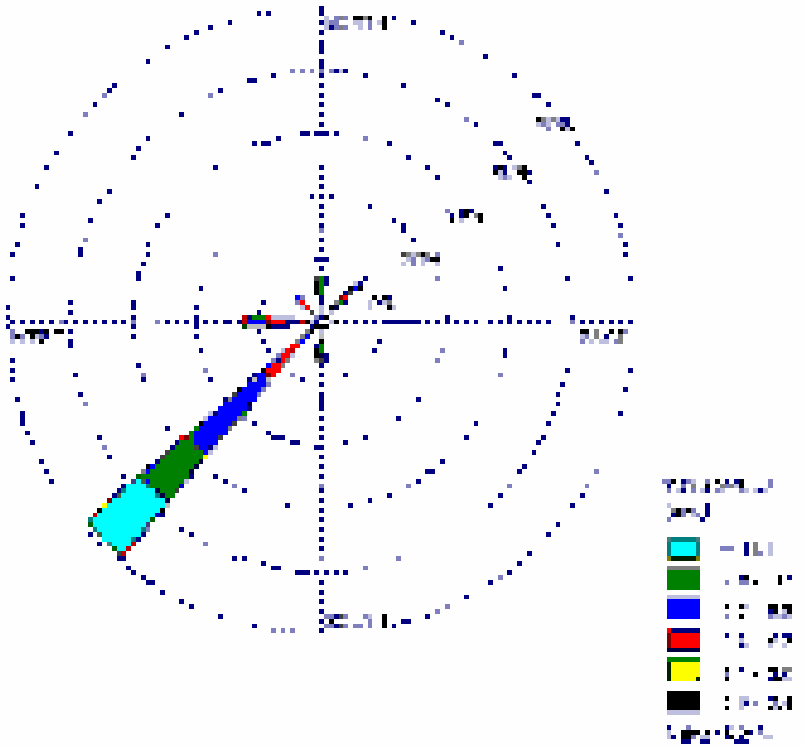
The proposed site is located at Jhimpir. According to the AEDP, it is a best air corridor. PMD data shows the wind speed of the area.

Table: Monthly Benchmark Wind Speeds for Jhimpir sites

	Monthly Mean Wind Speeds (m.sec-1)				
	30m	50m	60m	67m	80m
January	4.25	4.70	4.90	5.02	5.24
February	4.50	4.98	5.18	5.32	5.55
March	4.77	5.28	5.50	5.64	5.89
April	6.39	7.03	7.29	7.46	7.75
May	8.29	9.05	9.36	9.56	9.90
June	8.79	9.50	9.78	9.96	10.25
July	8.83	9.59	9.89	10.08	10.40
August	8.20	8.89	9.16	9.34	9.63
September	6.63	7.28	7.54	7.72	8.01
October	4.22	4.68	4.87	5.0	5.22
November	3.59	3.98	4.14	4.24	4.43
December	3.96	4.38	4.56	4.67	4.88
Annual Average	6.0	6.6	6.8	7.0	7.3

Source: Pakistan Meteorological Department

The typical wind rose map for Jhimpir based on the three year data (2002-2005) is illustrated below



Wind Rose indicates that most of the time the wind direction was southwest. The annual average wind speed is 6.68 m/s and the percentage when wind speed less than 2 m/s is 17.05% only

The wind speed distribution follows a Weibull-function and helps to identify each wind farm site according to its adequacy for wind energy exploitation and to meet project specific decisions such as the type of turbine that could be installed.

The wind rose is essential for TBCCPL wind farm design, as the exact positions of wind turbines depend on parameter configuration for each turbine site, taking into account the influences in wind flow between the turbines.

How Turbine Works

Power required in moving the wind turbine is available from the kinetic energy of the mass of air moving in the wind. As wind affects the blades of the rotor of a wind turbine, the rotor starts rotating due to the "principle of lift" just like as aircraft wings.

The performance of wind turbines based on that principle is at around 50% due to the relatively high lift-to-drag ratio, whereas simple turbines with small output (up to 2kW) or historic windmills operate according to the "principle of resistance" with a maximum performance of about 12%.

In most common wind turbine types, the rotational momentum of the rotor is being transmitted to a main shaft. A gear box increases number of revolutions per minute (rpm) and the high speed shaft is moving the generator unit thus producing energy.

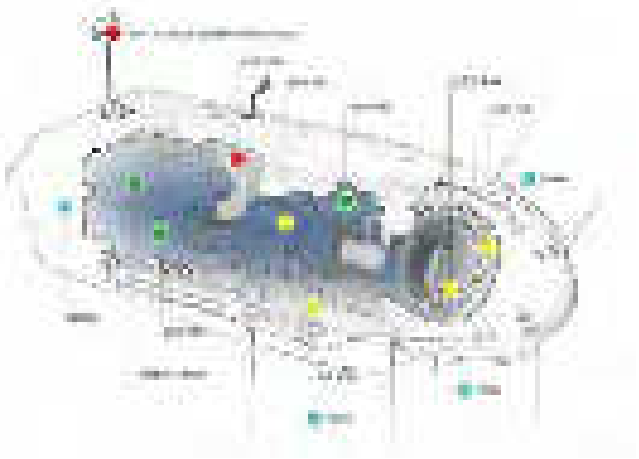
The basic components of a wind turbine are as follows:

1. **Rotor** – three blades, mounted on a hub – typical rotor diameters are 80-90m for today's larger machines. Blades are usually made from Glass Reinforced Plastic (GRP) and incorporate lightning protection measures. The picture below shows a single blade being transported to a wind farm site.

2. **Nacelle** – the "box" within which the main components are housed and home to the gearbox, generator and transformer as well as some of the control electronics. The picture below shows a nacelle being lifted onto the wind turbine tower (if you look closely you can see the construction team at the top of the tower waiting to fix the nacelle in to place)

3. **Gearbox** – converts the rotational speed of the rotor (typically 10-20rpm) to 1500rpm for the generator

4. **Generator** – converts rotational movement to electrical energy



5. **Transformer** – converts electricity from 415V or 690V to 11,000V for transmission down the tower. The transformer can be housed outside or inside the wind turbine tower itself.

6. **Tower** – usually steel, a cylinder supporting the nacelle and rotor. Typical tower heights are between 60m-100m. Cables run down the tower taking the electricity from the generator at the top, into the ground and then onto a connection point to the grid. Lifts or ladders allow maintenance crew to access the nacelle.

7. **Base** – a concrete base, typically 15m x 15m x 1m which acts as the foundation for the structure.

Operation of Turbine

When the wind blows the turbine hub turns into the wind. When the wind passes over the blade, the shape of the blade means that the air flows more quickly over one side of the blade than the other. This results in the turning of the rotor.

Wind turbines operate when the wind speed is within certain limits. There has to be enough wind for the blades to turn – typically 3-4m/s (or 7-9mph, 6-8 knots). When the wind speeds get to 25m/s (56mph, 49 knots), turbines typically shut down to protect the structure from excessive loads. Wind turbines are certified to specified levels and designed to the highest of these.

Instruments at the top of the nacelle (wind vane and anemometer) measure the wind speed and direction.

Control of the turbine

As wind speeds increase, so the energy generated by the turbine does as well. At some point where wind speeds are around 15m/s (34mph, 29 knots), the maximum (or rated) capacity of the turbine is reached. A limit has to be set to define the sizes of the various components – gearbox, generator, cables and rotor blades).

To control production of wind energy above the rated wind speed, the turbine can use various methods:

- **Variable pitch** – the blades of the wind turbine are feathered to limit the energy produced as wind speeds increase
- **Variable speed** – on some wind turbines, the rotor is allowed to speed up and slow down as the wind speed varies

In both cases, changes to the pitch or speed can happen several times a second so the wind turbine is always running in an optimized state for the wind conditions it sees, providing the most efficient extraction of energy from the wind and therefore maximizing renewable energy production.

All of the information about the wind turbines are recorded by computers and transmitted to an off-site control centre. Wind turbines are for the majority of the time self-sufficient although periodic mechanical checks are usually carried out every few months.

Wind Farm Efficiency

As wind passes a turbine's rotor, wind speed is reduced and air flow gets turbulent as shown in Figure below.

Wind turbines are influenced by turbulence which takes place resulting in wind speed reduction.

Wind farm efficiency is the factor (%) of total production of a wind farm in comparison to the sum of production of all individual turbines considered to be free of influence.

Nowadays, a farm efficiency of more than 41% is considered to have a good efficiency.

Wind Farm Components

A wind farm is composed of several indispensable installations, such as the proper wind turbines, turbines foundation, crane platform, access roads, intern cable trench, electrical evacuation power lines and grid connection components, the electrical substation.

Figure below shows a typical wind farm configuration:

Project Details

The proposed projects involves developing, owning and operating a 150 MW wind farm as three 50 MW Independent Power Plant project in Jhimpir, Sindh, Pakistan.

The generated electrical power will be purchased by the Central Power Purchasing Agency (CPPA)/NTDC and evacuated by the National Transmission and Dispatch Company (NTDC), which is responsible for the country-wide transmission of the electricity

Tricon Boston Consulting Corp Pvt Ltd (TBCCPL) Projects A, B & C each have been leased 3 parcels of 1,284 Acres of land totaling 3,852 acres in Jhimpir, District Thatta, Sindh for a period of 20 years by the Government of Sindh.

Project Development Steps

S.#	Steps	Status
Design Phase		
1	Letter of Interest (LOI)	Achieved
2	Land Allocation by Government of Sindh	Achieved
3	Micrositing	Achieved
4	Topographic Survey/Soil Investigations	Achieved
5	Grid Interconnectivity Study	Achieved
6	Selection of Turbine	Achieved
7	Selection of EPC Contractor	Achieved
8	Selection of O&M Contractor	To be decided
9	Feasibility Study	Achieved
10	Generation License	Achieved
11	Tariff Determination	Achieved
12	Submission of Performance Guarantee	Achieved
13	Letter of Support (LoS)	Achieved
14	Energy Purchase Agreement	In-Process
15	Implementation Agreement	In-Process
16	Financial Close	In-Process
17	Pre-Construction Phase	In-Process
18	Technical Drawings Development and Review	In-Process
Construction Phase		
19	Temporary Site Facility (TSF) Construction	
20	Construction of access roads and Installation of batching plant	

21	Excavation for WTG foundations	Future milestone/s
22	Steel Rebar Works	
23	Pouring	

S.#	Steps	Status
Construction Phase		
24	Construction of Sub-Station	Future milestone/s
25	Installation of WTG	
26	Excavation for Cabling	
27	Installation of equipments in Sub Station	
Operation Phase		

Project Location

Tricon Boston Consulting Corp Pvt Ltd (TBCCPL) projects A,B & C wind farms are located in Jhimpir region which is approximately 80 to 100 km east/ northeast of the city of Karachi in the south of Pakistan. Its topography can be considered generally as flat with an increasing height above sea level from about 30 to 40 m in the south up to 70 to 150 m in north-western direction. Some hill slopes of up to 160 m above sea level do exist in the centre and in the north of the region. The roughness is lower in the southern part.
The complete area is characterized of being dry land and with agricultural activities (mainly in its southern part). Jhimpir village is located in this area, although it is not included within the defined wind farm region. In the rest of the region scattered human settlements can be found.

Site Layout

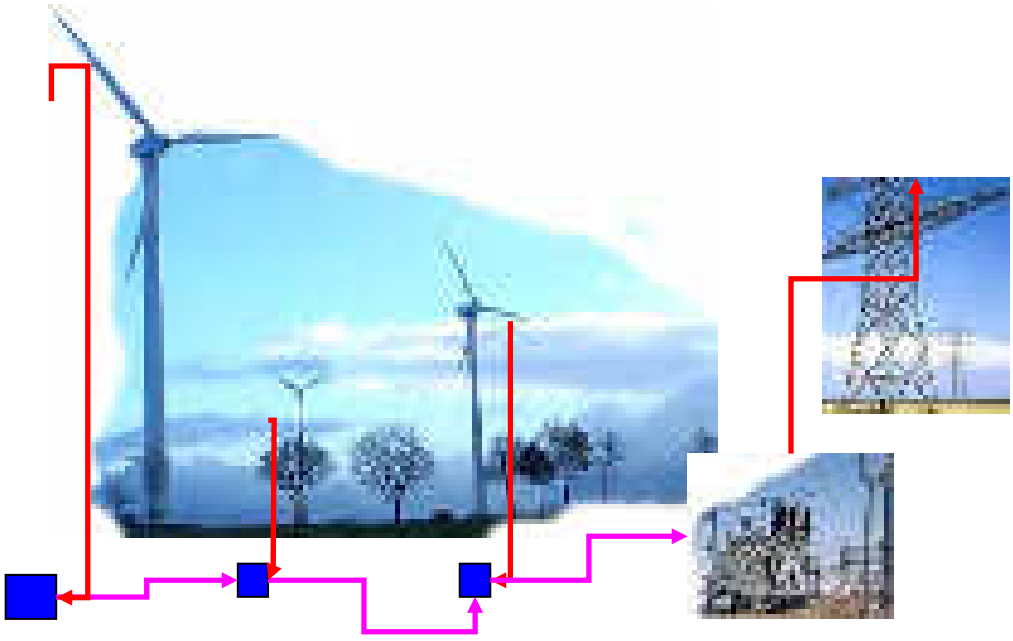
Based on the micrositing data, TBCCPL project A, B & C is likely to have the layout similar to the one as shown below

.

Wind Farm Components

The project components are:

- 29 turbines of 1.7 MW turbines have been selected having rotor diameter of 103 m. Each turbine will be mounted on a tower such that the hub height is 80 m and tip height around 130 m. The tower will be a prefabricated steel structure.
- 29 step up transformers mounted at the foot of each turbine tower
- Underground electrical collection system that leads to the project substation.
- Project operations and control building, which will also house the substation and grid connection to NTDC system.
- Project road network linked to all the wind turbines.
- Two meteorological masts, 100 m height, for collection of wind data.
- Plant O&M facility.
- Camp Site
- Standby generator



Logistics

All equipment, supplies and personnel will be moved to and from the site using road transport. Description of existing roads, additional roads required, and the vehicles to be used are given below.

Roads and Tracks

The project area is connected to Karachi via the Super Highway and the Nooriabad connecting road.

The area's existing tarmac roads will be used by project vehicles as they are, and no improvement will be required except for upgrading of the road leading from Nooriabad to Jhimpir windfarm area. This will entail widening, spreading gravel and compaction at selected locations and construction of lay-bys for ease of heavy transport movement. Road is around 25 km long and Government of Sindh is managing the road widening activity and infrastructure support is Government responsibility.

Vehicles and Traffic

The movement of heavy vehicular traffic will primarily be during the turbines delivery stage and during the movement of the batching plant and ancillaries. The batching plant usually requires the use of 4 flatbed trailers of 40-feet size with a load carrying capacity of 30 - 35 tons. The movement of the turbines and towers will occur over a two month period and will require 231 heavy haul truck / trailers, 60-feet size, with extended length and multiple axles having a load carrying capacity of 40 -70 tons. Additionally, 66 trucks / trailers of 20 - 25 ton capacity will also be used. A specialized crane will be used for the installation of turbine at a height of around 100 m.

A maximum of 6 vehicles (4 axles and above) per hour will be used during the construction period. This includes the buses and coasters required for movement of the site staff.

Project Schedule

It is expected that work on the projects will commence during the last quarter of 2016. Work will commence with the construction of the access road and site preparation (civil works). The construction phase is expected to take 15 months. The schedule of activities is expected to be as follows:

- Feasibility report submission to AEDB—
- Selection of Turbines---
- Generation License---
- Tariff determination with NEPRA
- Financial Closure for wind risk policy---

- Arrangement for investors/Financing ---
- Civil construction - roads:
- WTG foundations:
- Electrical construction start:
- Turbine delivery: October -
- Substation transformer(s) at site:
- Substation commissioned:
- Collection system commissioned:
- Turbine commissioning:

Selection of Wind Turbines

Based on the micrositing data, TBCCPL has evaluated the turbines of different manufacturer's and decided about the selection of WTG on the basis of following:

- Technology offered and the WTG efficiency and its impact on financial viability of the project
- Experience of existing wind farm operators in Jhimpir region
- Compatibility with the Grid

TBCCPL has selected GE 1.7-103 WTG and the Noise assessment and flickering impact is based on GE 1.7-103 WTG.

Selection of EPC and O&M Contractors

TBCCPL has selected HydroChina as EPC Contractor and GE as O&M Contractor. Al Bario local contractor for GE will work under GE during Operations phase.

Construction Activities

EPC contractor on receiving the Notice to Proceed (NTP) will initiate through its sub-contractors, the construction of Temporary Site Facility (TSF) and access roads.

TSF layouts and access roads layouts will be reviewed by the TBCCPL Civil Construction Engineer and Lender's Engineer for all technical aspects while HSE Consultant will review the layouts for HSE and CSR compliance requirements (international lenders and local laws) incorporation during the design phase.

The site construction camp will cover an area of 30,000 m2 and will have 4 construction trailers and 4 equipment storage trailers. There will also be vehicle parking, workers accommodation, steel yard and equipment staging areas.

The water pit will be lined with an impervious liner to prevent seepage and loss of water. Sewage septic tanks will be lined. These will be periodically emptied into tankers for transporting the sewage to the nearest treatment

facility. Nearest facility is around 85 km away and managed by Government. Gray water (from kitchen and washing areas) pits will not be lined, and water will be allowed to soak into the ground.

All fuel or oil storage areas will have an impervious base, with a containing dyke built around them to contain spills should an accident occur.

TBCCPL Civil Construction Engineers, Owner's Engineers and Lender's Engineers will review the wind turbine foundation technical drawings before the start of the excavation activities, steel works and pouring.

Each turbine location will involve compaction of around 4647 sq ft (36m x 12m) area, raising to an elevation of 4.5m, corresponding to the level of the road, and covering with a compacted gravel and clay surface {moram type material). This area will be the crane locating pad.

The excavated earth, obtained during the foundation construction will be used to construct the embankment for the road and for back filling. The remaining material required for the road embankments will be from the site.

The turbine manufacturing will have a supervising engineer onsite during the installation phase and the commissioning engineer during the start-up phase.

Installation of the sub-station is likely to be done by EPC contractor sub-contractors

Civil works will also include the construction of the Sub-station and site camp preparation. The steps taken in site preparation are expected to be as follows:

- Clearing of vegetation from identified areas
- Filling and compaction
- Construction of auxiliary facilities such as site camp, equipment and supplies storage areas, water tank and water pits, fuel storage areas and waste pits.
- Construction of the turbine foundations and the crane pad

The equipment installation phase will commence once the above activities have been completed. No fabrication at site will take place as all components are prefabricated and only assembly is required.

Staff

It is planned that, on an average, around 600 direct manpower will be required

during the peak construction phase. Local people will be hired for unskilled and skilled (depending on skill availability) jobs, especially during the construction phase and for security purposes.

Supplies

All supplies, both for construction and for the camp, will be transported by trucks from either Karachi or the adjoining areas, as required. This will include all fuels and oils, drilling requirements, spare parts for the construction machinery and food and supplies for the construction camp. Fuels and oils will be unloaded in designated areas.

The onsite storage capacity for fuel will be 30,000 gallons, consisting of 5 steel tanks of 6000 gallons each. The total fuel requirement is estimated to be 5.49 ML.

Water

During the construction phase an estimated 558,900 m3 of water will be required for civil works. The daily maximum will be around 6000 liters of water for civil works. The onsite storage capacity of water will be approximately 24,000 liters. This water will be obtained from the either the tube wells or lake or water tankers.

The camp will require 20,000 liters of potable water each day and this water will be stored in a plastic tank.

Electricity

The expected maximum requirement of electricity for construction and the camp is 1100 KVA. Diesel generators will be used for power generation to operate the construction equipment and for the camp. It is expected that 3 generating sets of 550 KVA each will be sufficient for the requirements. The welding generators will be in addition to the above generating capacity. The daily fuel requirement will be around 15000 liters.

Emissions from the generators will be reduced by ensuring that the engines are always properly tuned and maintained, and generators will be located so that emissions are blown away from the camp and work areas.

Waste Management

All efforts will be made to minimize waste generated during the construction period. The main types of waste that will be generated are:

- Fuels and oils
- Garage waste
- Sewage
- Camp waste

The foundation construction is not likely to generate any waste as bulk concreting will be done using concrete pump wastage of concrete will be minimal.

Fuels and oils will be stored in containers in areas with impervious floors and surrounded by dyke walls. Recyclable materials will periodically be transported out of the site and sold / given to contractors. Non-recyclable material will be collected and disposed of at designated landfill sites.

Most garage waste, such as used spare parts, is recycled in Pakistan. All such waste will be collected and sold / given to contractors for disposal off-site.

As part of the site preparation stage, a drainage and sewerage system will be constructed for the camp. The sewerage system will consist of soak pits for the collection of waste water from the camp kitchen and washing / ablution areas.

Sewage from the toilets will go into lined septic tanks. Sewage and solid waste disposal trucks will be used to remove the sludge, sewage and solid waste from the site.

All combustible domestic waste will be collected , suitably fenced to prevent it being blown away. Any non-combustible and non-biodegradable waste, such as glass, metal and plastic, will be separated and transported out of the site area, where it will be sold / given to a contractor for recycling or disposal at designated sites.

Noise

The generators and other heavy construction machinery will not produce excessive noise which will exceed the limits at the boundary of the plant. Workers near these machines will use appropriate PPE. Canopies will be used to act as noise barrier and limit the exposure of high noise to the work force.

Operational Activities

O&M 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.

Staff

There will be no residential staff at site once the operation commences. It is planned in addition to the security staff, a maximum of 30 operational people will be employed on three shifts to monitor the windfarm operations from the control room set in Nooriabad. . Security staff will be resident on site.

Supplies

All supplies, both for operations and for the site staff, will be transported by trucks from either Karachi or the adjoining areas, as required. This will include all fuels and oils, spare parts required for maintenance. Fuels and oils will be unloaded in designated areas, which will have above ground storage for 20000 gallons of fuel.

Water

Not more than 1500 liters per day of potable water will be required.

Waste Management

The drainage and sewerage system constructed during the construction phase will be used during the operations phase of the project i.e. soak pits for the collection of waste water from kitchen and washing / ablution areas and septic tanks for sewage from the toilets. Sewage and solid waste disposal trucks will be used to remove the sludge, sewage and solid waste from the site.

Noise and Flickering Effect

Once the turbines are in operation a simulation study of the noise and flickering effect that will be generated by wind turbines during operation will be conducted. Currently based on the data available w.r.t 1.7 MV turbines noise and flickering effect was calculated and detailed in environmental aspect and impact section.

Decommissioning Activities

The design plant life is 20 years. Decommissioning will involve the dismantling of the turbines, supporting towers and the Administration building / sub-station, and transporting it out of the project area. It is expected that this activity will take approximately 04 months and will require 300 heavy haul trucks (60-feet size) for the turbine components in addition to 1500 truckloads of other materials. The turbine components will be sold as scrap, and all the concrete will be broken up and removed to a landfill site. The stored fuel and oil, together with the containers, will be transported out of the site for sale / disposal at suitable landfill sites. The site road embankments will be leveled and the material spread evenly over the whole site. The site will be restored as far as possible to its original condition. The access roads may be left intact, if local people desire to use them. If not, they too will be dismantled and the land returned to its original condition.

6

Integrated Initial Environmental Examination Study

Since TBCCPL will be undertaking simultaneous construction activities of Project A, B & C with construction completion time frame of 13, 14 and 15 months respectively, therefore this section details the environmental aspect identification and impact analysis due to integration of project construction activities mainly during the civil construction and mechanical installation phases.

This section also identifies the positive environmental impact w.r.t. resource efficiency due to integration of project construction activities.

Following environmental aspects have been identified which may have an enhanced negative impact due to parallel construction activities at Project A, B & C. The environmental aspects and their mitigation measures are detailed below.

Environmental Aspect	Environmental Impact	Mitigation Measures
Simultaneous WTG Excavation activities and Sub-Station Construction at Project A, B & C	Dust Emission	Water showering frequency to be increased
Batching Plant Operation	Stress on water resource	
	Cement Bag waste generation	Environment friendly disposal
	Emission from Equipment exhausts	Preventive Maintenance. Monthly monitoring during initial three months and then quarterly monitoring
Increase in transportation during Pouring	Dust Emission	Water showering frequency to be increased
	Emission from Equipment exhausts	Preventive Maintenance. Monthly monitoring during initial three months and then quarterly monitoring
Increase in equipment transportation during equipment	Traffic Congestion on Highway and connecting roads	Traffic Management Plan in coordination with Motorway Police and Local authority
Equipment Installation	Packing Material waste	Environment friendly disposal
TSF office activities	Paper waste	Environment friendly disposal

Staff & Workers Accommodation activities	Sewage waste	Treatment methods through water hyacinth plant will be explored for re-use of water instead of disposal after septic tank Incase if the re-use of water is not feasible then sewage water from the lined septic tanks will be collected in tankers and send for treatment plant located in Hyderabad
	Kitchen/Canteen Waste	Environment friendly disposal. Prevention from decay of leftover food material which attracts kites and crows.

Following environmental aspects have been identified which may have an enhanced positive impact due to parallel construction activities at Project A, B & C.

Environmental Aspect	Environmental Impact
Construction of single TSF instead of three separate TSF's at Project A, B & C	Reduction in construction material and water consumption during construction.
Single TSF Operation	Reduction in fuel generator fuel consumption during TSF operations
Parallel labor intensive activities during civil construction phase	Higher Local Employment Rate for civil works

7

Site Selection Phase Environmental Impact Assessment

7.1. Displacement of existing land use and other environmental resources

The land for the proposed wind farm is the property of Government of Sind. Government of Sind has leased the land to the Alternate Energy Development Board which has sub-leased the land to project proponents

The total area of newly acquired land is 325 acre out of which not more than 200 acre will be actually utilized for the construction and installation of wind turbines. Before the lease of the land by AEDB, it was not utilized for the agriculture purpose.

There is absence of following since the last few decades on the major part of the land which will be utilized for the construction of the wind farm

- Any agriculture activity on the land.
- Any habitat of permanent existence.
- Any commercial activity on the land to support the livelihood of local residents of nearby villages
- Any human settlement on the land
- Any green field or wet land or sanctuary

Conclusion

Extent of displacement of existing land use and other environmental resources	❍ = No impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.2. Destruction of environmentally sensitive and critical areas

The proposed Wind farm is not located near any wetland (nearest is Keenjhar lake located at more than 20 km from the project site), mangroves, forest. Beside these, there is no existence of archeological sites within the 25 km of the project location.

The other environmental parameters like air and noise pollution will be limited within the NEQS and their interaction with the environmentally sensitive and critical areas will remain under control and minimized,

Conclusion

Destruction of environmentally sensitive and critical areas	❍ = No impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.3. Existence of hazards from adjacent land use

The proposed Wind farm is located on the land which is the principal property of Government of Sind and there is absence of any activity on the land since the time (which is more than 60 years) it was taken into possession by Government of Sind after independence.

The land adjacent to Wind farm will also be developed by other wind farm project proponents and currently there is no influx of any hazardous impact on the TBCCPL wind farm. In case of any development on the adjacent lands, there is very remote chance that the air currents and air flow will be restricted by the development. However since all the development activities in this region will be related to wind energy, therefore every proponent will be developing the project after gathering the micrositting data in order to maximize the power potential of the project and turbine.

Conclusion

Existence of hazardous from adjacent land use	❒ = Low impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.4. Existence of hazards to residents/human settlements from air pollution due to frequent temperature inversions

There is no temperature inversion reported in the metrological data for the project site during the last 30 years.

Conclusion

Existence of hazards to residents from air pollution due to frequent temperature inversions	❍ = No impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.5. Displacement of other site users

The land for the proposed Wind farm is the principal property of Government of Sind and there is absence of any activity on the land since the time (which is more than 60 years) it was taken into possession by Government of Sind after independence.

The survey of the proposed Wind farm site and the review of record available with town Government reflect that the land was never used for any waste disposal, deep mining, oil and gas extraction, industrial activity,

groundwater schemes etc. Also the onsite survey of the proposed project location identifies that there is no formal and established human settlement on the project location and the adjacent areas. Taking into account the 11 km length of the project area, any human settlement located in the mid of the area will remain settled their provided the settlement location is the coordinate for the wind turbine or the settlement location is creating barrier. In that case the human settlement will be provided land for settlement in the same area strip and all polices of IFC/World Bank and lending agencies will be followed for the establishment of human settlement.

Conclusion

Displacement of other site users	❒ = Low impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.6. Destruction of resources of historic or cultural significance

The land for the proposed Wind farm is the principal property of Government of Sind and there is absence of any activity on the land since the time (which is more than 60 years) it was taken into possession by Sind Government.

The survey of the proposed Wind farm site and the review of record available with City District Government reflect that the land was never used for any waste disposal, deep mining, oil and gas extraction, industrial activity, groundwater schemes etc. Also the onsite survey of the proposed project location identifies that there is no established human settlement on the project location and the adjacent areas. There is no structure and building of historic and cultural significance on the proposed location and the adjacent lands.

Conclusion

Destruction of resources of historic and cultural significance	❍ = No impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

7.7. Availability of existing infrastructure and services

Roads, Electricity, Gas, water, telephone, transport, schools, colleges, parks, playgrounds, hospitals, postal services, etc are identified as the infrastructure needs and service requirements.
The road network was already in place before the idea for the proposed project was conceived.

After the installation of proposed wind farm, basic infrastructure facilities related to education, health will be provided to local population and no resources already provided by Government to the area will be shared in this project.

Conclusion

Availability of existing infrastructure and services.	❒ = Low impact

Extent of Impact
❑❑❑ = High
❑❑ = Medium
❑ = Low
❍ = No impact
✓ = Locally favorable
✓✓ = Regionally favorable

7.8. Depletion of resources and overtaking of traditional industry

Due to the current economic meltdown, there is abundance of construction resources as the construction industry has slowed down. The prices of steel, cement, bricks, wood, tiles, glass etc have come down due to decrease in the local and export market demand.
There is no existence of traditional industry in and near the proposed project locations except for fishing.
Conclusion

Depletion of resources and overtaking of traditional industry	❒ = Low impact

Extent of Impact
❑❑❑ = High
❑❑ = Medium
❑ = Low
❍ = No impact
✓ = Locally favorable
✓✓ = Regionally favorable

8

Project Design Phase Environmental Impact Assessment

8.1. Impact on natural habitat within project areas

The land for the proposed Wind farm is the principal property of Government of Sind and under its current condition it is in barren condition with the absence of following since the last few decades

- Any agriculture activity on the land except for few small portions of land under cultivation only when water is available.
- Any habitat permanent existence
- Any commercial activity on the land to support the livelihood of local residents of nearby villages
- Any human settlement on the land is not identified as hamlets are inhabited when the water is available in the area, otherwise local population move with their livestock /cattle in other areas
- Any recreational activity for the local settlement and visitors.
- Any green field or wet land or sanctuary. Keenjhar Lake is located at a distance of more than 20 km from the project site

Conclusion

Loss or damage to natural habitat and recreational areas	❍ = No Impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

8.2. Depletion and pollution of local ground water

The land for the proposed Wind farm has water table at a depth of below 20 feet.

Since the proposed project will not need any water resource during the operation phase nor it will discharge water, therefore ground water table is not contaminated

Conclusion

Depletion and pollution of local ground water	❍= No Impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

8.3. Degradation of habitat from inappropriate or introduction of invasive exotic species

The proposed Wind farm is located on a land which is completely barren with no vegetation and any living habitat with permanent settlement.

During the activities related to infrastructure development, utilities provision and Wind farm construction there is remote possibility that any habitat will be uprooted.

The activity of wind farm construction is not likely to introduce any invasive species in the project area

Conclusion

Degradation of habitat from inappropriate or introduction of exotic species	❍ = No Impact

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact

✓ = Locally favorable
✓✓ = Regionally favorable

8.4. Solid waste management

The proposed project is likely to cause an increase in the solid waste in the form of machine parts, used oil, grease etc when the Wind turbines will undergo maintenance. Solid waste most likely to be generated will be categorized as organic waste consisting of food waste

Poor handling of solid waste will result in

- Smell in the surroundings
- Contaminating the land

Conclusion

Solid waste management	❒❒ = Medium impact

Extent of Impact
❑❑❑ = High
❑❑ = Medium
❑ = Low
❍ = No impact
✓ = Locally favorable
✓✓ = Regionally favorable

9

Construction Phase Environment Impact Assessment

Environmental Aspect and Impact Assessment is to identify key areas of potential impact to the environment, and in particular the valuable ecosystem components found in the Project area that might be adversely affected by Project activities. From this analysis, all areas are identified and assess all of the potential impacts of the Project on the environment. These areas are:

Construction Issue

The civil construction works for the project would consist of the following main tasks:

- Establishment, site access, site preparation
- Road construction to construction vehicle standard
- Foundation excavation and stabilization plus required hardstand areas for construction
- Foundation concrete
- Excavation of trenches for underground cables
- Final surface for roads
- Site re-vegetation and restoration
- Fencing

The construction of wind turbines requires the preparation of a level hardstand area adjacent to tower foundations. The hardstand is required for assembly of the turbine and rotor and positioning of the crane that will lift the nacelle and rotor blades into position. The potential area of disturbance at each wind tower site is up to 50m x 50m.

Conclusion:

Wind farm construction is the most crucial phase because it generates the environmental impacts. These impacts are generates due to work on the site. Raw material handling, piling and boring etc.

Impacts due to the production of raw material, mostly steel, concrete and aluminium, which are very intensive in energy consumption, but the energy production phase from wind is clean because no emissions are released from the turbine.

The impact is low because construction of wind farm is not taken long time. The overall construction period is about 9-10months. Hence this period causes short time impact.

Extent of impact on Construction	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Land use/Visual Impact

Wind turbines can cause a visual impact on the landscape, although opinion on this impact is divided. In Europe developers are obliged to avoid the most sensitive landscapes, such as national parks or areas of natural beauty. They undertake significant assessments of the visual effect on the landscape when preparing planning applications. On the other hand, in Pakistan proposed site is not an Archaeological or any other significant site. Kenjhar lake (Ramsar site) present about above 20 kms far from the site.

The Land used for the installation of turbines, transformers and worker living purpose and the remaining land let off the same condition.

Conclusion:

The proposed site conditions entirely different to the Europe. The site has much more wind potential area according to PMD report. TBCCPL only has less than 40 % of the total allotted area for installation of wind turbines. The site is not well developed, it is considered as a rural area. There is no archeological site and

agricultural land near to the proposed site. Villages are presents but far from the site.

A number of surveys during the Public Consultation meetings conducted during IEE study as well as during Stakeholder Engagement meetings have demonstrated that public concerns regarding the landscape and visual effects of wind turbines are significantly reduced that the turbines have no effect on the general public's perception of areas where they are located.

The installation of turbines not taken large areas. A minimum gap between the turbines is about 50-60 meters. Land can be used for agricultural purposes in buffer areas by the locals in case of rain water availability.

Extent of impact on Land use	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Habitats and plants

The habitats and plants present on site have been thoroughly assessed, and no rare habitats were identified. Some local plantation is found during the surveys.

Conclusion:

The impact is low because there is no evidence that there endangered species are present. Some habitats and plants may be removed during the construction, and due to the large vehicle movement. Such plant communities and habitats and those areas have been taken into account in the layout of the wind farm so as to minimize any potential impact.

To reduce or minimize the habitat and plant issue, the layout of the turbines and site infrastructure has been designed to avoid any significant impact on those species.

Extent of impact on Habitats and plants	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Wild life

The wind power energy is a clean energy. They are not producing harmful impact over the wildlife as compare to other energy resources. The list of environmental and wildlife impacts of other energy sources are long and varied, including:

- Habitat impacts from mining (coal, uranium), drilling (natural gas, oil), and compressing fuel (natural gas). Some of these effects are local, while others can extend over fairly broad areas.
- Habitat impacts from air and water pollution: acid rain, smog, mercury, drilling waste,

water disposal (fossil fuels).

- Habitat impacts from global warming (fossil fuels). Significant changes in some species' ranges are already occurring.
- Habitat impacts from thermal pollution of water (nuclear and fossil power plants).
- Habitat impacts from flooding of land and stream flow changes (hydro).
- Habitat impacts from waste disposal (coal).

While wind plants and their construction definitely have local impacts, the use of wind energy largely avoids these more far-reaching effects.

Special surveys have been undertaken for collecting data of all species whether these are in rare and protected species.

Surveys have been undertaken for rare and protected species, which could potentially be found on the site. Species which are found during the survey

are not including in the endangered species. The layout of the wind farm and access roads has been designed to ensure that these species remain undisturbed, and evidence collected from the IEE surveys concludes that none of the species referred to above will be affected during either the construction phase of the wind farm.

Conclusion:

The impact is short term because the construction work will be completed in 9-10 months. All staff which are present during the construction days will be trained that they are not involve in hunting any kind of wildlife.

Extent of impact on Wild life	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Birds

Pakistan gets a large number of guest birds from Europe, Central Asian States every year. The birds from north, spend winters in different wetlands and deserts of Pakistan, which are distributed almost throughout the country, from the high Himalayas to coastal mangroves and mud flats in the Indus delta. And, after winters they go back to their native habitats.

The proposed site is located at Jhimpir which is above 20 km away from the Kenjhar Lake, a Ramsar site. During the winter season those migratory birds are coming from the cold regions of Europe. Hundreds thousands of birds spend their winter at the lake and its adjacent area. The proposed site is approx. 20 km away from the lake. Birds use the lake for feeding and breeding purpose.
During construction of the wind farm, the possible effects of the birds are:

Noise - birds may be scared away from the usual location by construction noise or the presence of vehicles. During construction roads or path may physically destroy the birds feeding, breeding and roosting site.

Conclusion:

The chances of damaging the feeding and breeding of the birds sites is low because the proposed construction will be start from March and completed in November. In those months migratory birds are not present since Winter Migration starts from early Nov and back migration starts from February. The construction impact of local birds is low because there is no need of heavy machinery after the construction of wind farm.

Extent of impact on birds	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Soil contamination

The topography of the land along the proposed turbine locations generally plain valley with few to frequent rock outcrops and steep hills. This description of the site geology is based on the soil testing. Soil testing report is attached. Due to the non-erodible nature of the soils present on the proposed site, erosion and sedimentation control would not be an important issue for soil management. Activities such as the construction of site access tracks, foundation construction, ancillary works and cable trench construction and vehicle movement results around the site could not increase the levels of erosion from the site.

During excavation activities, materials are encountered which are not suitable for reuse on the site, these would be stockpiled prior to removal from the site and disposed of by a suitably qualified contractor in accordance with EPA requirements.

The low potential for contamination of soil at the site would be prevented by measures incorporated into the EMP to control the handling of any substances that may result in soil contamination.
The initial soil assessment indicates that site geological conditions do not pose any significant constraints to the construction of the turbine foundations. TBCCPL may commission further soil assessment in order to determine the exact sizing and depth of burial required to satisfy the design requirements.

The initial soil assessment indicates that site geological conditions do not pose any significant constraints to the construction of the access tracks or substation foundations. A granular base may be required in order to facilitate all weather access and minimize maintenance of tracks.

General erosion and sediment control measures would include:

• Keep open areas of excavation to a minimum.
• Maintain sediment control structures along drainage lines to prevent the transport of sediment from the site.
• Stockpiles of materials should be located away from drainage lines and formed with sediment control structures placed immediately down slope.
• Control drainage in areas of construction using surface drains and bunds.
• Dust suppression of construction areas using a water truck.
• Minimization of traffic in construction zones and use of a dedicated parking area i.e. site compound.
• Revegetate disturbed areas i.e. around turbine foundations as soon as practical.

Conclusion:

Mainly solid waste generated during the construction phase and hence the impact is low because the solid waste is collected and reused and other material which are not reusable are sold for recycling purpose.

Extent of impact on Soil contamination	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑ = High
❑❑ = Medium
❑ = Low
❍ = No impact
✓ = Locally favorable
✓✓ = Regionally favorable

- Noise

Construction noise is really a wide range of problems, Common construction noises include the sound from vehicles/cranes and their engines, the sound of vehicles tires, Construction noises are audible differently in each vehicle, simply because each auto maker designs and produces vehicles noise differently.

Conclusion:

The impact is low because the proposed site is not dense populated area, villages present but far from the site. The construction noise is local they cannot produce long term effects. Proper maintained vehicles are used during the construction period for minimizing the effect.

Extent of impact on Noise	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Air Quality

Dust emission is the major concern of air pollution during construction of the project. Site formation, foundation construction, cable laying, wind turbine erection and landscaping works are the main construction activities. Wind erosion, materials handling, on-site stockpiling and vehicles movements are the major dusty activities.

The site area is large, a mix of plain and hilly terrain, the construction period is short with minimum construction activities. The minimum distance of villages from the site is about 4-5 kms. Air Quality, as a result of the construction works, is not expected to deteriorate significantly. Therefore, with the implementation of dust suppression measures, the potential for causing dust impacts is very low.

Conclusion:

In order to reduce the dust emissions during construction phase, the following dust suppression measures stipulated and implemented by the Contractor.

- Covering entirely by impervious sheet or frequently watering of the on-site stockpile of excavated materials to keep wet always before backfilling.
- Frequent watering of exposed area or worksite of excavation to maintain surface wet, if necessary and practical.
- Imposition of speed controls for vehicles and unpaved site roads.
- Well-maintained diesel-powered mechanical equipment to avoid black smoke emissions.
- Shut-down of diesel-powered mechanical equipment or trucks inside the worksites when they are not in operation.
-

Extent of impact on Air quality	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Safety Hazards

Safety hazards related to the construction are

- Falls at the same level

- Falls against an object
- Falls from vehicles/equipment
- Falls from stairs, ladders and ramps
- Falls from one work level to another
- Falls into/through openings
- Reaching beyond the work surface
- Walking off unguarded edge
- Carrying objects
- Slippery surfaces
- Climbing onto or from work surface
- Using machinery or equipment
- Weather conditions: heat, rain, and/or winds

Conclusion:

Eliminate Falling Objects

- Maintain good housekeeping
- Dispose of left over materials
- Secure materials, tools, parts on hoists
- Eliminate over-head work of welders and burners—when unavoidable every effort to catch the fire must be made

Eliminate Lighting Hazards

- Preplan to limit exposures in non-daylight hours
- Use good lighting to illuminate work areas, pathways, corridors, hall ways, working platforms
- Have a supply of flashlights

Eliminate Weather Related Hazards

- Keep work areas cleared, dry, sanded, covered, barricaded, or protected
- Use temporary bracing
- Use personal protective equipment

Eliminate Electrical Hazards

- Instruct crew members on location of all sources of electrical power and proper work practices including that equipment must be grounded or double insulated
- Tag, barricade and post warning signs in hazardous areas

- Watch distances when transporting ladders, or scaffolds, or other materials
- Flag roof mounted weather heads to prevent tripping or falling over power lines

Eliminate Slipping & Tripping Hazards

- Maintain good housekeeping
- Look for and remove nuts, washers, cords, rope & tools
- Keep loose parts and pieces in secure containers or non hazardous area
- Clean up and properly dispose of left over materials
- Pay attention to work surfaces; for mud, sand, water
- Clean up oil, grease, paint, fireproofing, & dust

Extent of impact on Safety hazards	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Archeological Site

There is no archeological site exist.

Extent of impact on Archeological site	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Social Impact

The proposed project will produce the jobs during the construction. Local people will employ for work on the site. The local workers will increase their local living standards.

Conclusion:

The project will provide local benefits including:

• Local employment and contracts, where possible, during construction and ongoing maintenance
• People earnings are increased.
• People living standards are improved.

Extent of Socio-economic impact	✓ = locally favorable

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Compliance of Contractor and Subcontractor with the national minimum wage law, Pakistan Labor Laws and IFC/ADB Health, Safety and Environment (HSE) requirements

Tricon Boston Consulting Corp has ensured through formal contracts with EPC and bind them for compliance with Pakistan Labor laws including minimum wage, child labor, forced labor, harassment, working hours, etc and HSE for their as well as their sub-contractor activities

Extent of HSE and Social Compliance impact	❑ Low

Extent of Impact

❑❑❑ = High
❑❑ = Medium
❑ = Low
❍ = No impact
✓ = Locally favorable
✓✓ = Regionally favorable

10

Operational Phase Environment Impact Assessment

- Land use

The proposed site has a slightly hilly terrain at some points. The land is not used for agriculture purpose The total area of the wind farm is 3852 acre and only 20% required for wind farm establishment and the remaining land is available for livestock grazing (Govt. policy require). The wind farm doesn't impose any harmful effect on the land.

Conclusion:

No harmful effect on the land as wind is a cleaner technology.

Extent of impact on Land use	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Birds

Bird's mortality associated with the wind farms, when they are operation. Birds fly into the turbine tower or the blades and be killed or injured, and are particular risk of doing so in storms or conditions of poor visibility. Poorly sited wind farms have caused some major bird casualties.

Conclusion:

The migratory birds are coming from the cold regions and they spent their winter season at the proposed site because the site is near to the Kenjhar

Lake. Birds are killed or injured when they fly, the danger posed by rotating blades. The ratio of bird's mortality is minimum as compare to the birds are killed during hunting. Thousands of birds are hunted during the winter season. Birds are killed in urban areas.

Statistics on Birds Mortality (Source: http://www.greentechmedia.com/articles/read/Windpower-and-Bird-Fatalities)

Wind turbines ----0.1%
Communication towers----2.5%
Pesticides----7%
Vehicles----7%
High tension lines----8%
Cats----10%
Buildings and windows----55%
Others----10%

Extent of impact on Birds	❑❑ = Medium * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Soil contamination

Potential soil management issues during operation are similar to those identified during construction, although on a smaller scale, with:
• Potential for soil erosion from runoff discharge points (around the substation and control building), and general erosion from runoff around the site, such as from site access tracks and parking areas; and
• Potential for soil contamination from possible spills of chemicals used in operations and maintenance activities, such as lubricating oils within the turbines, transformer oil within the substation, or paints.

Conclusion:

In the Operational phase of the wind farm to ensure an adequate standard is applied to erosion and sediment control for the operation and management of the site.
Chemicals, such as oils and paints, are kept within the dedicated storage area in the site control room. This area will be sealed and designed to incorporate appropriate containment to prevent discharge of any spills to the ground. Transformers would be located within a bunded area of the switchyard.

Extent of impact on Soil contamination	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Noise

Sound (noise) from turbine operation comes in three main forms – broadband, tonal, and low-frequency. Improved engineering of large wind turbines has all but eliminated mechanical sounds from gearboxes, etc.

Complaints tend to center on the sound of turbine blades interacting with wind. A wind turbine creates sound pressure of 50-60 dB (A) (a decibel measurement) at 40 meters. For comparison, a busy office measures 60 dB (A), and nighttime ambient noise in the countryside (leaf rustles, etc.) measures between 20-40 dB (A).

Conclusion:

Virtually everything with moving parts will make some sound, and wind turbines are no exception. However, well-designed wind turbines are generally quiet in operation, and compared to the noise of road traffic, trains, aircraft, and construction activities, to name but a few, the noise from wind turbines is very low.

Wind plants are very, very quiet compared to other types of industrial facilities, such as manufacturing plants, but most industrial plants are not located in rural or low-density residential areas. In those types of areas, background noise tends to be lower than in urban areas.

On the other hand, wind plants are always located where the wind speed is higher than average, and the "background" noise of the wind tends to "mask" any sounds that might be produced by operating wind turbines, especially because the turbines only run when the wind is blowing.

An operating wind farm at a distance of 750 to 1,000 feet is no noisier than a kitchen refrigerator or a moderately quiet room.

Source/Activity	Indicative noise level dB (A)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom 35 Wind farm at 350m	35-45
Car at 40mph at 100m	55
Busy general office	60
Truck at 30mph at 100m	65
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Extent of impact on Noise	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

Wind turbines most commonly produce some broadband noise as their revolving rotor blades encounter turbulence in the passing air. Broadband noise is usually described as a "swishing" or "whooshing" sound. Some wind turbines (usually older ones) can also produce tonal sounds (a "hum" or "whine" at a steady pitch). This can be caused by mechanical components or, less commonly, by unusual wind currents interacting with turbine parts. This problem has been nearly eliminated in modern turbine design.

- Air Quality

Wind is a natural resource. Unlike most other generation technologies, wind turbines do not use combustion to generate electricity, and hence don't produce air emissions. Small amount of Lubrication required into the gear boxes of the turbine.

Conclusion:

Wind is a natural resource and don't create harmful effect at the air quality. There is no need of fossil fuel when electricity generating through wind because it is cleaner energy and hence air quality of the area is not changed when wind farm is in operation state.

Extent of impact on Air quality	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Public Health

The effect of public health when wind farm is in operation state, unlike most other generation technologies, wind turbines do not use combustion to generate electricity, and hence don't produce air emissions. The other is particulate matter, it is also produced when fossil fuel are burned

Conclusion:

Wind power is a green energy because it cannot produce green house gases and particulate matter. Wind is a natural resource for producing energy. The sun heating different parts of the earth unequally causes winds. A wind turbine converts the wind's kinetic energy into mechanical energy, which is then turned into electrical energy. No fossils fuels are burned and no green house gases & particulate

matter will generate in the wind farm and hence the air quality is improved which will improve the human health.

Extent of impact on Public health	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Social Impact

Conclusion:

Public opinion polls show that the vast majority of people favor wind energy, and support for wind plants if proponent will offer jobs to local and will provide their basic needs like education, drinking water, electricity and health.

Extent of impact on Social Impact	❑❑ = Medium * • Under consideration of mitigation /compensation measures

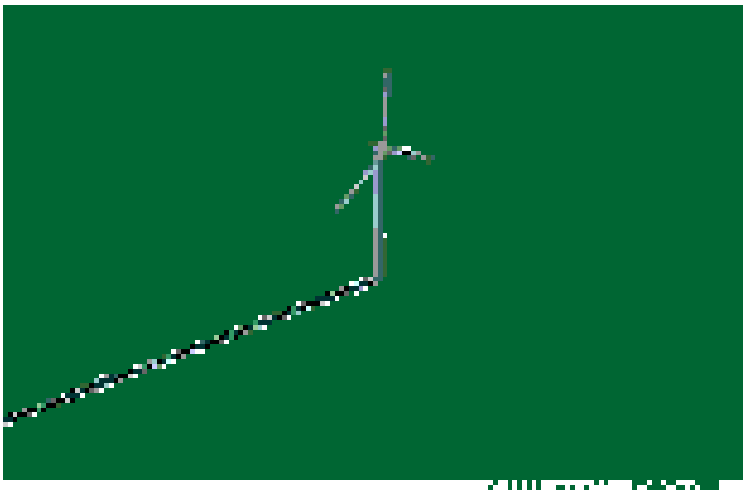
Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Shadow and Flicker

Shadow flicker is the term used to describe the stroboscopic effect of the shadows cast by rotating blades of wind turbines when the sun is behind them. This type

of shadow flicker is most common when the sun is at a low angle in the sky, such as mornings and evenings in the summer and just about any time in the winter. These shadows can extend great distances from the base of the turbine, particularly when the shadow is downhill from the turbines. The shadow can create a disturbance to people inside buildings exposed to such light passing through a narrow window. The shadow can also create problem to such people which are working in the field. The second type of flicker that can arise from wind turbines is strobing. Strobing occurs when turbine blades catch the sun and reflect it back towards the viewer. Since a turbine blade will be in the position where this reflection takes place up to 60 times per minute (20 RPM X 3 blades) the effect is like a strobe light. Strobing can occur at any time of day and can happen anywhere the turbines can be seen especially from the south, east and west.



Conclusion:

The site is located in the slightly hilly terrain. No such buildings and fields are present near to the site. Distance from the site to the nearby village is about 5-8 kms.

Extent of impact on Shadow and Flicker	❑❑ = Medium * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Visuality

Visuality means the visually dominant of the turbines – the turbines dominate the field of view and appear large scale. The character of the immediate area is substantially altered and the movement of the rotor blades is obvious.

Conclusion:

Visual impacts which can be minimized through careful design of a wind power plant. Using turbines of the same size and type and spacing them uniformly generally results in a wind plant that satisfies most aesthetic concerns. Computer simulation is helpful in evaluating visual impacts before construction begins.

Extent of impact on Visuality	❑❑ = Medium * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Safety Hazards

The wind farm operation and maintenance activities pose a low level of safety hazards to the nearby population.
Conclusion:

Extent of impact on Safety Hazards	❑ = Low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Interference with Telecommunication Systems

The moving blades of a wind turbine can distort electromagnetic signals. In the Jhimpir area, four different sources of electromagnetic signals may be affected: the microwave communication link between Jhimpir and other towns of Sindh, the television rebroadcast tower in Nooriabad, the VHF omni-directional radio (VOR) communication link, and the military radar. The wind turbines are not expected to interfere with any of these sources of electromagnetic signals because they are situated too far away from these facilities (35 kilometers).

Conclusion:

Extent of impact on Safety Hazards	❑ = Low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Climate Change Impact

TBCCPL Technical consultant Sgurr Energy has considered the risk on climate change on wind resource availability with the following comments

“Climate change is almost universally accepted but quantifying the impact in terms of wind speed is extremely difficult. Therefore, Sgurr Energy considers climate change as an uncertainty (rather than a loss), as climate change may equally lead to higher wind speeds in some regions rather than lower wind speeds.

An uncertainty of 1.0 % in wind speed has been considered by Sgurr Energy within the long term wind speed prediction uncertainty category. It should be noted that this uncertainty category also considers the long term reference data frequency distribution (based on number of years of long term data), reference data accuracy and reference data quality of correlation to onsite

measured data. All these factors, together with climate change uncertainty, are combined to obtain the overall long term wind speed prediction uncertainty."

The recent data analysis and simulations have identified that incase of increase in temperatures, the wind speed increases in coastal areas.

Conclusion:

Extent of impact on Safety Hazards	❑ = Low * • Under consideration of mitigation /compensation measures

Compliance of Contractor and Subcontractor with the national minimum wage law, Pakistan Labor Laws and IFC/ADB Health, Safety and Environment (HSE) requirements

Tricon Boston Consulting Corp has ensured through formal contracts with O&M Contractor and bind them for compliance with Pakistan Labor laws including minimum wage, child labor, forced labor, harassment, working hours, etc and HSE for their as well as their sub-contractor activities

Extent of HSE and Social Compliance impact	❑ Low

11

Decommissioning Phase Environment Impact Assessment

- Noise

Demolition noise is really a wide range of problems, Common construction noises include the sound from vehicles/cranes and their engines, the sound of vehicles tires, Construction noises are audible differently in each vehicle, simply because each auto maker designs and produces vehicles noise differently.

Conclusion:

The impact is low because the proposed site is not dense populated area, villages present but far from the site. The construction noise is local they cannot produce long term effects. Proper maintained vehicles are used during the construction period for minimizing the effect.

Extent of impact on Noise	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

- Air Quality

Dust emission is the major concern of air pollution during decommissioning of the project. Wind erosion, materials handling, on-site stockpiling and vehicles movements are the major dusty activities.

The site area is large, a plain terrain with some hilly portions, the construction period is short with minimum construction activities. The minimum distance of villages from the site is about 4-5 kms. Air Quality, as a result of the decommissioning works, is not expected to deteriorate significantly. Therefore, with the implementation of dust suppression measures, the potential for causing dust impacts is very low.

Conclusion:

In order to reduce the dust emissions during decommissioning phase, the following dust suppression measures stipulated and implemented by the Contractor.

- Covering entirely by impervious sheet or frequently watering of the on-site stockpile of excavated materials to keep wet always before backfilling.
- Frequent watering of exposed area or worksite of excavation to maintain surface wet, if necessary and practical.
- Imposition of speed controls for vehicles and unpaved site roads.
- Well-maintained diesel-powered mechanical equipment to avoid black smoke emissions.
- Shut-down of diesel-powered mechanical equipment or trucks inside the worksites when they are not in operation.
-

Extent of impact on Air quality	❑ = low * • Under consideration of mitigation /compensation measures

Extent of Impact

❑❑❑	= High
❑❑	= Medium
❑	= Low
❍	= No impact
✓	= Locally favorable
✓✓	= Regionally favorable

12

Project Neighborhood

Tricon Boston Consulting Corporation Pvt Ltd (TBCCPL) projects A, B & C, each having area of 1284 acre are located adjacent to each other.

Following projects are located on the eastern side of TBCCPL, at a distance ranging between 8 km to 16 km

Project Name	Capacity	Status
Three Gorges First Wind Farm (TGF)	50 MW	Operational
Three Gorges Second Wind Farm (TGF)	50 MW	Design Phase
Sapphire Wind Power Co Ltd (SWPCL)	52.8	Operational
Wind Eagle Pvt Ltd	50 MW	Design Phase
Sachal Energy Development Ltd	50 MW	Under Construction
Yunus Energy Ltd	50 MW	Under Construction
Gul Energy Ltd	50 MW	Under Construction
Metro Power Co Ltd	50 MW	Under Construction
Hawa Energy	50 MW	Design Phase
Fauji Foundation Energy	50 MW	Operational
Zorlu Energy	56.4 MW	Operational
Master Wind Energy Ltd	52.8	Under Construction
Aerospace New Energy Pak Co Pvt Ltd	200 MW (2 x 100 MW)	Design Phase

Following projects are located on the western and south western side of TBCCPL, at a distance ranging between 2 km to 16 km

Project Name	Capacity	Status
Din Energy Ltd	50 MW	Design Phase
Indus Wind Energy Ltd	50 MW	Design Phase
NASDA Energy	50 MW	Design Phase
Zulaikha Energy	50 MW	Design Phase
Noor Energy	50 MW	Design Phase
UniEnergy	50 MW	Design Phase
Gul Energy –II	50 MW	Design Phase
Metro Power-II	60 MW	Design Phase
Lakeside Energy	50 MW	Design Phase

Project Name	Capacity	Status
Tapal Energy	30 MW	Under Construction
Hartford Alternative Energy Ltd	50 MW	Design Phase
Artistic Milliner	50 MW	Design Phase
China Sunec	50 MW	Design Phase

13

Cumulative Environmental and Social Impact Assessment

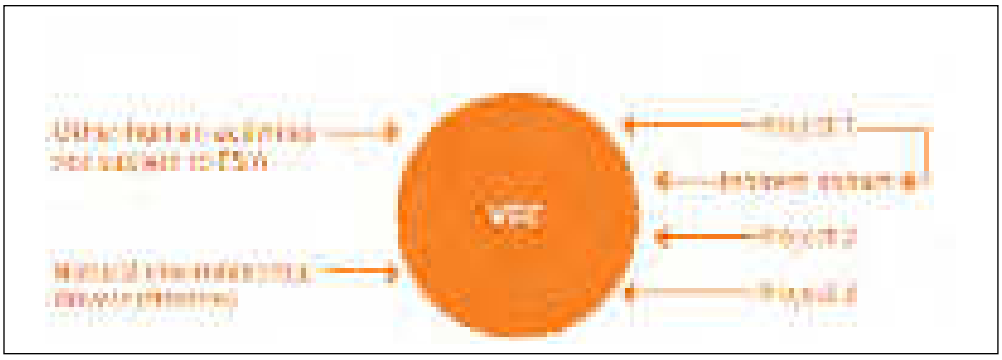
Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities

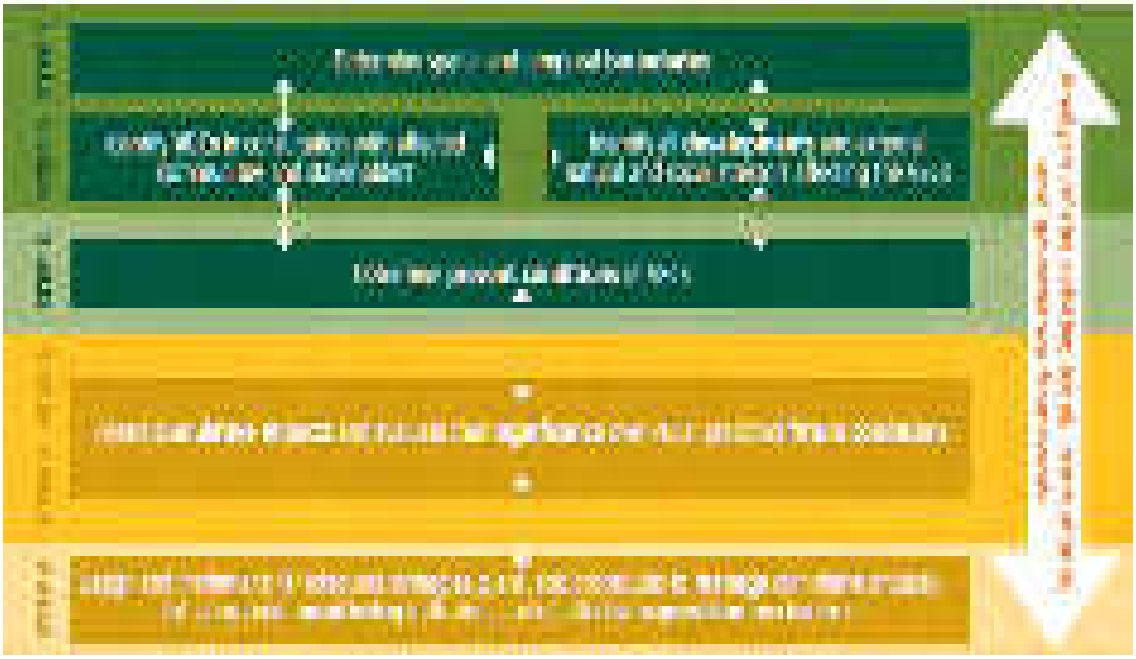
The IFC Performance Standard 1 defines the broader Project area to include "… areas potentially impacted by cumulative impacts from further planned development of the Project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken."

Approach for CIA

For TBCCPL, the Cumulative Impact Assessment is done by assessing impact of multiple projects/ activities on multiple/all environmental values/assets (with each value/asset assessed separately or by system)



Using the IFC Good Practice Handbook on "Cumulative Impact Assessment and Management" six step approach was used for conducting the CIA.



Step 1. Scoping of CIA

For CIA, only the impacts of wind farm projects which are either operational or under construction or planned on eastern and western side of TBCCPL are considered. Other activities e.g. construction of Grid, Transmission line and solar parks etc are not considered for CIA.

Similarly during the evaluation of environmental aspects and impacts, only those aspects are considered which will have a continued impact or those aspects are considered which will have high impact but for shorter duration.

Step 2. Wind Farms ---Present development status

Following projects are located on the eastern side of TBCCPL, at a distance ranging between 8 km to 16 km

Project Name	Capacity	Status
Three Gorges First Wind Farm (TGF)	50 MW	Operational
Three Gorges Second Wind Farm (TGF)	50 MW	Design Phase
Sapphire Wind Power Co Ltd (SWPCL)	52.8	Operational
Wind Eagle Pvt Ltd	50 MW	Design Phase

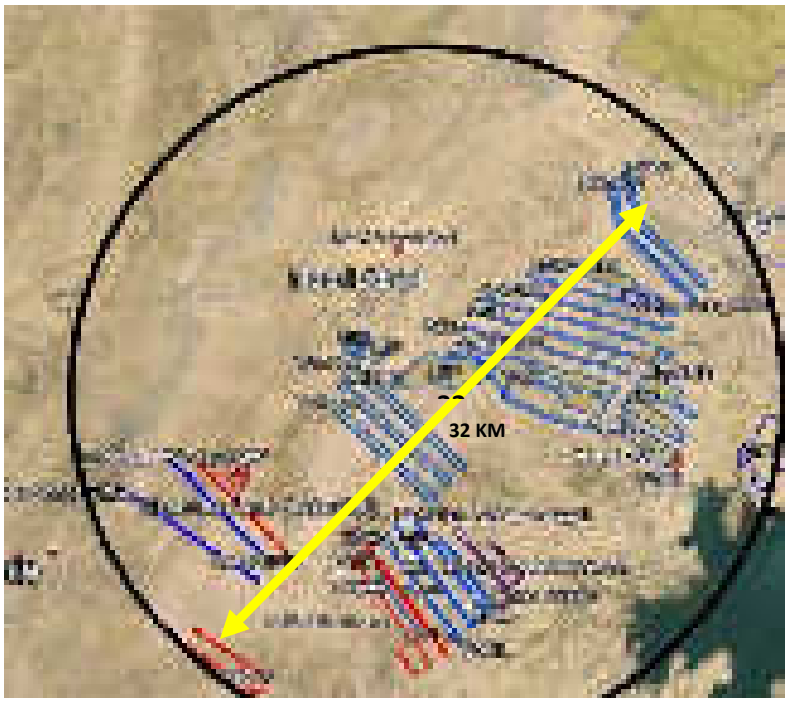
Sachal Energy Development Ltd	50 MW	Under Construction
Yunus Energy Ltd	50 MW	Under Construction
Gul Energy Ltd	50 MW	Under Construction
Metro Power Co Ltd	50 MW	Under Construction
Hawa Energy	50 MW	Design Phase
Fauji Foundation Energy	50 MW	Operational
Zorlu Energy	56.4 MW	Operational
Master Wind Energy Ltd	52.8	Under Construction
Aerospace New Energy Pak Co Pvt Ltd	200 MW	Design Phase

Following projects are located on the western and south western side of TBCCPL, at a distance ranging between 2 km to 16 km

Project Name	Capacity	Status
Din Energy Ltd	50 MW	Design Phase
Indus Wind Energy Ltd	50 MW	Design Phase
NASDA Energy	50 MW	Design Phase
Zulaikha Energy	50 MW	Design Phase
Noor Energy	50 MW	Design Phase
UniEnergy	50 MW	Design Phase
Gul Energy –II	50 MW	Design Phase
Metro Power-II	60 MW	Design Phase
Lakeside Energy	50 MW	Design Phase
Tapal Energy	30 MW	Under Construction
Hartford Alternative Energy Ltd	50 MW	Design Phase
Artistic Milliner	50 MW	Design Phase
China Sunec	50 MW	Design Phase

The total project developers who have been issued Letter of Intent (LOI) and land leased to them is more than 26 however the above list identifies those who have formally started work on the project

The overall area of approx. 32 Km is covered in the CIA.



Step 2. Identification of Valued Environmental and Social Component

The Jhimpir wind farm corridor is a rural area and not dominated by any agriculture land due to water scarcity and arid conditions. The area is generally flat and it has wind conditions that are favorable to the development of wind energy power plants. As a consequence, a number of developers are considering the construction of wind farms in the area. These projects vary in size but majority are of equal size i.e. 50 MW and have similar environmental and social impacts (both negative and positive). Therefore, this CIA is confined to the consideration of TBCCPL and neighboring wind farms and will assess the impact on 'valued' environmental and social characteristics of these wind farms.

In order to identify the VEC, following components were identified and based on the availability of data for making informed decision, concerns of stakeholders, significance determined by International bodies and lenders, importance stressed by regulators etc, VEC were identified.
For qualitative analysis, significance is rated as High (H), Medium (M) and Low (L).

Component	Significance Rating				
	Jhimpir region Available Data Conclusion	Local Stakeholder Concerns	International Bodies	Lenders	Regulators
Birds Movement and Mortality	M	L	H	H	M
Increase in Heavy Traffic	H	H	L	H	L

transport					
Visual and Landscape Impact	L	L	H	M	M
Blade Flickering Impact	L	L	H	H	M
WTG Noise Impact	L	L	H	H	M
Dust Emissions	M	M	L	M	M
Air Emissions	M	M	L	M	M
Stress on Water Resource	M	H	L	M	M
Stress on Biodiversity	L	L	M	M	M
Employment	H	H	M	H	H
Poverty Alleviation	H	H	M	M	M

For the TBCCPL CIA, the valued characteristics are considered to be:

Long Term Continued Impact

- **Movement of birds** – Keenjhar Lake, which was previously a declared sanctuary and now experience around 12000 birds per year compared to 150,000 birds in 1970's is located as follows
  - 20 km from TBCCPL
  - 18 km from Din Energy, NASDA, Lakeside
  - 8 Km from Master Wind Energy Ltd, Zorlu Energy, Fauji Foundation Wind Energy
  - 2 km from Aerospace New Energy

- **Landscape and visual impact** – the general area is flat with few elevation upto 500 feet. In clear bright day, from ground level and in flat terrain WTG's upto 4 KM can be seen however from elevated ground (above 350 feet) turbines can often be seen upto a distance of 8-12 km. From TBCCPL Project C land at elevation of 350 feet, WTG of Three Gorges First Wind Farm (8 km), Sapphire Wind Power Company (10 km) and Fauji Foundation Energy wind farms (12 km) can be seen

- **Employment** – there will be opportunities for employment during construction and operation of the wind farms.

Short Term High Impact

- **Construction activities including Transportation** – there is the potential that a number of wind farms will be constructed within the

next three years. Each one will require the transportation of turbine components and building materials on the highway and local road network

- **Stress on water resource**
  - Parallel construction of wind farms may create short term impact on underground water resource however incase of rain falls this impact will be mitigated / minimized

Information Sources

Information sources used for this assessment are following

- Initial Environmental Examination Reports of TBCCPL, Din Energy, Sapphire Energy, Master Energy, Yunus Energy, Metro Power Co, Gul Energy, Lakeside Energy, Indus Energy, NASDA Energy, Noor Energy, Zulaikha Energy, UniEnergy, Sachal Engineering Development Ltd,
- Birds Monitoring Report of TBCCPL for the period September 2015-Feb 2016
- Birds Monitoring Record of Sapphire Wind Power and Zorlu for Construction and Operation Phase
- Birds Monitoring Record of Master Wind Energy and Sachal Engineering Development Ltd for Construction Phase
- Stakeholder Engagement meeting records during construction phase of Sapphire Wind Power and Master Energy
- Public Consultation records of Sapphire Wind Power, Yunus Energy, Sachal Engineering Development
- WWF Incharge Mr. Khatri for Keenjhar Lake
- Baseline Noise Survey Report for Sapphire Wind Power and Master Energy
- Mapping of Hamlets within TBCCPL Project A, B & C and surrounding areas

As evident from the Wind farms development present status, out of 26 wind farm developers who have been leased land and who have initiated the project development activities, 16 projects are under design phase, six are under construction and four are operational. All the sixteen projects are expected to achieve commercial operation by end of 2018.

Step 3. Present Status of Valued Environmental and Social Components

- **Movement of Birds**
  - Present Birds Monitoring studies based on Scottish Natural Heritage guideline carried out for Tricon Boston Consulting Corp Pvt Ltd Project A, B & C indicates that the project area as well as the surrounding projects does not comes under the previously identified and marked migratory birds fly zone. This is also confirmed by isolated Birds Monitoring through point search methodology carried out by Sapphire Wind Power, Master Energy, Zorlu Energy etc where during the last two years no

mortality of birds reported at WTG.

- Environmental degradation of area, pollution of Keenjhar Lake, Haleji Lake and Hadero lake, industrial wastewater from Kotri in Keenjhar Lake, fishing pressure, birds hunting and trapping pressure. Recent study (Birds Monitoring Study conducted for TBCCPL during the period Sep 2015-March 2016) indicates identification of 44 species of birds of which 33 are resident and 11 are migratory. In 1970's, Keenjhar lake was visited by 120,000 birds but now the population has reduced to 12000 as reported by WWF (Source: http://www.dawn.com/news/939675/calamitous-decline-of-birds-at-keenjhar-lake).
- At present approximately 264 wind turbine towers are erected in Jhimpir and in next three years 450 towers will be erected. The recently point search based birds monitoring data (March 2016-May 2016) indicates that no reasonable size of birds flock seen in the area and isolated birds when flying in the direction of towers usually change their direction and did not collide with the tower. Also few isolated cases were observed where birds passes between the blades as the blades rotation is usually 20 per minutes.
- Most of the wind farms are located at a distance of more than 15 km from Keenjhar Lake and birds landing at lake for feeding purpose usually dive at an angle of 30 when they are approximately 5 km away from the lake.

- Since the project and surrounding area has less availability of food on the land as well as at lakes, only few observations were recorded of birds resting near project area.

- **Landscape and Visual Impact**

Wind farms included in the cumulative assessment are Sapphire, Three Gorges First Wind Farm, Tapal Energy, Master Wind Energy, Sachal Engineering Development Ltd, Yunus Energy, Metro Power, Gul Energy, Zorlu Energy, FFC Wind Energy. All these farms have physical structures and approx. 286 WTG's. In the coming three years approx. 464 WTG will be installed in the area. The number of turbines for projects may decrease as the projects opt higher rating WTG's.

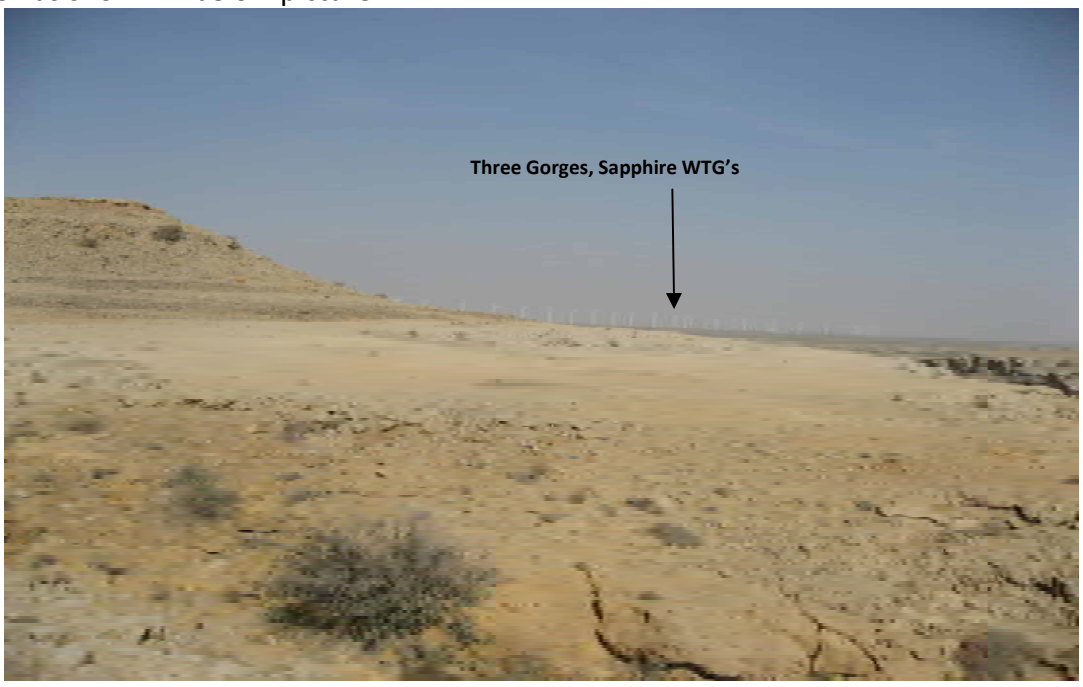
Wind projects can have a significant effect on the visual landscape as the turbines are tall and are visible from a distance. Some people find the turbines and their slowly rotating blades to be pleasing additions to the visual landscape, but others find they are distracting and negative.

Current Aerial View of Three Gorges First Wind Farm and Sapphire Wind Power

For the Jhimpir area, combined visibility approach was used to determine the visual impact. On the main Jhimpir road and in clear day, two successive wind farms Three Gorges First Wind Farm and Sapphire Wind Power are visible at a distance of approximately 10 kms. In cloudy and dusty day, wind farms are visible at a distance of 5 kms.

Since the Jhimpir area has elevated terrains at different points, the wind farms which are on the eastern side of the road are not visible due to approx. 300 feet elevation.

From the elevated position, wind farms of Three Gorges First Wind Farm, Sapphire Wind Power, Zorlu Energy and FFC Energy which are at a distance between 8-12 kms can be seen as shown in below picture.



The current landscape at some points are changing and few portions of land adjacent to road and in front of Three Gorges First wind farm are now converted into agriculture land and onion is cultivated. As the economic conditions of locals improved during the construction phase of Three Gorges, Sapphire Wind Power, few locals have digged bore and use underground water for agriculture purpose.

Due to the digging of bores and availability of underground water resource, the previously uncultivated area (due to non-availability of water) is now under cultivation (approx. 2 km of area).

The landscape also changes to green land when the area receives the rainfall and the local nearby community brings their cattle to the green fields for grazing or cultivate the land for season agriculture activities.

Location near Zorlu Energy wind farm **Location near TBCCPL wind farms**

From the local resident's point of view, the wind farms structures are not creating any visual impact for them due to following reasons

- Most of the hamlets / villages are atleast 500 m away from the WTG structures as required by the local environmental body NOC condition. The hamlets are located mainly in the buffer zone area between different projects and their distance from WTG ranges between 600m – 900 m.
- Due to elevations of land at various points, adjacent WTG structures beyond 3 kms are not visible to the community living in nearby hamlets/villages.
- From Nooriabad turning to Jhimpir, the road was initially a single track and there was a risk of visual distraction due to immediate visibility of Three Gorges First Wind Farm however due to construction of double track and widening of roads as well as construction of Grid Station and transmission line, a direct visibility is slightly restricted also the risk minimized due to construction of double track and widening of roads.

- **Construction Activities mainly Transportation**

  At the present transportation of heavy wind farm equipments have not created any negative impact on the roads as well as on the local community due to following reasons.

  - The project development duration for the initial projects was 6-8 years e.g. Zorlu Energy, FFC Energy, Three Gorges First Wind Farm, Sapphire Wind Farm and due to this these projects started construction during different time frames e.g. Zorlu started construction in 2009, FFC Energy in 2011, Three Gorges First Wind Farm in 2012 and Sapphire Wind Power in 2014. This resulted in transportation of equipments in different time frames and no congestion was ever reported

or observed. Similarly no grievance was reported by local community due to following reasons

- No population on the transportation route
- The Nooriabad-Jhimpir road is used by local community only for transportation by motorbikes and cars and heavy transportation vehicle is rare.
- No night time transportation was allowed.

- As the project development time frame reduced particularly w.r.t. construction time frame therefore construction time frame overlapped for Master Wind Energy , Sachal Engineering Development Ltd, Yunus Energy, Gul Energy, Metro Power Co, however the transportation impact was reduced by adoption of alternate route for Yunus Energy, Gul Energy and Metro Power and not following Nooriabad-Jhimpir road. The alternate route is that the vehicles coming from the Superhighway do not turn towards the Nooriabad-Jhimpir road but crosses the Nooriabad and after covering 15-20 km distance turns right towards Gul Energy, Metro Energy as these projects are located close to Superhighway

- **Stress on water resource**

At the present underground water is used for the following activities during the construction of wind farm

- Batching plant
- Dust suppression
- WTG Construction
- TSF activities
- Drinking water

During the operational phase of wind farms, the water consumption is restricted to TSF activities and maintenance activities only and is significantly less than the construction phase.

Due to low rainfall in Jhimpir area there are no water reserves and use of water from Keenjhar is not allowed. The underground water resource is used by few communities for their needs. A water pipeline is constructed from Keenjhar to Nooriabad for industrial use. Currently there is no indication regarding the depletion of underground water tables and the current bore wells have accessed water below 150 feet if large bore pipes used while for normal bores the water is available at 80 feet and near the Jhimpir city the water is available at 40 feet (The area has slope as we move from Nooriabad to Jhimpir city). The occasional rainfall helps to maintain the underground water levels.

In the coming three years, the construction of wind farms will be creating an impact on underground water resource for short time as this impact is likely to be mitigated by rainfalls and water conservation practices during construction activities.

- **Employment**

  As the project development time decreases, the parallel construction activities at Sapphire Wind Power, Yunus Energy, Gul Ahmad Energy, Metro Power Energy resulted in larger number of local employment compared to when Zorlu Energy, Three Gorges First Wind Farm, FFC Energy were under construction due to their separate construction time frames.

Step 4. Cumulative Impact on Valued Environmental and Social Components

- **Movement of Birds**

  Based on the projects (16 in number) who have been leased land, are in design phase and expected to be completed by end of 2018. The recent birds monitoring study (Study period September 2015-February 2016 based Scottish Natural Heritage Guideline using Vantage point methodology) at TBCCPL project area indicates that the area is not experiencing huge number of migratory birds and during the seven month study period including the winter migration period, only 11 migratory species have been identified out of total of 44 species. The point search method used at Sapphire Wind Power, Zorlu Energy, Master Wind Energy during construction and

operation phases have also not identified any mortality of birds near the WTG's or surrounding 250 meter circumference.

The additional 460 + WTG's , mainly in the neighborhood of TBCCPL project area are not expected to increase the likelihood of birds mortality or obstruction in birds movements due to following reasons.

- The highly polluted waters of Keenjhar, Haleji and Hadero lakes have drastically reduced the food availability for the birds and the total number of birds at Keenjhar have declined from120, 000 to 12000 during the last forty years as per survey conducted by WWF (http://www.dawn.com/news/939675/calamitous-decline-of-birds-at-keenjhar-lake).
- Hunting and trapping of birds is the pressure which adds to the reason of declining bird's population in the area.
- The tail end distance of majority of projects (atleast 12 projects) is above 20 km from the Keenjhar, Haleji and Hadero lakes and at these distances birds flight have been observed above 100 meters and usually birds take an angle of 30 at a distance of 5 km when landing at the lakes.
- Resident birds were observed at 50 feet height
- The loss of biodiversity in Jhimpir area also does not support the food availability for birds.
- The birds monitoring data based on point search methodology collected at Sapphire Wind Power Co and Master Wind Energy Ltd has not reported any mortality and injury of birds due to collision with WTG structures and blades. Also it is noted that birds change their flight direction when flying at low height and the WTG structures come in the way.
- Recent observations by WWF[1] have noted that the migratory birds have change their resting destination due to above factors and now their presence is more in the Tharparkar region due to following factors
  - Water availability
  - Local population don't kill the birds and doesn't support hunting of birds and provide food

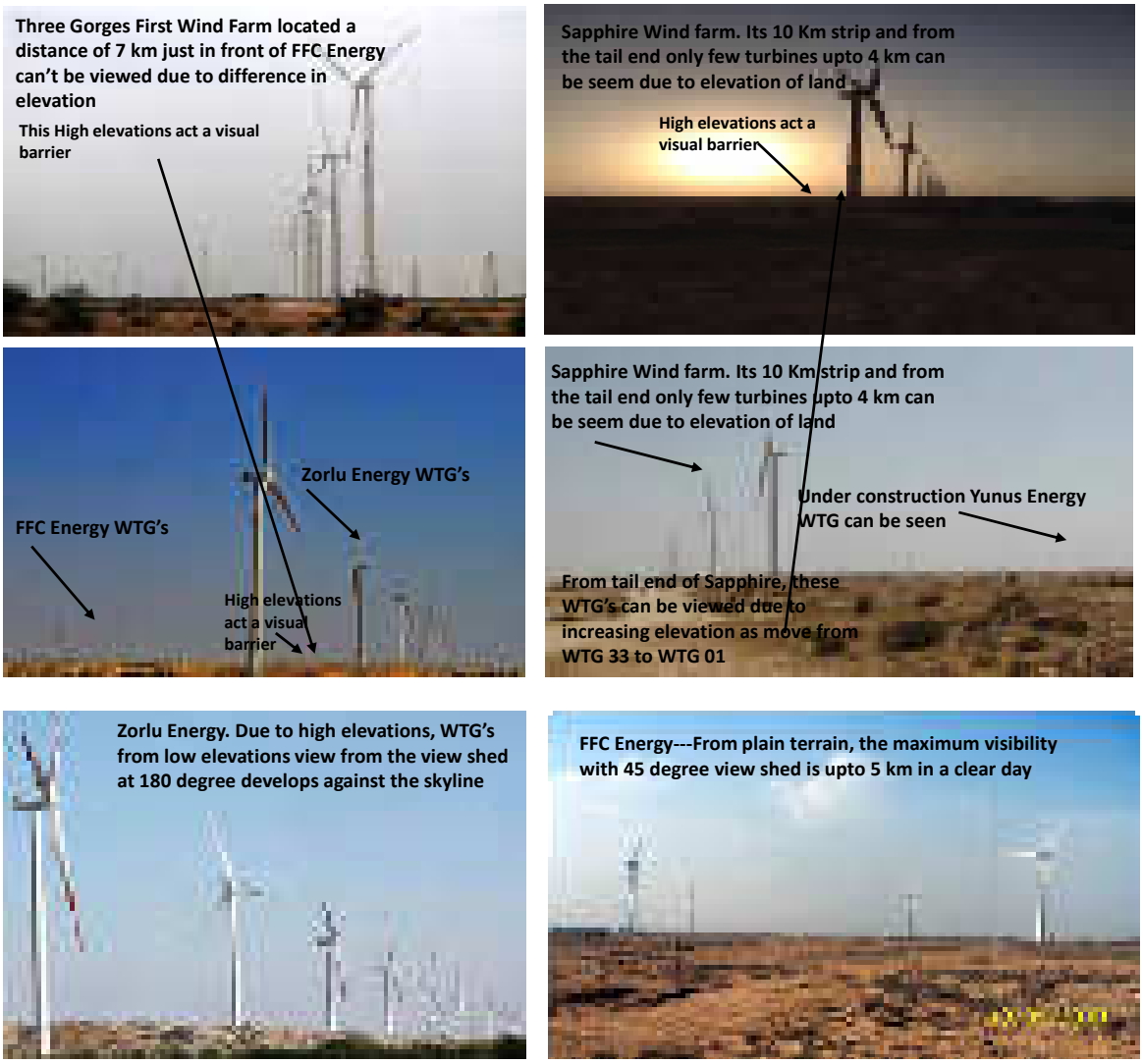
  The proposed development of TBCCPL and other projects in the neighborhood of TBCCPL are unlikely to impact negatively on the current status of birds (residents and migratory) w.r.t. their flight direction, flight path, flight height and their activities (resting, roasting, feeding etc)

[1] This is based on both, personal communication with WWF Director Mr. Rab Nawaz based in Karachi as well as from the published articles, reports and news.
(http://www.thaindian.com/newsportal/enviornment/pakistans-war-against-terror-affects-migratory-birds-lead_100270299.html);
(http://www.ce.utexas.edu/prof/mckinney/ce397/Topics/Indus/Indus_Manchar_Lake_2010.pdf);
(http://www.wwfpak.org/publication/pdf/Natura-June-14.pdf)

- **Landscape and Visual Impact**

  Visual or aesthetic resources refer to those natural and cultural features of an environment setting that are of visual interest to people. The project site is not located in a protected area or a tourist / resort area, it is located on a mix of plain and hilly topography and not considered as an aesthetically significant place. Thus a visual impact is not considered as significant. However the visual impacts associated with the current operational, under construction and proposed wind farms will be permanent for those residing in closed settlement.

  The potential cumulative visual impact of all the operational, under construction and proposed wind farms will primarily result changes to the visual character of the area within the view catchment. The nature of these changes will depend on the level of the visual contract between the turbines, the topography and the existing landscape within which they would be viewed. The degree of contract between the turbines and the surrounding landscape will result from one or more of the visual characteristics such as color, shape, scale, texture and reflectivity. Since the TBCCPL and its adjacent projects sites have hilly topography and the closest settlements are located at lower elevations, the turbines will be viewed against the sky.



Current Projects and their Visual impact

The below picture captures the future visual impact of proposed wind farms which are adjacent to TBCCPL projects.

Expected Aerial View of Jhimpir after 2019

- **Construction Activities mainly Transportation**

  With reference to TBCCPL, the other projects which are in the initial phase of the design are not expected to have the overlapping construction time frames. The below table defines the tentative timelines of TBCCPL and its neighborhood projects

Project Name	Time Frame
Hartford Alternatives Energy Ltd	TSD Construction started
United Energy	Construction started
HAWA Energy	Construction started
TBCCPL Project A, B & C	October 2016
UniEnergy	July 2017
Din Energy Ltd	December 2017
Indus Wind Energy Ltd	December 2017
NASDA Energy	December 2017
Lakeside Energy	December 2017
Zulaikha Energy	December 2017
Noor Energy	December 2017
Aerospace New Energy	July 2018

From end 2017 till mid of 2019 it is expected that the project area and its surrounding may experience high transportation activities as Din Energy, Indus Energy, NASDA Energy, Lakeside Energy, Zulaikha Energy, Noor Energy are working as a collective group and processing their pre-construction activities e.g. Filing for Generation License, Filing for Tariff, evaluating the EPC contractor, selection of turbines, Financial close etc jointly. The transportation impact can be mitigated by following means

  - Developing access road from the project area to

Super Highway and avoid use of Nooriabad-Jhimpir road

- Since National Highway is also in the process of widening of roads, use of National Highway Thatta road
- Developing access road from the project area to Super Highway and avoid use of Nooriabad-Jhimpir road

Also the current construction/conversion and widening of existing Super Highway into Motorway is expected to complete by end of 2017 which will help in reducing the heavy vehicle transportation impact

14

Environment Management and Monitoring Plan

An EMP is an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction and operation, and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

All EMPs have the purpose of protecting the environment, and are based around the objectives of Pakistan Environmental Protection Act. This includes requiring persons engaging in polluting activities to prevent environmental degradation and adverse risks to human and ecosystem health, make progressive environmental improvements, achieve effective integration of environmental, economic and social considerations in the decision making process, promote shared responsibility for the environment, and promote the principles of ecologically sustainable development.

Purpose of EMP

The primary purpose of the EMP is to provide information to the EPA on a proposed/existing development within the local and regional framework, with the aim of emphasizing how the proposed/existing development may impact on the relevant environmental factors and how those impacts may be mitigated and managed so as to be environmentally acceptable.

An EMP requires the proponent to:

- describe the proposed/existing development;
- describe the receiving environment;
- outline the potential impacts of the proposed/existing development on factors of the environment;
- identify the proposed management strategies to ensure those environmental factors are appropriately protected; and
- demonstrate that the proposed/existing development should be judged by the EPA to be environmentally acceptable.

Objectives of EMP

The objectives of the EMP are to:

- place the proposed/existing development in the context of the local and regional environment;
- adequately describe all components of the proposed/existing development, so that the EPA can consider approval of a well-defined project;
- provide the basis of the proponent's environment management program, which shows that the environmental impacts resulting from the proposed/existing development, including cumulative impact, can be acceptably managed; and
- provide a document that clearly sets out the reasons why the proposed/existing development should be judged by the EPA to be environmentally acceptable.
- To control, prevent, avoid, overcome, and/or minimize the negative impacts which may occur during operations.
- To enhance the anticipated positive impacts so that greater benefits can be achieved.
- To formulate a policy to control the impacts from business activities and operations on the environment. This would include technological, socio-economic and institutional actions to prevent and/or handle possible negative impacts, and actions to develop the positive impacts.
- To define the target location for environmental management activities, and establish a schedule of actions.

What should be in EMP?

There is no universally accepted standard format for EMPs. The format needs to fit the circumstances in which the EMP is being developed and the requirements which it is designed to meet (World Bank, 1999). According to the World Bank (1999) EMPs should contain the following components:

* Summary of Impacts: The predicted negative environmental impacts for which mitigation is required should be summarized.
* Description of mitigation measures: The EMP identifies feasible and cost effective mitigation measures to reduce significant negative environmental impacts to acceptable and legal levels. Mitigation measures should be described in detail and be accompanied by designs, equipment descriptions, and operating procedures.

The technical aspects of implementing the mitigation measures should be described.

* Description of monitoring programme: Environmental performance monitoring should be designed to ensure that mitigation measures are implemented. The monitoring programme should clearly indicate the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions.
* Institutional arrangements: Responsibilities for mitigation and monitoring actions should be clearly defined.
* Legal enforceability: The key legal considerations with respect to EMPs are:
    - o Legal framework for environmental protection; and
    - o Legal basis for mitigation.
* Implementation schedule and reporting procedures: The timing, frequency, and duration of mitigation The measures should be specified in an implementation schedule, showing links with the overall project. Procedures to provide information on the progress and results of mitigation and monitoring measures should also be clearly specified.
* Cost estimates: Costs should be calculated for both the initial investment and recurring expenses for implementing the mitigation measures.

Types of EMP

There are three broad categories of EMPs in the project lifecycle: the construction EMP, the operations EMP and the decommissioning EMP.
The objectives of these EMPs are all the same, namely to:

1. identify the possible environmental impacts of the proposed activity; and
2. develop measures to minimize, mitigate and manage these impacts.

The difference between these EMPs is related to the difference in mitigation actions required for the different stages of the project cycle.

The Construction Phase Environmental Management Plan

The construction phase EMP provides specific environmental guidance for the implementation and construction phase of a project. It is intended to enable the management and mitigation of construction activities so that environmental impacts are avoided or reduced. These impacts range from those incurred during start up (e.g. site clearing, erection of the construction camp) to construction activities (i.e. erosion, pollution of watercourses, noise, dust).

Information presented in the EMP is typically categorized as follows:

* identify the specific activity or potential impact that requires management;
* determine the mitigation measures to be implemented;
* identify the performance indicator;
* identify who would be responsible for implementation; and
* identify who would be responsible for monitoring.

The Operational Phase Environmental Management Plan

The operational phase EMP provides specific guidance related to the operational activities associated with a particular development. The roles and responsibilities for mitigation, monitoring and performance assessment for the operational life of the development are specified in the EMP.

The Decommissioning Phase Environmental Management Plan

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities.

However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include contamination of soil and groundwater, stock that has been abandoned (e.g. oil drums, scrap equipment, old chemicals) and old (unserviceable) structures. The decommissioning phase EMP provides specific guidance with respect to the management of the environmental risks associated with the decommissioning stage of a project. The decommissioning phase EMPs are typically encountered within extractive industries such as minerals mining and oil and gas exploration and extraction.

Structure of the EMP

The EMP consists of the following:

- Summary of legislation and guidelines
- Organizational structure and roles and responsibilities;
- Environmental management and monitoring plan
- Communication and documentation
- Change management plan

Summary of National and International Legislations and Guidelines

It is expected that TBCCPL will adhere to all the relevant national legislations, international conventions and the wind farm development guidelines as well as other international guidelines. TBCCPL will also ensure conformance of its own staff and assigned contractors to these legislations and guidelines prior to start of the project activities.

Legislation/Guidelines	Description
National Environmental Legislation/Guidelines	
Pakistan Environmental Protection Act (1997)	The key legislation empowering the Government of Pakistan to frame and enforce regulations for the protection of environment. The PEPA 1997 is broadly applicable to air, water, soil, marine and noise pollution, and handling of hazardous wastes. Penalties have been prescribed for those contravening provisions of the Act. Under section 12 of the PEPA 1997, no project involving construction activities or any change in the physical environment can be undertaken unless an IEE or EIA is conducted and a report submitted to the federal or provincial EPA.
Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, (2000)	The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA. The Regulations also require that all projects located in environmentally sensitive areas require preparation of an EIA.
National Environmental Quality Standards (1993 and 2000)	The NEQS specify standards for industrial and municipal effluents, gaseous emissions, ambient air requirements and emission levels for Sulfur dioxide and Nitrogen oxide, vehicular emissions and noise levels. The PEPA specifies the imposition of a pollution charge in case of non-compliance with the NEQS. The standards were last revised in 2001
National Environmental Policy (2005)	NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, "to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country.
Sindh Wildlife Protection Ordinance, (1972, and Amendments (2001)	This Ordinance provides for the preservation, protection, and conservation of wildlife. It calls for the formation and management of protected areas and prohibits wildlife hunting particularly of species declared protected under the Ordinance. The ordinance also specifies three broad classifications of the protected areas: national parks, wildlife sanctuaries and game reserves.
The Ports Act (1908)	The Act empowers the Government of Pakistan to make any rules to safeguard public health from the spread of any infectious or contagious disease. This is applicable to all vessels arriving at or sailing from any port to which the Ports Act applies (including the Karachi port). The Act also states that no ballast or rubbish/oil [illegible] mixed with oil shall be discharged into any port to which the

Legislation/Regulation	Description
	Not yet applied
Sindh Fisheries Ordinance (1980)	The Ordinance provides for the issuing of a fishing licence on payment of an amount for fishing in public waters. For the sale or trade or processing of fish in markets and fisheries. For the declaration of ownership of any public water or any water over the inland waterways. For the protection and management of fisheries in private waters. For banning the use of any poisonous and harmful substance in the fishing activities and, for preventing or upon fishing the use of fish as food.
The Forest Act (1927)	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, breaking, removing forest produce, damaging and setting fire to reserved and protected forests. The provincial forest is vested in the Council (Crown) and provincial forest officers are responsible to conserve and protect forests and wildlife in Sindh Wildlife Sanctuary, especially Chinkara, Indus Dolphin.
Antiquities Act (1975)	The preservation of cultural resources in Pakistan is governed by the Antiquities Act of 1975. The act is designed to protect "antiquities" from destruction, theft, negligence, unauthorized excavation, trade and export.
Land Acquisition Act (1894)	The Act authorizes compulsory acquisition of land for any public purpose, including for companies and for public purposes, on payment of compensation.
Pakistan Penal Code (1860)	The Pakistan Penal Code, originally enacted as Act XLV of 1860, is the principal criminal code of Pakistan. It was drafted on the recommendations of the first Law Commission of British India established in 1834 under the Charter Act of 1833. It came into force in British India during the early British Raj period, and continues to be in force in Pakistan, with numerous subsequent amendments.
Civil Procedure Code (1908)	The Code applies to all civil courts except where the Federal Government, after consulting the Supreme Court, by notification in the official Gazette, declares that the Code shall not apply to any specified class of proceedings or to any class of Courts. The Code consists of 158 sections and 51 Orders. The Code regulates the jurisdiction of the courts and the res judicata. It provides for the institution of suits, the issuance of summons, the production and admission of evidence, the execution of decrees, the payment of costs, the granting of interlocutory orders, and the appointment of receivers. It also provides for the appointment of commissioners to examine witnesses and to make local investigations.
National Environmental and Nature Conservation Arrangements	
National Conservation Strategy	Within the framework of NCS the National Conservation Strategy (NCS) was formulated as the Government's primary policy document on national environmental issues. All the provincial Governments have developed provincial conservation programs. The NCS identifies 14 core areas including conservation of biodiversity; pollution prevention and abatement; soil and water conservation and improvement of urban living environments; and institutional mechanisms to achieve these aims.
Environmental Action Plan	The plan is a mechanism that can identify and encourage the efforts of a government to protect the environment.

Legislation/Guidelines	Description
Policy for Development of Renewable Energy for Power Generation	In December 2006 the Government of Pakistan published the first national policy [illegible] renewable sources of energy. The provisions apply to hydropower plants with a capacity of up to 50MW, solar thermal, photovoltaic and wind energy. [illegible]
National [illegible] Policy [illegible]	The Policy provides [illegible] framework [illegible] production and management of [illegible] resources [illegible]
Institutional Framework	
Environment and Conservation	There is a well-established framework for environmental management in Pakistan. The Ministry of Environment deals with environment and biological resources. Within the ministry, the NCS was established in 1992, is responsible for overseeing the implementation of the strategy. Two organizations, The Pakistan Environmental Protection Council (PEPC) and the Pak EPA are primarily responsible for administering the provisions of the PEPA, 1997. The PEPC oversees the functioning of the Pak EPA. Its members include representatives of the government, industry, non-governmental organizations and the private sector. The Pak EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to [illegible] hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces.
Renewable Power Generation Alternative Energy Development Board (AEDB)	The Alternative Energy Development Board (AEDB) was established as an autonomous body attached to the Cabinet Division on 12th May 2003. The Board was established to act as a central agency for development, promotion and facilitation of renewable energy technologies, formulation of plans, policies and development of technological base for manufacturing of renewable energy equipment in Pakistan.
International Conventions	
United Nations Convention on the Law of the Sea 1982	This convention establishes a comprehensive framework for the regulation of all ocean space. UNCLOS contains provisions governing, inter alia, the limits of national jurisdiction over ocean space, access to the seas, navigation, protection and preservation of the marine environment, exploitation of living resources and conservation, scientific research, seabed mining and other exploitation of non-living resources, and the settlement of disputes. Pakistan is among the [illegible] that have signed the UNCLOS.
United Nations Convention on [illegible]	The UNCCD is an [illegible]

Legislation/Guidelines	Description
Environment and Development (1992)	development in a wide spectrum of environmental issues. The conference concluded with important new conventions like the Earth Charter, Agenda 21, the Convention on Climate Change, and the Convention on Biodiversity.
The World Heritage Convention (1972)	This Convention provides for the protection and conservation of natural sites (including any significant cultural sites) throughout the world. The sites are nominated by the state in whose territory they are located and then listed after review of the proposal by the World Heritage Committee. The Convention obligates the states to ensure identification, protection and transmission of the natural heritage to future generations.
Climate Change Convention and Kyoto Protocol (1992)	The convention aims at stabilizing greenhouse gases (GHGs) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. To achieve the objective of the convention, all parties are generally required to develop national inventories of emissions, formulate and implement national and regional programs of mitigation measures. All developed country parties were specifically obliged to take measures to limit GHG emissions by the year 2000 to 1990 levels and the developing countries (including Pakistan) to take all measures in support of the protection of atmosphere without any strict commitment on the quantified reduction of these gases in a time frame.
The Convention on Biological Diversity (1992)	The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programmes and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.
The Convention on Conservation of Migratory Species of Wild Animals (1979)	The Convention requires countries to take action to avoid endangering of migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species.
The Convention on Wetlands of International Importance, Ramsar (1971)	Obligates Pakistan to identify and protect wetlands in the country. So far 19 sites in Pakistan have been declared as wetlands of International Importance or Ramsar Sites.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	The convention requires Pakistan to impose strict regulation (including penalties, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival.
International Union for Conservation of Nature and Natural Resources Red List (2006)	Lists wildlife species experiencing various levels of threats internationally. Some of the species included in the IUCN red list are also present in the proposed wind farm sites.

Legislation/Guidelines	Description
International Environmental Guidelines	
World Bank Guidelines on Environmental Environmental Assessment Operational Policy 4.01 [illegible] Environmental Assessment Sourcebook, Volume I	The World Bank provides general guidelines for environmental assessments of development projects. These guidelines help prospective projects [illegible] environmental [illegible]. The guidelines call for carrying out EIAs or IEEs of projects based on severity of their impacts.
World Bank Environmental Assessment Sourcebook, Volume III	Provides guidelines on Environmental Assessment of Energy and Industry Projects. An update on this source book is the issue of Regional Environmental Assessment (REA) was made in June 1996. The EA Sourcebook Update describes REA in terms of its [illegible] purposes, advantages, operational [illegible], selection criteria, and key components. It also discusses challenges associated with REA preparation and offers examples from Bank experience.
World Bank Pollution Prevention and Abatement Handbook	Provides general environmental management policies with specific techniques for the prevention of [illegible] pollution in industries including wind energy projects. Proper guidelines are prescribed for major pollutants as well as typical air emissions and water effluents from industrial sectors. The Handbook also prescribes guidelines for noise levels.
International Finance Corporation (IFC) Environmental, Health and Safety (EHS) guidelines (2007)	The EHS guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. The EHS guidelines on wind energy include information relevant to environmental, health and safety aspects of onshore and offshore wind energy facilities.

Organizational Structure and Roles and Responsibilities

Project Organizational Structure

The TBCCPL proposed project will include the following organizations/actors:

- Proponents including various wind farm developers, promoters, investors as owners of the EMP;
- Construction contractors carrying out the wind farm installation works as executors of the EMP during construction phase of the project; and
- Turbine manufacturers as Wind farm Operation and Maintenance (O&M) contractor and TBCCPL technical team as executor of the EMP during the operational phase of the project.
- Wind farm Decommissioning contractors

These organizations have the following roles and responsibilities during the project.

Roles and Responsibilities of the Proponents

As project proponent and owner of the EMP, the TBCCPL will be responsible for ensuring the implementation of the EMP. The Project Director / Technical Director /CEO and/or highest ranking official of TBCCPL will be responsible for the overall environmental performance of the project. The TBCCPL will monitor the environmental performance of the project to ensure that the project is carried out in accordance with governing legislations, their relevant corporate policies and recommendations of this IEE.

Roles and Responsibilities of Contractors

TBCCPL will appoint wind farm construction contractor(s) for the construction, installation, testing, commissioning and decommissioning of the wind farms including the auxiliary facilities. Similarly a wind farm O&M contractor will be appointed for operations of the plant. O&M contractor will manage all the day to day operations of wind farm and will also have its custody. These contractors will be responsible for implementation of, or adherence to, all provisions of the EMP and with any environmental and other codes of conduct required by project proponents. Overall responsibility for environmental performance of the operation will rest with the senior management of the contractors in Pakistan. Site managers of the contractors will be responsible for the effective implementation of the EMP.

Planning and Design of the Operation

Design of the Operation

Design and operations of the wind farm development have been described in Project Description of IEE report. Following approval of the IEE, if any aspect of the operations or requirements of the IEE need to be changed, the wind farm developers/promoters will categorize that change in accordance with the Change Management Plan and take appropriate measures thereof.

Approvals

Obtaining No objection Certificate (NOC) from Sind Environment Protection Agency will not absolve the TBCCPL or its appointed contractors/suppliers of any other legal obligations and hence the proponent and its contractors and suppliers will obtain all other relevant clearances and necessary approvals required by the Government of Pakistan or Government of Sindh prior to commencing the respective operations.

Contractual Provisions

Adherence to the requirements of the IEE and EMP in terms of environmental mitigation will be required from all project contractors and suppliers and thus EMP will form part of their contracts with the wind farm developers/promoters.

Implementation of the Operations

Coordination with Stakeholders

TBCCPL will ensure that there are clear channels of communication and mechanisms of coordination with disparate project stakeholders on environmental and social matters as required by the EMP are maintained throughout the operation.

Environmental Management Systems

TBCCPL and the contractors will ensure that the mitigation measures mentioned in the IEE are adhered to and organizational HSE Management Systems implemented during various wind farm development projects.

Monitoring

The Director Projects/ General Manager/Chief Executive Officer (CEO) of TBCCPL will be responsible for the overall environmental performance of the project. The wind farm developers/promoters and their contractors will ensure that monitoring of the project activities is carried out according to the monitoring programme outlined in the EMP. If an in-house capability is not available, the proponent can also hire Independent Monitoring Consultant to monitor the compliance and effects monitoring according to the various provisions of EMP.

Approvals

The project contractors will be responsible for obtaining all relevant approvals from TBCCPL such as approvals for waste contractors, water source and others as specified in the environmental management and monitoring plan.

Trainings

TBCCPL and its contractors and suppliers will be responsible for the training of entire staff involved in various project activities in an environmentally sound manner. TBCCPL and its contractors and suppliers will be responsible for providing induction to their staff members on the IEE, the EMP and their implementation provided for in the EMP. It is also expected that the proponent/contractor will conduct cultural trainings to their staff for respecting the local norms and social systems. The training programme is discussed briefly below

Communication and Documentation

For effective monitoring, management and documentation of the environmental performance during the operation all environmental matters will be discussed between TBCCPL site representative and resident engineers during daily or weekly meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between the TBCCPL and the contractors. Any issues that require attention of Director Projects/General Manager/Chief Executive Officer (CEO) will be communicated to them for action. TBCCPL and their contractors will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the project. Minutes of the meeting will be properly recorded and circulated amongst all concerned site staff and higher management.

Operations Monitoring

TBCCPL and their contractors will be responsible for effective monitoring for efficient operations of the wind farm and its auxiliary systems.

Restoration

TBCCPL will ensure that the sites are restored efficiently at the end of construction activities/decommissioning in accordance with the requirements of the IEE and EMP and relevant standard industrial practices.

Minimum Distances

The IEE specifies minimum distances to be maintained from environmental features including communities, water resources and archaeological sites etc. These minimum distances are provided in Table. The contractors shall ensure that these minimum distances are adhered to during the operation.

Environment Management Plan

In this section, the Environment Management Plan (EMP) and Environmental Monitoring Plan are presented. The EMP as well as the IEE should be updated based on the results of detail engineering.

Exhibit 12.3.1 Site Access

Element	Management Plan	Responsibility
Controls	• Access in and out of the site must be allowed only at one point to minimise impacts during construction. • All areas of construction activity will be fenced by the client prior to construction, unless authorization to the contrary is given by the Site Manager. Fencing will be done at individual areas of construction and around the full perimeter of the site. • Construction activities must be limited to areas which are deemed to be safe, and deemed as the minimum area needed for the construction activity. All sites that are identified by the Site Manager as being unsafe will be indicated as such with warning signs in the local languages. • All work done in day time.	Site Manager

Exhibit 12.3.2 Site Clearing

Element	Management Plan	Responsibility
Controls	The size of areas subjected to land clearance will be kept to a minimum. • Only areas as instructed by the Site Manager must be cleared. • Cleared vegetation debris which has not been utilized or collected by local communities will be collected and disposed of to a suitable waste disposal site. It will not be burned on site. • No vegetation will be cut or collected off construction sites for burning or for any other purpose without the prior permission of the Site Manager.	Site Manager

Exhibit 12.3.3 Plant Repair, Maintenance & Cleaning

Element	Management Plan	Responsibility
Controls	• No vehicle maintenance and repairs will be undertaken within a 30m radius of any water courses and drainage lines. Any facilities susceptible to oil, petrol and diesel spillage will be located a minimum of 30m and preferably 50m from all water course. • Repair yards, batching plants and stationary machines will be provided with sumps, and spilled fluids and runoff will be kept in a conservancy tank until removed from the site and disposed off in safe side. • Adequate collection facilities such as diversion mounds, ditches, drains, oil separation sumps and sedimentation ponds will be constructed at each location with a pollution potential. • Regular inspections will be carried out to detect leaks and spillages. These facilities will be maintained as regularly as is necessary to ensure they meet the original specification.	Site Manager

Exhibit 12.3.4 Noise

Element	Management Plan	Responsibility
Potential Impact	Nuisance noise from construction activities affecting the surrounding areas	Site Manager
Sources	• Site preparation and earthworks • Construction related transport • Foundations and plant equipment installation	
Controls	• Noise control measures must be implemented. All noise levels must be controlled at the source. • All employees must be given the necessary ear protection plug, if necessary. • Affected parties must be informed of any excessive noise factors. • No loud music is allowed on site and in construction camps. • Impose prescribed working hours of between 09:00 and 18:00, with preferably no work permitted on nights and holidays.	

	• A speed restriction of 40km/h will be imposed on all construction vehicles on site, in order to limit additional noise generated by these vehicles. • Appropriate and effective mufflers must be fitted to earthmoving and other vehicles on the site. • Noise from vehicles and on-site powered machinery and equipment will not exceed the manufacturer's specifications, based on the installation of noise attenuation measures.	
Maintenance	•All construction equipment must be maintained in good working order. • Silencers on construction equipment will be maintained to ensure no deterioration in noise-dampening capacity.	
Corrective Actions	• The Site Manager will respond timeously in the event of any complaints by local residents or others about disturbing noise. The noise source will be identified and appropriate noise mitigatory measures instituted in consultation with the affected party (ies). • In the case of legitimate complaints the noise level must be tested by a specialist	

Exhibit 12.3.5 Aesthetics

Element	Management Plan	Responsibility
Potential Impact	The negative visual impact of the construction of the wind farm on surrounding communities.	Site Manager
Sources	• Wind farm construction site • Roadways • Associated construction equipment and vehicle movement	
Controls	• Careful planning and sensitive placement of light fixtures and the fitment of covers and shields designed to contain rather than spread light. • Damage to the natural environment must be minimized. • Trees and tall woody shrubs must be planted to provide a natural visual shield. Excavated material must not be placed on such plants and movement across them must not be allowed, as far as	

	practical. • All lighting where practical, must be "down" to minimise the visual impact of the facility at night. Lighting must be directed towards the areas they are supposed to illuminate. • The minimum amount of lighting must be used. • The Architectural and Cultural heritage of the area must be included in the design guidelines for development.	
Maintenance	Timely maintenance of the ancillary infrastructure and general surrounds of the property (i.e. gardens, access roads etc.)	
Corrective Actions	If a visually intrusive component of the site is identified, procedures must be altered or updated to ensure effective management.	

Exhibit 12.3.6 Flora and Fauna

Element	Management Plan	Responsibility
Potential Impact	Impact on both flora and fauna as a result habitat destruction due to construction activities.	Site Manager
Sources	• Construction camp and labor • Mobile construction equipment • Traffic to and from site	
Controls	• No disturbing, injuring or killing of any flora and fauna (including birds and other wildlife) for any purposes. • No feeding of wildlife. • No domestic animals are to be brought onto the site. • The construction site will be kept clean and tidy. • Site Manager will train all employees, contractors and subcontractors of the project associated with the needless destruction of wildlife.	

12.3.7 Heritage

No Heritage found at the site

Exhibit 12.3.8 Air Quality

Element	Management Plan	Responsibility
Sources	• Vehicles • Emissions from Concrete and asphalt batch plants • Fire	Site Manager
Controls	• All activities on-site must comply with the requirements of the Pakistan Environmental Protection Act. • Burning of materials including wood, grass and refuse which emit visible smoke will not be permitted on construction sites. • Waste must be disposed, as soon as possible on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours and attracting vermin. • No open fires are to be allowed on site. • Ensure that batching plants are fitted with the appropriate filters.	
Maintenance	• The Site Manager will ensure that all vehicles and machinery are fitted with appropriate emission control equipment, are maintained frequently and serviced to the manufacturers' specifications.	
Corrective Actions	• If monitoring results or complaints indicate inadequate compliance with the EMP, the source of the problem must be identified and existing procedures or equipment modified to ensure that the problem is rectified.	

Exhibit 12.3.9 Dust Control

Element	Management Plan	Responsibility
Potential Impact	Dust and particulates from vehicle usage, excavation, temporary stockpiles and land clearing affecting the surrounding community and site visibility	Site Manager
Sources	• Clearing of vegetation and topsoil • Excavation, grading / scraping and transport of material • Loading and unloading of trucks • Re-entrainment of deposited dust by vehicle movement • Wind Erosion from stockpiles and unsealed roads and surfaces	
Controls	• Speed limits must be enforced in all areas, including public roads and private property to limit the levels of dust pollution • Dust must be suppressed on access roads and construction sites during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of run-off. • Dust dispersion from construction activities, unsurfaced roads, spoil dumps and other construction locations will be limited and suppressed to the maximum extent practical. • Spoil dumps will be positioned such that they are not vulnerable to wind erosion. • An appropriate freeboard will be maintained in trucks hauling dirt, sand, soil and other loose material when leaving the road reserve.	
Maintenance	• Roads must be sealed as soon as possible and maintained to ensure that dust from road or vehicle sources will not exceed prescribed levels • Any cleared areas must be watered to ensure that dust levels are minimized prior to sealing or revegetation	
Corrective Actions	• In the event of serious levels of dust pollution, the implementation of constant dust monitoring by qualified consultants must be undertaken • If monitoring results or complaints indicate	

	inadequate compliance with the EMP, the source of the problem must be identified and existing procedures modified to ensure that the problem is rectified	

Exhibit 12.3.10 Water for Domestic Use

Element	Management Plan	Responsibility
Controls	• The provision of potable water and safe drinking utensils at various points on the site. • Provision of facilities for hand washing at all ablution facilities and near all toilet facilities. • Site Manager must ensure construction crews are provided with an appropriate portable water supply, safe and healthy sanitary facilities and protection against exposure to environmentally dangerous or unhealthy situations or conditions. • All runoff water from fuel deposits, vehicles washing areas and other equipment must be collected and directed through oil traps to settlement ponds. These ponds must be suitably lined. • All runoff washing water and changing facilities must not be disposed of directly into drainage lines, streams or rivers, but in an environmentally acceptable manner.	Site Manager

Exhibit 12.3.11 Waste management

Element	Management Plan	Responsibility
Potential Impact	• Ineffective use of resources resulting in excessive waste generation • Litter or contamination of the site or water through poor waste management practices	Site Manager
Sources	• Office and workshop facilities • Transformers • Fire services and fire water storage • Water storage tank • Fuel and oil storage	

Controls	• All structures and/or components replaced during maintenance activities are appropriately disposed of at an appropriate waste disposal site or sold to a recycling merchant for recycling. • Ensure that care is taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. If any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation. • Waste handling, collection and disposal operations are managed and controlled by a waste management contractor • Waste – Leaked oil and chemicals □ Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority □ Waste must be stored and handled according to the relevant legislation and regulations. • General Waste □ Recycled where possible or disposed of properly to landfill as designated by the administering authority • Hazardous Waste □ Separate hazardous and general waste and dispose hazardous waste to an appropriate hazardous waste disposal site. • Sewage □ Disposal to municipal sewer.	
Maintenance	• Uncontaminated waste must be removed at least weekly for disposal. • Contaminated or regular wastes must be disposed of as necessary ad in accordance with legislation	
Monitoring	• Visual inspection of the site must be carried out daily for evidence of litter or waste material that has been inappropriately disposed of by site personnel • Waste collection must be monitored on a regular basis • Weekly and monthly reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor	

	and monitored by the management representative.	
Corrective Actions	• Corrective action is required to be undertaken immediately after a complaint is made or non-conformance is identified. • Upon the identification of any non-conformance, appropriately feasible remediation measures must be determined and implemented.	

12.4 Environmental Management Plan during Operation Phase

Exhibit 12.4.1 Noise

Element	Management Plan	Responsibility
Potential Impact	• Nuisance noise from the commissioning and operations activities.	Site Manager
Sources	• Staff transport and equipment transport • Turbines • Maintenance activities	
Controls	• In order to reduce the overall noise emission to acceptable levels, final design of equipment will ensure the level of noise emission from the wind farm must be limited to levels guaranteed by the turbine manufacturer. • All noise from activities at the wind farm during the operation and maintenance of the wind farm must be within acceptable limits (according to the Pakistan Environmental Protection Act) • LE will provide all equipment with standard silencers and maintain silencer units on vehicles and equipment in good working order, for those vehicles where it is necessary.	
Maintenance	All equipment, including vehicles, must be properly maintained in order to minimise noise generation.	
Monitoring	• Observation of on-site noise levels by Site Manager.	
Corrective Actions	• Corrective action is required to be undertaken immediately after a complaint is made or non-conformance is identified. • Any complaints regarding noise must be	

	investigated, sources identified and mitigation measures implemented.	

Exhibit 12.4.2 Visual Impact

Element	Management Plan	Responsibility
Potential Impact	Negative impact on amenity for the surrounding community	Site Manager
Sources	• Wind farm	
Controls	• Turbines made of low reflective materials • Use of colours on turbines that are neutrally toned and suit the surrounding landscape • Retention of as much existing vegetation as possible. • Implementation of tree/shrub planting to assist screening the observer from the wind farm.	
Maintenance	• Vegetation barriers must be regularly maintained so as to ensure minimal visual intrusion.	
Monitoring	• Observation of site appearance by the Site Manager	
Corrective Actions	• If a visually intrusive component of the site is identified, the procedures must be altered or updated to ensure effective management.	

Exhibit 12.4.3 Flora and Fauna

Element	Management Plan	Responsibility
Potential Impact	Impact of operational activities on flora and fauna in the surrounding areas.	Site Manager
Sources	• Movement of employee and visitor vehicles within and around the site •Wind turbines	

Controls	• Implementation of a site rehabilitation and landscaping program • Use of indigenous plants in landscaping and rehabilitation activities • The maintenance staff may not harm or kill any flora and fauna during the activities of maintenance and during operation.	
Maintenance	• Vegetative barriers must be regularly maintained so as to ensure minimal visual intrusion • Maintenance of plants on site to ensure continued viability of vegetative barriers • Maintenance of rehabilitated areas to ensure sustainability.	
Monitoring	• Observation of site appearance by Site Manager	

Exhibit 12.4.4 Air Pollution Management

Wind is cleaner technology and doesn't emit the greenhouse gases and particulate matter.

Exhibit 12.4.5 Shadow

Element	Management Plan	Responsibility
Potential Impact	•Eyes problem	Project Consultant
Sources	•Turbine	
Controls	• Calculation of shadow must be taken before the Installation •Turbine installation such a way that minimum shadow will not produce the effect for more than 30 minutes per day or 30 hours per year	

Environmental Monitoring and Trainings

Environmental Monitoring is required to measure the effectiveness of all mitigation measures and to indicate where corrective actions or changes to management measures are required.

Environmental Monitoring

Environmental monitoring can be categorized into the following types;

- Compliance monitoring;
- Effects monitoring; and
- Post Project Monitoring.

Compliance Monitoring

Compliance Monitoring will be carried out to ensure compliance with the requirements of the IEE and EMP. TBCCPL and contractors will carry out the inspections on a routine basis. The EMP provided in this section will be used as a management and monitoring tool.

The contractor's site managers will be responsible for compliance with the recommendations of the EMP during field operations. Above all, TBCCPL will have to monitor the contractors' compliance with the EMP and to ensure that there is a system and plan in place for each activity including dedicated HSE staff on-site. The HSE staff will regularly check and record the contractors' compliances with the EMP, environmental audits, records of all noncompliances, all remedial actions taken to mitigate the project impacts. These will be documented in the monthly based environmental monitoring reports during construction and decommissioning phases.

Effects Monitoring

Actual impacts of the project activities on selected receptors will be monitored and any unanticipated impacts that exceed the levels anticipated in the IEE will be identified and appropriate mitigation measures suggested. An effects monitoring report will be generated that will compare the environmental impacts on different receptors after suitable intervals of time. Effects monitoring will be conducted before, during and after the construction/decommissioning phases and during the operation phase.

The effects monitoring requirement for construction and operation phase of wind farm has been detailed in this section.

Post-project Monitoring

The objective of this monitoring will be to determine the level of residual impacts of the project activities on physical, biological and socio-economic receptors of the project area after construction and decommissioning phases. The monitoring may be carried out within one month after the end of all activities in the project area. As part of the post project monitoring restoration of sites will also be checked. All the findings/recommendations of environmental monitoring at the end of

construction and decommissioning phases will be incorporated in the final environmental monitoring reports.

Environment Monitoring Plan

Parameter	Location	Frequency
Waste water	Discharge from the housing scheme	Six monthly
Noise	Inside the housing scheme at eight different locations	Six monthly
	Outside the housing scheme at a distance of 7 m	Yearly
Emissions	Inside the housing scheme at eight different locations	Six monthly
Environment, Occupational Health and Safety Inspection	Whole Housing scheme	Quarterly
Compliance with the National Labor Law		

Environmental Trainings

Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness and also the linkages will be developed with client and different organizations:

- A set mechanism should be established to access the training requirements of project staff and required trainings provided. Some mandatory trainings at site, for example, should include sensitization of the staff on local culture, introductory lessons on the area's endangered species, archeological sites, and other sensitivities and how to ensure lesser intrusion in local environment.
- Trainings should be identified by mutual consultation amongst clients, monitoring consultants, and SEPA.
- Health, Safety and Environment (HSE) issues will be implemented and monitored with HSE site representative for client/contractor. HSE representatives will give trainings to the local staff, staff of contractors/promoters and drivers.
- Community site representative will be responsible for community issues. The representative should be adequately qualified and be sensitive to the local norms and traditions. The representative should undertake training in negotiations skills and conflict management etc, if required.

The objective of training programme is to ensure that the requirements of the IEE and EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related restrictions specified in the IEE and EMP. Table below presents the training programme.

Change Management Plan

The IEE recognizes that changes in the operations or the EMP may be required during the operation and therefore a Change Management Plan has been provided to manage such changes. The management of changes is discussed under two separate headings, changes to the EMP and changes to the Operation.

Changes to the EMP

The IEE and the EMP have been developed based on the best possible information available at the time of the IEE study. However, it is possible that during the construction and operation phase some aspects of the EMP may require alteration owing to their non-applicability in certain areas or the need for additional mitigation measures based on the findings of environmental monitoring during the construction and operation phase. In such cases the following actions shall be taken.

- A meeting will be held between the wind farm developers/promoters and the concerned contractors. The meeting should discuss the proposed deviation in plan or design from the original EMP and should be mutually agreed upon.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the original EMP clause/plan or design, the change that has been agreed upon, and the reasons for the change.
- The report will be signed by all the parties and will be filed at the site office. A copy of the report will be sent to the wind farms developers/promoters and contractor head offices.
- All relevant project personnel will be informed of the change.

Changes to the Operation

The change management system recognizes three orders of changes.

First Order

A first order change is one that leads to a significant departure from the project described or the impacts assessed in the REA and consequently require a reassessment of the environmental impacts associated with the change e.g., change in location of the wind farm site etc.

Action Required: Environmental impacts of the proposed change will be reassessed and sent to the relevant EPA for approval.

Second order

A second order change is one that does not result in significant change in project description or impacts that are significantly different from those detailed in the REA e.g., extension in the site area etc.

Action Required: The required action for such changes is to reassess the impact of the activity on the environment and specify additional mitigation measures if required and report the changes to the relevant EPA.

Third Order

A third order change is one that does not result in impacts above those already assessed in the EIA, rather these may be made on site to minimize the impact of an activity such as increase in project workforce.

Action Required: The only action required for such changes will be to record the alteration in the Change Record Register.

15

Environment Management Plan Cost Estimate

General Management of EHS and CSR

S.#	Environmental Measure	Responsibility	Activity Duration	Monthly Cost Estimate	Annual Cost Estimate
1.	EHS Manager	EPC /O&M Contractor	On-Going	50,000	600,000
2.	EHS Engineer			30,000	360,000
3.	EHS Supervisor			20,000 * 2	480,000
4	Administration Manager			60,000	720,000
5	Independent Monitoring Consultant	Project Owner	On-Going	45,000	540,000
6	Independent Birds Monitoring			35,000	420,000

Construction Phase and Operation Phase—Environment

S.#	Environmental Measure	Responsibility	Activity Duration	Monthly Cost Estimate	Annual Cost Estimate
1.	Emission Testing of Construction Machinery and Maintenance	EPC Contractor	9 Months	25,000	300,000
2.	Noise Testing of Construction Machinery			20,000	240,000
3.	Disposal of wastewater	EPC /O&M Contractor	On-Going	60,000	720,000
4	Water Cost for sprinkling/showering	EPC Contractor	9 Months	30,000	180,000
5	Construction and Maintenance of Secondary Containment	EPC /O&M Contractor	On-Going		20,00,000
6	Solid Waste Disposal Cost (Incineration)		On-Going	45,000	540,000

Construction Phase and Operation Phase —Occupational Health & Safety

S.#	Occupational Health & Safety Measure	Responsibility	Activity Duration	Monthly Cost Estimate	Annual Cost Estimate
1.	Drinking Water Testing	EPC /O&M Contractor	On-Going	10,000	120,000
2.	Fire Extinguishers Filling/Re-Filling			20,000	240,000
3.	First Aid and Medical Treatment			45,000	540,000
4	Personal Protective Equipments (Goggles, Safety Shoes, Hard Hats, Harness, Gloves etc)			60,000	720,000
5	Cranes Load Testing				500,000
6	Ambulatory Support				800,000

16

Corporate Social Responsibility Plan Cost Estimate

Construction Phase and Operation Phase —Corporate Social Responsibility

S.#	Occupational Health & Safety Measure	Responsibility	Activity Duration	Monthly Cost Estimate	Annual Cost Estimate
1.	Stakeholder Engagement Meetings	Project Owner	Quarterly	10,000	120,000
2.	Drinking Water arrangements		On-Going	30,000	360,000
3.	Medical Camps arrangements			40,000	480,000
4	Establishment of vocational trainings programs			100,000	120,00,00
5	Establishment of Basic education programs			600,000	720,000

Total Annual Estimate for EHS and CSR = PKR 12,900,000 (12.9 Million) for One Project.
For Three projects A,B & C, the total cost will be around 39 Million

17

Public Consultation

Public Consultation presents the details of public consultation meetings with the community members and key stakeholders of the project area including WWF, villagers, Government officials and NGO representatives.

TBCCPL has developed Stakeholder Engagement Plan (SEP) and first stakeholders engagement meeting was conducted in June 2016.
Administration and HR Manager of TBCCPL are responsible to implement the SEP throughout the project life cycle.
Independent Monitoring of the SEP implementation will be done.

Objective of Public Consultation

The main objective of the public consultation process conducted in the project area was to disseminate information about the project to the communities and its expected Environmental impacts among primary stakeholders.
Another important objective of public consultation was to determine the extent of the impact of different project activities on the environment and suggest appropriate mitigation measures. The overall objectives of the Public Consultation process were given as follows.

- To inform and acquire feedback from primary stakeholders on project activities
- To gain the consent of all the primary stakeholders for carrying out project activities
- To identify potential issues and mitigation measures
- To incorporate community and stakeholders concerns in the project documents

Methodology

The input from the primary and secondary stakeholders were collected by following method

- Conducting survey
- Executing formal stakeholders meetings

The survey team held meetings with primary stakeholders in the target area. The team visited nearby areas in the project area to meet local people and community leaders. The villages were identified with the help of project map.

During these meeting a simple, non-technical summary of the project was given, along with an overview of the projects likely human and environmental impacts. Following the project descriptions, a discussion was held s that the participants could voice their concerns and opinions. These concerns and suggestion were recorded in field notes.

Consultation Process

Public consultation meetings were held at major locations. Project descriptions was done in detail yet explained in simple language. Gender specialist also conduct public consultation meeting at selected places. During meeting gender related questions were asked in informal way. Women were encouraged to ask questions and share their concerns related to project which were carefully return. The project was welcomed by the people.

Stakeholders Meeting

A formal stakeholders meeting was conducted on June 22, 2012. The meeting was attended by the primary and secondary stakeholders. Project description along with baseline scenario and alternatives were explained to the participants.

After the briefing participants were encouraged to ask the questions and detailed response was provided to their queries.

A formal feedback regarding the project and its outcomes was collected at the end of the meeting.

Public Consultation Outcome

Since a political dispute about the owner ship of the land has been created by the area locals, therefore majority of the stakeholders expressed their concern regarding the authority of Sind Government to lease the AEDB as the land owner claims that in the Revenue department record, the land is still their property and even if the Sind Government has leased the land to AEDB then adequate compensation has not been given to the land owners.

No negative comments were raised by the local villagers as the proposed wind farm is not causing any relocation of rural and native human settlement. They are optimistic and expecting that with the windfarm developments they will get employment opportunity as well as the more infrastructure and basic need support in terms of education, electricity, drinking water and health.

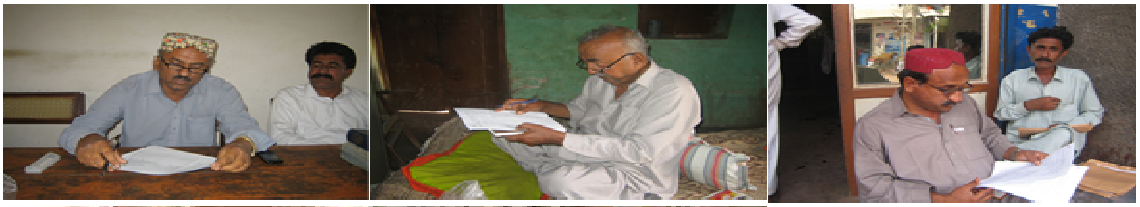
Summary of Response from Stakeholders

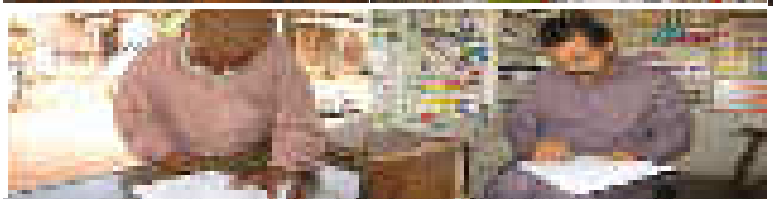
Total Questions = 11

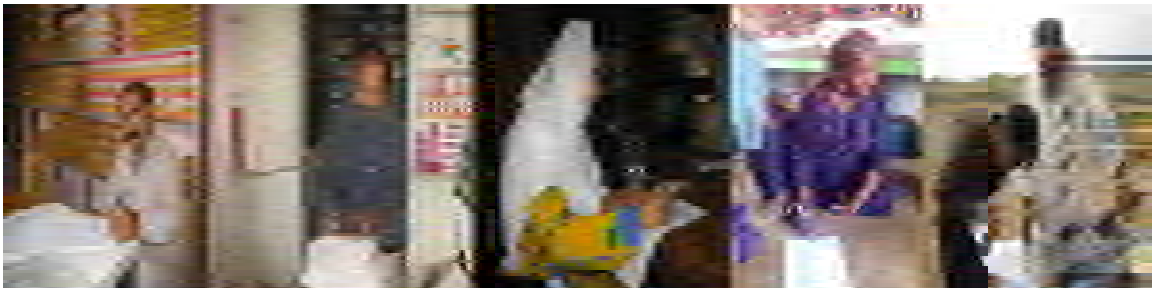
Total Respondents = 37

Questions		Yes	No
Do you understand the nature of the project		**37**	**0**
Do you understand the positive impacts of this project		**37**	**0**
Do you understand the negative impacts of this project		**31**	**6**
Do you think this project is beneficial for the common man		**1**	**36**
What you think are the advantages of this project	Majority were not able to relate the macro advantage of this project with their social well being		
What you think are the disadvantages of this project	Private companies have been leased land without compensation to land owner		
Do you think advantages are more than disadvantages	Macro level	36	1
	Micro level	15	21
What is your impression regarding this meeting	Majority of respondents desire that contents of these reports are taken into consideration by authorities		
What you like about this project	Majority of respondents think that sooner or later due to the presence of all the projects the local area environment will improve in terms of basic needs fulfillment		
What you do not like about this project	Local land owners were not consulted by the Government		
Do you think this project should be initiated.		**25**	**11**

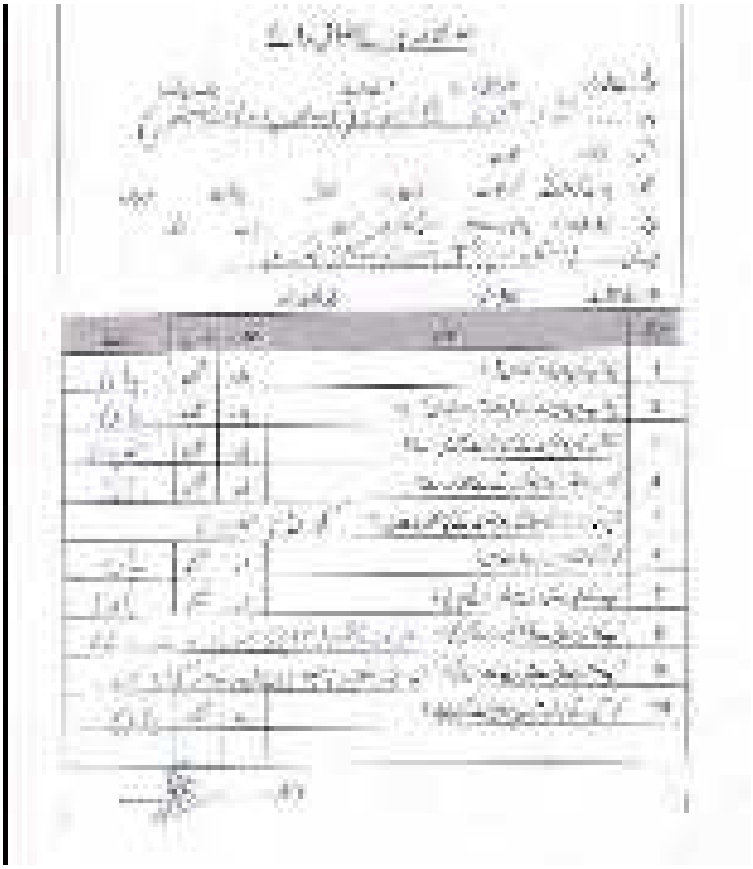
Evidences of Public & Stakeholders Consultation :

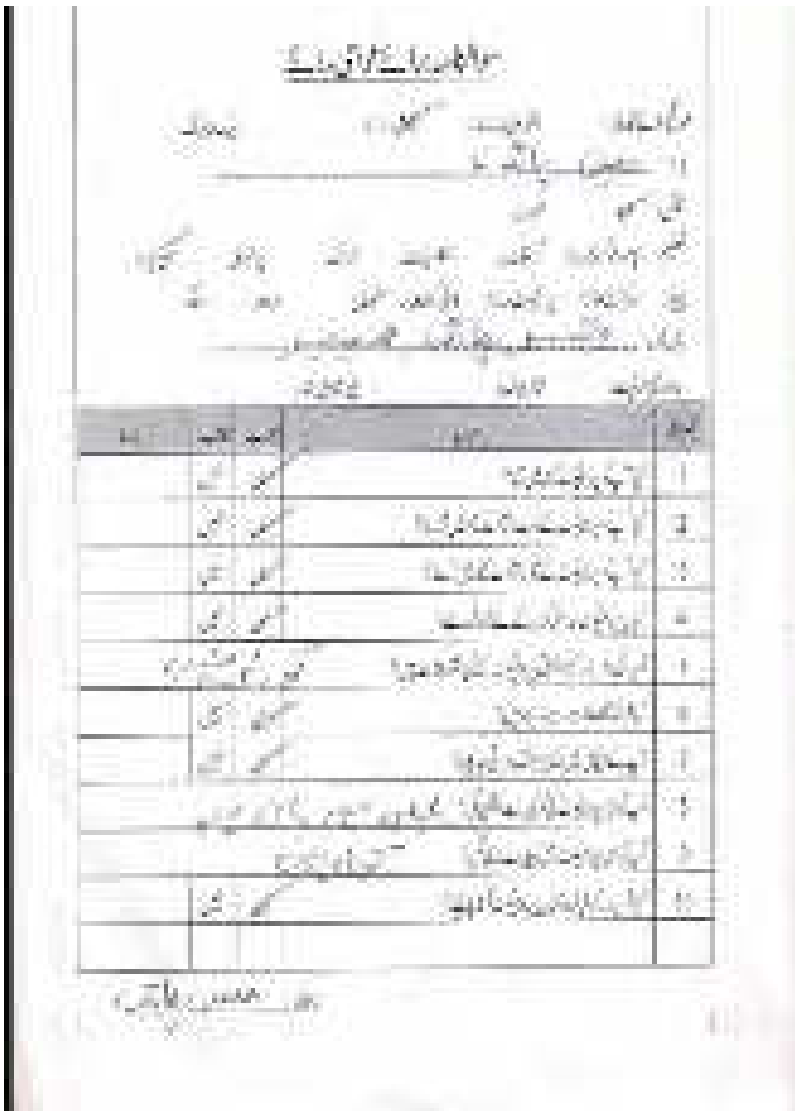


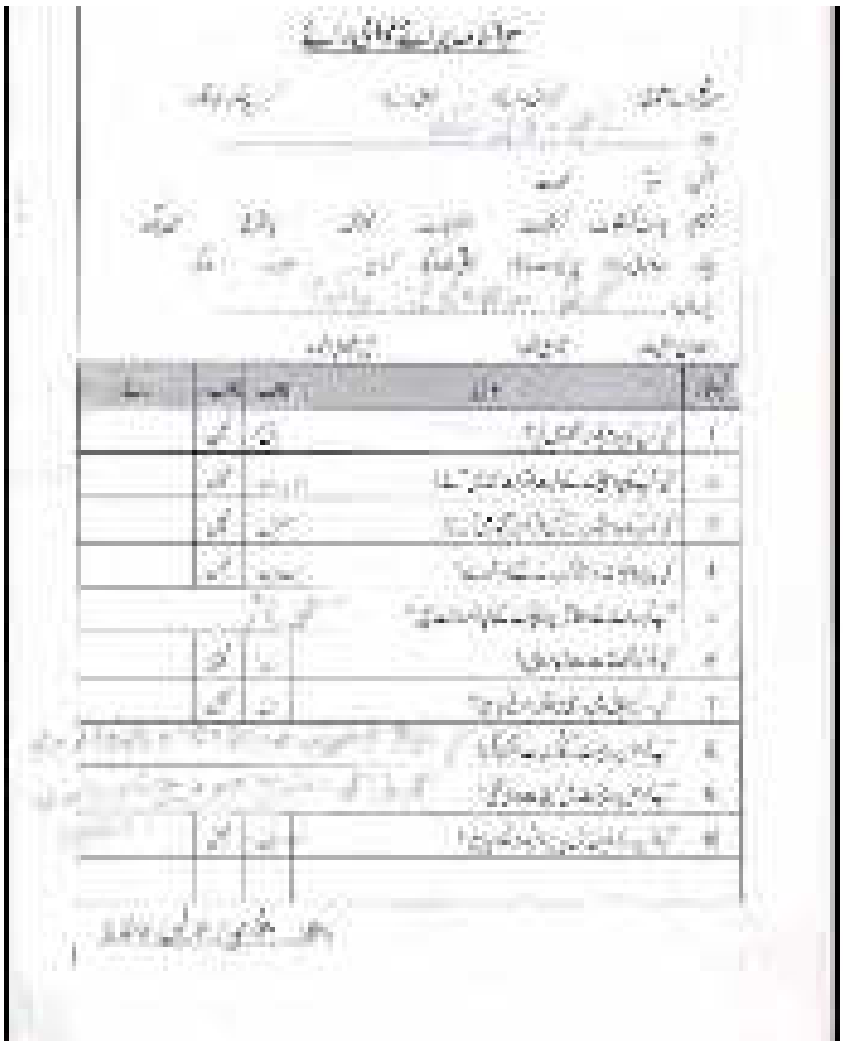




Samples of Filled Questionnaires as Evidences of Public & Stakeholders Consultation :







The questions raised and reply to those questions is detailed below

Q Asked by Ghulam Mustafa Chang village Jhimpir that what the local community will get by the project proponent if the project is on the land on which they are living for past many years?

A--Consultant replied that the villagers do not have any right to claim land ownership as the land is owned by the Government. The land is leased by Govt. of Pakistan to Alternate Energy Development Board (AEDB) and AEDB has sub-leased the land to project proponent. Although villagers do not have the land ownership but proponent has decided to give some basic health dispensary and other facilities etc to the villagers under the CSR programme.

Q.: Asked by Aziz Chang village Yar Muhammad Chang that how the noise will be controlled?

A--Project Manager has replied that the generated noise will be low because those wind turbines are selected which generates low noise and those will be monitored against the monitoring plan.

Q: Asked by Mr: Shahnawaz from SCOPE makli that how the electricity will be transmitted & distributed?

A--Consultant replied that generated electricity from wind farm will be export to National Grid (HESCO) they will manage the transmission & distribution system.

18

Analysis of Alternatives

18.1 Preamble

This section highlights the various project management and design alternatives that were considered and carefully examined during the selection of the land site (by AEDB), preparation of the feasibility report and the environmental assessment report.

18.2 Management Options

The management alternatives examine the no-action option that means not initiating the development of windfarm and bringing no reduction in the supply demand gap of electricity as well as no reduction in greenhouse gases if fossil fuel options were used to generate the electricity. This option is discussed below:

18.3 No-Project Option

The no-project option (not developing any wind power project in the region) entails that the region would receive no new impacts, neither positive nor negative. Therefore, this option implies the avoidance of negative impacts derived from the wind farms development on the biotic and physical environment of the region. However, this option does not solve the necessity of increasing the national energy supply and would entail not making use of one of the energy natural resources with a highest potential in the region. At the same time, it does not provide local development opportunities in this region where, according to the socio-economical baseline study conducted, electricity and employment are some of the main necessities identified by the local communities (according to the baseline conducted). Furthermore, the alternative analysis shows that no alternative locations exist for setting wind farm developments without causing a high environmental impact depending on power generation potential of the area and the electricity load demand.

Other consequences proceeding with the no-project option are:

- loss of an opportunity to offset tonnes of greenhouse gas emissions per year and concert them into carbon credits under CDM mechanism as it has already happened in India and China;
- loss of an opportunity for companies to begin or to continue expanding their renewable energy development interests in Pakistan.

Alternative Site Option

Methodology

The methodology as defined below was employed by AEDB to determine the most suitable areas to host wind farms in the Gharo wind corridor is:

I. Description of “Wind farm development in the Gharo wind corridor”.
II. Determination of the potential impacts of wind energy projects.

III. Territorial diagnostic.
IV. Development of an environmental unit map.
V. Evaluation of sensitivity: Development of sensitivity map.
VI. Evaluation of capability of use: Development of capability of use map.

The windfarms are by their very nature located where the wind potential is significant—where high velocity winds are prevalent for most parts of the day and most parts of the year. In Pakistan, such conditions are found along the Gharo wind corridor in Sind and along the coastal areas of Baluchistan. Since the load centers (areas having high electricity demand or where major human population density is without electricity) is located in Sind than in Baluchistan, therefore setting up the windfarms in Baluchistan means setting up the transmission lines which have their own social and environmental impacts. While in Sind, the national transmission and distribution system is already in existence therefore setting up the windfarm in this corridor is a viable options as it has less environmental impacts in terms of support infrastructure requirements.

Design and Technological Alternatives

This section contains a description of the alternatives that must be considered for wind farm projects:

- connection to the grid;
- wind farm output;
- turbine capacity, height, numbers and locations;
- layout of access tracks and ancillary structures;
- location of viewing platform;
- transportation of components to the site

Grid capacity refers to the ability of a transmission network to transmit electricity. Grid capacity is influenced by different physical and climatic conditions including:

- diameter of the electrical conductor;
- distance between power poles and closeness of lines to the ground;
- ambient air temperature; and
- cooling effects of the wind.

Grid capacity is an important factor in the ability to distribute electricity from a wind farm and therefore the wind farm's size. The wind farm output will increase as the wind speed increases and more energy is transferred through the turbines to create electricity. Increased wind speed also cools the transmission lines, increasing their capacity. This means that the capacity may increase with the wind farm output.

As an example, at a wind speed of 1 m/s (along the transmission line), 20 MW could be exported on each line up to temperatures of 35 ºC. At a wind speed of 2 m/s (along the transmission line), 25 MW could be exported on each line up to temperatures of 35 ºC (Wallace and Coulter, 2004).

Generation curtailment would be determined to ensure that capacity of the network is not exceeded. Country Energy's investigation will provide further information on the overall capacity of the grid.

Turbines can be designed to be less noisy by, for instance, changes in shape of the trailing edge or changes in blade pitch, but at a cost to generation efficiency. The ultimate control of noise is to stop one or some turbines at times when the noise they create causes distress.

Concerning turbine capacity, the International Electrotechnical Commission's (IEC) International Standard (IEC 61400-1) provides a classification based on the characteristics of wind at a site into four classes: I, II, III and IV. Class I is the highest wind speed and IV the lowest. Wind speed classes are combined with two turbulence intensity categories (A and B) to provide eight different classes IA to IVB. Turbines available on the market are certified to meet the site wind classifications described above.

The energy production potential of specific turbine specifications should be compared against the costs of that turbine specification in order to select the turbine that provides the best return on investment.
The numbers of turbines should depend on the physical constraints of the site (to maximize wind resource and property boundaries), the wind energy resource optimization modelling and the objectives of the companies.
It should be considered the following factors in selecting access track routes:

- requirement for gradient of no more than 14% construction requirements, in particular the amount of cut and fill required;
- areas of environmental sensitivity including location of items of archaeological significance, reptile habitat and vegetation; and
- visual impact of the access tracks along the ridgeline, particularly the visual impact of areas of cut and fill.

Potential locations for the wind farm substation should be identified and assessed in terms of:

- optimizing the electrical system layout;
- minimizing energy losses from each turbine to the substation and from the substation to the transmission network;
- accessibility; and
- minimizing potential environmental impacts.

Electrical transmission lines are required to connect the output of each turbine to the substation. The cable network would be clearly marked above ground, and a map maintained, to prevent accidental contact during subsurface works on the site. The substation itself would be equipped with an underground copper earthling grid size to dissipate calculated fault currents.
It should be proposed the construction of a viewing platform to provide a designated and safe area for people in vehicles to stop, park and view the wind farm. Additionally, it should be proposed the inclusion of interpretation panels and information at the viewing platform to inform the public about wind farms, generation of electricity from renewable sources and features of the surrounding physical environment including local native wildlife and habitat and archaeological features and history.
An assessment of the alternatives available to transfer wind turbine equipment to the site should be made concerning:

- port of entry;
- landside transportation method;

- landside transportation route; and
- site access

Environmental Benefits of Wind Energy

- **CO2 reduction**

  Climate change is the single most important sustainable development issue facing the energy sector, but it has implications for us all.
  Climate change is believed to be caused primarily by the increase in levels of carbon dioxide from the burning of fossil fuels. Climate change is a real threat to future generations, causing unpredictable weather patterns with adverse impacts on agriculture, wildlife, human health and the economy. The urgent need to tackle climate change by reducing carbon emissions has risen to the top of the world's agenda.

  Climate change is leading to changes in temperature, rainfall patterns, snow cover, wind and storm events, flooding and coastal erosion. All of these could have significant impacts on world's climate.

  Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

  By reducing CO2 emissions and addressing climate change, wind power ensures that the energy we use to meet our daily needs is truly from a sustainable source. To be completely sustainable in both the global and local contexts, the environmental impacts of individual developments must not have unacceptable impacts on the local natural heritage and local communities.

  Once constructed, wind farms generate emission-free electricity, replacing electricity generated by coal and gas power stations and therefore wind farms help us to reduce our greenhouse gas emissions.

- **Improve Human Health due to Air Emission Reduction**

  The main pollutant of concern is particulate matter, which is mainly produced when fossil fuels are burned. In addition, ground level ozone – called sometimes photochemical smog has important impacts.

  The pollutant of most concern for human health is airborne particulate matter. For example, particles with a diameter less than 10 millionths of a meter (PM10) or even smaller particles such PM2.5 can penetrate deep into the respiratory tract and bring about adverse cardio-pulmonary effects.

Wind power is a green energy because it cannot produce greenhouse gases and particulate matter. Wind is a natural resource for producing energy. The sun heating different parts of the earth unequally causes winds. A wind turbine converts the wind's kinetic energy into mechanical energy, which is then turned into electrical energy. No fossils fuels are burned and no greenhouse gases & particulate matter will generate in the wind farm and hence the air quality is improved which will improve the human health.

Benefits of Wind Energy

- Wind energy is an ideal renewable energy because:
- It is a pollution-free, infinitely sustainable form of energy
- It doesn't require fuel
- It doesn't create greenhouse gasses
- It doesn't produce toxic or radioactive waste.
- Wind energy is quiet and does not present any significant hazard to birds or other wildlife.
- When large arrays of wind turbines are installed on farmland, only about 2% of the land area is required for the wind turbines. The rest is available for farming, livestock, and other uses.
- Landowners often receive payment for the use of their land, which enhances their income and increases the value of the land. (Govt. policy restrictions)
- Ownership of wind turbine generators by individuals and the community allows people to participate directly in the preservation of our environment.
- Each megawatt-hour of electricity that is generated by wind energy helps to reduce the 0.8 to 0.9 tonnes of greenhouse gas emissions that are produced by coal or diesel fuel generation each year.

Wind Security of Our Energy

- Ensuring a secure and reliable electricity supply is essential for the People of Pakistan. Long term reliance on diminishing fossil fuel resources and demand of gas increases our vulnerability to volatile market prices and supply risks and we have all been affected in recent months by increases in the costs of domestic energy prices. A diverse mix of generation methods reduces such risks and wind generated power can be an important contributor in such a mix.

- Wind is an indigenous, safe, clean and plentiful source of energy. A modern wind turbine with a capacity of 2 megawatts (MW) will produce enough power to meet the typical annual needs of over 1,100 homes.

19

Grievances Handling Mechanism

Effective and timely response to community complaints and other stakeholder's grievances is essential for maintaining good community relations, avoiding conflicts and legal litigations.

The objective of a grievance management system is to ensure that all comments and complaints from any project stakeholder, including local/regional authorities, residents of nearby areas, TBCCPL and its EPC and O&M Contractor employees, , EPC and O&M Contractor sub- contractors 'employees and other interested parties, are considered and addressed in an appropriate and timely manner.

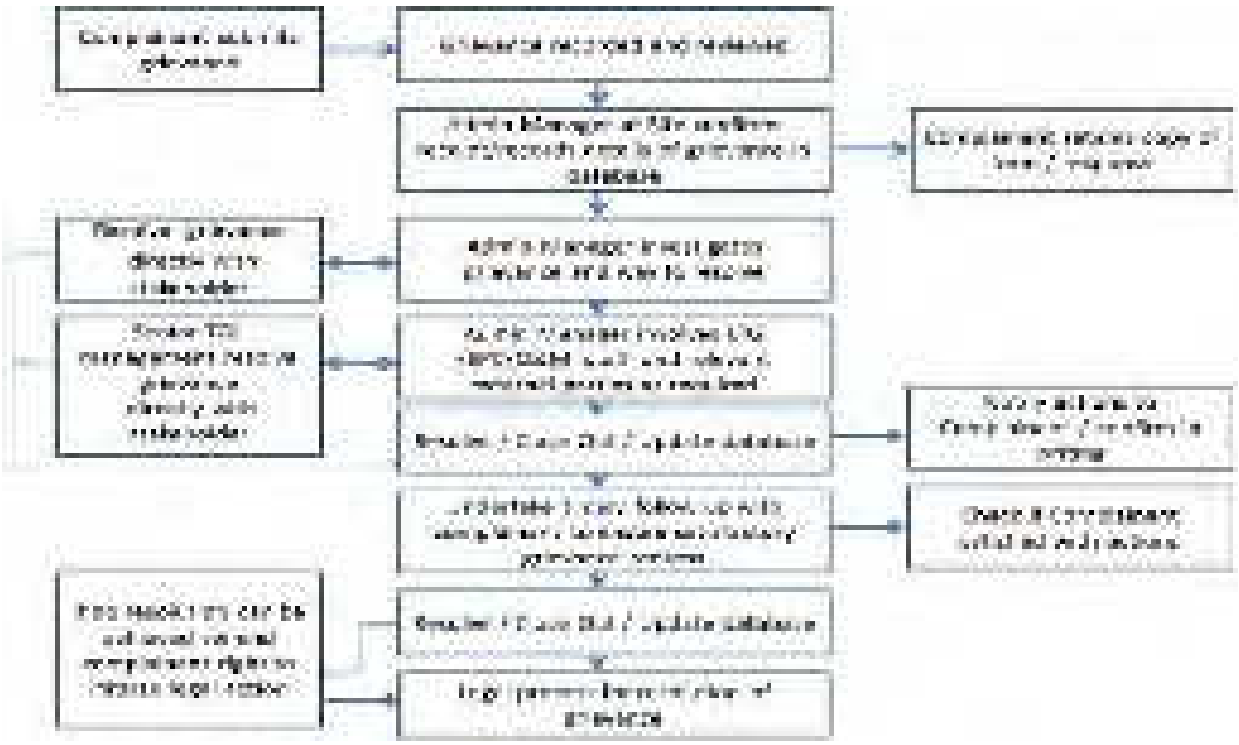
All grievances will be acknowledged and responded to within a reasonable timeframe.. Critical Grievances from external and internal stakeholders requiring immediate attention will be addressed within one week's time frame while minor grievances from external and internal stakeholders will be addressed within maximum time frame of one month.

External (Public and other Stakeholders) Grievance

All local residents and other community / stakeholder grievances about the Project will follow the procedure set out in this Plan. The procedure is defined in detail as annexure along with supporting templates and forms.

External grievances can be received directly or during the stakeholder consultation meetings

The following figure summarizes the TBCCPL Grievance mechanism for the wind farm:



Internal (Worker) Grievance

TBCCPL is committed to enforcing its comprehensive labour and employment policies, including its requirements on workplace discrimination and harassment, across the entire workforce. This policy requires that all employees and contractor workers are to be treated fairly, with dignity and respect, and have equal employment opportunities.

The Grievance Management procedure includes an authorized process for workers to raise grievances and concerns to TBCCPL Administration Manager and senior management, covering any issues that are work related, that affect an employee or contractor or contractor employee, or that an employee deems unfair. Such concerns may relate (but are not limited) to the following:

- Management decisions;
- Occupational health and safety concerns;
- The behavior or conduct of another employee, manager, or contractor; and
- The effects of TBCCPL Human Resources policy or procedures.

TBCCPL will ensure that all grievances raised by workers are treated impartially, respectfully and confidentially. In addition, anyone who becomes aware of or suspects any violations of obligations is encouraged to report the facts or their suspicions directly to senior management or through the whistleblowing system set out in the TBCCPL Code of Ethical Conduct.

20

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21

Annexures

21A

Wind Turbine (GE 1.7-103) Residual Noise Calculations

Noise is generated by wind turbines as they rotate to generate power. This only occurs above the „cut-in" wind speed and below the „cut-out" wind speed. Below the cut-in wind speed there is insufficient strength in the wind to generate efficiently and above the cut-out wind speed the turbine is automatically shut down to prevent any malfunctions from occurring. The cut-in speed of GE 1.7-103 WTG at turbine hub height is normally between 3.5 m/s and the cut out wind speed is 23 m/s.

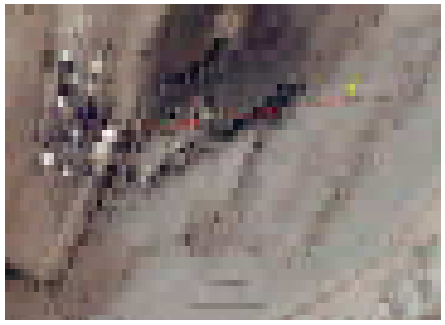
Noise levels are greater when the wind is blowing from the turbines towards the receiver location. With cross-winds (where the wind blows across a path between the turbine and the receiver), noise levels can be expected to be around 2 dB lower than downwind noise levels. For upwind propagation, (i.e. where the wind blows from the receiver towards the turbine), the noise level can be expected to be at least 10 dB lower. Exception to this 10 dB reduction occur within a distance of up to five times the hub height or where the ground falls away rapidly between the turbine and the receiver.

For TBCCPL, receptors were identified for the Project A, B & C. Three receptors were identified for Project A at WTG 1, 3 and 23, no receptor identified for Project B and one receptor identified for Project C at WTG 25.

The measurement of noise at these receptors were done to measure the background noise. The residual noise level of GE 1.7-103 WTG at different distances from WTG are calculated through software.

TBCCPL-Project A- WTG 1
480 m away

TBCCPL-Project A- WTG 3
546 m away



Background Noise Level at Project Area

Project	WTG	Noise
A	1	35
A	3	45
A	23	40
C	25	44

TBCCPL-Project A- WTG 23
350 m away

TBCCPL-Project A- WTG 25
371 m away

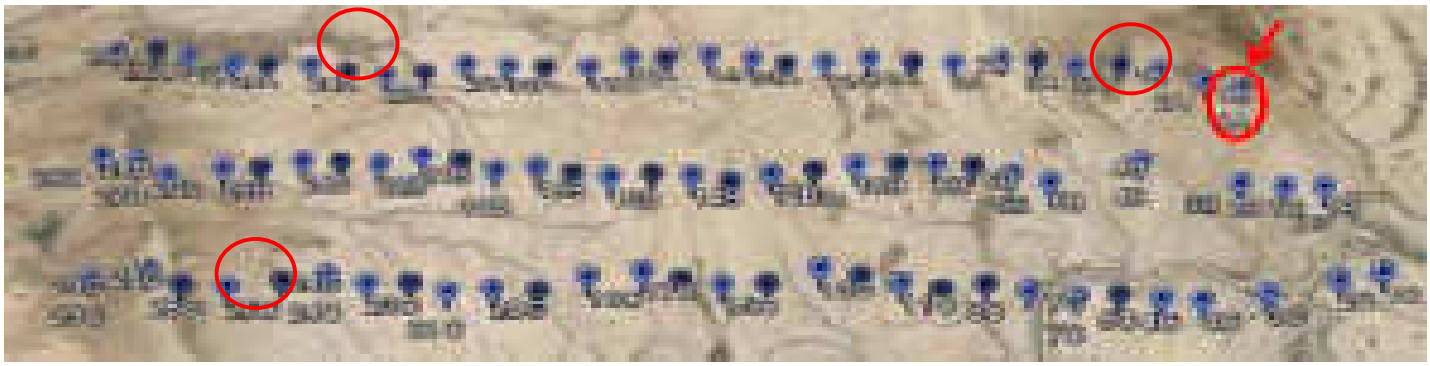
GE 1.7 MW Residual Sound at different distances in Project Area

The resulting noise level of GE WTG's at different receptors located at Project A and C is not above the background noise level measured at these receptors i.e. 45 dB.

21B

Shadow / Flickering Analysis
Turbine (GE 1.7-103)

For shadow / flickering analysis, the project boundary w.r.t. Project A and C is considered and receptors / human settlements near boundary WTG's identified.



The shadow / flickering analysis for GE 1.7-103 having hub height of 80 meter and blade length of 51.5 meter indicates that the rotor blades will not have any impact in terms of flickering as the project area does not have any formal human settlement however hamlets do exists near the project locations but these hamlets are not occupied during the whole year and mainly used for nomadic living purpose as when the area receives rainfall and water becomes available, the location population return to these hamlets and cultivate the land. In the absence of water and in condition of drought local population move away from this area.

The shadow /flickering analysis indicates that WTG blades will not create any significant impact on any nearby human settlement due to following factors and the flickering effect is not likely to exceed the limit of 30 minutes per day and 30 hours per year.

- The area is predominantly un-inhabitant
- The local environment regulatory body binds the project developer to place WTG atleast 500 m away from any human settlement
- Few hamlets present near the project area are not inhabitant round the year as the local population move away during drought and no rain season.

Summary Result of Shadow Flicker Calculations

Receptor ID (Hamlet Name)	Coordinates	Turbine ID causing flicker effects	Distance from closest turbine causing flicker effects(meters)	Total Days of shadow flicker per year	Total Hours of shadow flicker per year	Duration of Longest Daily shadow flicker event (minutes)	Average daily shadow flicker event (minutes)	Total No. of days per year when shadow flicker exceeds 30 minutes per day	Times of greatest potential shadow flicker exposure	Remarks (Description of Receptor present in the area)
1 (Karam Palari)	25° 4'44.42"N / 67°46'38.63"E	TBCCPL-Project A- WTG 1	480	200	20	12 minutes	6 minutes	None	Sunset	The hamlets are arranged in such a way that few of the hamlets form the boundary around the other hamlets so the exposure of shadow flicker is minimum to inhabitants
2 (Peeru Palari)	25° 4'31.01"N / 67°46'38.64"E	TBCCPL-Project A- WTG 3	546	200	17	12 minutes	5.1 minutes	None	Sunset	
3 (DilMurad Palari)	25.02936N/ 67.83577 E	TBCCPL-Project A- WTG 23	350	200	28	20 minutes	8.4 minutes	None	Sunset	
4 (Motio Palari)	25.04724N/ 67.83561E	TBCCPL-Project C- WTG 25	371	200	26	20 minutes	7.8 minutes	None	Sunset	

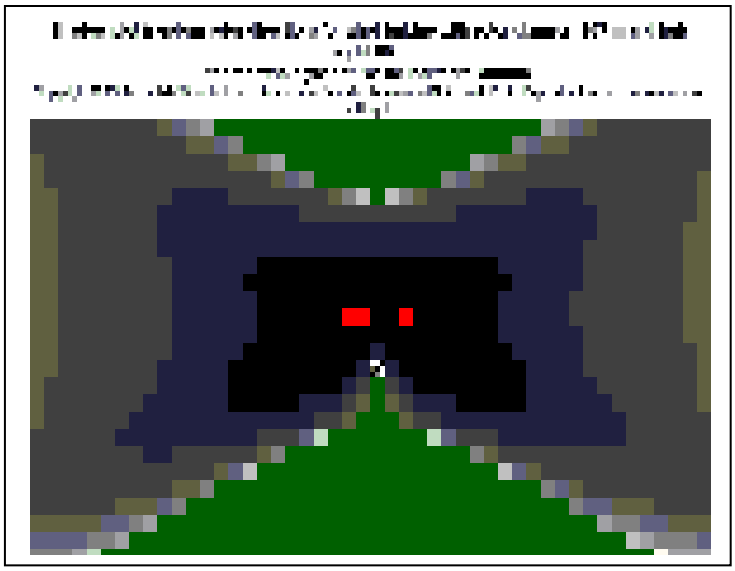
Following data was considered for modelling

- Mean sunshine duration
- Wind speed
- WTG operating hours
- Direction of Blade
- Any barriers between receptors

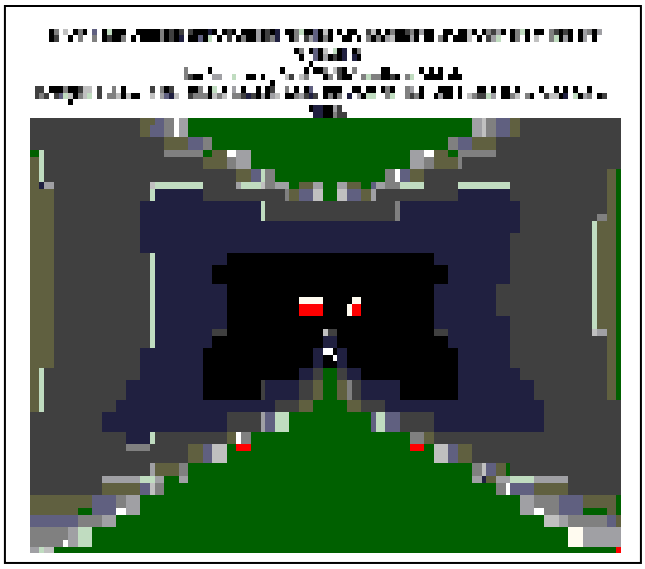
Project A-WTG-01

Project A-WTG-03

Project A-WTG-23

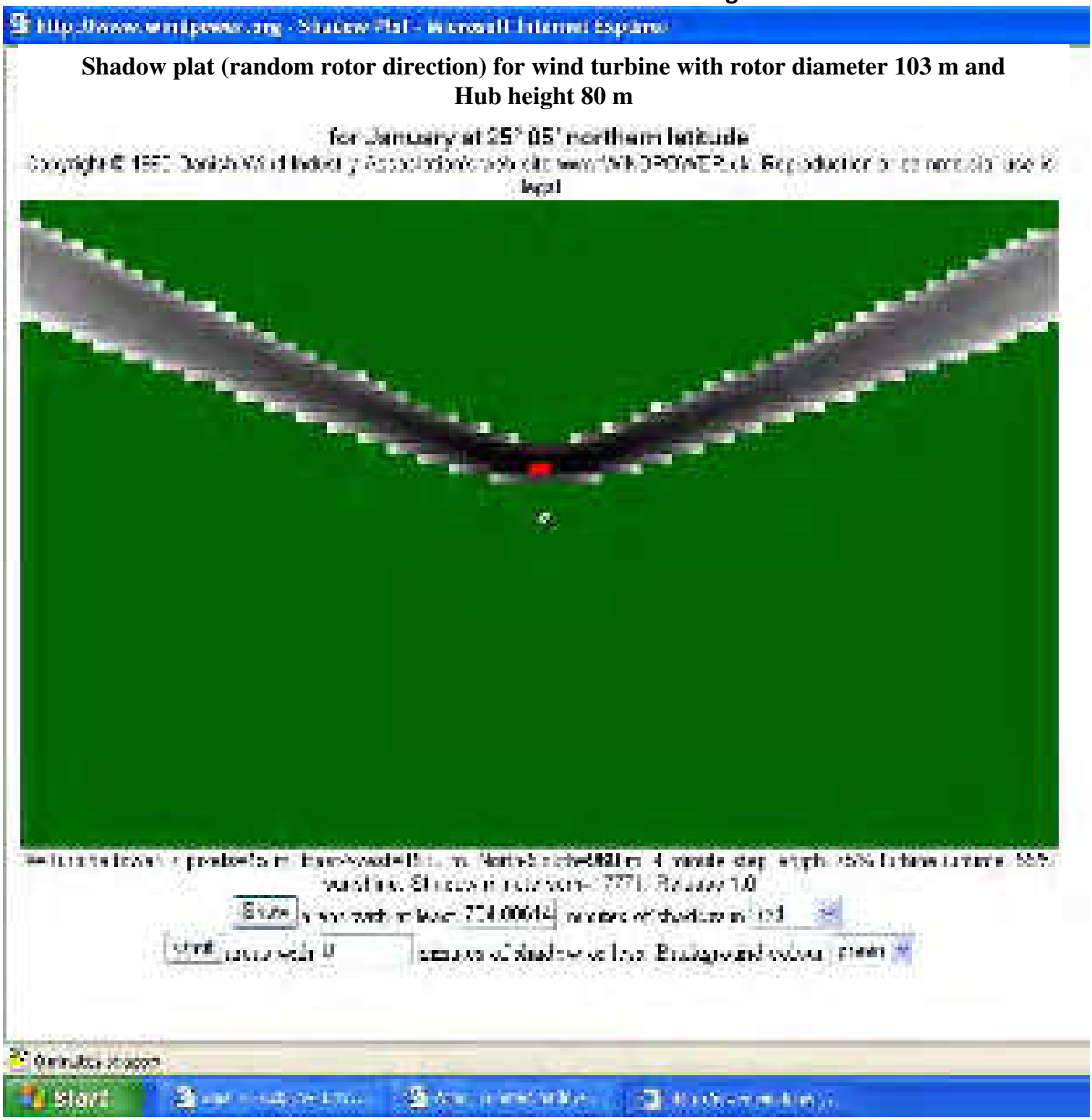


Project C-WTG-25



Shadow / Flickering Effect Calculation of Wind Turbines at 103 m Rotor Dia & 80 m Hub Heights

Shadow plat (random rotor direction) for wind turbine with rotor diameter 103 m and Hub height 80 m



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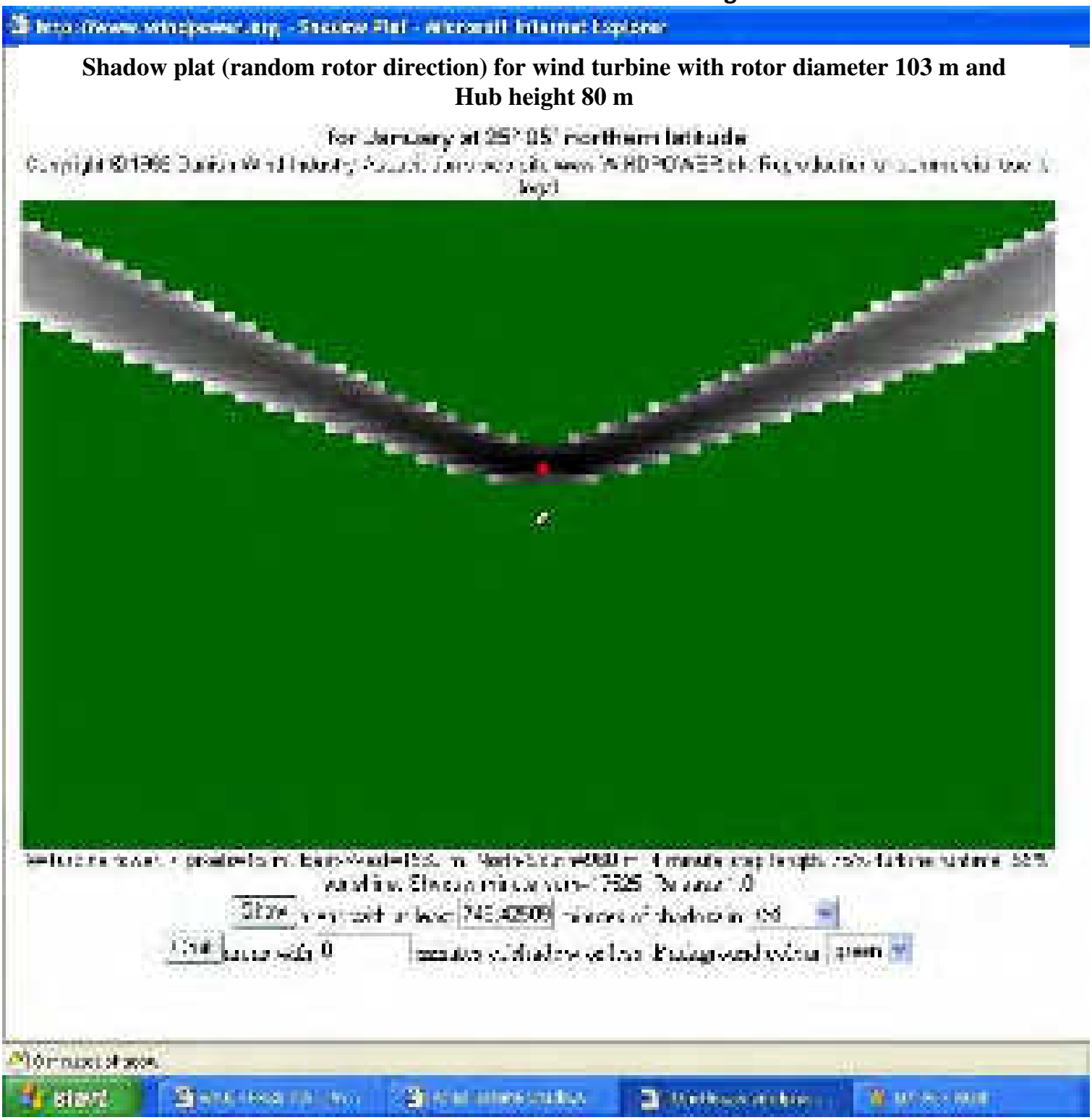

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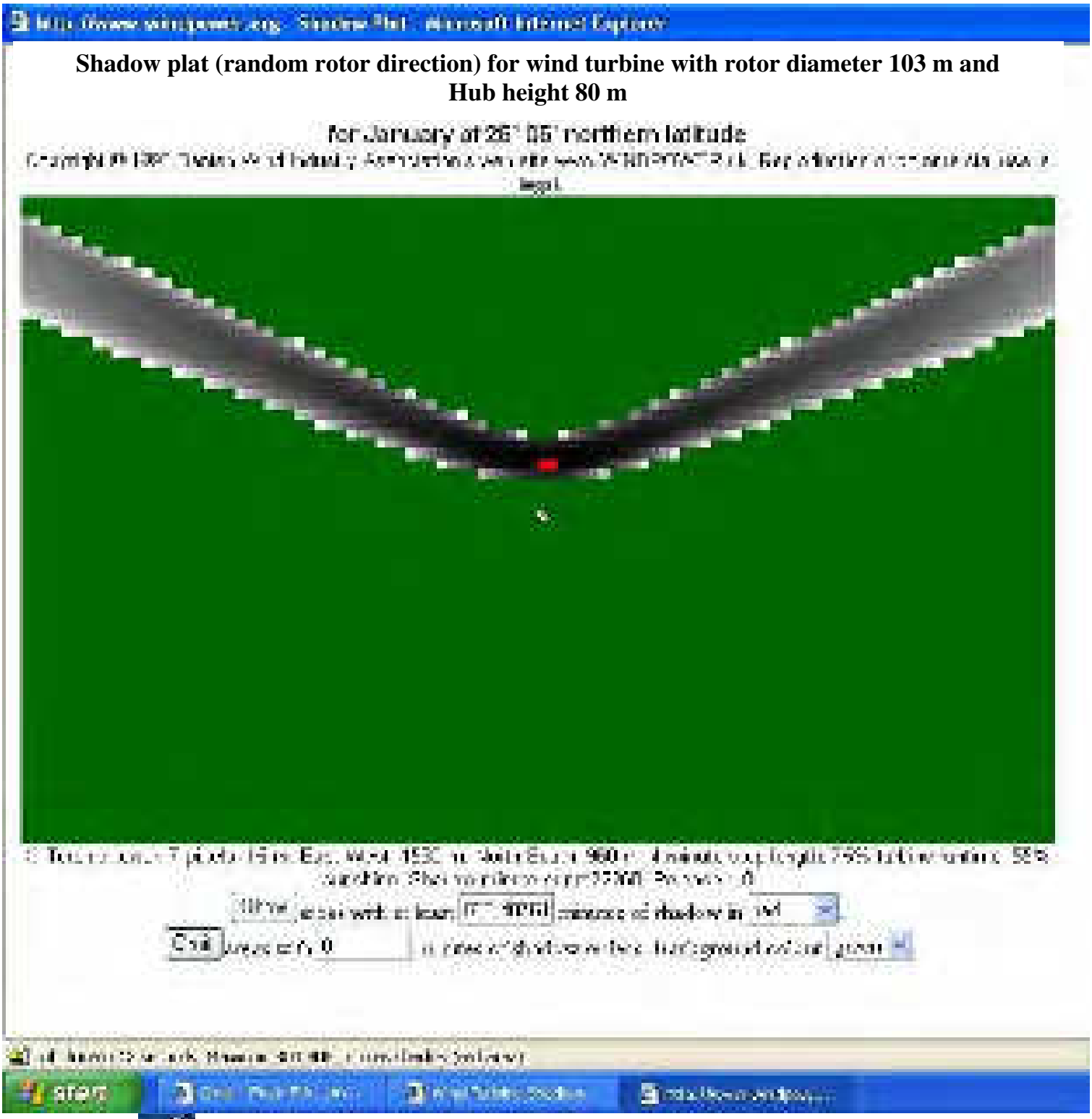

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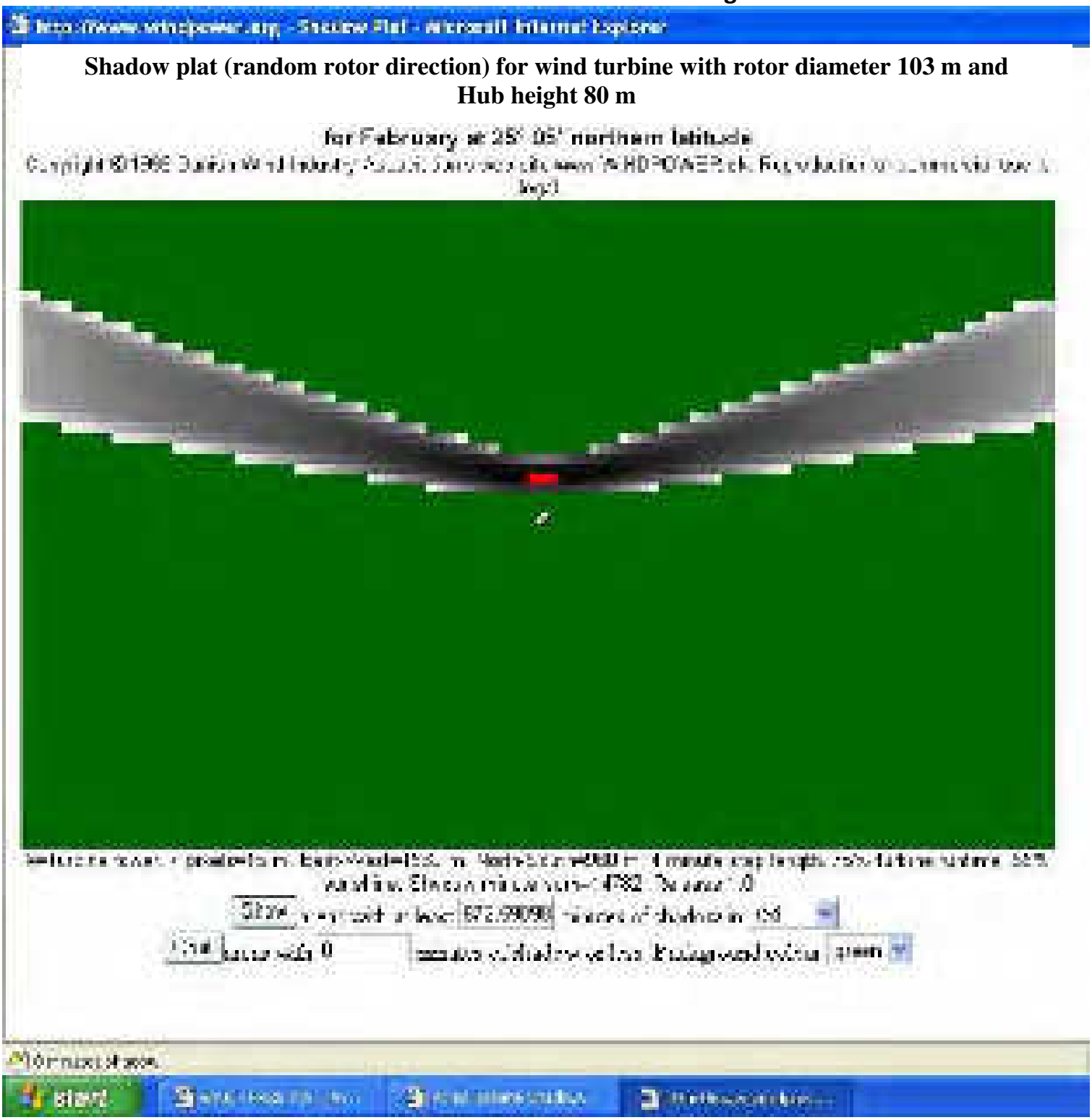

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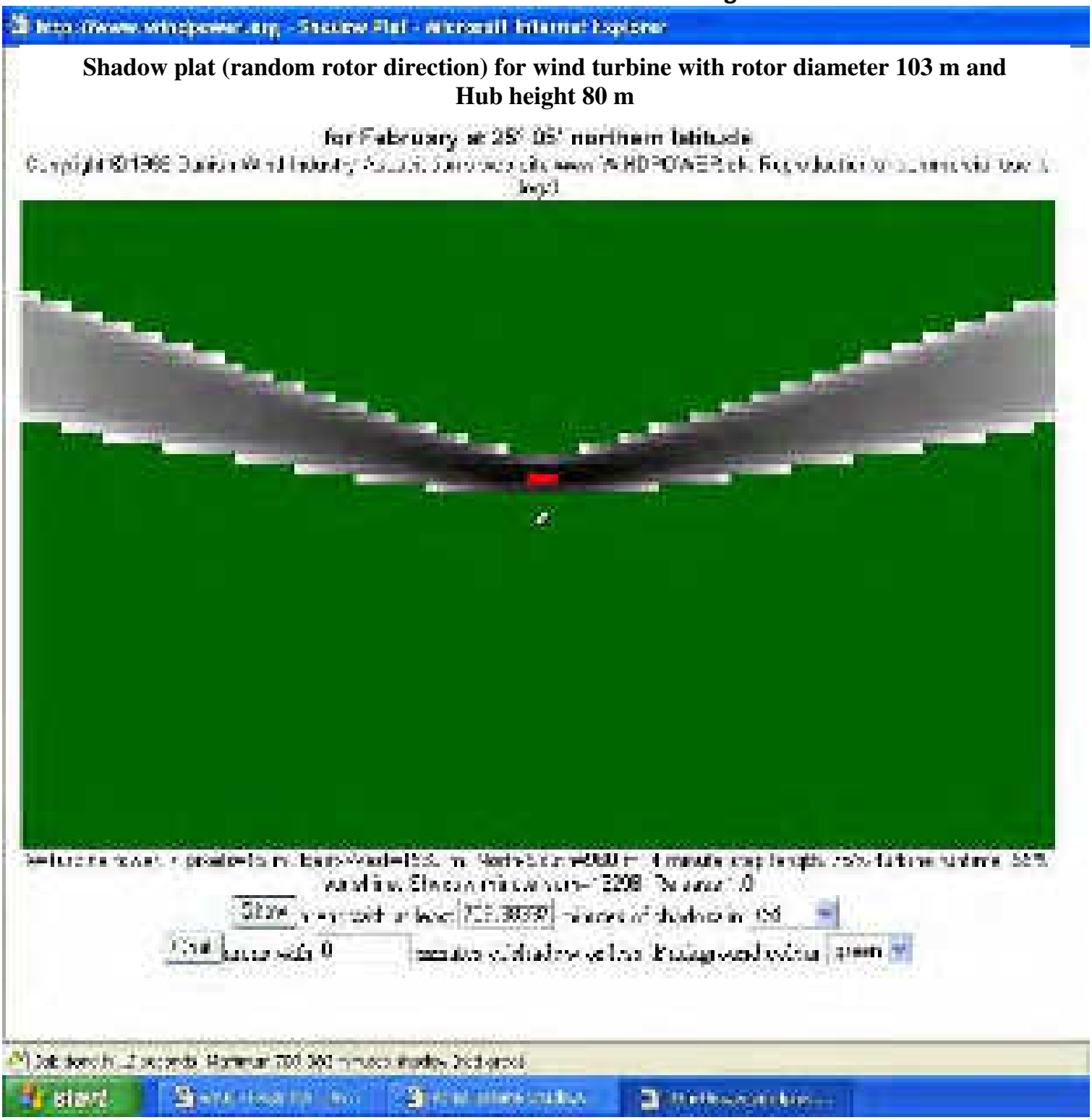

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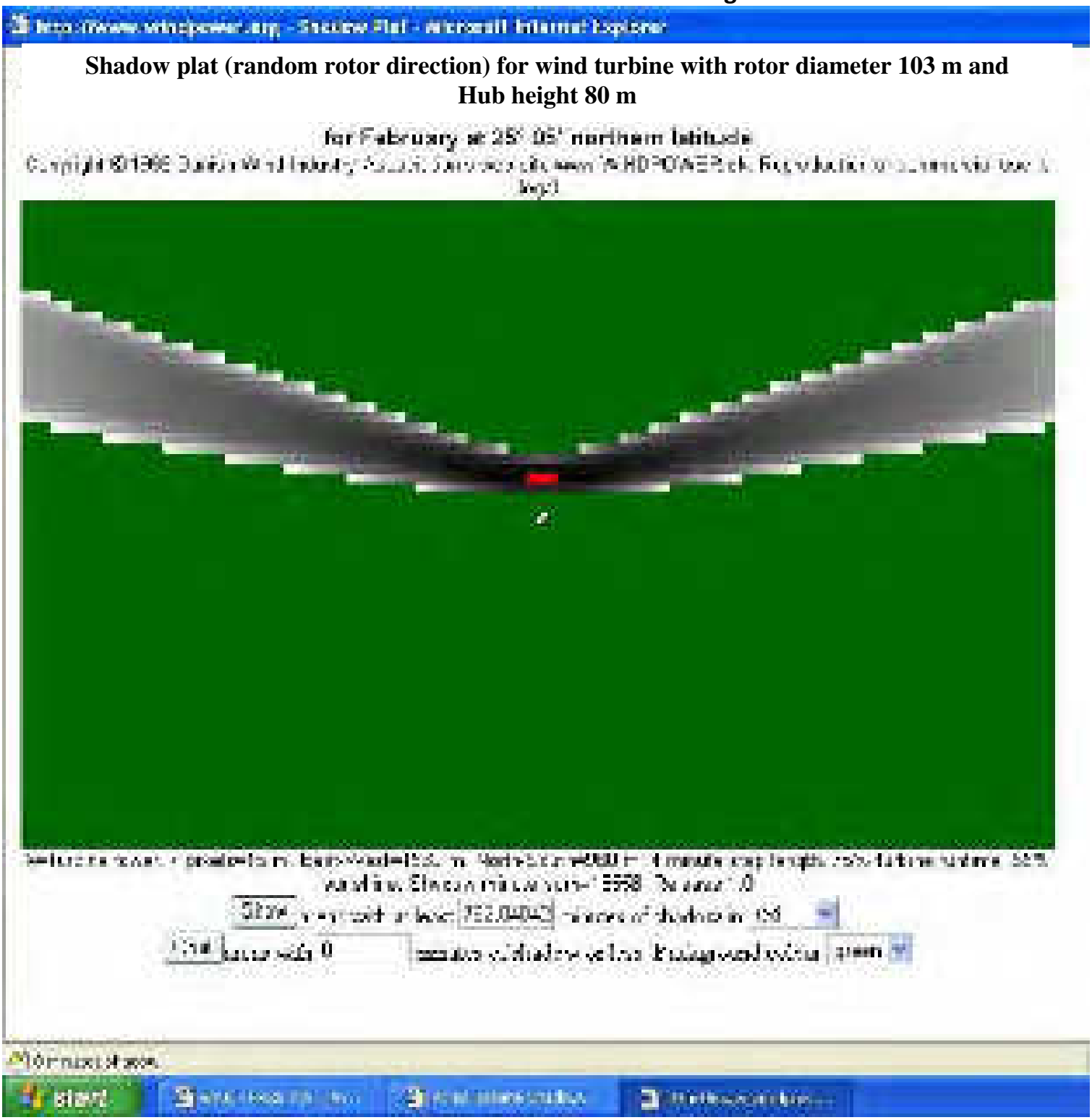
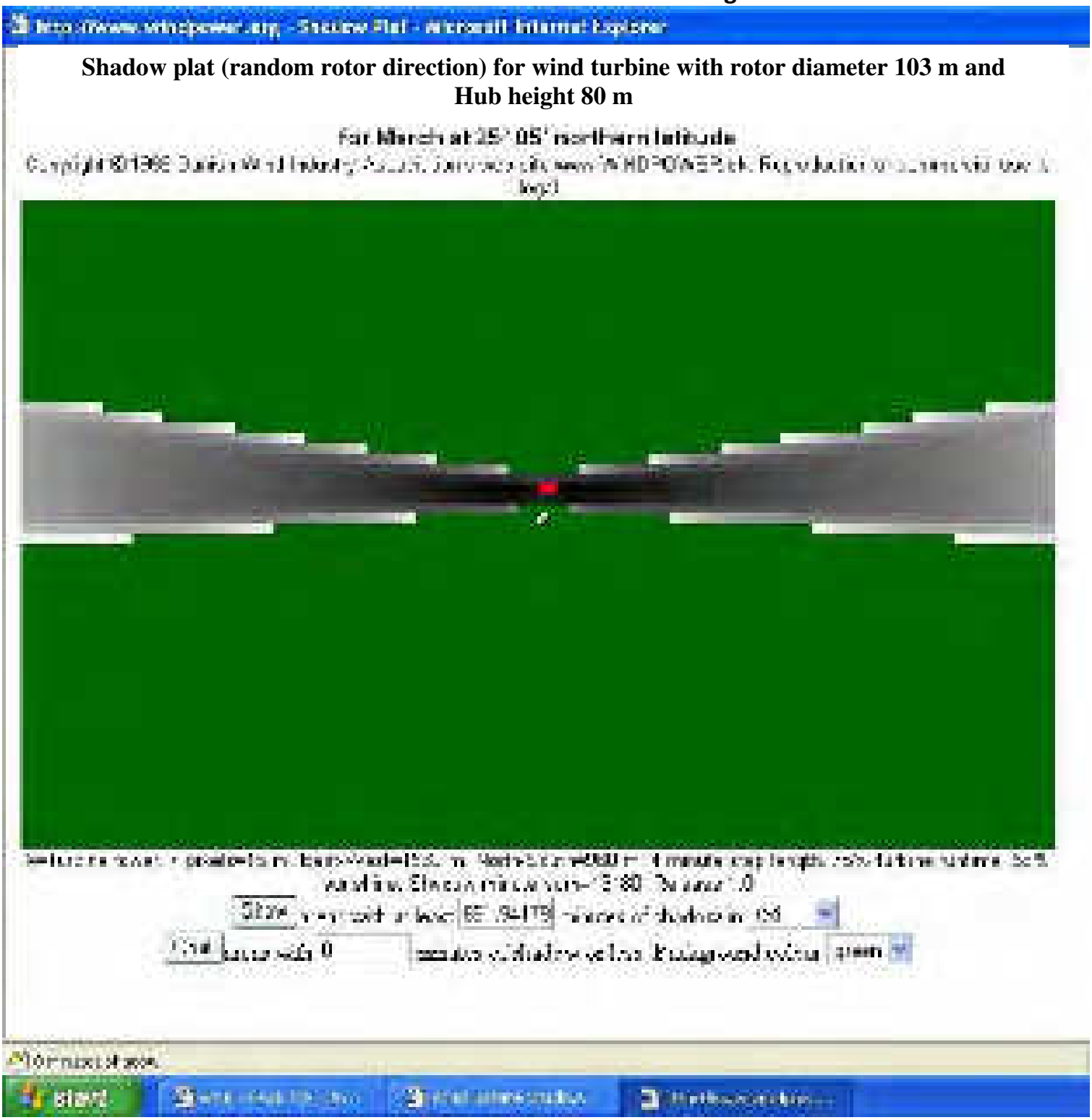


Shadow / Flickering Effect Calculation of Wind Turbines at 103 m Rotor Dia & 80 m Hub Heights

Shadow plat (random rotor direction) for wind turbine with rotor diameter 103 m and Hub height 80 m



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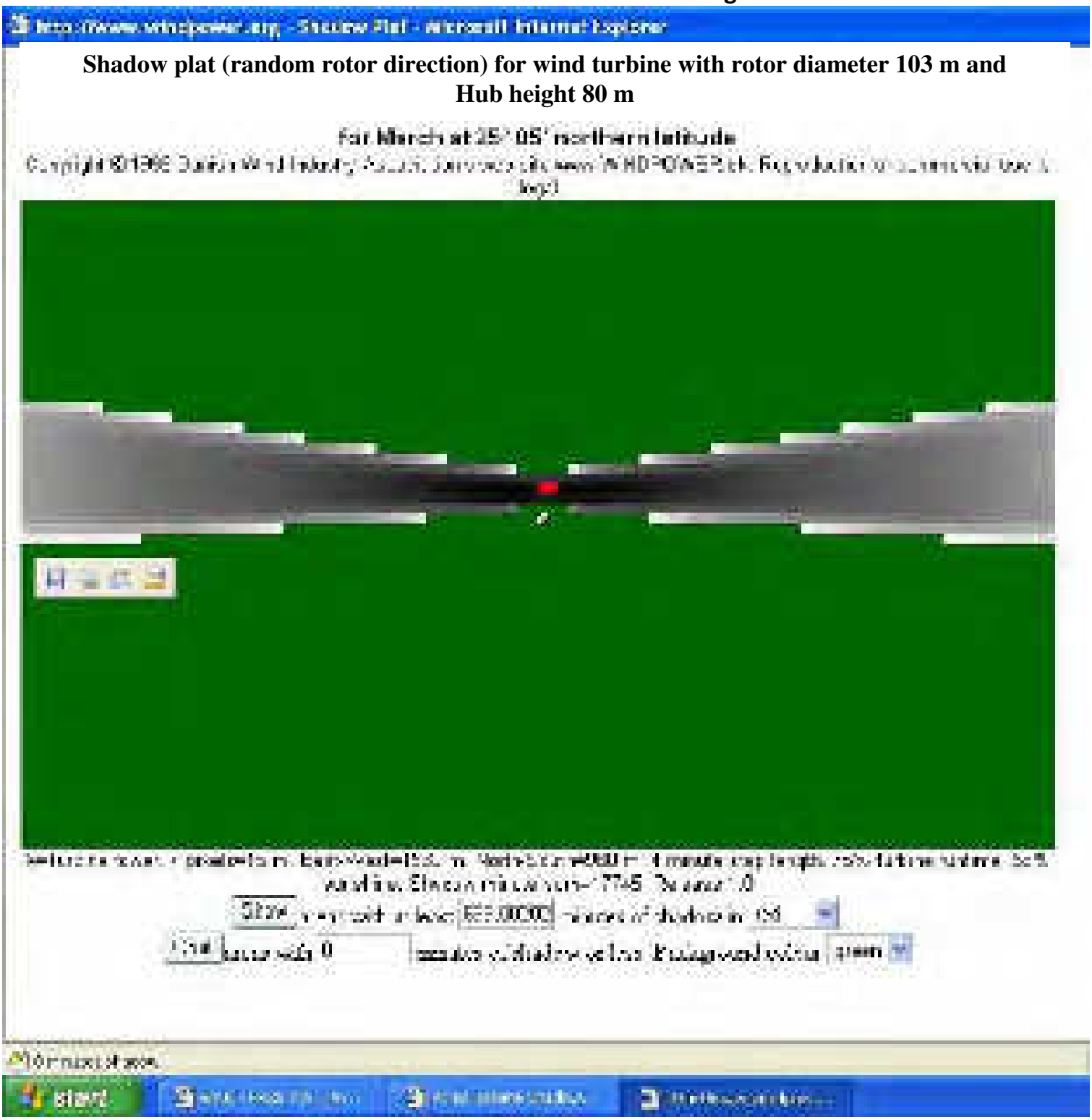

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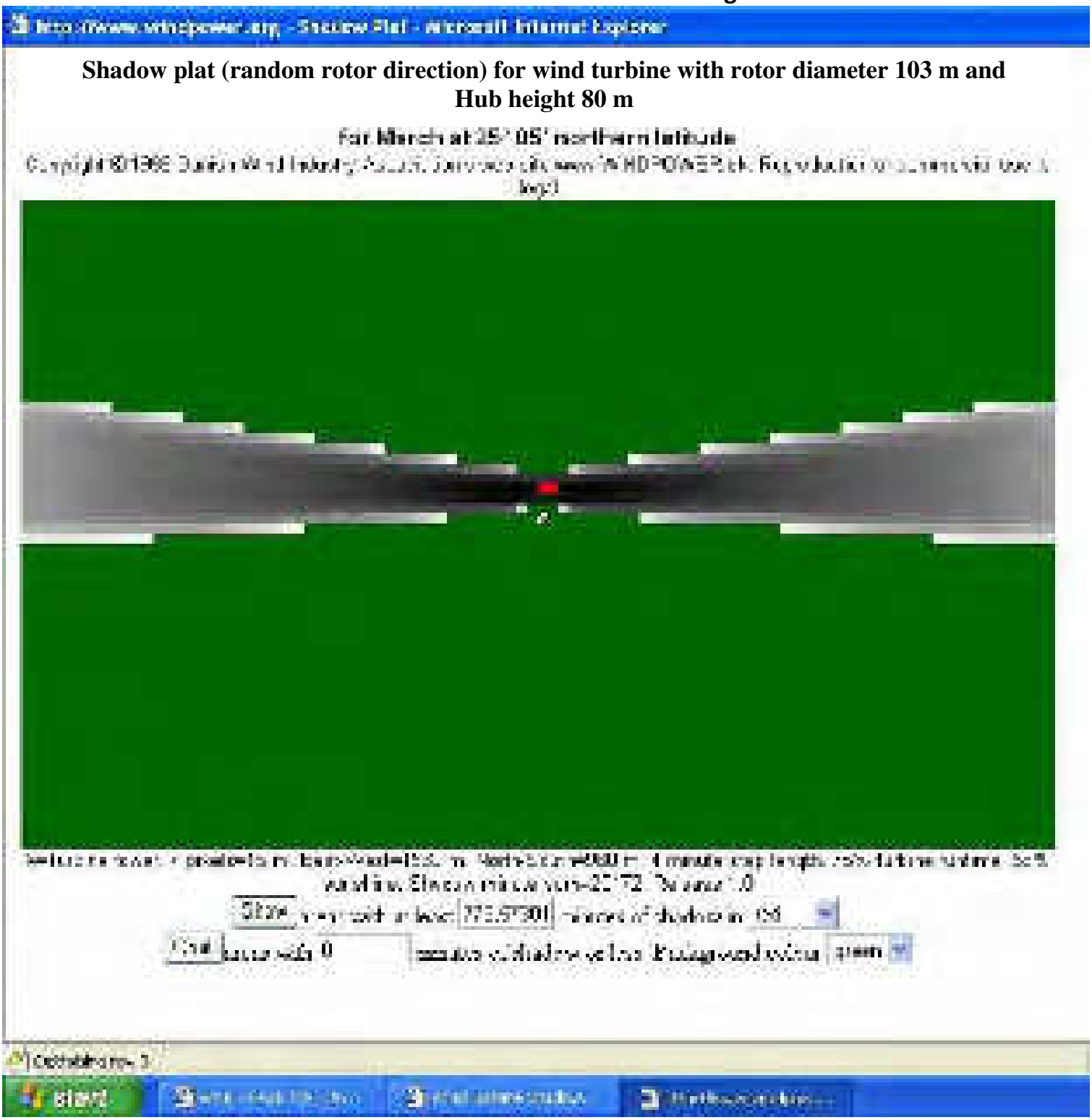

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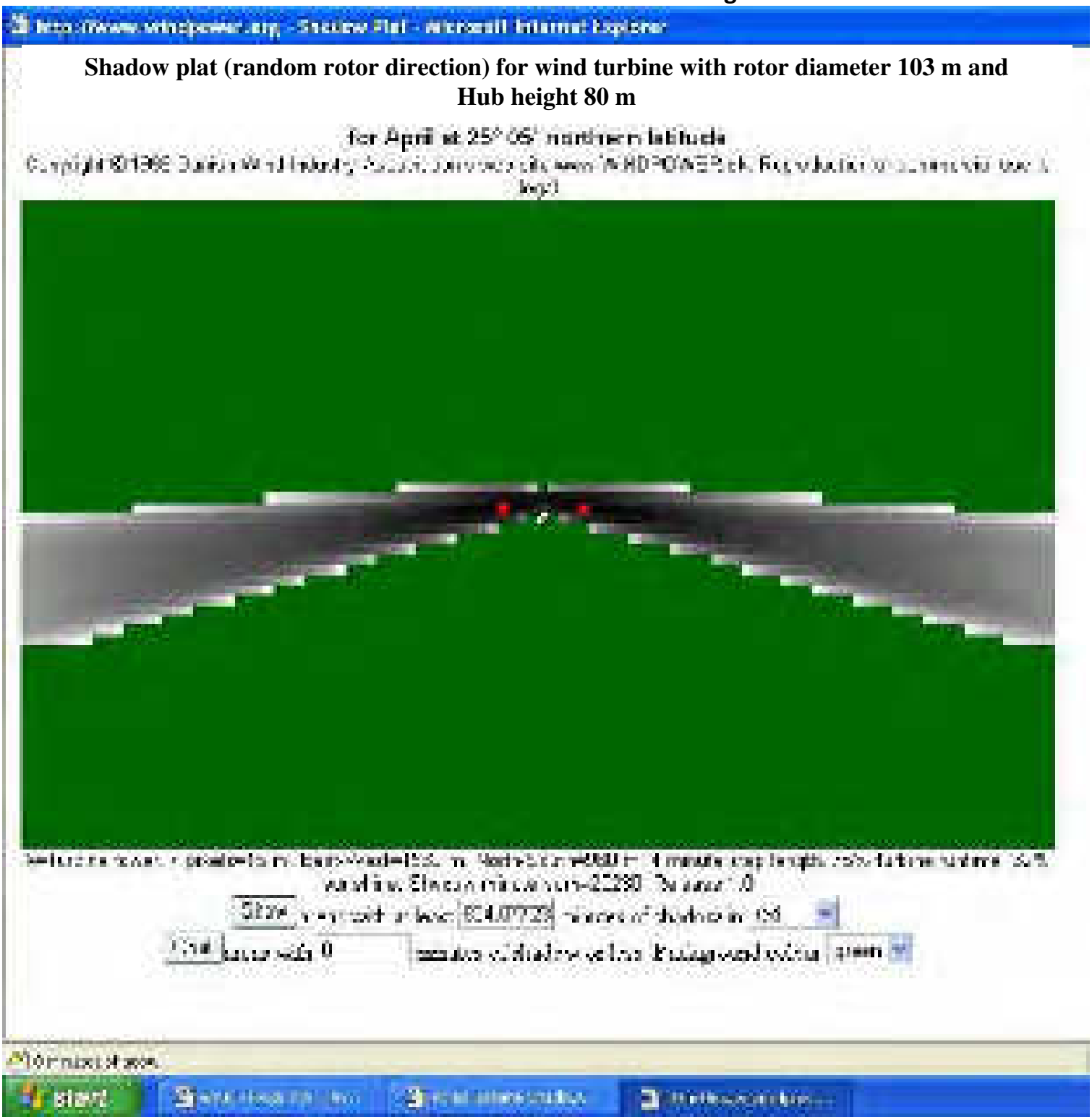

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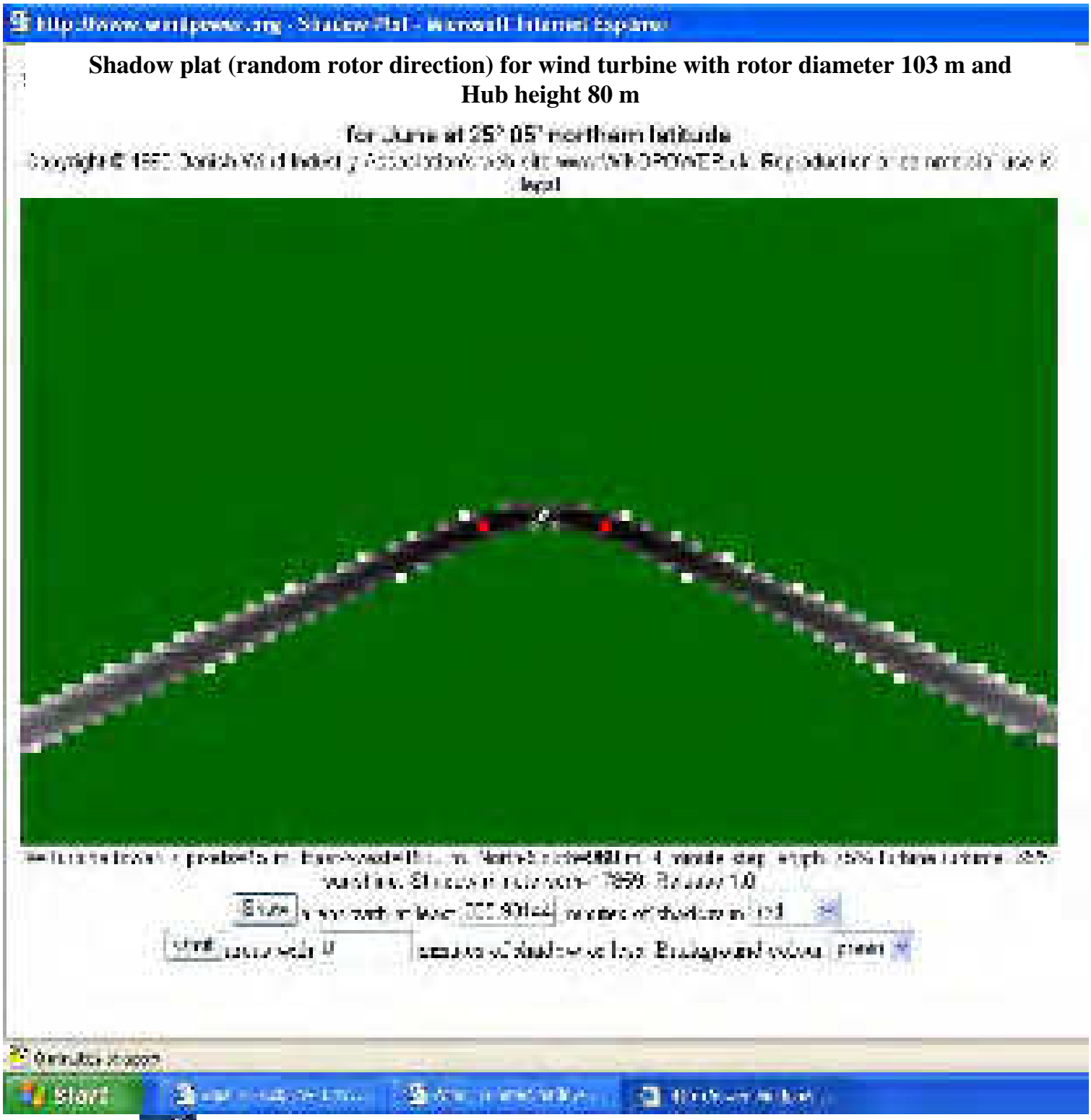

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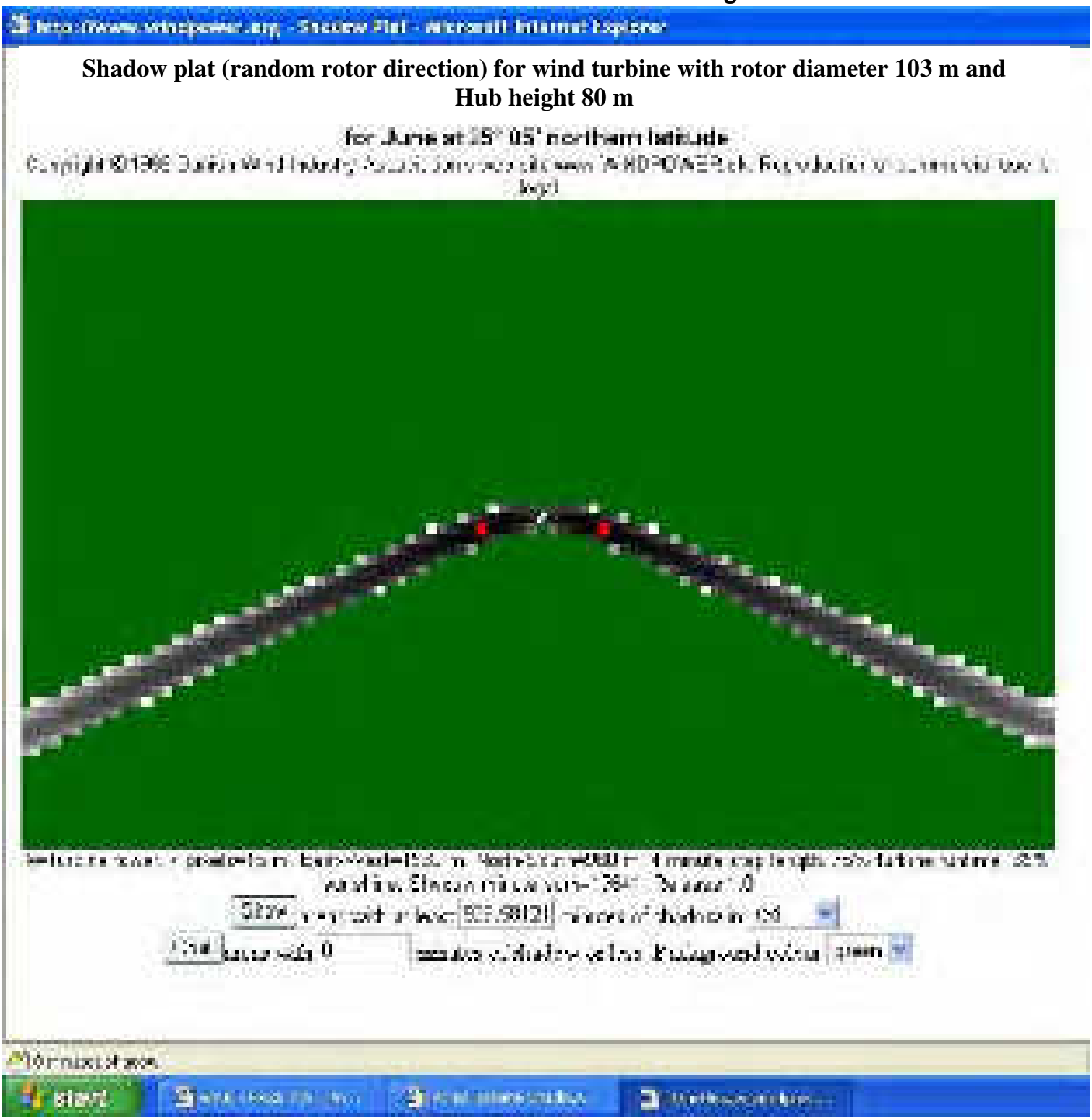

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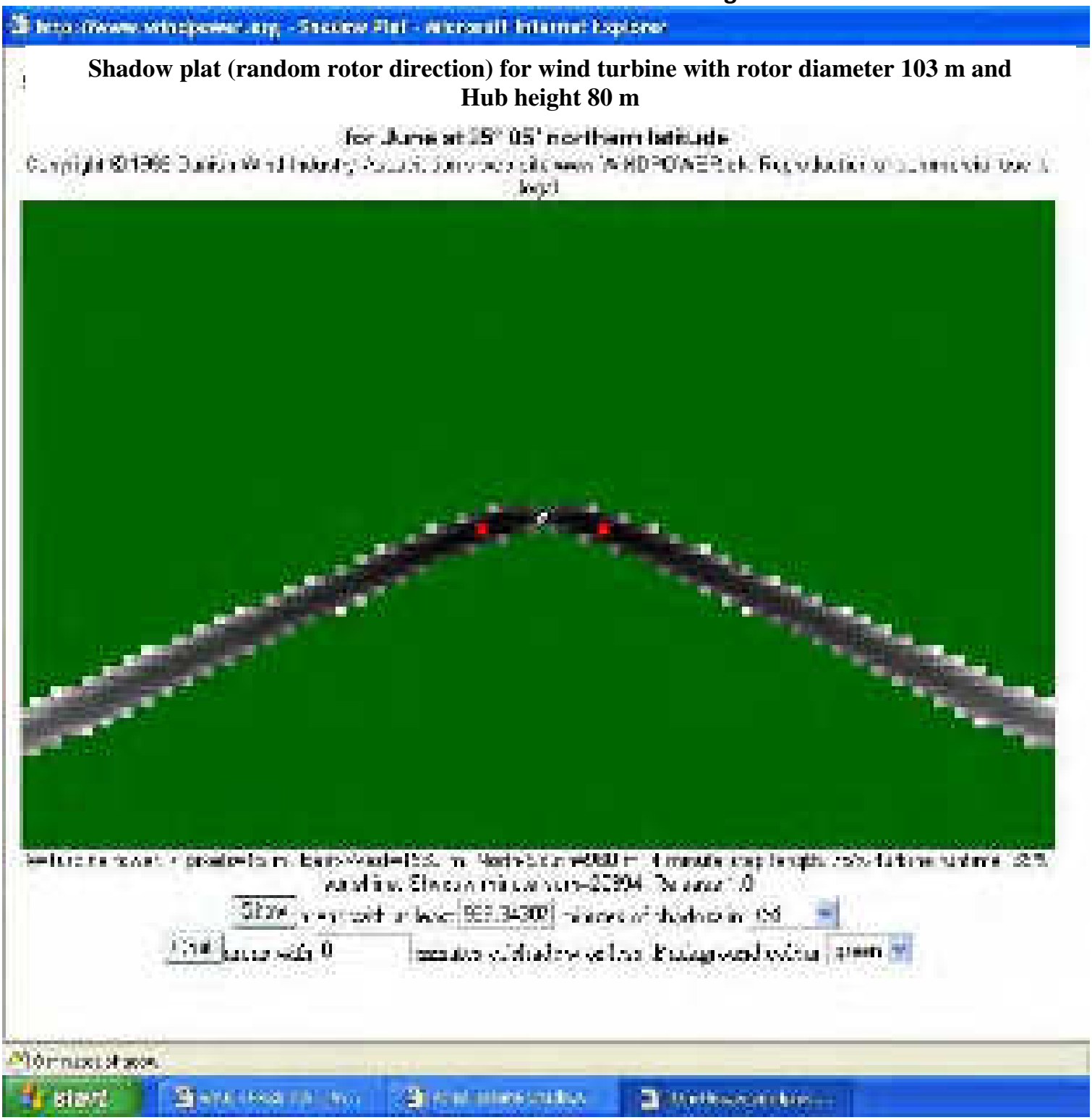

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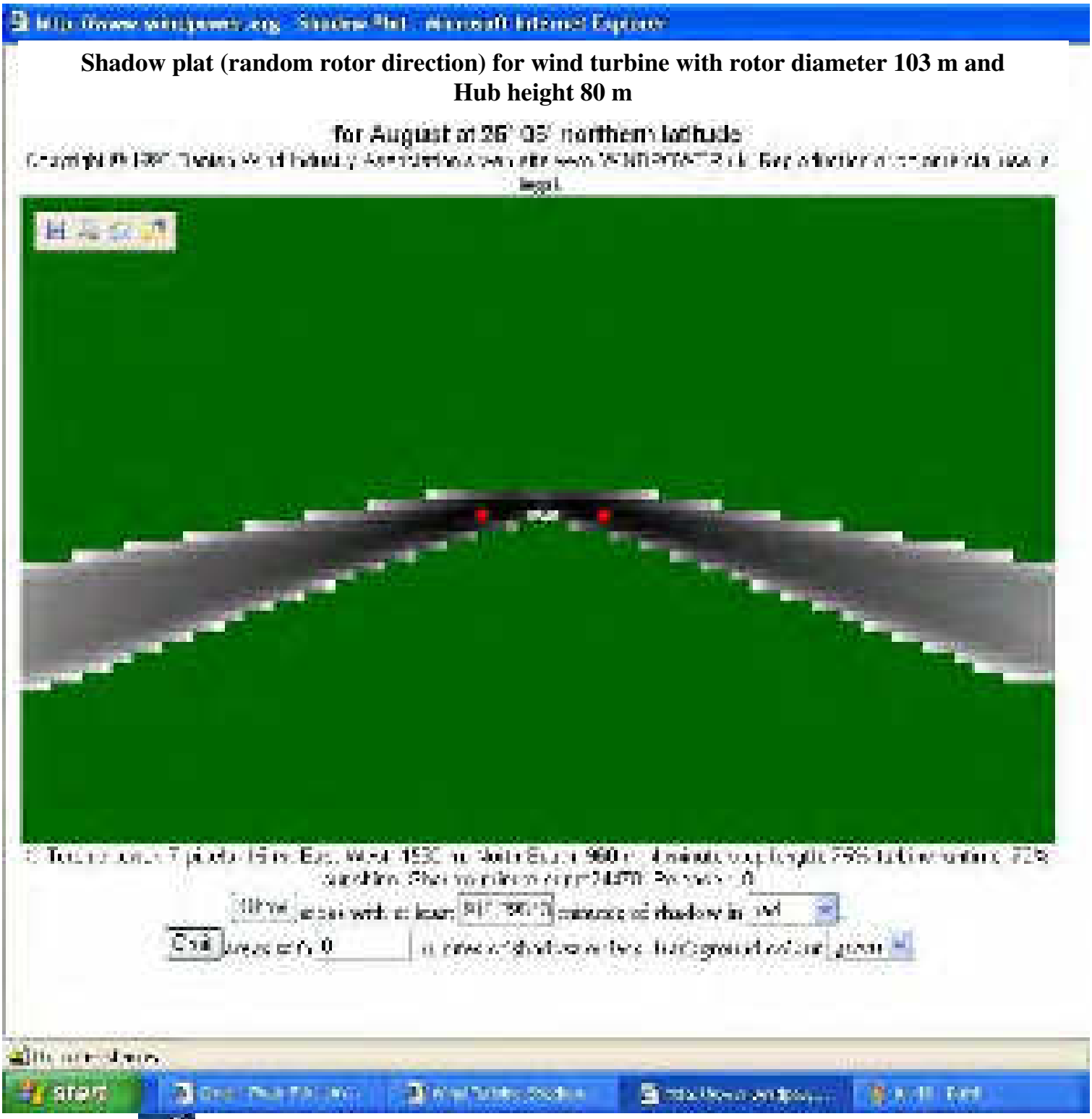

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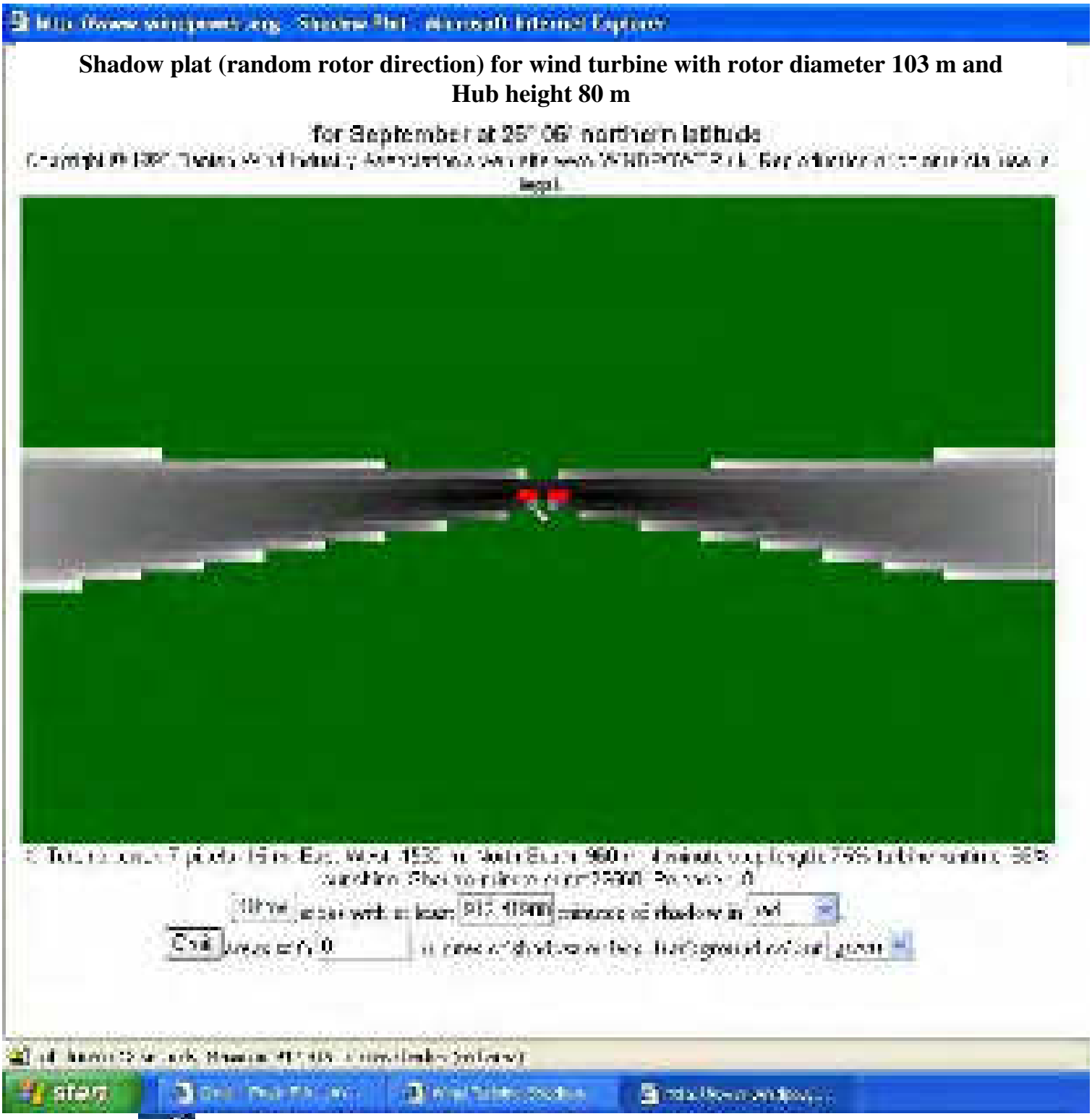

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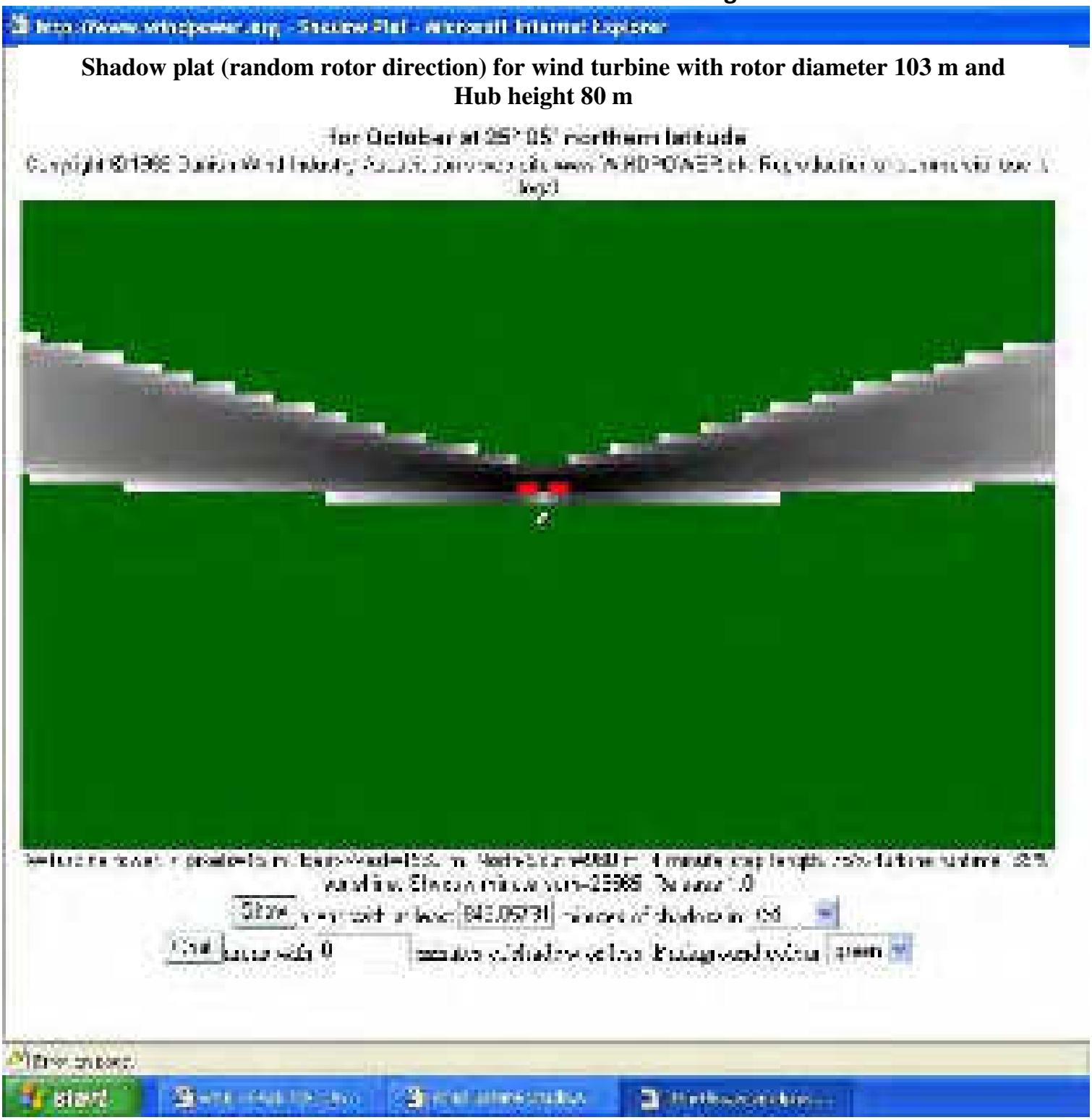

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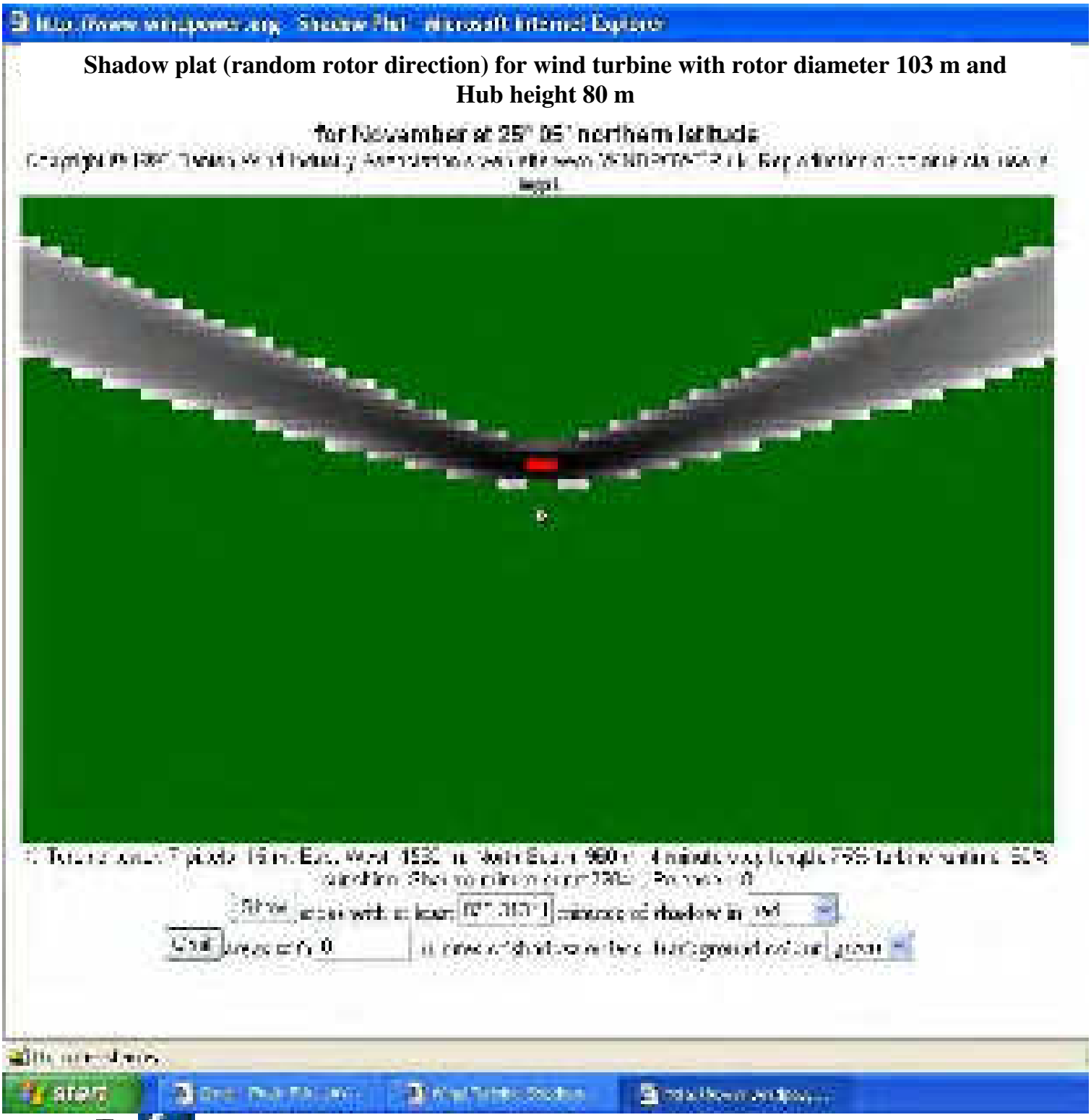

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21C

Summary of Birds Monitoring Report---Key Findings

Introduction and Background of the Study

- Tricon Boston Consulting Corporation (TBCC) is planning to develop, own and operate three wind farms, each of 50 MW located in Thatta District, Sindh Province, in the south of Pakistan.
- Three major wetlands are located in the vicinity (20 kilometers or more) from the project site - towards the south are (Halejee Lake and Hadero Lake) and Keenjhar Lake towards the east.

Birds Monitoring Study of the project area was conducted in order to determine the following:

- Current baseline scenario with respect to birds migratory and flight pattern as no data specific to project area is available in published literature
- Assess collision risk.

TBCC engaged a former WWF Consultant as their Ornithological consultant for the designing and monitoring of Birds Monitoring Study and Arch Associates as consultant for execution, data analysis and reporting of study against a structured protocol based on Scottish Natural Heritage "Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities"

guidelines.

Objective of Birds Monitoring Study

- The overall objective of ornithology surveys of TBCC wind farm project area was to identify and quantify the impact of the project on key avian species (and by association adjacent designated sites), to subsequently inform final turbine layout to mitigate through design and finally to develop additional mitigation, (e.g. turbine shut down, habitat/species management plan), and will form baseline for future operational monitoring.

- The general objectives are:
  i. To monitor resident and migratory birds within the premises where the wind farm is intended to be installed
  ii. To determine potential resident and migratory birds in the project area
  iii. To determine the composition of species of resident and migratory birds
  iv. To determine the flight pattern of the birds in the project area.

- Specific objectives: The specific objective of ornithology surveys of TBCC wind farm project area is to evaluate the following potential risks to birds:

  I. Direct habitat loss through construction of wind farm infrastructure;

  II. Displacement (sometimes called indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds;

  III. Death through collision or interaction with turbine blades and other infrastructure (i.e. collision risk).

Number of Vantage Points and Duration of the Study:

There were a total of eight (8) Vantage Points and the study was conducted from September 2015 to March 2016 (7 months)[2] which covered migration period.

Historical Data

- Historical Pathway of Migratory Birds in Province of Sindh, (From North to South) directions of arrow also showing the movement of birds from North-west to south East

[2] The monitoring study will be continued to have a full year of monitoring results during operational phase as well.

Initial Results

- **List of Species observed during the study period**

Birds species recorded during the monitoring of the project area (with their corresponding status and IUCN Classification) are listed below:

S.no	Common name	Scientific Name	Status	IUCN Classification*
1	Common Crow	*Corvus splendens*	Resident	LC
2	King crow	*Dicrurus macrocercus*	Resident	LC
3	Common Kite	*Milvus migrans*	Resident	LC
4	Common Buzzard	*Buteo buteo*	Resident	LC
5	Tawny Eagle	*Aquila rapax*	Resident	
6	Lesser spotted Eagle	*Aquila clanga*	Partial Resident	LC
7	Shikra	*Accipiter badius*	Resident	LC
8	Egyptian Vulture	*Neophron percnopterus*	Resident	EN
9	Boniells eagle	*Hieraatus fasciatus*	Migrant	LC
10	Booted Eagle	*Hieraatus pennatus*	Migrant	LC
11	House sparrow	*Passer domesticus*	Resident	LC
12	Jungle sparrow	*Passer pyrrhynotus*	Partial Re	LC
13	Ashy crown finchlark	*Eremopterix grisea*	Resident	LC
14	Crested Lark	*Galerida cristat*	Resident	LC
15	Indian desert lark	*Caandrella raytal*	Resident	LC
16	Rock Pigeon	*Columba livia*	Resident	LC
17	Collered dove	*Streptoelia decaocto*	Resident	LC
18	Little brown dove	*Strepotoelia senegalensis*	Resident	LC
19	Turttle dove	*Streptoeliatranquebarica*	Resident	LC
20	Jungle Babbler	*Turdoides striatus*	Resident	LC
21	grey partridge	*Francolinus pondicerianus*	Resident	LC
22	Grey shrike	*Lanius excubitor*	Resident	LC
23	rofous backed shrike	*Lanius schach*	Resident	LC
24	Baybacked shrike	*Lanius vittatus*	Resident	LC
25	Sand grouse	*Pterocles exustus*	Resident	LC
26	Swallow	*Hirundo rustica*	Resident	LC
27	Desert Wheater	*Oenanthe deserti*	migrant	LC
28	Eastern pied Wheater	*Oenanthe picata*	Migrant	LC
29	Hoopoe	*Upupa epope*	Migrant	LC
30	House bunting	*Emberiza striolata*	Resident	LC

S.no	Common name	Scientific Name	Status	IUCN Classification*
31	Indian Robin	*Saxicoloides fulicata*	Resident	LC
32	Warbler	*Prinia buchanani*	Resident	LC
33	pied bush chat	*Saxicola caprata*	Resident	LC
34	White wagtail	*Motacilla alba*	migrant	LC
35	Red start	*Phoenicurus ochruros*	Migrant	LC
36	Little beeEater	*Merops orientalis*	Migrant	LC
37	Blue cheeked B.Eater	*Merops superciliosus*	Migrant	LC
38	Cream coloured courser	*Cursorius cursor*	Resident	LC
39	Quil	*Coturnix coturnix*	Resident	LC
40	Red vented bulbul	*Pycnonotus cafer*	Resident	LC
41	White cheeked bulbul	*Pycnonotus leucogenys*	Resident	LC
42	Persian Rock Pipit	*Anthus similis*	migrant	LC
43	Indian Roller	*Coracias benghaensis*	Resident	LC
44	Sun Bird	*Nectarinia asiatica*	Resident	LC
45	Houbara bustard	*Chlamydotis undulata*	Migrant	VU

Legend: LC = Least Concern; VU = Vulnerable; EN = Endangered

- **List of Species from IBAT Proximity Report**

IUCN RED LIST OF THREATENED SPECIES

Given its broad habitat, the following species are potentially found close to the area of interest:

Taxonomic group	Scientific Name	Common Name	IUCN Red List category
Aves	Aegypius monachus	Cinereous Vulture	NT
Aves	[illegible]	[illegible]	NT
Aves	Aquila heliaca	Eastern Imperial Eagle	VU
Aves	Aythya nyroca	Ferruginous Duck	NT
Aves	Chlamydotis macqueenii	Asian Houbara	VU
Aves	Circus macrourus	Pallid Harrier	NT
Aves	Clanga clanga	Greater Spotted Eagle	VU
Aves	Columba eversmanni	Yellow-eyed Pigeon	VU
Aves	Ephippiorhynchus asiaticus	Black-necked Stork	NT
Aves	Esacus recurvirostris	Great Thick-knee	NT
Aves	Falco cherrug	Saker Falcon	EN
Aves	Falco chicquera	Red-necked Falcon	NT
Aves	Falco jugger	Laggar Falcon	NT
Aves	Gyps bengalensis	White-rumped Vulture	CR
Aves	Haliaeetus leucoryphus	Pallas's Fish-eagle	VU
Aves	Limosa limosa	Black-tailed Godwit	NT
Aves	Marmaronetta angustirostris	Marbled Teal	VU
Aves	Mycteria leucocephala	Painted Stork	NT
Aves	Neophron percnopterus	Egyptian Vulture	EN
Aves	Numenius arquata	Eurasian Curlew	NT
Aves	[illegible]	White-rumped Vulture	EN
Aves	Pelecanus crispus	Dalmatian Pelican	VU
Aves	Pelecanus philippensis	Spot-billed Pelican	NT
Aves	Rynchops albicollis	Indian Skimmer	EN
Aves	Sterna acuticauda	Black-bellied Tern	EN
Aves	Sterna aurantia	River Tern	NT
Aves	Sypheotides indicus	Lesser Florican	EN
Aves	Vanellus gregarius	Sociable Lapwing	CR
Mammalia	Axis porcinus	Hog Deer	EN
Mammalia	Capra aegagrus	Wild Goat	VU
Mammalia	Hyaena hyaena	Striped Hyaena	NT
Mammalia	Manis crassicaudata	Indian Pangolin	EN
Mammalia	[illegible]	[illegible]	VU
Mammalia	Panthera pardus	Leopard	NT
Reptilia	Uromastyx hardwickii	Hardwicke's Spiny-tailed Agama	VU
Reptilia	Crocodylus palustris	Mugger	VU
Reptilia	Gavialis gangeticus	Gharial	CR

-

- **Observations/Sightings**

  - Three stations were regularly visited and the observations were taken from different vintage points. Some of the species were regularly observed while some species such as the Egyptian vulture (*Neophron percnopterus)* and Huobara bustard (*Chlamydotis undulata*) were seen only once. Out of 45 total species, 11 species were considered as "migrants" while 34 were considered as "residents" (1 was considered partial resident). There were eight (8) species which were considered as raptors and 36 were considered perching birds. Calling of flying birds (Crans) and grey partridge were noted but birds were not physically seen (i.e. from vantage point of A).
  - Other representatives of various groups of bird observed in the area are as under.

a. It is habitat of Sand grouse (breeding ground as well) out of four only 1 sp. was recorded.

b. Quil 1sp.

c. Falcons, Eagle, Vulture 8spp.

d. Perching birds 29spp.

e. Houbara bustard 1sp.

f. Partridge 1sp.

g. Courser 1sp.

h. Egyptian vulture 1sp.

  - Data reveals that only 11 species are migrant. It is difficult to find out dependency of birds in the project site probably due to presence of other variable locations (cultivated land or semi cultivated areas, orchard) where water feeding as well as nesting sites are more available. Nearly all birds recorded from the area and from surroundings can be termed as terrestrial birds except one species of White wagtail (*Motacilla alba)*, common crow (*Corvus splendens),* common Kite (*Milvus migrans),* House sparrow *(Passer domesticus),* Sun bird (*Nyctarinia asiatica),* two species of Bulbul (*Pycnonotus cafer* and *Pycnonotus leuocogenys)* which can be seen at any wetland area. Shikra (A*ccipiter badius)*, Tawny Eagle (*Aquila rapax)* and even the common buzzard (*Buteo buteo)* and lasser spotted eagle are frequently visiting the wetland areas. Hoopoe (*Upupa epops)* has been observed regularly from different locations of project site.
  - Field data of flight height and directions show that birds are not moving at any particular direction and that only four birds moved from east to west whilst 14 birds were observed that moved from south to north.

- The flight height of various species of birds remained under the height of 50feet.
- The Falcon species on the other hand are acquiring the height of 500 feet. Two species of eagles Booted eagle and Booonellis Eagle not sighted again like Egyptian vulture that was observed at maximum height only once. The Egyptian vulture (*Neophron percnopterus)* was the most common species of vulture in the province of Sind and its population rapidly declined and was not observed since long time. It was observed from Vantage Point 1A when three birds entered from North western side and moved towards the South eastern side. All were at the height of 200m (650 ft).

- **Classification of Observed Species**

  - Based on the list of species observed during the bird monitoring study, **only one (1) species, the Egyptian Vulture (*Neophron percnopterus*) was considered Endangered (EN)** under IUCN Red List of Threatened Species and as identified in the IBAT Proximity report which listed species that can be potentially found close to the area of interest. **Another species, the Houbara bustard (*Chlamydotis undulata*) is considered Vulnerable (VU). The rest of the species are under the Least Concern (LC) classification.**

- **Initial Conclusion/Recommendation**

  - Based on the initial results, the bird monitoring study has this initial conclusion:

"One the basis of above trends and observations related to birds species, count, flight height, it can be concluded that Tricon Boston Consulting project will not alter the current birds baseline w.r.t. species and count negatively as very less chances of birds collision exists. However with the construction and operation of wind farm and due to existing wind farms, human activity has increased in the area and poor waste management practices particularly related to food waste may attract the resident birds mainly crows in the area."

- Vantage point survey/monitoring will be continued to have a full year of observation data.
- The site can be considered as not along a major fly route of migratory birds as desktop assessment of historical pathway of migratory birds in the Province of Sindh shows a north to south direction located east of the project site following the Indus River.
- The birds' level of flight activity and its distribution over the project site show that most species observed are perching birds and fly at a height of not more than 15 meters which is well below the lower blade tip of 28.5 meters. The Egyptian vulture was observed to fly at a height of 200m (650 ft), way above the upper blade tip of 131.5 meters.
- Collision risk is considered low and is further reduced by the minimum spacing between any pair of wind turbines which is 339 meters. While

collision risk impacts to birds and bats (as there are no known bat populations in the vicinity) is considered low, a program to monitor potential bird/bat collision (through ground searches) is incorporated in the Environmental Management and Monitoring Plan during operations.

Based on the data collected during the study period, the analysis of data indicates the following trends

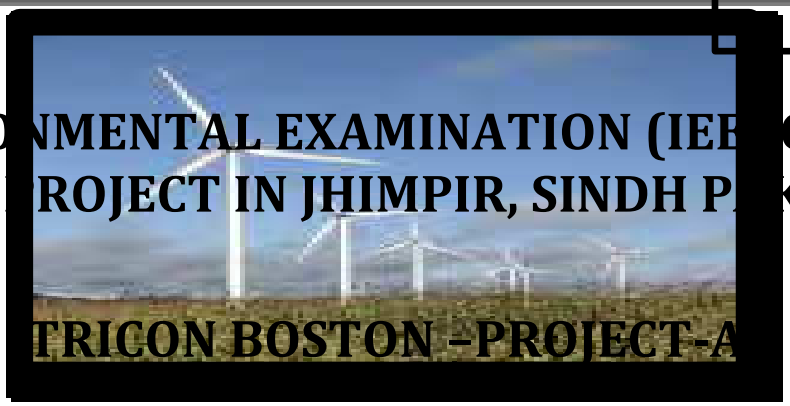
- The food availability which is core reason for birds to land in the project area, is very limited
- Number of species visiting the project site and its surrounding area are belonging to the group that are spending more time on perching and acquiring the flight height of not more than 50 feet
- Number of bird existing at Vantage Points are very limited which is than (50 to100).
- The flight height of maximum of the species is well below the danger zone of 40 meter
- Maximum species observed in the area are flying at low heights (upto 20 m) in search of food.
- The natural environmental conditions are playing important role to control the population of animal.
- Aridity and hard desert like appearance of the area is one of the major factor which is still working as a limiting factor against the birds' numbers and their population in the area.

21D

Initial Environmental Examination (IEE) Report of Project A

ORIGINAL

INITIAL ENVIRONMENTAL EXAMINATION (IEE) OF 50 MW WIND POWER PROJECT IN JHIMPIR, SINDH PAKISTAN



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Prepared in April, 2014

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APPROVAL SHEET

TITLE	:	Initial Environmental Examination (IEE) of 50 MW Wind Power in Jhimpir Sindh Pakistan (Tricon Boston-Project-A)
DOCUMENT NUMBER	:	RE2-131-139-001 Issue: 01
CLASSIFICATION	:	**UN CLASSIFIED**
PREPARED BY	:	**(Sana Ahmed)** Manager Projects Renewable Resources (Pvt.) Ltd sana@renewableresources.com.pk
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APPROVED BY	:	.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
CBD	Convention on Biological Diversity
CITES	Convention on Trade of Endangered Species
CLs	Core Labor Standards
dB	Decibel
DMC	Developing Member Countries
EIA	Environmental Impact Assessment
EHS	Environment Health and Safety
EMP	Environment Management Plan
ESMC	Environmental and Social Management Cell
EPA	Energy Purchase agreement
EMMP	Environment Monitoring and Management Plan
GAD	Gender and Development
GHG	Greenhouse Gas Emissions
GRM	Grievance Redressal Mechanism
IEE	Initial Environmental Examination
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
km	Kilometers
LAA	Land Acquisition Act
LOS	Law of Seas
MEA	Multilateral Environmental Agreements
MW	Mega Watt

MWh	Mega Watt Hour
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NGO	Non Governmental Organization
NOx	Nitrogen Oxides
NREL	National Renewable Energy Laboratories
NTDC	National Transmission and Dispatch Company
O & M	Operation and Maintenance
PEPA	Pakistan Environment Protection Act
POPs	Persistent Organic Pollutants
Pak-EPA	Pakistan Environment Protection Agency
PV	Photo Voltaic
RE2	Renewable Resources (Pvt.) Ltd
SCR	Social Complaint Register
SHEE	Safety Health Environment and Energy
SOx	Sulphur Oxides

EXECUTIVE SUMMARY

Introduction:

Tricon Boston Consulting Corporation Private Limited got three separate LOIs from AEDB for the development of 3 x 50 MW wind power projects in Jhimpir Sindh Pakistan.

The three projects are referred as **"Tricon Boston Project-A", "Tricon Boston Project-B", and "Tricon Boston Project-C",**

This document is ***Initial Environmental Examination*** (IEE) report of ***50 MW Wind Power Project*** of **"Tricon Boston Project-A"** in Jhimpir, Sindh Pakistan.

This Initial Environmental Examination(IEE) report is prepared to fulfill the obligation given in Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 (attached as Annexure-V) made by Pakistan Environmental Protection Agency in exercise of power by section 33 of Pakistan Environmental Protection Act, 1997. According to these regulations, projects falling in any category listed in Schedule-I of the regulations shall require IEE and the projects listed in Schedule-II of the regulations shall require IEE and provision of section 12 of the regulations shall apply to such projects

The project of Tricon Boston Project-A falls in category listed in schedule-I, therefore Initial Environmental Examination (IEE) is conducted for the Project.

Proponent's Introduction:

Tricon Boston (Tricon) is a Boston based business-house, with international reach and

helping improve mutual trust and respect between two important nations and two proud and honorable people.

Since Tricon initial exploratory probes starting as far back as April 2005, Tricon continued to significantly enhance its presence in Pakistan advocating with the local government regulators and local and international development agencies for a more aggressive re-look on their renewable endowments, particularly solar and wind. The efforts were duly rewarded when Pakistan Alternate Energy Development Board (AEDB) acting, among others, on the advise and help from Tricon, put Pakistan's vast wind corridors to bid under an open international competitive tendering process.

Based on one the best bids submitted Tricon along with other major business houses including the likes of Fauji Foundation, Sapphire and Gul Ahmed Energy, was one of the successful bidders, with all four awarded contracts to set-up 150 mega watts wind power project on BOO basis in Pakistan's most sought after wind corridor of Jimphir, a short distance to Pakistani business hub of Karachi.

Consultant's Introduction:

Renewable Resources is the project consultant engaged for the development of project including Initial Environmental Examination (IEE) of the project.

The contact details of consultant are given below;

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Renewable Resources (Pvt.) Ltd, is a private consultancy specialized in Renewable Energy (RE), Energy Efficiency (EE) and Environmental (Env) projects. The company is owned by group of professionals who have remained involved in the renewable energy program of Pakistan and a solid grip on project development, feasibility studies, policy negotiations, requisite approvals, security documents etc.

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

RE2 has gained a significant experience in conducting Environmental and Social Impact Assessments (ESIA), Initial Environmental Examination (IEE) of renewable energy projects in accordance to national and international laws. The study covers all the baseline environmental conditions and anticipated environmental impacts of the project and comprehensive Environmental Management Plans.

So far, RE2 has conducted more than fifteen (15) Environmental studies of renewable energy projects which have been approved from the concerned Environmental Protection Agencies.

Study Methodology:

The study was conducted using standard methodology prescribes by national and international

agencies to facilitate the review of identified environmental issues, an understanding and description of the environment within which the activities will occur or potentially have influence on social and biological environment. The IEE study comprises of baseline data on existing conditions on physical and biological environment, and social environment together with the anticipated environmental impacts and proposed mitigation measures. Detailed assessment of the social and biological environment of the area was conducted through field survey for the distance up to 10 km radius of the project site, however the influence zone of the environmental impacts is considered as 5 km.

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

An IEE is a complete process that begins at the earliest stage of the project development planning and continues throughout the life of the project. Following are the listed stages of an Initial Environmental Examination study:

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

Statutory Requirements:

The report fulfils the following regulatory requirements

- Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 with reference to Pakistan Environmental Protection Act, 1997
- Asian Development Bank Polices and Guidelines
- Performance Standards of IFC and World Bank group,2012
- The best practices followed at international level.

Project Overview:

The wind farm project of 50 MW is located in Jhimpir Sindh. A land of 1284 acres are leased to
Tricon Boston Project-A by Government of Sindh for the development of wind project. Tricon Boston Project-A is located towards the North East of Karachi at around 95 Km. The Karachi Hyderabad Motorway (Super Highway) is connecting road to the Tricon Boston Project-A site The total land area of Tricon Boston Project-A land is 1284 acres

The project will install 33 wind turbines generators (WTGs), each with rated output of 1.5 MW.

Description of Environment:

A data collection survey that included geology, meteorology, hydrology, ambient air quality,
water quality, soil characteristics, noise levels, shadow forecasting, 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.

As per the physical survey done by Mr. Sohail Ahmed and Ms Beena Shoaib of Pakistan Alternative Energy Engineering Services, there are three Goths/settlements in the project area of Jhimpir. The total number of population of Goths is 250-400. It was observed that the area is in development stage and there is no industrialization in the area thus the baseline emissions are very low. The area is identified as Wind Corridor and many other wind power projects are in development phase. There are no well-developed drainage systems in the area. The conventional source of fuel is wood or kerosene oil. There is very sparse vegetation in the forms of herbs and shrubs. There is no reserved forest site or sanctuary located within the project land area. There are negligible impacts on the noise, air and water quality; that too would diminish as the project shall come online. At present the project site is located in remote areas with very little social and commercial activity. However, with the development of number of wind farms in the area, it is expected that the area will be developed into a model zone with advance health and education facilities and improved living

Stakeholder Consultation:

Stakeholder consultation was carried out as part of IEE study. The main objectives of the consultations were to apprise the stakeholders about the proposed project activities; obtain their views, concerns and recommendations; and address / incorporate them in the project design - thus enhancing the environmental and social performance of the project.

Impact Assessment and Mitigation:

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

Environmental Management Plan:

An Environmental Management Plan (EMP) has been developed to provide an implementation mechanism for the mitigation measures mentioned above and has been updated in the light of the EPA decision circumstances. The EMP provides the organizational structure for the environmental and social management system during the project, and defines the roles and responsibilities of project players. The EMP includes a mitigation plan, a monitoring plan, the communication and documentation requirements, and training needs, in the context of the environmental and social management of the project.

It is observed from the international practices around the world that birds get adapted to such heighted structures like any other electrical tower, aviation towers etc. and ratio of bird hit with turbines is very low. Noise will be less than 70 dB (A) which is within the range as per National Environmental Quality Standards (NEQs) of Pakistan. There are no exceeds of shadow from the permissible limits. The environmental disturbance normally associated with construction activities will be minimized through an Environment Management Plan (EMP), implementation of which will continue during project operation and which includes monitoring arrangements.

The project has no carbon, sulfur, nitrogen emissions; nor their oxides, thus not a threat to the environment.

It is concluded that the project will be a positive development in the area and improve the socio-economic conditions of area through generation of employment opportunities and opening of ways for the development of this area. There are no negative environmental impacts of the project, rather it is a green energy project and contribute in environmental sustainability of the area. The project will also help to promote renewable energy in Pakistan and meeting energy demand of the country. In view of the above mentioned rationales, it is concluded that development of 50 MW wind project of Tricon Boston will have no significantly adverse environmental impact and the project can be regarded as **Environmental Friendly Green Project**.

SECTION 1

INTRODUCTION AND PURPOSE OF STUDY

1.1 PROJECT PROPONENT

Tricon Boston (Tricon) is a Boston based business-house, with international reach and presence, focused on renewable energy and rural development projects on public-private-partnership models as core business and social responsibility targets.

Excited by the tempting mix of clean, renewable energy initiative intertwined and comingled with sustainable rural development and encouraged by US initiatives for American business and industry to help Pakistan bridge its rapidly growing energy demand-supply gap that is threatening to tear apart the very fabric of the already fragile Pakistani society, Tricon Power, a wholly owned subsidiary of Tricon, entered the Pakistan market to explore and setup renewable energy projects that can help bridge the energy demand-supply gap at affordable costs plus also enhance Pak-US commercial interactions, creating jobs on both side and also helping improve mutual trust and respect between two important nations and two proud and honorable people.

Since our initial exploratory probes starting as far back as April 2005, Tricon continued to significantly enhance its presence in Pakistan advocating with the local government regulators and local and international development agencies for a more aggressive re-look on their renewable endowments, particularly solar and wind. The efforts were duly rewarded when Pakistan Alternate Energy Development Board (AEDB) acting, among others, on the advise and help from Tricon, put Pakistan's vast wind corridors to bid under an open international competitive tendering process.

Based on one the best bids submitted Tricon along with other major business houses including the likes of Fauji Foundation, Sapphire and Gul Ahmed Energy, was one of the successful bidders, with all four awarded contracts to set-up 150 mega watts wind power project on BOO basis in Pakistan's most sought after wind corridor of Jimphir, a

1.2 PROJECT BACKGROUND & JUSTIFICATION

Pakistan's major electricity sources are thermal and hydro generation. The primary thermal generation fuels employed are furnace oil and gas. While both are produced domestically, demand already outstrips supply by a considerable amount. Oil import is a significant burden on the national exchequer and the increasing import bill continues to exert further pressure on the foreign exchange reserves. Electricity mix of Pakistan (2010-2011) is presented in **Figure 1.1**.

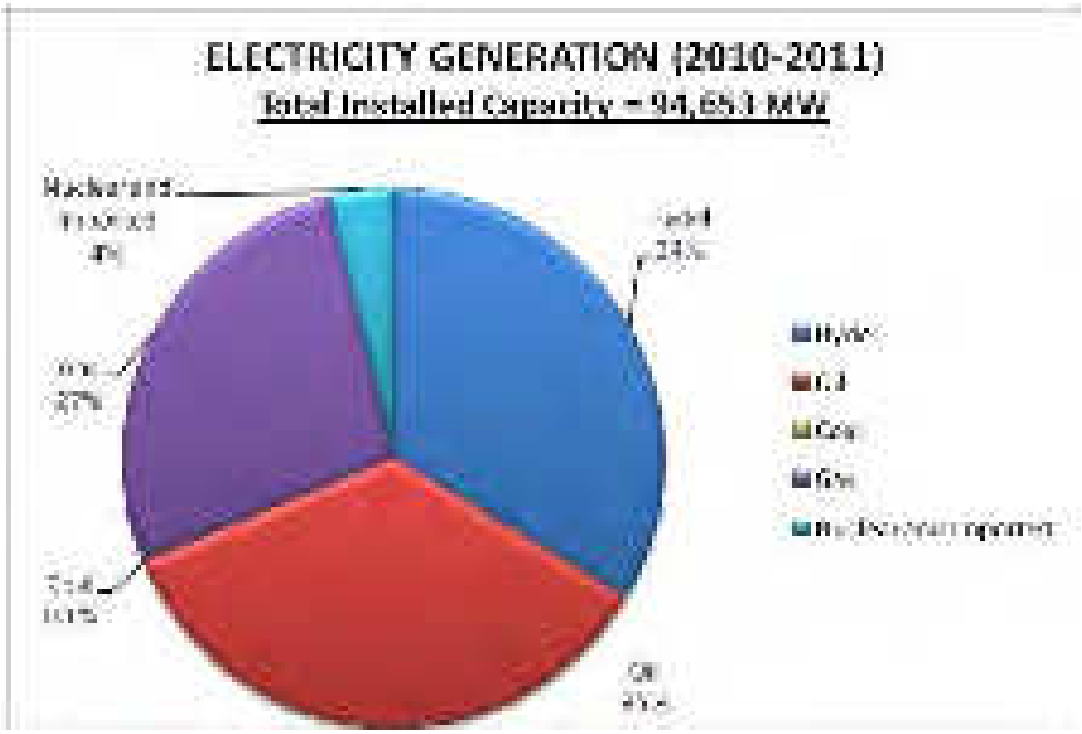


Figure 1.1: Electricity Mix of Pakistan by Source[1]

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

Alternatives to further fuel imports for electricity generation are the use of domestic coal, or generation from hydro-electric or other renewable sources, such as wind and solar power.

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

Looking at how the country's future electricity needs might be met in a way that supports the environmental objectives of the Government of Pakistan, wind generation has the potential of being a strong contributor. The development of wind generation Projects could reduce dependence on oil based thermal power generation, increase diversity in Pakistan's electricity generation mix, and reduce greenhouse gas (GHG) emissions which shall portray a better image of Pakistan among the international community. Also the per kWh tariff for wind power Projects are now comparatively less than that of furnace oil tariff; particularly the Rental Power Projects.

1.3 PROSPECTS OF WIND ENERGY IN PAKISTAN

Pakistan has 1046 km long coastal line with very encouraging wind regime. According to a study carried out by NREL and the wind masts installed in the Gharo and Keti Bandar wind corridor, the average wind speed in the region is 7.4 m/s making a regional potential of more than 50,000 MW. Wind Map of Pakistan by NREL is shown below

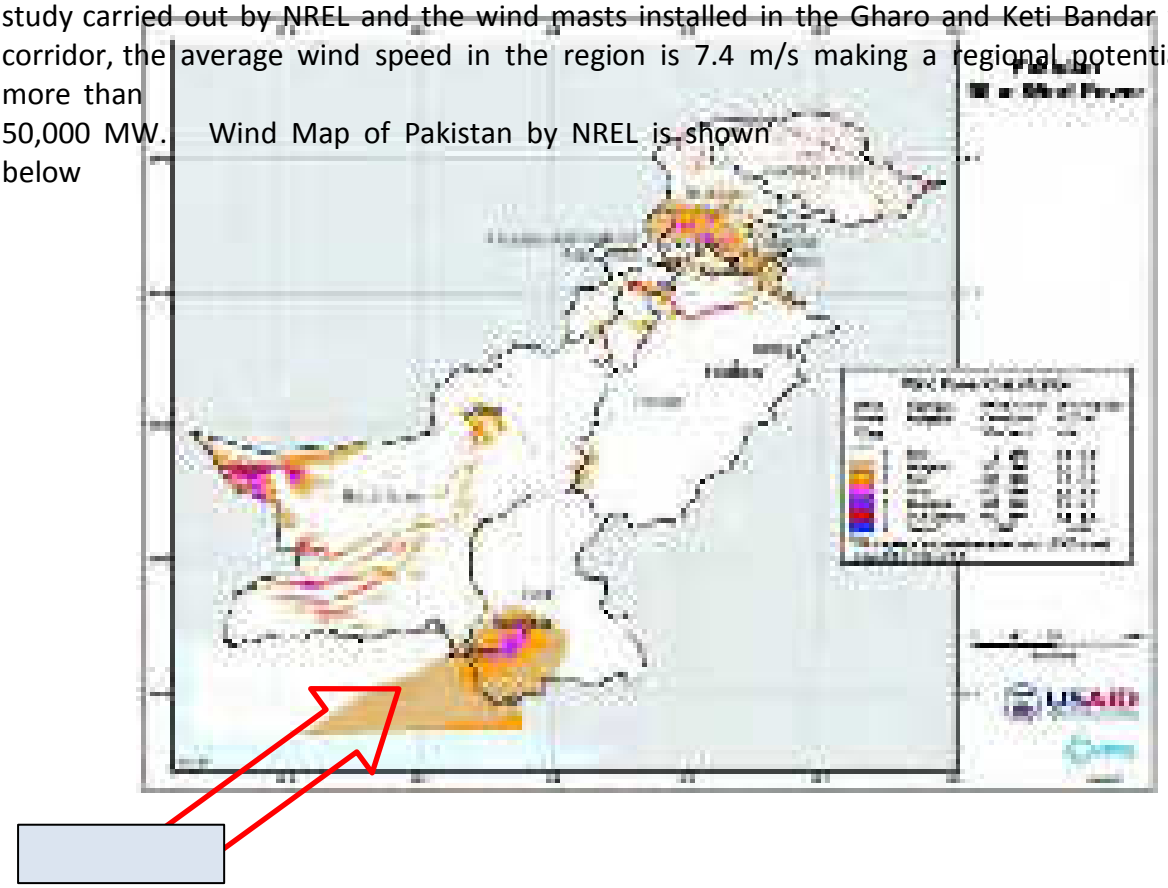


Figure 1.2: Wind Map of Pakistan by NREL

Wind Corridor

The Government of Pakistan (GOP) is diversifying its energy mix on fast track basis to ensure Energy Security, Sustainable Development, Social Equity and Environmental Protection, Wind energy resources are abundantly economical generation of power. Therefore, wind

1.4 PROJECT OVERVIEW & OBJECTIVES

The Tricon Boston Project-A project of 50 MW is located in Jhimpir Sindh. A piece of land of
1284 acres is leased to Tricon Boston Project-A by Government of Sindh for the development of project. Project sites of Tricon Boston Project-A are located towards the North East of Karachi at around 90-95 km. The Karachi Hyderabad Motorway (Super Highway) is connecting road to the Tricon Boston Project-A site. The total land area of Tricon Boston Project-A land is 1284 acres

The project will install 33 wind turbines generators (WTGs), each with rated output of 1.5 MW. The brief overview of project is summarized in **Table 1.1** below;

S. No	Particulars	Description
1	Project Site	Jhimpir-Jamshoro, Province of Sindh, Pakistan
2	Project Capacity	50 MW
3	Total number of Wind Turbines to be installed	33
4	Wind Turbine Model, Capacity	Goldwind, 1.5 MW
4	Annual Electricity supplied to the Grid	140 GWh
5	Estimated Project Cost	110 million USD approx.

Table 1.1: Project at a Glance

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

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

.

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

vii. Conserve natural resources including land, forests, minerals, water, and

ecosystems. viii.Improve local physical infrastructure such as access roads and

transmission network

1.5 NEED AND OBJECTIVES OF IEE STUDY

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

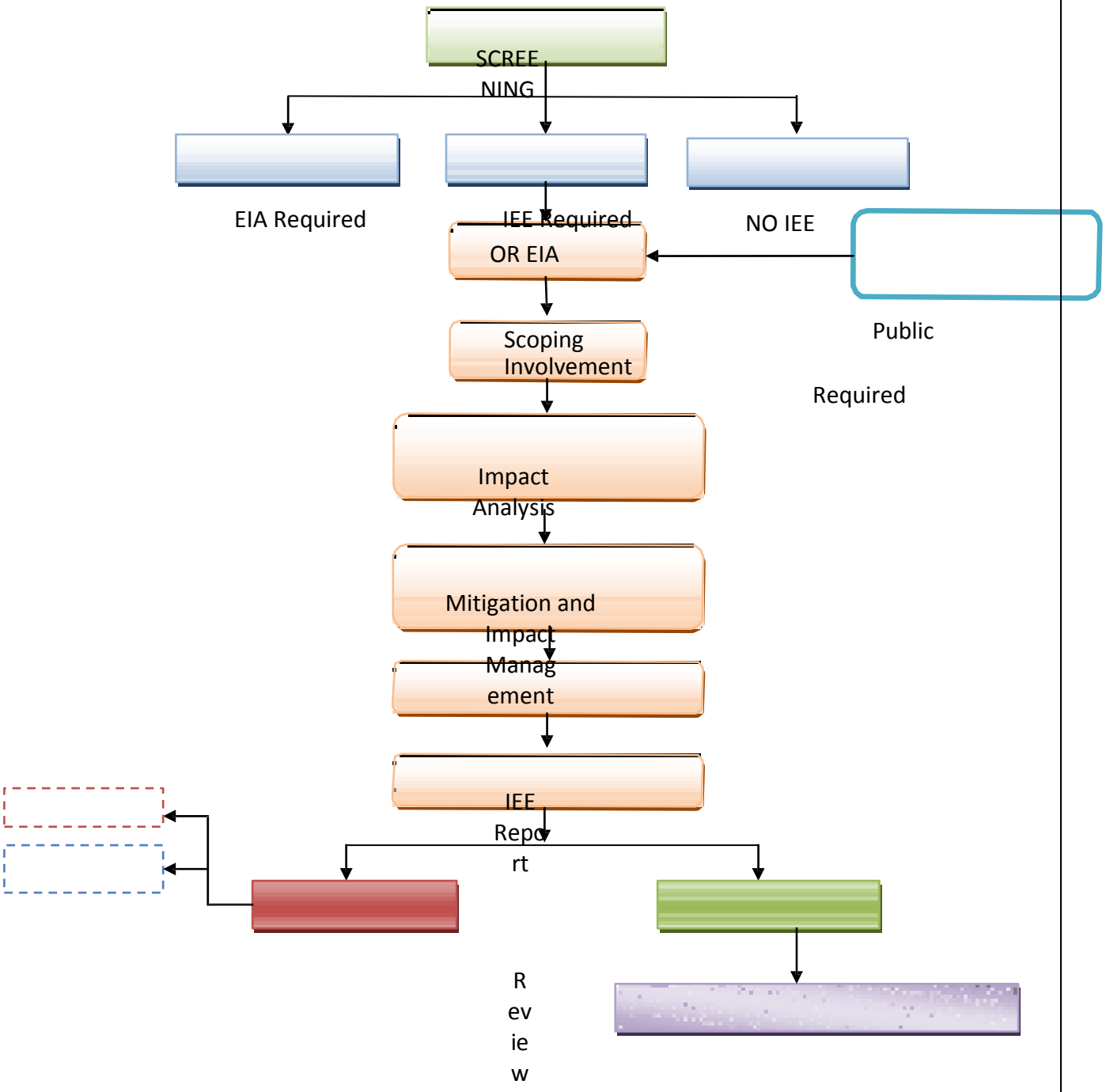
The IEE/EIA Regulations 2000 issued under PEPA 1997 provides separate lists for the projects requiring IEE or EIA. This Initial Environmental Examination(IEE) Report is made to fulfill the obligation given in Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 (attached as Annexure-V) made by Pakistan Environmental Protection Agency in exercise of Power by section 33 of Pakistan Environmental Protection Act, 1997. According to these regulations, projects falling in any category listed in Schedule-I of the regulations shall require IEE and the projects listed in Schedule-II of the regulations shall require IEE and provision of section 12 of the regulations shall apply to such projects

The capacity of Project-A of Tricon Boston is less than 50 MW, therefore the project falls under category of Schedule-I requiring Initial Environmental Examination (IEE).

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

- Category of the project consistent with Pakistan Environmental Protection Act, 1997
- Highlight baseline environmental and social conditions of the project area along with identification of environmentally sensitive areas and concerned stakeholders
- Relevant host country laws, regulations, applicable treaties and agreements
- Protection of human health, cultural properties and biodiversity including endangered species and sensitive ecosystems
- Major hazards; Occupational health and safety; Fire prevention and life safety
- Socio-economic impacts; Land use: Land acquisition; Involuntary resettlement
- Impacts on indigenous peoples and communities; if applicable
- Cumulative impacts of existing, proposed and anticipated future projects
- Efficient production, delivery and use of energy;
- Pollution prevention and waste minimization, pollution controls (liquid effluent and air emissions) and solid and chemical waste management; and
- GHG reduction potential

1.6 IEE PROCESS FLOW CHART



1.7 APPROACH AND METHODOLOGY

The IEE comprises of baseline data on existing conditions on physical, biological and social environment together with the anticipated environmental impacts and proposed mitigation measures. Detailed assessment of the social and biological environment of the area was conducted through field survey for the distance up to 10 km radius of the project site, however the influence zone of the environmental impacts is considered as 5 km.

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

The overall methodology and main phases of the IEE are briefly given below;.

1.7.1 Scoping

The key activities of this phase included:

Project Data Compilation: A generic description of the proposed activities relevant to environmental assessment was compiled with the help of the proponent.

Published Literature Review: Secondary data on weather, soil, water resources, wildlife, and vegetation were reviewed and compiled.

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

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

Baseline Data Collection: A considerable amount of baseline information on the project area was available from existing literature and other studies conducted close to the project

1.7.2 Impact Assessment

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

- Geomorphology
- Groundwater and surface water quality, with particular reference to the coast
- Ambient air quality and ambient noise levels
- Ecology of area, including flora and fauna especially with reference of migratory birds
- Local communities
- Noise impact
- Shadow impact

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

- The present baseline conditions
- The potential change in environmental parameters likely to be effected by project related activities
- The identification of potential impacts
- The evaluation of the likelihood and significance of potential impacts
- The defining of mitigation measures to reduce impacts to as low as practicable
- The prediction of any residual impacts, including all long-term and short-term; direct and indirect; beneficial and adverse impacts
- The monitoring of residual impacts

1.7.3 Documentation

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

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

Following Annexure is attached with the report to support the results and findings of

survey; Annexure-I: Environmental Management Plan
Annexure-II: Budgetary Estimates
Annexure-III: IEE/EIA Guidelines
Annexure IV: National Environmental Quality Standards
Annexure V: Social Survey Report
Annexure Annexure VI: Social Survey
Forms
Annexure VII: Snapshots of Social Survey

1.8 METHOD FOR EVALUATING IMPACT

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

=High

=Medium

=Low

=No Impact

=Locally Favorable

=Regionally Favorable

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

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

SECTION 2

2 STATUTORY REQUIREMENTS OF IEE

This chapter discusses the national and international policies, legal and administrative framework as well as institutional setup relevant to environmental and social assessment of the proposed project.

2.1 NATIONAL ENVIRONMENTAL LAWS

A number of laws exist in Pakistan pertaining to environmental protection. However, the enactment of comprehensive legislation on the environment, in form of an act of parliament, is a relatively new phenomenon. Most of the existing laws on environmental and social issues have been enforced over an extended period of time, and are context specific. The laws relevant to the developmental projects are briefly reviewed below.

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

The National Conservation Strategy (NCS) is the primary document addressing environmental issues of the country. NCS is duly recognized as the National Environmental Action Plan. The document identifies 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural environment. The areas include restoration of rangelands, pollution prevention and abatement, and preservation of cultural heritage etc.

2.3 ENVIRONMENT INSTITUTIONS AND ADMINISTRATION

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

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

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

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

2.4 LAWS, REGULATIONS AND GUIDELINES

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

2.5 PAKISTAN ENVIRONMENTAL PROTECTION ACT, 1997

The key features of the law that have a direct bearing on the proposed project relate to the requirement for an initial environmental examination (IEE) and EIA for development projects. Section 12(1) requires that: "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof." The Pak- EPA has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies. As the proposed project will be located near Karachi, it falls under the jurisdiction of the PEPA.

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

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

The IEE-EIA Regulations, 2000 also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.
- An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.
- The EIA or IEE is submitted to the concerned EPA—provincial EPAs if the project is located in the provinces or the Pak-EPA if it is located in Islamabad.
- A fee, depending on the cost of the project and the type of the report, is submitted along with the document.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.
- The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- The EPA is required to make every effort to complete the IEE and EIA review

- When the EPAs accord their approval subject to certain conditions:
- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- An Environment Management Plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The IEE approval is valid for three years from the date of accord.

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

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

2.7 SECTORAL GUIDELINES FOR ENVIRONMENTAL REPORTS-WIND POWER PROJECTS

These wind power sectoral guidelines are part of a package of regulations and guidelines. They should be read as in context of the overall IEE guidelines package. These guidelines has been prepared by Federal EPA in collaboration with other key stakeholders, including provincial EPAs and Planning Development Division from both the Federal government and provinces, other agencies , NGOs representative of chambers of commerce and industry and other consultants.

These guidelines consist of comprehensive guidelines and procedures for the environmental assessment of wind power projects in Pakistan. It is emphasized that the various guidelines should be read as a package; reliance on the sectoral guidelines alone is inadequate.

2.8 POLICY FOR DEVELOPMENT OF POWER GENERATION PROJECTS, 2006

The Alternative Energy Development Board (s) was established as an autonomous body attached to the Cabinet Division on 12th May 2003. The Board was established to act as a central agency for development, promotion and facilitation of renewable energy technologies, formulation of plans, policies and development of technological base for manufacturing of renewable energy equipment in Pakistan. In Feb 2006, the administrative control of the Board was shifted from the Cabinet Division to the Ministry of Water & Power. The AEDB has developed the national policy for promoting renewable energy sources in the medium and long term, which is known as the Policy for Development of Renewable Energy for Power Generation, 2006. AEDB is also responsible for getting land leased from the Revenue department and lease it out to various investors/promoters for wind farms development.

The current project is developed under provisions of the Policy for Development of Renewable
Energy for Power Generation,
2006.

2.9 NATIONAL AND INTERNATIONAL ENVIRONMENTAL STANDARDS

2.9.1 National Environmental Quality Standards, 2005

The National Environmental Quality Standards (NEQS), promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources,

- Maximum permissible limits for motor vehicle exhaust and noise,

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

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

2.9.2 National Environmental Policy, 2005

The National Environmental Policy (NEP) was approved by the PEPA in its 10th meeting on 27th December 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country.

The broad Goal of NEP is, "To protect, conserve and restore Pakistan s environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies the following set of sectoral and cross-sectoral guidelines to achieve its Goal of sustainable development.

a. Sectoral Guidelines:

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

b. Cross Sectoral Guidelines

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

- Integration of environment into development planning;
- Legislation and regulatory framework;

- Public awareness and education; and
- Public private civil society partnership.

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

2.9.3 Land Acquisition Act, 1984

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

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

2.9.4 Telegraph Act, 1985

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

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

2.9.5 The Sindh Wildlife Protection Ordinance, 1972

The Sindh Wildlife Protection Ordinance, 1972 empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As no activities are planned in declared protected areas, provision of this law is not applicable to the proposed project.

2.9.6 The Sindh Fisheries Ordinance, 1972

The Sindh Fisheries Ordinance, 1980 regulates fishing in the public waters, including the coastal areas, of Sindh. It empowers the government of Sindh to issue licenses for fishing in public waters, put restriction on the type of equipment that can be used for fishing, restrict fishing in certain areas or of certain species of fish, regulate the onshore trade of fish catch, and regulate the fish processing industry. Article 8 of the Ordinance prohibits the discharge of wastewater to public waters without the consent of the Director Fisheries.

As no activities are planned for this project which can breach this Ordinance therefore, provision of this law is not applicable to the proposed project.

2.9.7 The Forest Act 1927

The Forest Act, 1927 empowers the government to declare certain areas reserved forest. As no reserved forest exists in the vicinity of the proposed project, the provisions of this law are not applicable to the proposed project.

2.9.8 Canal and Drainage Act, 1873

2.9.9 The Antiquities Act,1975 & the Sindh Cultural Heritage (Preservation)Act, 1994

The Antiquities Act of 1975 ensures the protection of Pakistan's cultural resources. The Act defines 'antiquities' as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export.

The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the project proponents are obligated to ensure that no activity is undertaken within 61 m (200 ft) of a protected antiquity, and to report to the Department of Archaeology, Government of Pakistan any archaeological discovery made during the course of the project. The Sindh Cultural Heritage (Preservation) Act, 1994 is the provincial law for the protection of cultural heritage. Its objectives are similar to those of the Antiquity Act, 1975. No antiquity protected under these two laws was identified in the vicinity of the proposed project.

2.9.10 Factories Act, 1934

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

2.9.11 Pakistan Explosive Act, 1884

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

2.9.12 Employment of Child Act, 1991

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

Tricon Boston Project-A and its contractors will be bound by the ECA to disallow any child labor at the project sites or campsites.

2.9.13 Civil Aviation Rules, 1994

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

- No person shall operate a light in the vicinity of an aerodrome which because of its glare is liable to dazzle pilots of aircraft taking off from or landing at that aerodrome; or which can be mistaken for an aeronautical ground light. If such a light is operated it shall be extinguished or satisfactorily screened immediately upon notice being given to the person or persons operating the light, by the Director-General or by the Manager or by a person authorized by him.

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

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

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

There is no airport in close proximity to the project area; therefore, it is highly unlikely that wind Power Project construction and operation activities might be affected by any of the aforementioned rules. However it is recommended to the proponent of the project to take relevant permission from Civil Aviation Authority for the installation of wind turbines. The blade tips of wind turbines will be marked with red to make the structure more visible from a distance to the aircrafts.

2.9.14 Pakistan Penal Code, 1860

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

2.10 ASIAN DEVELOPMENT BANK (ADB) POLICIES & STANDARDS

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

- Safeguards Policy Statement
- Policy on Gender and Development
- Social Protection Strategy
- Public Communications Policy
- Core Labor Standards

2.10.1 2009 Safeguard Policy Statement

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

The Involuntary Resettlement Policy: Minimize, mitigate and/or compensate for adverse project impacts, on the environment and affected people when avoidance is not possible

2.10.2 Policy on Gender and Development

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

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

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

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

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

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

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

2.10.3 Social Protection

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

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

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

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

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

Social Protection System in Asia and Pacific Region

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

2.10.4 2005 Pubic Communications Policy

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

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

2.10.5 Core Labor Standard

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

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

2.11 INSTITUTIONAL SETUP FOR ENVIRONMENTAL MANAGEMENT

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

2.12 OBLIGATION UNDER INTERNATIONAL TREATIES

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

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

These MEAs impose requirements and restrictions of varying degrees upon the member countries, in order to meet the objectives of these agreements. However, the implementation mechanism for most of these MEAs is weak in Pakistan and institutional setup nonexistent. Although almost all of the above MEAs would apply to the projects in one way or the other, the ones which have direct relevance for the proposed project include the Basel Convention Montreal Protocol, Stockholm Convention, UNFCCC and Kyoto Protocol.

SECTION 3

DESCRIPTION OF PROJECT

3 DESCRIPTION OF PROJECT

3.1 PROJECT LOCATION

The 50 MW wind project of Tricon Boston Project-A is located in Jhimpir, District Thatta, Sindh Pakistan, where Jhimpir wind corridor is identified as potential area for the development of wind power projects. The land has been leased by Government of Pakistan to Tricon Boston Project-A. The project site of Tricon Boston Project-A is located towards the North East of Karachi at a distance of approximately 95 km. The site is easily accessible through Karachi Hyderabad Motorway (the Super Highway). The total land acquired for the project is 1284 acres. The project site has very sparse little vegetation consisting of small shrubby bushes. Location of project on Pakistan map is shown in Figure 3.1. The lands coordinate of the project site are marked in Figure 3.2 and coordinates of the site are given in Table 3.1.

Figure 3.2: Tricon Boston Project-A Wind Project Site Layout

Tricon Boston Project-A Land Coordinates		
Latitude	**Longitude**	**Name**
25.01309257	67.85151093	WF-01
25.01674465	67.85435601	WF-02
25.07996812	67.77677322	WF-03
25.08344213	67.77987675	WF-04

Table 3.1: Land Coordinates of Tricon Boston Project-A

The project area is barren as depicted below in Figure 3.3;

Project Site
(View-1)

Project Site

3.2 ROAD ACCESS

The project site is easily accessible throughout the year.

The major track form Karachi to Nooriabad is through Karachi Hyderabad Motorway. The access from Nooriabad to the Site is a single track with semi metalled road named Thatta Thano Bula Road turning toward the site. However, the terrain is flat with minimal settlement and long and heavy vehicles can easily move. The total distance from Karachi to the site is around 95 km.
The satellite overview of track from Karachi to the project site is shown in Figure 3.4.

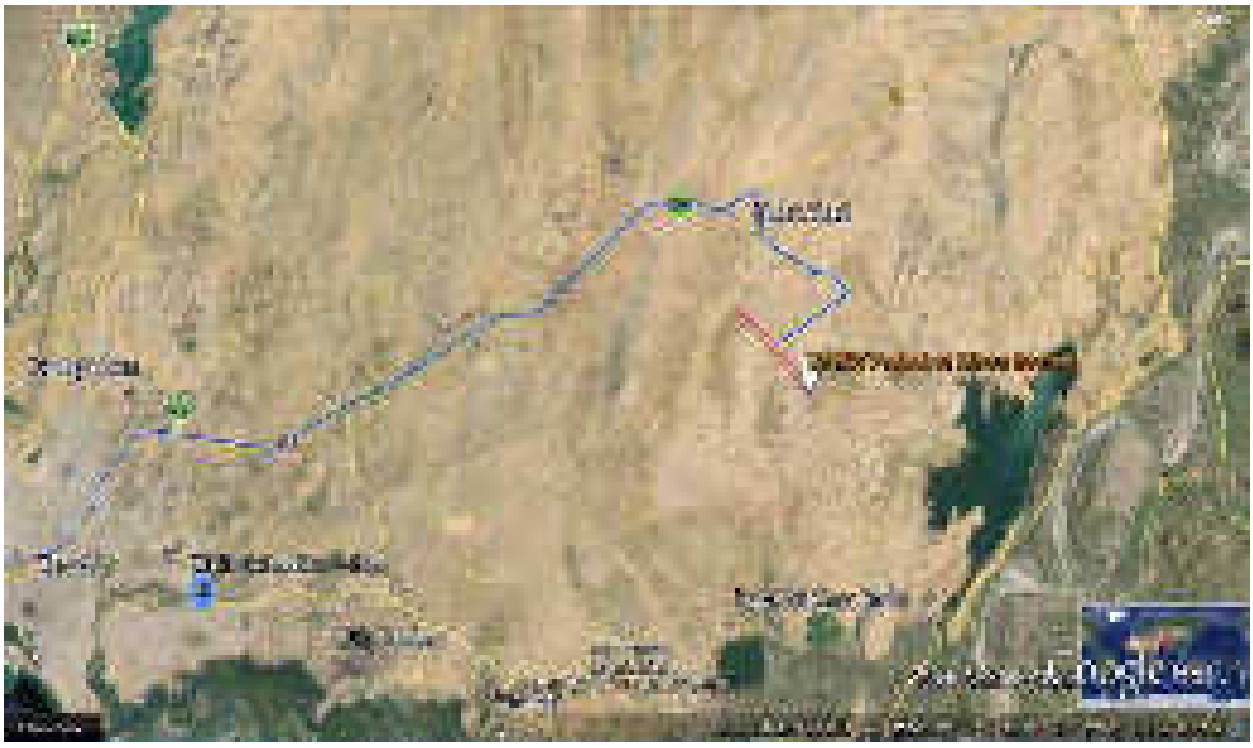


Figure 3.4: Ariel View of Complete Track

Figure 3.5: Closer View of Thatta-Thano Bula Road towards Site

3.3 PROJECT SIZE AND COMPONENTS

The project is of 50 MW capacities and about 33 wind turbines of each 1.5 MW capacity will be installed.

The project can be divided into four major phases;

- Pre-Construction Phase
- Construction Phase
- Operation and Maintenance Phase
- Decommissioning Phase

3.3.1 Preconstruction Phase

Pre-construction phase consists of;

- Land Procurement
- Soil and topographic Survey
- Installation of wind measuring mast
- Wind Resource Assessment and Micrositing
- Approvals from Government Departments (discussed in section 2.9)

3.3.2 Construction Phase

Construction Phase of the project will be awarded to EPC firms selected through competitive bidding process. It is estimated that direct manpower required during the Construction phase will be about 500.Unskilled jobs will be offered mainly to the local people particularly during the construction Phase.

Construction activities will be mainly comprised of

- Construction of site roads, crane pads at each wind turbine site

- Construction and installation of substation

All supplies both for construction and for the camp will be transported by trucks from Karachi. This will include all fuels and oils, drilling equipment, spare parts for construction machinery and food supplies for construction camps.

3.3.3 Operation and Maintenance Phase

Operation and Maintenance staff for the wind farm sites will be maintained in shifts to keep the availability of wind turbines on high performance. Wind farm will need a maximum of 20 Person per shift in addition to the security staff.

3.3.4 Decommissioning Phase

Decommissioning of wind farm site after having remained in operation for the life cycle of estimated 25 years will not lose its value as a wind power generation system. Its performance would demand up-gradation rather than decommissioning of plant. The tower and turbine may need replacement while the old ones will be sold as scrap to be the appropriate disposed off.

However if the site is to be decommissioned much before the designated plant life, it will be initiated by dismantling of the turbines, supporting towers, substation and transporting them out of the project area. The activity will take approximately 06 months and will require 600-800 truck loads to transport the material. The turbine material and the tower will be sold as scrap and concrete will be broken and move to the landfill site. The stored fuel or oil will be transported out of the area for sale or disposal at suitable landfill site. The site will be leveled to make it available for regular use.

3.4 PROJECT SCHEDULE

The feasibility of the Project has been completed and submitted to AEDB. It is expected that the Tariff would be applied soon after submission of feasibility. This would follow to execute EPA and reach financial close by end of 2014. The planned CoD is 2nd Quarter of 2016.

No	Milestone	Anticipated Date
1	Submission of Feasibility Study	1st QTR of 2014
2	Tariff Application	2nd QTR of 2014
4	EPC Contract Signing	2nd QTR of 2014
5	Tariff Approval	3rd QTR of 2014
6	EPA/IA	4thQTR of 2014
7	Financial Close	1st QTR of 2015
7	Project COD	2nd QTR of 2016

3.5 LOCATION OF GRID

The Tricon Boston Project-A 50 MW Wind Power Plant is planned to be built in the Jhimpir region. The electrical network in vicinity of the site of the plant comprises of LV (11 kV) and HV (132 kV and 220 kV) lines. For projects with installed capacity >10 MW, connection must be made with HV lines.

Hyderabad Electrical Supply Company 132/11 kV grid station is in Jhimpir. Distance of grid station the Project site is around 20 km.

Figure 3.6: Nearest HESCO grid station

3.6 WIND TURBINE DETAILS

The project shall use a total of thirty three (33) Wind turbines of 1.5 MW

each. Brief technical specification of wind turbine model is given in Table

3.2.

The WTG selected for this project shall be type IEC IIC windward 3-blade unit with a single capacity of 1500kW, a high single unit utilization rate and a full farm utilization rate. The permanent magnetic exciting turbine is preferential in the same conditions. The basic features of turbine are given below:

Table 3.2: Technical Specifications of Wind Turbine

Make	Gold Wind
Rated Power	1.5 MW
Hub Height	85 m
Blade Diameter	77 m
No of Turbines	33

3.7 NET ENERGY YIELD AND CAPACITY FACTOR

The net energy yield and capacity factor of 50 MW wind farm is calculated and presented in Table 3.3.

Number of WTG	33
Approximate Net Energy Production [GWh]	140
Capacity Factor [%]	31

SECTION 4

BASELINE ENVIRONMENTAL CONDITIONS

4 BASELINE ENVIRONMENTAL CONDITIONS

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.

4.1 CLIMATIC CONDITIONS

The climate of the project area can be broadly classified as arid, moderate, hot and humid. The mild winter is restricted to the November-February period. The summer extends from May to September, which overlaps the short spells of the main rainy season during July-August. The weather tends to be very humid during June, July and September and is pleasant during March April.

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. The meteorological stations of Badin and Hyderabad are located within the wind corridor. However the meteorological data from

Table 4.1: Average Maximum and Minimum Temperatures of Karachi

Month	Average Temperature (ºC)		Relative Humidity (%)		Total Rainfall (mm)
	Min	Max	am	Pm	Mean
Jan	13	25	63	45	3.6
Feb	14	26	72	49	6.4
Mar	19	29	79	57	8.3
Apr	23	32	87	62	4.9
May	26	34	88	68	0
Jun	28	34	86	69	3.9
Jul	27	33	28	73	64.4
Aug	26	31	90	74	44.8
Sep	25	31	89	71	22.8
Oct	22	33	83	57	0.3
Nov	18	31	68	49	1.7
Dec	14	27	64	45	4.5

The climatic conditions of Thatta and Badin districts may be taken as moderate as a whole. The climate is tempered by the cool sea breeze which blows for eight months of the year from March to October. During the monsoon season the sky is cloudy but there is very little precipitation. The climate in summer is generally moist and humid. The cold weather in the districts start from the beginning of November when a sudden change from the moist sea breeze to the dry and cold north-east wind brings about as a natural consequence, an immediate fall in temperature. The annual average of maximum and minimum temperatures of Jhimpir are given in Table 4.2 and presented in Figure 4.1.

Table 4.2: Average Maximum and Minimum Temperatures in Jhimpir Region (°C)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
24	28	33	38	41	40	37	35	36	36	31	26
12	15	19	23	26	28	27	26	25	23	19	14

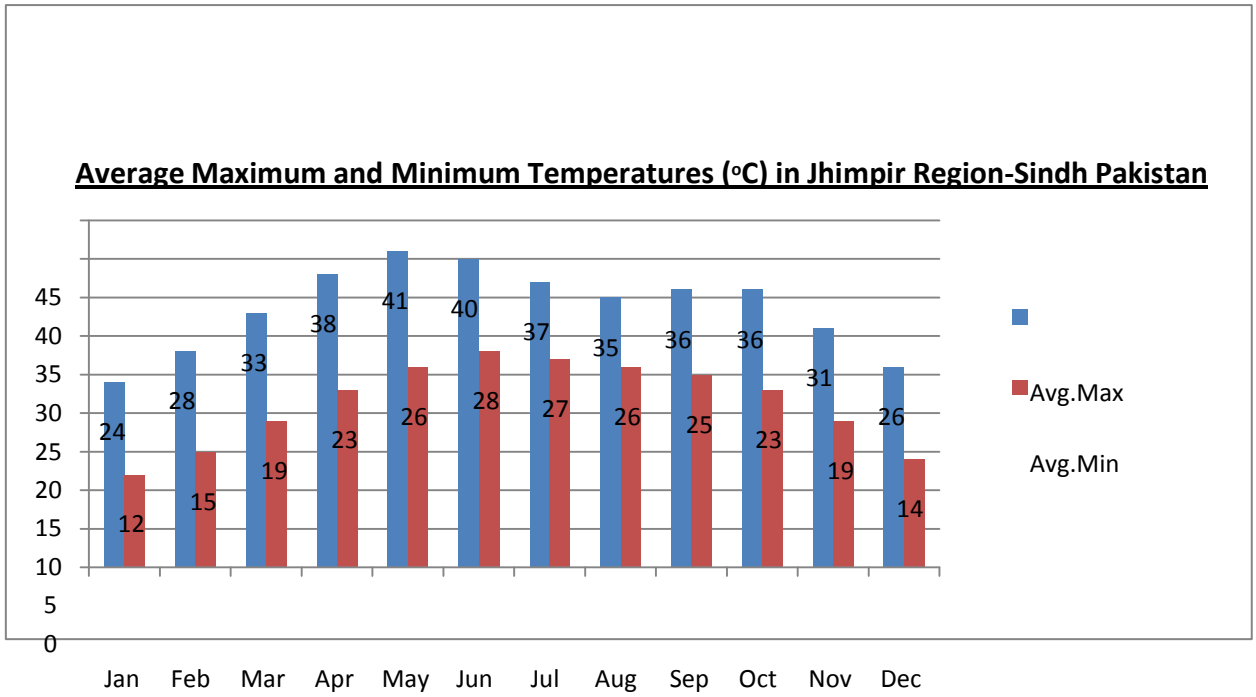


Figure 4.1: Graph of Average Maximum and Minimum Temerature (°C)

The annual precipitation takes place mainly during summer. It is unevenly distributed. Average rainfall as per meteorological record is given in Table 4.3, most of which occurs in monsoon season, from April to September.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14mm	6mm	7mm	6mm	5mm	12mm	21mm	50mm	13mm	3mm	0mm	16mm
2	1	1	1	1	2	3	7	2	0	0	1

Table 4.3: Average Precipitation and Rainfall Days in Jhimpir Region

4.2 SURFACE AND GROUND WATER HYDROLOGY AND DRAINAGE

Major water reserve of the area is Keenjhar Lake also known as Kalri Lake. It is about 20 km from the wind farm site. It is 24 km long and 6 km wide and has an area of 14000 ha (35,583 acres). The lake is fed by the Kalri Bagar feeder canal 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. Keenjhar is a wild life sanctuary and a Ramsar site.

Figure 4.2: Satellite View of Keenjhar/Kalri Lake near Project Site

The only perennial water channel in the area is the Kalri Baghar (KB) Upper Feeder which feeds Keenjhar Lake with Indus water from Kotri Barrage. The KB Feeder is about 20 km away from the Jhimpir wind farm site and lies on its eastern side. The KB feeder is about 61 km long and its design discharge is about 258 cubic meters per second (cumecs). Kinjhar Lake is also being fed by the hill torrents during floods from the western side. The catchment area of these hill torrents are about 1664 sq km and have their outfall into the Kinjhar Lake. These hill torrents includes; Rodh Nai and Liari Nai. Baran Nai which is the principal source of flood drops into the River Indus downstream of Kotri barrage.

Figure 4.3: View of Kinjhar/Kalri Lake near Project Site

Kinjhar Lake is the main source of fresh water for drinking and irrigation for the areas downstream of Jhimpir including the city of Karachi. Kinjhar Lake is an artificial water storage reservoir located in Thatta district. It came into existence as a consequence of implementation of the Kotri Barrage canals Irrigation Project. This artificial reservoir has been formed out of natural depressions of Sonheri and Kinjhar Dhands. The gaps between the surrounding hills of the dhands were closed with the construction of earthen embankments having an average height of about 7.6 m. Apart from KB Feeder, hill torrents and Kinjhar Lake there is no other source of surface water available in the area. The quantity of water in Kinjhar Lake is ample to fulfill the requirements of the downstream areas for irrigation and drinking purpose. The location of the surface water sources within the Jhimpir project area is also shown in Figure-9.

Regular Surveys have not been carried out to assess the availability and quality of Ground water in the Province of Sindh. Various sources estimates that the volume is 3-5 MAF scattered in 28% of the geographical area of Sindh. This water is found mainly along the Indus water channels and in few underground streams. In recent years, drought has caused excessive extraction of groundwater to make up for the lack of irrigation water. This, in turn, has resulted in rapid depletion of the groundwater and filling up of the

The Physical parameters of Groundwater in district Jamshoro and Distrcit Thatta is given in Table 4.3

Table 4.3: Physical Parameters of Groundwater Quality in Jamshoro and Thatta

Area	pH	TDS(mg/ml)	EC (µSm/cm)	SAL(PPT)	Temp(°C)
Jamshoro Phatak	7.7	877	1777	0.9	24.4
Thatta	8.2	233	463	0.2	26.8

The area is very poor in terms of the indicator of piped water, which is available to only about
14% of the housing units. About 13% of rural households have hand pumps inside the housing units, while 16% use outside ponds for fetching water and 6% of housing units use dug wells. The ground water level of the site is 115 meter.

The drainage system in the area is not developed. Booster pumping station for water supply pipeline is established to supply water from Keehchar lake to Nooriabad Industrial State located at around 10 km.

Figure 4.4: Booster Pumping Station from Kinjhar Lake to Nooriabad Industrial Estate

4.3 AMBIENT AIR QUALITY

The area in and around the project site is underdeveloped with no industrial development nearby but the area is likely to develop into a modern city after development of wind power projects in the area. The primary sources of air pollution include traffic near Karachi Hyderabad Motorway. The key pollutant likely to be found at these locations includes Carbon monoxide (CO), oxides of Nitrogen (NO_x), sulfur dioxide (SO_x) and particulate matters but in very minor quantities. In general the air quality of the area is high with no significant air pollutants.

4.4 NOISE QUALITY

There is very minor human settlement on the project area. Rest of the space is lying vacant. Traffic near the project site is consequently very low, industrialization is also very less, thus baseline noise levels are low.

4.5 SEISMIC HAZARDS

According to the seismic zoning map of Pakistan, the Jhimpir region falls in **ZONE II-B** with moderate to severe damage area probability with G Factor is g=0.1-0.3 as shown in Map in Figure 4.5. Earthquake records indicate that this region has experienced several earthquake tremors in the past, as well as in recent times. The region has some major tectonic features, including Runn Kutch-Karachi fault, Pab fault, Ornach-Nal fault, Surjan fault, and Jhimpir fault.

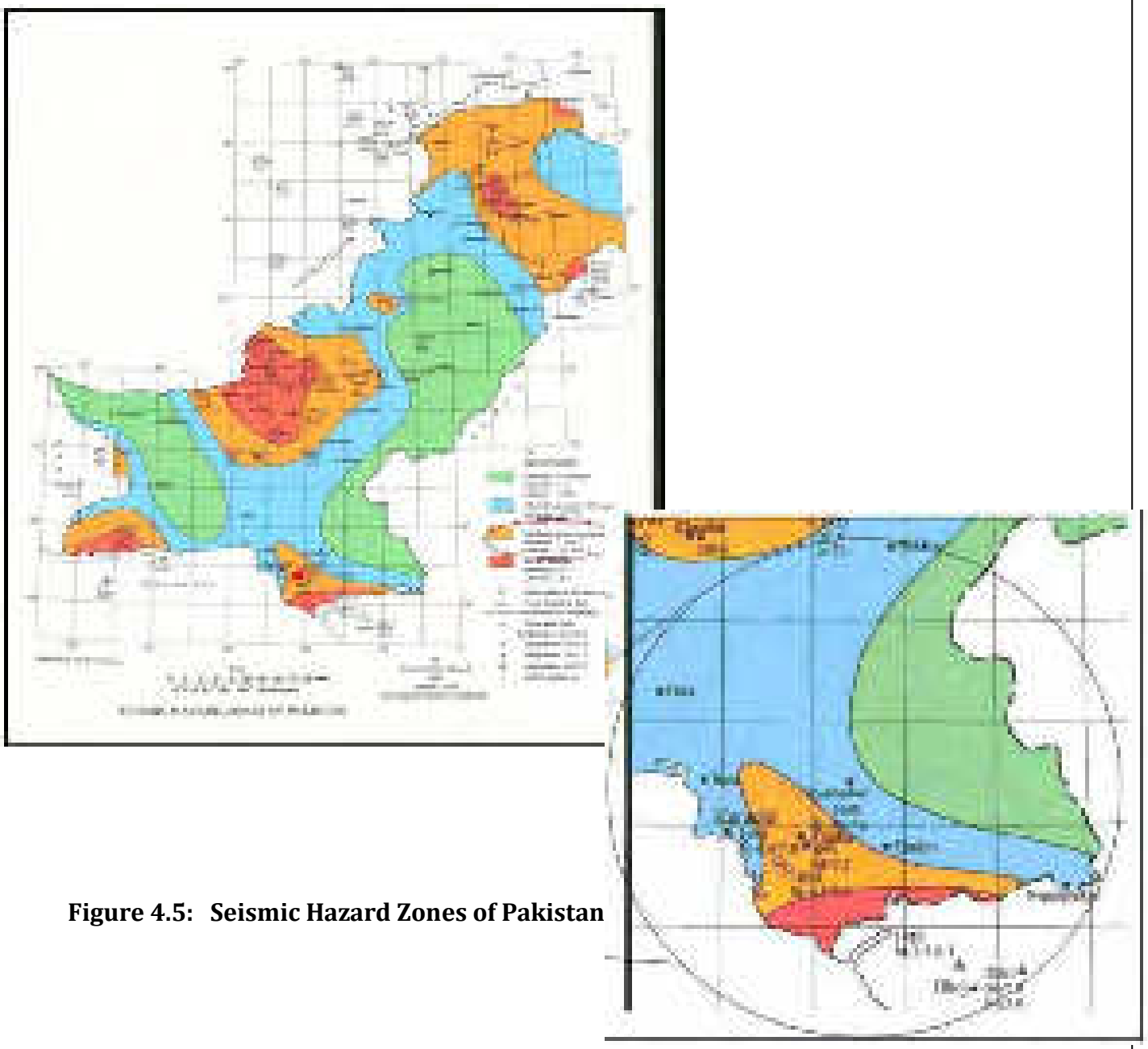


Figure 4.5: Seismic Hazard Zones of Pakistan

Figure 4.6: Seismic Map of Pakistan

4.6 FLOODS

Sindh province has two sources of flood. The Riverine flood is more predictable and allows ample time to react whereas the torrential flood floods leave almost no time to respond. Torrential floods have lesser frequency and duration but very high intensity therefore impact is also severe. These floods normally occur in monsoon months of July and August when its catchment areas in Balochistan receive heavy rains. Western boundary of Sindh is connected with Blochistan through Khirthar hills.

The recent flood came in Sindh in year 2011, which devastated more than 11000 villages in the Kacha and surrounding area displacing more than 213,000 households from their villages along with 1,065,000 numbers of livestock. Thatta district was the worst affected in Sindh for being the last district on the Indus River where the flood stayed for around two months. Official data reveals that around a million people were directly hit in this most-backward district of the province.

According to Flood map of Pakistan, Sindh province falls under moderate to heavy flooding zone.

4.7 GEOLOGICAL SETTINGS

The project area has a wide range of soil types due to its diverse land forms which include sandy, deltaic, alluvial, gravel, coastal and mountainous.

The Prevailing geologic conditions in the region are the results of extensive in deposition, coastal movements, and erosion over a long period of time 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 angel strike-slip fault 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 detailed, that the effect can be appreciated.

The hilly region of western Sindh consists almost entirely of rocks belonging to the tertiary system of geological nomenclature. It is only along the Laki range and in its neighborhood that there is some exposure of rocks belonging to the next older system; the cretatious with the exceptions of some volcanic beds associated with these cretatious strata, all the rocks formation of western Sindh are the sedimentary origin. All of the more important hills messes consist of limestone. Great majorities of this limestone deposit belongs to the nummultic period and are largely built up of the accumulated shells of foraminifera principally those belonging to the genus nummulties.

Table 4.4: Geological Formations covered in the Wind Corridor of Jhimpir

Geological Symbol	Description	Percentage (%) of Total Area
Q	Unconsolidated surface deposits of silt and gravel of recent period	32.57
Te	Eocene Sedimentary Rocks (Mostly Limestone) of Tertiary Ages	67.43

4.8 SOIL CLASSIFICATION

The texture of soils in the wind corridor ranges from loamy saline, silty and clayey in the coastal areas to gravely, mainly loamy and clayey soils in the inland areas.

The loamy soils in the coastal areas are strongly saline (hence devoid of any agriculture), moderately alkaline (pH of 7.9 to 8.4) and strongly calcareous ($CaCO_3$ content greater than
15%). The soil in the inland areas, especially those areas covered under the lower Indus basin,
consists mainly of loamy and clayey soils. These soils have little or no salinity (0 to 4dSm-1) and are moderately alkaline (pH of 7.9 to 8.4). The soils are generally non-saline, non-sodic except local saline patches in inter-dual valleys and some parts of the alluvial plain.

The soil of Jhimpir is classified as mainly loamy saline and part gravely. The soil is similar in nature to the soil of Gharo area. However the soils in some patches may be different with a slight salinity (between 4dSm-1 to 8dSm-1). This type of soil is usually neutral (with a pH of 6.6 to 7.3), and moderately calcareous (with $CaCO_3$ content in the range of 3% to 15%). Properties of soil in some patches of the wind farm may be indifferent to the ones stated above with moderately alkaline (pH of 7.9 to 8.4), strongly calcareous (with a $CaCO_3$ content of greater than 15%) with little or no salinity (between 0dSm-1 to 4dSm-1). This type of soil is usually neutral (with a pH of 6.6 to 7.3), and moderately calcareous (with $CaCO_3$ content in the range of 3% to 15%)

4.9 LAND USE CAPABILITY

The land area covered by the wind farm site of Tricon Boston Project-A consists of complex of agriculturally unproductive (rock) land and some poor grazing (gravely land) (Class VIII, VII). This area constitutes about 38.3% of the total wind farm area and is also incapable of agriculture as the soil underneath mainly consists of rock and gravel. The remaining portion (about 61.7%) of the land is a complex of poor torrent-watered crop land and poor (loamy) grazing land. Some part of this land is capable of agriculture being fed by torrent water whereas the remaining portion comprises of grazing area (capable of growing grass and shrubs)

Table 4.5: Land Use Capability Class in Jhimpir

Classification No	Soil (Class)	Capability	Percentage (%) of Total Area
7	IV, VII	Complex of poor torrent-watered cropland and poor (loamy) grazing land	61.68
10	VIII,VII	Agriculturally un-productive(rock) land and some poor grazing (gravely) land	38.32

Tricon Boston Project-A site consists of areas that have variable land use. The rocky and gravely soil formation devoid the major land area for any agricultural use. However the land area is also influenced by perennial grazing consisting of short grasses shrubs and scrubs. This area is dependent on residual moisture from torrent overflows. The major bushes found in the area include Devi, Chali, Damral and Darathi (local names). No medicinal value is associated with these plant species found in the area.

4.10 SOCIO ECONOMIC FEATURES

4.10.1 Local Settlement Pattern and Population

Jhimpir being in the administrative control of Thatta district is unique in terms of population sensibility and characteristic. The total area of Thatta is 17,355 sq/km. The total population consist of 1,113,194 scattered in several *goths/paras*.. Gender wise distribution shows a figure as 589,341 are Male and 523,853 are of Female. The population density of Thatta is 64.1 per sq/ km. the percentage of total population receding in urban setting is 11.2 %. The average house hold of size is of 5.1 persons. The average growth rate of population has remained from
1981-98 as
2.26.

Kalo Goth and Ali Khan Jhakro Goth are the villages observed while surveys which are located in the vicinity of Tricon Boston projects in Jhimpir.

Distance of Kallo Goth from designated wind farm sites is ± 3 kilometers. Goth is based on around 50 houses with population of ± 400 personals.

Digital coordinates of Goth
are;

25°07'37.3
6"N
67°
46'39.97"E

The average growth rate of population has remained from 1981-98 as
2.26.

Ali Khan Jakhro Goth is adjacent with designated wind farm sites. Distance of Goth from designated wind farm sites is ± 02 kilometers. Goth is based on around 20 houses with population of ± 100 personals.

Digital coordinates of Goth are.

25°06'54.3
1"N
67°47'17.
41"E

4.10.2 Health and Education Facilities

The health infrastructure in Thatta is scant. Three out of the six coastal Talukas do not have any Rural Health Centre or any Veterinary Dispensary. A particular problem of access to health services is the scattered nature of the population. Thus many of the people have no access to health services within a convenient location from their homes. Serious ailments have to be treated at Thatta, Hyderabad or Karachi. Many of the diseases occurring in the area are water borne, and due to lack of sanitation facilities. A basic health care centre is present in the area with very minimum facilities and staff.

The literacy rate in Thatta District was reported to be 22% in 1998. The male literacy rate was three times higher at 32% compared with the female literacy rate of only 11%. The literacy rate in urban areas was much higher at 46% compared to only about 19% in rural areas. A single primary school is located in the area.

Government High Secondary school for boys and girls is located at around 28 km from the
Project Site. There is another private school in Bachal Jhakro.

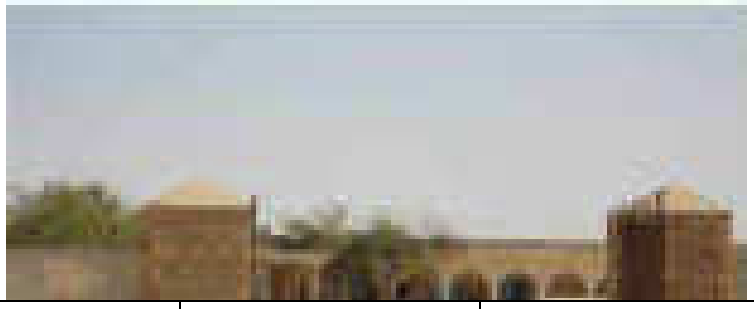


Figure 4.9: Basic Health Unit in Project Area

4.10.3 NGOs Working in the Area

Different national and international NGOs are working in Thatta district with the help of their local partners. Their scope of work Ranges from relieve operation in coastal areas of Thatta to social welfare and livelihood improvements initiatives. Some are working on CPI (Community Physical Infrastructure). Some have found their way in providing microfinance to local communities through social collateral. Few of these are also working on awareness and advocacy. NGOs and institution working in the area includes NRSP (national Rural Support Program), Aga Khan Planning and Building Services (AKPBS), PPAF (Pakistan Poverty Alleviation Fund), IUCN, WWF, SPO and Pakistan Fisher Folk Forum.

4.10.4 Occupational Pattern

The area does not offer opportunities for employment and the population is primarily engaged as cheap unskilled labor force either in Nooriabad, Thatta, or Hyderabad and Karachi. Skilled labors are mostly drivers, welders, plumbers and electricians. Government service is relatively rare. Government service is relatively rare. Very less numbers of locals are working in Pakistan Steel Mill Dolomite Project and Pakistan Railway station in Jhimpir.

4.11 ECOLOGY

4.11.1 Vegetation

The dominant trees and shrubs are bubul (*Acacia nilotica*), Khabar (*Salvadora oleoides*) kaneli (*Prosopis spicegra*), Kandi *(Prosopsis Senegal)*, kikar *(Acacia arabica*), lai (*Tamarix gallica), Tamarix aphylla*, willo or bahanand siris (*Acacia lebbek*). The dominant trees, shrubs and under shrubs of sand dunes are represented by ak (*Calotropis procerra*) besides babul, kandi and karil, etc. The plants found cultivated or wild near villages in the alluvial tracts are neem (*Azadirachta indica*), ber (*Zizyphus jujube*), serrel *(Albizzia lebbeck)* etc.

4.11.2 Wild Life

Animals: The wildlife in the area has been affected by colonization of the area and many wild life species have either diminished or vanished. At present hyenas and wolves are hardly ever seen. Jackals are fairly common and foxes are seen in the rapidly contracting area of dry waste. Hog deer which were once seen along the bank of River Indus are uncommon and pigs though diminished are still found in small numbers. Hare and deer are fairly common. Wild animals' inventory of Sindh region is given in **Annexure IV.**

Birds: Among birds grey partridge is common in the project area due to termite in the project area while black partridges are not common in the project area as they are found near the water channels. Kunj are now not regular winter visitors. Sand grouse of various kinds visit the district in the cold weather, but the expansion of the cultivated area has driven them away. This also applies to the houbara which was quite common in former times. Quails are also common. The other birds found in the district are Indian cursor, small Indian swallow plover, black and glossy ibris, sirkeer malikoha or cuckoo, Indian scoops owl, dusky horned owl, etc. Birds that visit the Keenjhar Lake include badak, ari, dhanore, seeklo, hong, pen, san, jonghlo, blue bet etc but during the last 30 years the number of birds adopting the migratory path have reduced due to various reasons mainly less food availability in Keenjhar area.

4.11.3 Infrastructure and Industry

The district is linked by road with other districts. National Highway from Karachi to Peshawar passes through Thatta for a length of 200 kilometers.

The main railway line from Karachi to Peshawar also connects the district. The principal railway stations are Jangshahi, Dhabeji and Jhimpir.

Electricity is available in 21% rural housing units while kerosene oil is still used in 77% of the rural dwellings. Firewood is used as the main cooking fuel in about 91% of rural households and 77% of urban households.

The district is also equipped with digital and non-digital telecommunication system besides postage and telegraph.

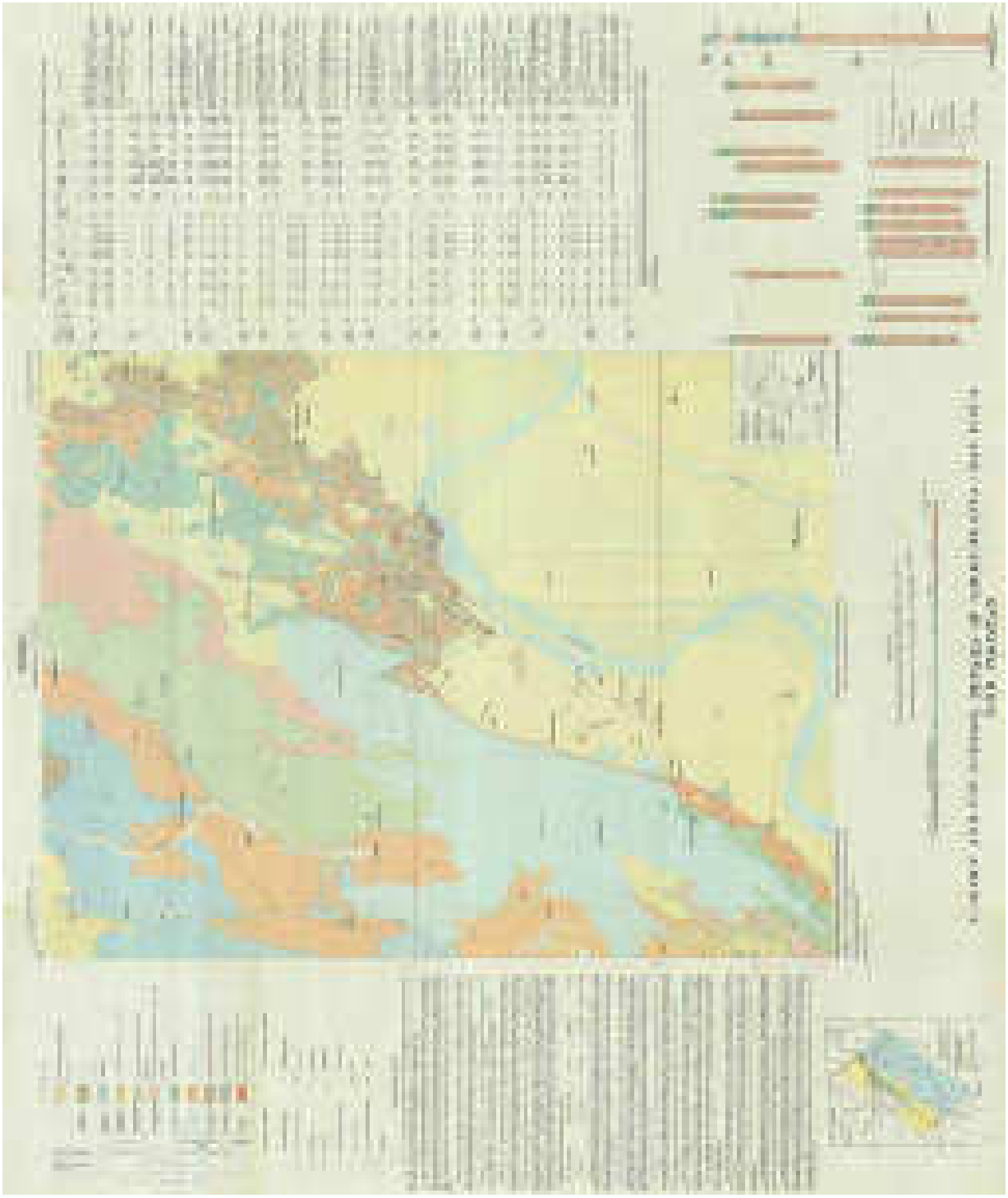
From the industrial point of view, Thatta District has progressed considerably. There are about 30 industrial units established in the district.

4.11.4 Archaeological Sites

No archaeological sites are present near the project site.

4.12 NATURAL MINERAL RESOURCES

The area near the project site area is very rich in natural resources. Coal reserves of about 28 million tones cover an area of 350 sq. miles are present in the area of Jhimpir.



SECTION 5

ANALYSIS OF PROJECT ALTERNATIVES

5 ANALYSIS OF PROJECT ALTERNATIVES

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

5.1 WITH OR WITHOUT PROJECT

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

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

Looking at how the country's future electricity needs might be met in a way that supports the environmental objectives of the Government of Pakistan; wind power generation has the potential of being a strong contributor. The development of wind power generation projects could reduce dependence on fuels for thermal power generation, increase diversity in Pakistan's electricity generation mix, and reduce greenhouse gas (GHG) emissions avoiding thermal power generation. The project will also add to the power generation from Renewable energy resources and help in meeting target of Government to achieve 5 % power generation from RE by 2015.

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

5.2 ALTERNATIVE FUEL

The only viable generating options for energy production to meet the supply-demand gap in project region are fossil fuel energy. Pakistan is already facing huge short fall in fulfilling the coal requirement for already existing thermal power plant. The quality of coal is also low to medium in the region resulting in fly ash, carbon footprints and sulphur fume emission when its burnt.

Coal power generation cause serious environmental threats including air pollution , coal dust, contamination of ground water, emissions of heavy metal pollutants which in turn can cause serious health issues.

So, it is imperative to look for alternatives to fossil fuel based power generation to achieve long term power solution of the country.

5.3 LOCATION ALTERNATIVES

The area where the project is located is the identified wind corridor of Jhimpir. The location of the project is selected on the base of suitable terrain and wind speed availability in the area. Jhimpir Wind Corridor is also considered as most suitable land for wind power

study which is more reliable and actual site

based. The major reasons for the selection of

this site are;

- Adequate wind resource that allows for the operation of utility-scale wind turbines;
- Proximity and sufficient access to an adequate electric transmission/Grid;
- Contiguous areas of available land resource;
- Compatible land use;
- Willing land lease participants and host communities;
- Limited sensitive ecological issues;
- Sufficient distance from major population centers; and
- Compliance with Local, State, and Federal laws and regulations

SECTION 6

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 LAND USE

The total land of Tricon Boston Project-A project is 1284 acres out of which a portion of land is categorized to set up a wind farm project.

There is absence of following since the last few decades on the land;

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

Micro-sitting of wind turbines to avoid any disturbance to human settlement.

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

Extent of displacement of existing land use or other environmental resources = No Impact

6.2 AIR QUALITY

The Project involves power generation using wind energy — a clean source of energy (i.e., no fuels are used). Air pollution will increase during construction (due to truck/vehicle traffic to the project site, minor construction required to erect the WTG, earthwork, development of access roads, vehicle traffic on un metaled road, etc. Also, use of construction vehicles and equipment and idling of vehicles carrying construction raw materials add to the emissions.

However, the increase in air pollution is temporary. Also, the nearest human habitat is quite away from the project site. Thus the impact of the construction activity on air pollution will be minor and temporary. Construction emissions will be substantially greater than emissions from project operation activities, but still limited in volume.

Impact on Air Quality =
Low

6.3 NOISE QUALITY

Project construction involves a variety of noise generating activities that include the use of grading, excavating/drilling/minor blasting of tower foundations, concrete batching, tower erection, the construction of ancillary structures / concreting, material movement, site

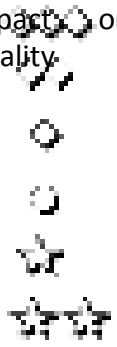
Construction activities at site are expected to produce noise levels in the range of 75–90 dB(A), with most works carried out during daytime.

The noise levels produced during construction will not have a significant impact on existing ambient noise levels at receiving sites as noise generating activities are dispersed and most construction activities will occur during the day when higher noise levels are tolerated due to higher background noise levels. In addition, the constructions phase will only be few month's duration therefore the intermittent impact from construction noise is deemed to be negligible.

During Project operation, noise will be generated from rotor movement through the air, from turbine operation and from vehicle movements and machinery operation around the site for maintenance and repair purposes. Blades moving through the air produce an aerodynamic noise. This noise is detectable when it is greater than the background noise, generally at wind speeds between the turbine cut-in wind speed (when the turbine starts to generate power) and up to 8-9 m/s (before the background noise starts to mask the noise from the blades and turbine). In addition, the operating turbine may produce a tonal noise.

The modern tubular towers contribute towards minimizing the noise emissions.	

Impact on Noise Quality



= Medium

6.4 NOISE FROM WIND TURBINES

No landscape is ever completely quiet. The modern tubular towers contribute toward minimizing the noise emissions. Birds and human activities emit sound, and at winds speeds around 4-7 m/s and up to the noise from the wind in leaves, shrubs, trees, masts etc. will gradually mask (drown out) any potential sound e.g. from wind turbines. This makes it extremely difficult to measure sound from wind turbines accurately. At wind speeds around 8 m/s and above, it generally becomes a quite abstruse issue to discuss sound emissions from modern wind turbines, since background noise will generally mask any turbine noise completely.

The sound power level from a single wind turbine is usually between 90 and 105 dB(A). This creates a sound pressure level of 50-60 dB(A) at a distance of 40 meters from the turbine, i.e. about the same level as conversational speech[3].

Figure 6.1 is released by GE, which shows the comparison of various common sounds with respect to the sound generating from Wind turbines. The research explains that a large wind turbine isn't very loud from an objective standpoint. According to this data, at a very close distance of
300 meters away, a turbine will be somewhere between an air conditioner (50 decibels) and a refrigerator (40 decibels). At about 500 meters, the levels drop to about 38 decibels, which is well below the typical 40-45 decibels of background noise in a populated area.

So wind turbines aren't any louder than what a common person already used
to.

The quality of wind farm noise is one factor. Researchers are looking at whether the low-frequency sound of blades has a different psycho-social impact than noise from highways or airports. It's very common that people living close to turbines call the sound “penetrating.”
Of course, different people handle the sound in different ways. Many residents are unfazed by turbines at close distances.

However, noise analysis will be done before the start of the project and it is ensured that the noise levels of the turbines remain within the permissible standards.

Figure 6.1: Noise Generating from Wind Turbine[4]

Modern wind turbine models will be used in this project because those have improved technology by introducing gearless mechanism, upwind rotors, sound proof nacelles to reduce mechanical noise, design amendments in blades. Noise from wind turbines varies with wind speed, but is generally comparable to the background sound in a typical household at 40 to 60 dB. The noise from wind turbines is usually measured in relation to ambient noise. If the wind is at higher speeds, the ambient noise level will be higher. Most new wind turbines will have noise levels at or close to ambient level. Distances of 100 feet are usually sufficient to keep noise levels below 60 dB, which has been suggested as a reasonable regulatory limit.

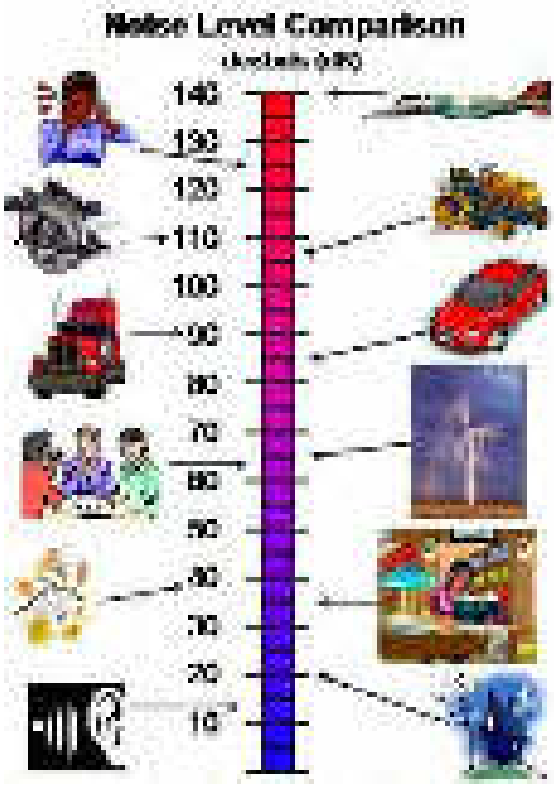


Figure 6.2: Noise Generating from Wind Turbine[5]

Impact of Noise Generated from Turbine	= Medium

6.5 SHADOW FORECASTING

Wind turbines, like other tall structures will cast a shadow on the neighboring area when the sun is visible. For a community living very close to the wind turbine, it may be annoying if the rotor blades chop the sunlight, causing a flickering (blinking) effect while the rotor is in motion.

It is predicted quite accurately the probability of when and for how long there may be a flicker effect. It might not be known in advance whether there is wind, or what the wind direction is, but using astronomy and trigonometry a likely, or a "worst case" scenario can be predicted.

Figure 13: Shadow Flicker of Wind Turbine

In a study conducted by Department of Energy and Climate Change, UK, the data of wind turbines of 18 countries were selected to study the shadow flicker impact. The study concluded that “the so called “shadow flicker” caused by wind turbines does not pose a significant risk to health of the nearby residents. There is no case reported about any significant impact of shadow flicker in any of the wind farms in the countries included in the study[6].

At distances of greater than 1,000 feet between wind turbines and receptors, shadow flicker usually only occurs at sunrise or sunset when the cast shadows are sufficiently long. Moreover, there is a common trend of the people is to build homes at shady places in Pakistan.

Impact of Shadow flicker	= Low

6.6 WATER USE AND QUALITY

The volume of water used during project construction and operation is low. Water is required for plant civil works, will be sourced from ground water.	

Once the wind farm is operational, water is only required for the domestic use of project staff at the site.

Water Use & Quality	= Low

6.7 GROUNDWATER CONTAMINATION

Groundwater contamination can occur if chemicals or any other waste materials are not properly handled or are incorrectly disposed of and leach into the water table or if wastewater from plant activities is not properly disposed of.

All the waste material will be handled and disposed of in accordance with accepted safe practices, with no harmful substances released by the Project. Therefore, there will be no effect on surface water quality or ground water contamination.

Impact of Shadow flicker	= No Impact

6.8 BIOLOGICAL ENVIRONMENT

6.8.1 Bird Life / Avian Collision

Birds can be affected by wind farm development through loss of habitat, disturbance to their breeding and foraging areas and by collisions caused by the rotating turbine blades. **Pakistan used to receive a large number of migratory birds from Europe and Central Asian States every year almost 30 years ago. In the recent timings as per the data collected in the Wind corridor of Mirpursakro and Jhampir, the number of birds coming through Indus flyway have reduced. The main reason for the less number of migratory birds is less availability of food, less availability of fresh water, contamination of existing water reservoirs etc** These birds spend the winters in Pakistan and go back to their native habitats in the summers. The route these birds take from Siberia to Pakistan is known as International Migratory Birds Route Number 4. It is also called the Green Route or Indus Flyway. Out of seven flyways, Indus Flyway is one of the busiest routes. Birds begin their journey in November. February is the peak time and by March they start flying back. These periods may vary depending upon weather conditions in Siberia and in Pakistan. Compared to other causes of mortality among birds, the effect of wind power is relatively minor. Non-collision impacts on birds such as site avoidance and disruption of migratory behavior could also been significant. However since, according to a survey conducted by WWF in 2009, number of birds in and around Keenjhar Lake has reduced drastically in recent years, besides 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. As a general rule, birds notice that new structures have arrived in their area, learn to avoid them in movements, and are able to continue feeding and breeding in the location. Wind farm technology is little bit new in Pakistan but this is the technology that was being used in the western and developed countries a decade age A study report (Sept. 2005) by the US Government Accountability Office (GAO) on the effects of wind energy development on wildlife determined that many fewer birds fly into wind turbines than is generally thought.

Although several hundred utility-scale wind farms currently operate across the (US), such problems appear to be limited to two project areas, according to the report. 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[7]. There seems no threatened or endangered bird species found at the site. Any development of the wind

The impact of wind energy development on bird populations came to prominence due to the high number of mortalities associated with one of the world's largest wind farm developments in California's Altamont Pass[8]. This wind farm had up to 5,600 wind turbines in operation and is located in a year-round, high activity area for raptors. Additional factors including prey abundance, high-speed rotor blades, and lattice tower structures which provided horizontal cross-bars for perching, rapid blade movement, and the close proximity of turbines.

Another research cited 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

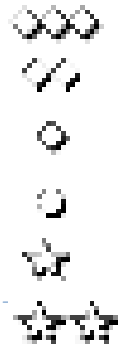
In Spain, a study showed 0.13 dead birds per year per turbine. By comparison in the USA, over
100 million birds are estimated to die each year from colliding with vehicles, buildings, power lines power lines and other structures, with wind power responsible for just 1 out of every
5,000 - 10,000 avian
fatalities.

However, from the minimal expected impact of bird's collision with the wind turbines following
mitigations are
proposed;

- The wind towers to be erected minimum at a distance of 300 meters to avoid the avian collision and to give the birds a wider corridor for the access in the project area
- Regular checking of the vacuums or holes in the towers to avoid nesting facility of any of the birds
- Bird mortality count in the immediate vicinity is proposed to establish a strong link between the wind turbines and birds mortality for two years starting from the commissioning of the wind farm

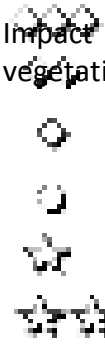
Impact on bird life	◆

= Low



6.8.2 Flora and Vegetation

As there is no dense vegetation or forestation in the project site area, therefore, there will be no damage to any kind of vegetation or forests. There will be no need for vegetation clearing or deforestation during the project.	



Impact on Flora and vegetation

= No Impact

6.9 SOCIO ECONOMIC ENVIRONMENT

6.9.1 Archeological Sites

No archaeological sites are present near the project site.

Archeological Sites	☆☆ = No Impact

6.9.2 Re-Settlement

Project is located on government-owned land. The nearest settlement to the Project site is approximately 2 km away. Therefore, no human re-settlement is required.

Resettlement	◇◇ = Medium

6.9.3 Visual Impact on Landscape

The addition of the Project to the local landscape will have a significant visual impact, as it would be first time in Pakistan. In European countries wind turbines are considered to give insignificant visual impact due to the fact that wind power technology is very common there and large numbers of wind turbines are installed. But as far as Pakistan is concerned, wind power is an emerging technology for local peoples and it would give a noteworthy positive visual impact.

Visual Impact on Landscape	☆☆ = Regionally Favorable

6.9.4 Aviation Hazard

No aviation hazard will be created by the Project as it is located 50 km from the nearest airport at Karachi. In addition, the blades are marked with red bands to make the structure more visible.

Aviation Hazard	

= No Impact

6.9.5 Traffic Management

The impact on traffic will be minimal and due to trucks carrying construction material and WTG components as well as vehicles to carry personnel. Traffic will need to be planned and managed effectively to avoid inconvenience for the local populace and/or endanger public safety.

Traffic Management	

= Low






6.9.6 Labor Welfare and Safety

Labor Welfare & Safety	◇ = Low

6.9.7 Seismic Hazards

The damage zone classification of the region where the site is located is ZONE II-B (moderate to severe damage). The foundation design of the wind turbine generator (WTG) will take account of this seismic factor.	◇

Labor Welfare & Safety	= Low

SECTION 7

ENVIRONMENT MANAGEMENT PLAN

7 ENVIRONMENT MANAGEMENT PLAN

7.1 PURPOSE AND OBJECTIVE OF EMP

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

The specific objectives of the EMP are to:

- Define the responsibilities of the project proponents, contractors, and environmental monitors, and provide means of effectively communicating environmental and social issues among them
- Define the implementation mechanism for the mitigation measures identified during the present study.
- Define the monitoring mechanism and identify monitoring parameters in order to:
  - Ensure the complete implementation of all mitigation measures, and

7.2 COMPONENT OF EMP

The EMP consists of the following:

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

All the components of EMP are discussed from Section 7.3 to 7.9

7.3 INSTITUTIONAL ARRANGEMENT

Tricon Boston will establish an Environment & Social Management Cell (ESMC) at Corporate and Site level, headed by a Project Director to be responsible for day-today implementation of the Project. Tricon Boston is responsible for undertaking the project in accordance with the Initial Environmental Examination (IEE) and implementing the Environmental and Social Management Plan as per ADB's Safeguard Policy Statement (2009).

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

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

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

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

- Implement the environment policy guidelines and environmental good practices at the sites.
- Advise and coordinate the contractor(s) activity towards effective environment management.
- Implement environment and safety manual.
- Carry out environmental and social survey in conjunction with project planning cell while route selection of the alignment at the planning stage to avoid negative environmental impact.
- Make the contractor staff aware of environmental and social issues so that EMP could be managed effectively.

The Framework of Environment and Social Management Cell are shown in **Figure 7.1** and

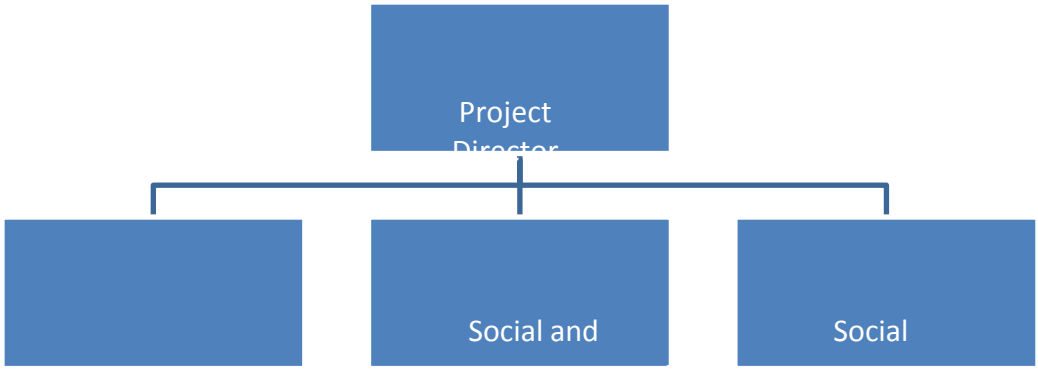


Figure 7.1: Framework of Environment and Social Management Cell

(ESMC) Table 7.1: Identification of Activities and Potential Impact

(O & M Phase)

S. No	Designation	Responsibility
1	Project Director (01)	❖ Environment and Social Policy and Directions
2	EHS Engineer (01)	❖ Overall in-charge of operation of environment & social management facilities ❖ Ensuring legal compliance by properly undertaking activities as laid down by regulatory agencies from time to time and interacting with the same
3	Social and Environmental Monitoring Expert (02) (from contractor side)	❖ Secondary responsibility for environment & social management and decision making for all environmental issues including Safety and Occupational Health ❖ Ensure environmental monitoring and social issues related to project as per appropriate procedures

7.4 MITIGATION & MONITORING PLAN

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

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

- A listing of the potential impact associated with that project activity
- A comprehensive listing of mitigation measures (actions)
- The person(s) responsible for ensuring the full implementation of the action
- The person(s) responsible for monitoring the action
- The timing of the implementation of the action to ensure that the objectives of mitigation are fully met.
- It should be emphasized that the mitigation measures will have to be translated into environmental as well as social requirements and specifications to be made part of the contracts for the construction activities, with legal binding.

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

- Ensuring that the mitigation measures included in the IEE are being implemented completely.
- Ensuring the effectiveness of the mitigation measures in minimizing the project's impacts on social and environmental resources.

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

7.5 GRIEVANCE REDRESSAL MECHANISM

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

Tricon Boston shall have a standard mechanism
to

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

Under the GRM, the ESMC will maintain the Social Complaint Register (SCR) at the sites to document all complaints received from the local communities or any other stakeholder. The information recorded in the Register will include date of the complaint, particulars of the complainant, description of the grievance, actions to be taken, the person responsible to take the action, follow up requirements and the target date for the implementation of the mitigation measure. The register will also record the actual measures taken to mitigate these concerns.

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

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

7.6 REPORTS AND DOCUMENTATION

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

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

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

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

7.7 ENVIRONMENTAL AND SOCIAL TRAININGS

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

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

During the O&M phase of the project, these trainings will continue to be conducted by ESMC

7.8 PUBLIC DISCLOSURE REQUIREMENTS

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

7.9 BUDGETARY ESTIMATES FOR EMP IMPLEMENTATION

The primary component of the environmental and social management cost pertains to the personnel dedicated for EMP implementation. The overall estimated cost of EMP implementation is given in **Annexure-II**

SECTION 8

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

~~8 INFORMATION DISCLOSURE,~~ CONSULTATION AND PARTICIPATION

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

A questionnaire was developed to assess the general concerns of the local resident of nearby villages about this project. Mr. Sohail Ahmed of Pakistan Alternative Energy Services himself filled the questionnaires after asking the questions to the native people. Filled questionnaires are attached in **Annexure-VIII** and snapshots of consultative meeting are also attached in **Annexure IX.**

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

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

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

During the stakeholder consultations carried out in the communities near the proposed site, the participants were first provided the salient information about the proposed project.

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

SECTION 9

CONCLUSION AND RECOMMENDATION

9 FINDING AND RECOMMENDATION

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

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

The proposed project will have number of positive impacts and negligible negative impacts to the existing environment as follows:

- Significantly improvement in the economic activities in the surrounding areas due to generation of direct and indirect employment opportunities.
- There is negligible removal of trees for the project, which is the main positive impact to the proposed project area.

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

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

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

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

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

Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts, along with their associated costs. Adverse impacts if noticed during implementation will be mitigated using appropriate design and management measures. The potential cumulative and residual impacts of the project as a whole indicate the project classifies as a category "B", in accordance with ADB's Safeguards Policy Statement 2009. The Project is not considered highly sensitive or complex. Mitigation measures related to construction, as specified in the EMP, will be incorporated into civil works contracts, and

ANNEXURE

ANNEX – I

Environment Management

Plan

Annexure – I

Environment Management

ENVIRONMENTAL ISSUE	MITIGATION MEASURE	TIME FRAME	RESPONSIBILITY
Site Access	**Plan** • Access in and out of the project will be minimized to one point to minimize impact during construction • All areas of construction activity will be fenced to limit the activities within the premises	Construction	Contractor
LAND ENVIRONMENT			
Impact on land use on project	Limit activities within the project	Construction	Contractor
Soil contamination by construction waste and fuel	Minimize oil and fuel spills from construction equipment by appropriate operation and	Construction and Maintenance	Contractor
Sourcing quarry material	Sand, aggregates, and other quarry	Construction	Contractor
Material spill	Use close cabin delivery vehicles or	Construction	Contractor
Debris disposal	Make SOPs recommended by relevant agencies/authorities	Construction	Contractor
BIOLOGICAL ENVIRONMENT			
Ecological impact	Identify and approve shrubs and trees to be fell and removed if	Pre-Construction	Sponsor & Contractor
Natural habitat	Avoid temporary disposal of demolition debris and excavated material Labor camps and stockyards beyond the project construction area Staff will be trained to avoid prey	Pre-Construction and Construction	Sponsor & Contractor

SOCIO-ECONOMIC ENVIRONMENT			
Local traffic management	Plan temporary traffic arrangements during construction within the construction area. Review the	Construction	Contractor
Traffic control and safety	Give special consideration to local traffic management for the safety of pedestrians, especially	Construction	Contractor
Providing labor camps and facilities	Abide by the contract conditions and directions with respect to siting of labor camps, providing temporary sanitation facilities.	Construction and Operation	Contractor & Sponsor
Occupational health	All the precautionary measures as required for the safety of	Construction and Operation	Contractor & Sponsor
Safety precautions	Take adequate precautions to prevent danger from electrical equipment	Construction and Operation	Contractor & Sponsor
Providing first aid kit	Provide a readily available first aid unit including an adequate supply of sterilized dressing	Construction and Operation	Contractor & Sponsor
Exposure to loud noise	Ensure workers exposed to loud	Construction and Operation	Contractor & Sponsor
AIR POLLUTION			
Air quality impact	No major impact on air quality. Dust generated by movement of vehicles is temporary and will be minimize after the completion of	NA	NA
Dust emission due to vehicles on un-metaled roads	Sprinkle unpaved roads used by the contractor with water at least once a day to control fugitive dust emissions—at least near habitations and vegetative	Construction	Contractor
Dust emission during foundation civil works	Water the construction site periodically to minimize fugitive dust generation	Construction	Contractor

	foundations.		
Dust emission during earthwork	Store all earthwork and construction materials in a manner to minimize generation	Construction	Contractor
Noise and dust Emissions from drilling operations	Employ all possible and practical measures to control noise	Construction	Contractor
Construction equipment emissions	Manage construction activity induced noise to within daytime hours. The contractor can employ mitigation measures such as restricted and/or	Construction	Contractor
NOISE POLLUTION			
Noise from Construction Activities from site preparation, earth works, foundation and plant equipment installation	All staff will be provided with ear plugs. No loud music is allowed in the construction camps. A prescribed working times from 0800 hrs to 1700 hrs preferably with no work activities at nights or during holidays. A speed restriction of 40 km/h will be imposed on all	Construction	Contractor
WATER ENVIRONMENT			
Water contamination due to improper storage of construction material	Store construction material containing fine particles in an enclosure so that sediment laden water does not drain into	Construction	Contractor
Blockage and change in drainage pattern	If the channel or drains get blocked due to negligence, ensure that they are cleaned. Once the work is completed in all respects, the contractor will clean up the drains along the project road	Construction	Contractor
Water contamination due	Conduct daily inspections at	Construction	Contractor

improper debris disposal	construction site to ensure removal of construction debris.		
Disposal of sewerage water	Provide an adequate treatment facility to treat the sewage generated from toilets before	Construction	Contractor
WASTE MANAGEMENT			
Ineffective use of resources resulting in excessive waste generation	Ensure that care is taken to avoid any oil spill or hazardous waste Appropriate waste disposal facility must be arranged in	Construction	Contractor
Littre or Contamination of the site or water through poor waste management practices	Visual inspection of the site must be carried out daily for evidence of liter or waste has been inappropriately disposed by the	Construction	Contractor

ANNEX – II

Budgetary

Estimates

Budgetary Estimates for EMP			
S.No	**Budget Heads**	**Cost (PKR)**	**Description(PKR)**
1	EHS Engineer (02)	3,600,000	100,000 for the period of 36 months
2	Social and Environmental Expert (From Contractor side)(02)	To be Paid by Contractor	
3	Environmental and Social Trainings during Construction and Operation	500,000	2 Trainings Sessions @ PKR 250,000 per training session
4	Miscellaneous	500,000	Environment and social issues
5	Contingencies	460,000	10% of the above cost
	Total	**5,060,000**	

Annexure – IV

IEE / EIA Guidelines by Government of Pakistan

PAKISTAN ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF IEE AND EIA) REGULATIONS, 2000

S.R.O. 339 (1)/2001. - In exercise of the powers referred by section 33 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), Pakistan Environmental Protection Agency, with the approval of the Federal Government is pleased to make the following Rules, namely : -

1. Short title and commencement

(1) These regulations may be called the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

(2) They shall come into force at once.

2. Definitions

(1) In these regulations, unless there is anything repugnant in the subject or context –

(a) "Act" means the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997);

(b) "Director-General" means the Director-General of the Federal Agency;

(c) "EIA" means an environmental impact assessment as defined in section 2(xi);

(d) "IEE" means an initial environmental examination as defined in section 2(xxiv); and

(e) "section" means a section of the Act.

(2) All other words and expressions used in these regulations but not defined shall have the same meanings as are assigned to them in the Act.

3. Projects requiring an IEE

A proponent of a project falling in any category listed in Schedule I shall file an IEE with the Federal Agency, and the provisions of section 12 shall apply to such project.

4. Projects requiring an EIA

A proponent of a project falling in any category listed in Schedule II shall file an EIA with the Federal Agency, and the provisions of section 12 shall apply to such project.

5. Projects not requiring an IEE or EIA

(1) A proponent of a project not falling in any category listed in Schedules I and II shall not be required to file an IEE or EIA:

Provided that the proponent shall file –

(a) an EIA, if the project is likely to cause an adverse environmental effect;

(b) for projects not listed in Schedules I and II in respect of which the Federal Agency has issued guidelines for construction and operation, an application for approval accompanied by an undertaking and an affidavit that the aforesaid guidelines shall be fully complied with.

(2) Notwithstanding anything contained in sub-regulation (1), the Federal Agency may direct the proponent of a project, whether or not listed in Schedule I or II, to file an IEE or EIA, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendation in writing of the Environmental Assessment Advisory Committee constituted under Regulation 23.

(3) The provisions of section 12 shall apply to a project in respect of which an IEE or EIA is filed under sub-regulation (1) or (2).

6. Preparation of IEE and EIA

(1) The Federal Agency may issue guidelines for preparation of an IEE or an EIA, including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.

(2) Where guidelines have been issued under sub-regulation (1), an IEE or EIA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify in the IEE or EIA any departure therefrom.

7. Review Fees

The proponent shall pay, at the time of submission of an IEE or EIA, a non-refundable Review Fee to the Federal Agency, as per rates shown in Schedule III.

8. Filing of IEE and EIA

(1) Ten paper copies and two electronic copies of an IEE or EIA shall be filed with the Federal Agency.

(2) Every IEE and EIA shall be accompanied by –

(a) an application, in the form prescribed in Schedule IV; and

(b) copy of receipt showing payment of the Review Fee.

9. Preliminary scrutiny

(1) Within 10 working days of filing of the IEE or EIA, the Federal Agency shall –

(a) confirm that the IEE or EIA is complete for purposes of initiation of the review process; or

(b) require the proponent to submit such additional information as may be specified; or

(c) return the IEE or EIA to the proponent for revision, clearly listing the points requiring further study and discussion.

(2) Nothing in sub-regulation (1) shall prohibit the Federal Agency from requiring the proponent to submit additional information at any stage during the review process.

10. Public participation

(1) In the case of an EIA, the Federal Agency shall, simultaneously with issue of confirmation of completeness under clause (a) of sub-regulation (1) of Regulation 9, cause to be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project, a public notice mentioning the type of project, its exact location, the name and address of the proponent and the places at which the EIA of the project can, subject to the restrictions in sub-section (3) of section 12, be accessed.

(2) The notice issued under sub-regulation (1) shall fix a date, time and place for public hearing of any comments on the project or its EIA.

(3) The date fixed under sub-regulation (2) shall not be earlier than 30 days from the date of publication of the notice.

(4) The Federal Agency shall also ensure the circulation of the EIA to the concerned Government Agencies and solicit their comments thereon.

(5) All comments received by the Federal Agency from the public or any Government Agency shall be collated, tabulated and duly considered by it before decision on the EIA.

(6) The Federal Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

11. Review

(1) The Federal Agency shall make every effort to carry out its review of the IEE within 45 days, and of the EIA within 90 days, of issue of confirmation of completeness under Regulation 9.

(2) In reviewing the IEE or EIA, the Federal Agency shall consult such Committee of Experts as may be constituted for the purpose by the Director-General, and may also solicit views of the sectoral Advisory Committee, if any, constituted by the Federal Government under sub-section (6) of section 5.

(3) The Director-General may, where he considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.

(4) The review of the IEE or EIA by the Federal Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under Regulation 10, and views of the committees mentioned in sub-regulations (2) and (3) above.

12. Decision

On completion of the review, the decision of the Federal Agency shall be communicated to the proponent in the form prescribed in Schedule V in the case of an IEE, and in the form prescribed in Schedule VI in the case of an EIA.

13. Conditions of approval

(1) Every approval of an IEE or EIA shall, in addition to such conditions as may be imposed by the Federal Agency, be subject to the condition that the project shall be designed and constructed, and mitigatory and other measures adopted, strictly in accordance with the IEE/EIA, unless any variation thereto have been specified in the approval by the Federal Agency.

(2) Where the Federal Agency accords its approval subject to certain conditions, the proponent shall –

(a) before commencing construction of the project, acknowledge acceptance of the stipulated conditions by executing an undertaking in the form prescribed in Schedule VII;

(b) before commencing operation of the project, obtain from the Federal Agency written confirmation that the conditions of approval, and the requirements in the IEE/EIA relating to design and construction, adoption of mitigatory and other measures and other relevant matters, have been duly complied with.

14. Confirmation of compliance

(1) The request for confirmation of compliance under clause (b) of sub-regulation (2) of Regulation 13 shall be accompanied by an Environmental Management Plan indicating the measures and procedures proposed to be taken to manage or mitigate the environmental impacts for the life of the project, including provisions for monitoring, reporting and auditing.

(2) Where a request for confirmation of compliance is received from a proponent, the Federal Agency may carry out such inspection of the site and plant and machinery and seek such additional information from the proponent as it may deem fit:

Provided that every effort shall be made by the Federal Agency to provide the requisite confirmation or otherwise within 15 days of receipt of the request, with complete information, from the proponent.

(3) The Federal Agency may, while issuing the requisite confirmation of compliance, impose such other conditions as the Environmental Management Plan, and the operation, maintenance and monitoring of the project as it may deem fit, and such conditions shall be deemed to be included in the conditions to which approval of the project is subject.

15. Deemed approval

The four-month period for communication of decision stipulated in sub-section (4) of section 12 shall commence from the date of filing of an IEE or EIA in respect of which confirmation of completeness is issued by the Federal Agency under clause (a) of sub-regulation (1) of Regulation 9.

16. Extension in review period

Where the Federal Government in a particular case extends the four-month period for communication of approval prescribed in sub-section (5) of section 12, it shall, in consultation with the Federal Agency, indicate the various steps of the review process to be taken during the extended period, and the estimated time required for each step.

17. Validity period of approval

(1) The approval accorded by a Federal Agency under section 12 read with Regulation 12 shall be valid, for commencement of construction, for a period of three years from the date of issue.

(2) If construction is commenced during the initial three year validity period, the validity of the approval shall stand extended for a further period of three years from the date of issue.

(3) After issue of confirmation of compliance, the approval shall be valid for a period of three years from the date thereof.

(4) The proponent may apply to the Federal Agency for extension in the validity periods mentioned in sub-regulations (1), (2) and (3), which may be granted by the Federal Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Federal Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

18. Entry and inspection

(1) For purposes of verification of any matter relating to the review or to the conditions of approval of an IEE or EIA prior to, during or after commencement of construction or operation of a project, duly authorized staff of the Federal Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.

(2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Federal Agency for this purpose and pursuant thereto.

19. Monitoring

(1) After issue of approval, the proponent shall submit a report to the Federal Agency on completion of construction of the project.

(2) After issue of confirmation of compliance, the proponent shall submit an annual report summarizing operational performance of the project, with reference to the conditions of approval and maintenance and mitigatory measures adopted by the project.

(3) To enable the Federal Agency to effectively monitor compliance with the conditions of approval, the proponent shall furnish such additional information as the Federal Agency may require.

20. Cancellation of approval

(1) Notwithstanding anything contained in these Regulations, if, at any time, on the basis of information or report received or inspection carried out, the Federal Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved IEE or EIA is incorrect, it

shall issue notice to the proponent to show cause, within two weeks of receipt thereof, why the approval should not be cancelled.

(2) If no reply is received or if the reply is considered unsatisfactory, the Federal Agency may, after giving the proponent an opportunity of being heard:

(i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or

(ii) cancel the approval.

(3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.

(4) Action taken under this Regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.

21. Registers of IEE and EIA projects

Separate Registers to be maintained by the Federal Agency for IEE and EIA projects under sub-section (7) of section 12 shall be in the form prescribed in Schedule VIII.

22. Environmentally sensitive areas

(1) The Federal Agency may, by notification in the official Gazette, designate an area to be an environmentally sensitive area.

(2) Notwithstanding anything contained in Regulations 3, 4 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Federal Agency.

(3) The Federal Agency may from time to time issue guidelines to assist proponents and other persons involved in the environmental assessment process to plan and prepare projects located in environmentally sensitive areas.

(4) Where guidelines have been issued under sub-regulation (3), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the EIA pertaining to the project.

23. Environmental Assessment Advisory Committee

For purposes of rendering advice on all aspects of environmental assessment, including guidelines, procedures and categorization of projects, the Director-General shall constitute an Environmental Assessment Advisory Committee comprising –

(a) Director EIA, Federal Agency … Chairman

(b)	One representative each of the Provincial Agencies	…	Members
(c)	One representative each of the Federal Planning Commission and the Provincial Planning and Development Departments	…	Members
(d)	Representatives of industry and non-Governmental organizations, and legal and other experts	…	Members

24. Other approvals

Issue of an approval under section 12 read with Regulation 12 shall not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law for the time being in force.

SCHEDULE I
(See Regulation 3)

List of projects requiring an IEE

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock, stud and fish farms with total cost more than Rs.10 million

2. Projects involving repacking, formulation or warehousing of agricultural products

B. Energy

1. Hydroelectric power generation less than 50 MW

2. Thermal power generation less than 200 KW

3. Transmission lines less than 11 KV, and large distribution projects

4. Oil and gas transmission systems

5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage

6. Waste-to-energy generation projects

C. Manufacturing and processing

1. Ceramics and glass units with total cost more than Rs.50 million

2. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost less than Rs.100 million

3. Man-made fibers and resin projects with total cost less than Rs.100 million

4. Manufacturing of apparel, including dyeing and printing, with total cost more than Rs.25 million

5. Wood products with total cost more than Rs.25 million

D. Mining and mineral processing

1. Commercial extraction of sand, gravel, limestone, clay, sulphur and other minerals not included in Schedule II with total cost less than Rs.100 million

2. Crushing, grinding and separation processes

3. Smelting plants with total cost less than Rs.50 million

E. Transport

1. Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metalled roads) with total cost less than Rs.50 million

2. Ports and harbor development for ships less than 500 gross tons

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume less than 50 million cubic meters of surface area less than 8 square kilometers

2. Irrigation and drainage projects serving less than 15,000 hectares

3. Small-scale irrigation systems with total cost less than Rs.50 million

G. Water supply and treatment

Water supply schemes and treatment plants with total cost less than Rs.25 million

H. Waste disposal

Waste disposal facility for domestic or industrial wastes, with annual capacity less than 10,000 cubic meters

I. Urban development and tourism

1. Housing schemes

2. Public facilities with significant off-site impacts (e.g. hospital wastes)

3. Urban development projects

J. Other projects

Any other project for which filing of an IEE is required by the Federal Agency under sub-regulation (2) of Regulation 5

SCHEDULE II
(See Regulation 4)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation over 50 MW
2. Thermal power generation over 200 MW
3. Transmission lines (11 KV and above) and grid stations
4. Nuclear power plans
5. Petroleum refineries

B. Manufacturing and processing

1. Cement plants
2. Chemicals projects
3. Fertilizer plants
4. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost of Rs.100 million and above
5. Industrial estates (including export processing zones)
6. Man-made fibers and resin projects with total cost of Rs.100 M and above
7. Pesticides (manufacture or formulation)
8. Petrochemicals complex
9. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel),printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than Rs.10 million
10. Tanning and leather finishing projects

C. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs.50 million and above

D. Transport

1. Airports

2. Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of Rs.50 million and above

3. Ports and harbor development for ships of 500 gross tons and above

4. Railway works

E. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 50 million cubic meters and above or surface area of 8 square kilometers and above

2. Irrigation and drainage projects serving 15,000 hectares and above

F. Water supply and treatment

Water supply schemes and treatment plants with total cost of Rs.25 million and above

G. Waste Disposal

1. Waste disposal and/or storage of hazardous or toxic wastes (including landfill sites, incineration of hospital toxic waste)

2. Waste disposal facilities for domestic or industrial wastes, with annual capacity more than 10,000 cubic meters

H. Urban development and tourism

1. Land use studies and urban plans (large cities)

2. Large-scale tourism development projects with total cost more than Rs.50 million

I. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas

J. Other projects

1. Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5.

2. Any other project likely to cause an adverse environmental effect

SCHEDULE III
(See Regulation 7)

IEE/EIA Review Fees

Total Project Cost	IEE	EIA
Upto Rs.5,000,000	NIL	NIL
Rs.5,000,001 to 10,000,000	Rs.10,000	Rs.15,000
Greater than Rs.10,000,000	Rs.15,000	Rs.30,000

SCHEDULE IV
[See Regulation 8(2)(a)]

Application Form

1.	Name and address of proponent		Phone: Fax: Telex:	
2.	Description of project			
3.	Location of project			
4.	Objectives of project			
5.	IEE/EIA attached?	IEE/EIA :	Yes/No	
6.	Have alternative sites been considered and reported in IEE/EIA?		Yes/No	
7.	Existing land use		Land requirement	
8.	Is basic site data available, or has it been measured?	(only tick yes if the data is reported in the IEE/EIA) Meteorology (including rainfall) Ambient air quality Ambient water quality Ground water quality	<u>Available</u> Yes/No Yes/No Yes/No Yes/No	<u>Measured</u> Yes/No Yes/No Yes/No Yes/No
9.	Have estimates of the following been reported?	Water balance Solid waste disposal Liquid waste treatment	<u>Estimated</u> Yes/No Yes/No Yes/No	<u>Reported</u> Yes/No Yes/No Yes/No
10.	Source of power		Power requirement	
11.	Labour force (number)	Construction: Operation:		

<u>Verification.</u> I do solemnly affirm and declare that the information given above and contained in the attached IEE/EIA is true and correct to the best of my knowledge and belief.

Date _____

Signature, name and _____
designation of proponent
(with official stamp/seal)

SCHEDULE V
[See Regulation 12]

Decision on IEE

1. Name and address of proponent _____

_____

2. Description of project _____

3. Location of project _____

4. Date of filing of IEE _____

5. After careful review of the IEE, the Federation Agency has decided –

(a) to accord its approval, subject to the following conditions:

_____
_____

or (b) that the proponent should submit an EIA of the project, for the following reasons –

_____
_____

[Delete (a) or (b), whichever is inapplicable]

Dated _____

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VI
[See Regulation 12]

Decision on EIA

1. Name and address of proponent _____

_____

2. Description of project _____

3. Location of project _____

4. Date of filing of EIA _____

5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –

(a) to accord its approval, subject to the following conditions:

_____
_____

or (b) that the proponent should submit an EIA with the following modifications-

_____
_____

or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

_____
_____

[Delete (a)/(b)/(c), whichever is inapplicable]

Dated _____

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VII
[See Regulation 13(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that I fully understand and accept the conditions contained in the approval accorded by the Federal Agency bearing tracking no. _____ dated _____, and undertake to design, construct and operate the project strictly in accordance with the said conditions and the IEE/EIA.

Date _____

Signature, name and _____
designation of proponent
(with official stamp/seal)

Witnesses
(full names and addresses)

(1) _____

(2) _____

SCHEDULE VIII
(See Regulation 21)
Form of Registers for IEE and EIA projects

S. No.	Description	Relevant Provisions
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I and II)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Project capital cost	
9.	Date of receipt of IEE/EIA	
10.	Date of confirmation of completeness	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	
13.	Conditions of approval/reasons for refusal	
14.	Date of Undertaking	
15.	Date of extension of approval validity	
16.	Period of extension	
17.	Date of commencement of construction	
18.	Date of issue of confirmation of compliance	
19.	Date of commencement of operations	
20.	Dates of filing of monitoring reports	
21.	Date of cancellation, if applicable	

Annexure – VI

National Environmental Quality Standards (NEQs)

Statutory Notification (S. R. O.)
THE NATIONAL ENVIRONMENTAL QUALITY STANDARDS

S. R. O. 742 (I)/93.--In pursuance of the powers conferred by clause (d) of section 6 of the Pakistan Environmental Protection Agency Ordinance. 1983 (XXXVII of 1983), the Pakistan Environmental Protection Agency. With the prior approval of the Pakistan Environmental Protection Council, hereby establishes the National Environmental Quality Standards as contained in the Annexes to this notification.

2. These National Environmental Quality Standards relating to municipal and liquid industrial effluents(Annex I), industrial gaseous emissions (Annex II) and motor vehicle exhaust and noise (Annex III), shall come into force with immediate effect, except in the case of industrial units to which the following schedule shall apply:

Existing industrial units i.e. those units already in production _____ 01 July, 1996

New industrial units i.e. those units that will come into production on or after 30th June, 1994 _____ 01 July, 1994

Annex I

National Environmental Quality Standards for Municipal and Liquid Industrial Effluents (mg/L, Unless Otherwise Defined)

S.No	Parameter	Standards
1.	Temperature	40°C
2.	pH value (acidity/ basicity)	6-10 pH
3.	5-days Biochemical Oxygen Demand (BOD) at 20°C	80 mg/l.
4.	Chemical Oxygen Demand (COD)	150 mg/l.
5.	Total suspended solids	150 mg/l.
6.	Total dissolved solids	3500 mg/l.
7.	Grease and oil	10 mg/l.
8.	Phenolic compounds (as phenol)	0.1 mg/l.
9.	Chloride (as Cl)	1000 mg/l.
10.	Fluoride (as F)	20 mg/l.
11.	Cyanide (as CN)	2 mg/l.
12.	An-ionic detergents [2](as MBAS)[3]	20 mg/l.
13.	Sulphate (SO_4)	600 mg/l.
14.	Sulphide (S)	1.0 mg/l.
15.	Ammonia (NH_3)	40 mg/l.
16.	Pesticides, herbicides, fungicides and insecticides	0.15 mg/l.
17.	Cadmium[4]	0.1 mg/l.
18.	Chromium[4] (trivalent and hexavalent).	1.0 mg/l.
19.	Copper[4]	1.0 mg/l.
20.	Lead[4]	0.5 mg/l.
21.	Mercury[4]	0.01 mg/l.
22.	Selenium[4]	0.5 mg/l.
23.	Nickel[4]	1.0 mg/l.
24.	Silver[4]	1.0 mg/l.
25.	Total toxic metals	2.0 mg/l.
26.	Zinc	5.0 mg/l.
27.	Arsenic	1.0 mg/l.
28.	Barium	1.5 mg/l.
29.	Iron	2.0 mg/l.
30.	Manganese	1.5 mg/l.
31.	Boron	6.0 mg/l.
32.	Chlorine	1.0 mg/l.

Explanations :

1 Assuming minimum dilution 1 : 10 on discharge. Lower ratios would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.

2 Assuming surfactant as bio-degradable.

3 MBAS means Modified Benzene Alkyl Sulphates.

4 Subject to total toxic metals discharge as at S . No. 25.

Annex II

National Environmental Quality Standards for Industrial Gaseous Emissions (mg/Nm^3, Unless Otherwise Defined)

S.No.	Parameter	Source of emission	Standards
1.	Smoke	Smoke opacity not to exceed:-	40% or 2 (Ringlemann Scale).
2.	Particulate matter.[1]	Boilers and furnaces:	
		(I) Using Oil.	300
		(ii) Using Coal.	500
		(iii) Cement Kilns.	200
		Grinding, crushing, clinker coolers and related processes, metallurgical processes, convertors, blast furnaces and cupolas.	500
3.	Hydrogen Chloride	Any.	400
4.	Chlorine	Any.	150
5.	Hydrogen Fluoride	Any.	150
6.	Hydrogen Sulphide	Any.	10
7.	Sulphur Oxides	Sulfuric Acid Plants. Others.	400 400
8.	Carbon Monoxide	Any.	800
9.	Lead	Any.	50
10.	Mercury	Any.	10
11.	Cadmium	Any.	20
12.	Arsenic	Any.	20
13.	Copper	Any.	50
14.	Antimony	Any.	20
15.	Zinc	Any.	200
16.	Oxides of Nitrogen (NOx)	(i) Any Nitric Acid manufacturing unit. (Ii) other sources	400 400

Explanations :

Based on the assumption that the size of the particles is 10 microns or more.

Annex - III

National Environmental Quality Standards for Motor Vehicle Exhaust and Noise

S.No	Parameter	Standards (maximum permissible limit)	Measuring method
1.	Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more.
2.	Carbon Monoxide.	Emission Standards : New Vehicles. 4.5 % Used Vehicles. 6 %	Under idling conditions: Non dispersive infrared detection through gas analyzer.
3.	Noise.	85 db (A).	Sound-meter at 7.5 meters from the source.

Source:

The content of this document has been taken from:

The Gazette of Pakistan, Extraordinary, Published By Authority, Islamabad, Sunday, August 29, 1993, Part II, Statutory Notification (S. R. O.), Government Of Pakistan; Environmental and Urban Affairs Division (Pakistan Environmental Protection Agency); Notifications; *Islamabad, The 24th August, 1993*

Annexure – VII

Social Survey

Report

SOCIAL SURVEY REPORT

Project Name	3 x 50 MW Wind Power Projects of Tricon Boston
Project No.	1404-32
Author	Zafar ullah Khan, Beena Shoaib, Sohail Ahmed & Kashif Khoso
Location	Jhimpeer, Sindh - Pakistan
Date	04.04.2014
Weather	Sunny
Wind	Windy

Pos	Comments	Pictures
01	General view of designated area for Wind Farm. The area is open and flat and mixture of hard and rocky ground with small bushes. Distance of sites from Karachi Toll Plaza is ± 80 kilometers. Designated sites for wind farms have two accesses one from main superhighway and one from national highway.	
02	The northern area of wind farm is adjacent with main superhighway M9.	

03	Kallo Goth adjacent with designated wind farm sites. Distance of Goth from designated wind farm sites is ± 3 kilometers. Goth is based on around 50 houses with population of ± 400 personals. Digital coordinates of Goth. 25°07'37.36"N 67° 46'39.97"E	
04	Ali Khan Jakhro Goth adjacent with designated wind farm sites. Distance of Goth from designated wind farm sites is ± 02 kilometers. Goth is based on around 20 houses with population of ± 100 personals. Digital coordinates of Goth. 25°05'48.96"N 67° 50'04.19"E	
05	Nazeer Plari Goth adjacent with designated wind farm sites. Distance of Goth from designated wind farm sites is ± 1.8 kilometers. Goth is based on 04 houses with population of ± 30 personals. Digital coordinates of Goth. 25°06'54.31"N 67°47'17.41"E	

06	General view of Columbia Agriculture farm. Distance of Columbia agriculture farm from designated wind farm sites is ± 1.2 kilometers. Digital coordinates of farm. 25°01'30.46"N 67°56'07.86"E	
07	Hyderabad Electrical Supply Company 132/11 kV grid station in Jhimpeer. Distance of grid station from designated wind farm sites is ± 20 kilometers. Digital coordinates of Grid Station. 25°01'50.36"N 68°00'22.64"E	
08	Jhimpeer railway station. Distance of railway station from designated wind farm sites is ± 25 kilometers. Digital coordinates of railway station. 25°01'50.36"N 68°00'22.64"E	

09	Government Secondary school Jhimpeer. Distance of the school from designated site for wind farm is + 23 kilometers.	
10	Basic Health Unit Jhimpeer. Distance of the health unit from designated site for wind farm is ± 22 kilometers.	
11	General view of Jhimpeer City. Distance of the city from designated site for wind farm is + 24 kilometers.	

12	General view of keenjhar lake. Distance of the lake from designated site for wind farm is ± 25 kilometers.	
13	The Tomb of Syed Hussain Shah situated near Keenjhar Lake. Local villagers and people from other villages visit The Tomb to pay homage to Syed Hussain Shah and Ameer Peer. Distance of the Tomb from designated site for wind farm is ± 25 kilometers.	
14	Shivmaha Dev Temple near Keenjhar lake. Distance of temple from designated site for wind farm is ± 25 kilometers.	

15	Graveyard near Keenjhar Lake. Distance of graveyard from designated site for wind farm is ± 25 kilometers.	
16	Consultation with the locals.	
17	Consultation with the locals.	

18	Consultation with the locals.	
19	Consultation with the locals.	
20	Consultation with the locals.	

21	Consultation with the locals.	
22	Consultation with the locals.	
23	Consultation with the locals.	

24	Consultation with the locals.	
25	Consultation with the locals.	
26	Consultation with the locals.	

27	Consultation with the locals.	
28	Consultation with the locals.	
29	Consultation with the locals.	

30	Consultation with the locals.	
31	Consultation with the locals.	
32	Consultation with the locals.	

33	Consultation with locals of Jhimpeer city near keenjhar lake.	
34	Consultation with locals of Jhimpeer city at railway station.	

General Information

Local Information: Kallo Goth, Nazeer Plari Goth and Ali Khan jakhro Goth are the villages observed while survey. Villages are based on around 100 ± houses with the population of around ± 500 people.

Trees: Trees found in the designated area includes Acacia nilotica (babul), Salvadora oleoides (khabar) and Prosopsis senegal (kandi),Acacia arabica (kikar), Tamarix gallica (lai), tamarix aphylla, willo or bahanand siris (acacia lebbek).

Bush: Major Bush species found in the area include Devi, Chali, Damral and Darathi (local names). No special medicinal value is associated with these bush species by the locals.

Grass: Wild grass and kallar grass are the major grass species in the designated area.

Birds: The most common birds found in the environment are sparrows, crows, robins and doves. Migratory birds such as ducks, geese, and waterfowl occasionally visit this area. Cranes are observed during spring and autumn migration, however they over fly the project area and do not land here. The residents of Goth reported that the **koonj** over flying but not landing in the area.

Flora & Fauna: The designated sites for Wind Farm is a barren land with only a few self growing stunted bushes covering small portions of the land. The land is rocky and has a very deep water table of around 100m, so possibility of vegetation in that area is unlikely currently the vegetation cover is very sparse, providing limited habitat for fauna. It is due to very scarce rains in the area. A very few numbers of common reptiles are found in the area, which can share their abode with the wind farm as the actual land use is very low. The rest of the area is available for their fun & frolic. There seems no threatened or endangered flora & fauna species present at the site. And development of wind farms in that area will not have any impact on the existing flora & fauna situation. In near past deer, wolf, jackals and fox were found in great quantity. None of these animals, except the jackal, are to be found here in the environment The mongoose and snakes are both present in the environment. Major species include Black Cobra and Lundi (local name)

Water: The land is rocky and has a very deep water table of around 100m. Local are using hand pumps to utilize the water or taking water from Jhimpeer or Nooriabad.

Health: Health facilities are not available in the area. Serious ailments have to be treated at Jhimpeer, Kotri, Hyderabad or Karachi. Many of the diseases occurring in the area are water borne, and the lack of sanitation facilities

Occupation: The area does not offer opportunities for employment and the population is primarily engaged as cheap unskilled labor force either in Wind Projects, Nooriabad, Thatta, or Hyderabad and Karachi. Skilled labors are mostly drivers, welders, plumbers and electricians. Government service is relatively rare. Very less numbers of locals are working in Pakistan Steel Mill Dolomite Project and Pakistan Railway station in Jhimpeer.

Electricity: Only Kallo Goth is facilitated with electricity.

Education System: No education facilities are available in the area. Primary, Secondary and Higher Secondary schools for boys & girls are available in Jhimpeer and surrounding area's for further studies locals need to study in Thatta, Makli, Hyderabad or Karachi.

Archaeological site: There are no formally registered sites of historic or historic archaeological significance at designated Site. During survey no archaeological findings were observed. The nearest ones, which are far away from project site, are Bhambhore, Amri, Harappa & Mohenjo-daro.

NOTICE:
This Report is send today to all participants. If no comments/changes will be made within 05 days, it means this report is accepted by all participants.

Distribution List

Name	Company	Distributed via: (e-mail)
Dr. Irfan Afzal Mirza	Renewable Resources Pvt Ltd.	irfanmirza@renewableresources.com.pk
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Karachi, 07th of April, 2014

Reported by: Sohail Ahmed, Beena Shoaib, Zafar Ullah Khan & Kashif Khoso

Annexure – VIII

Social Survey

Forms

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: Rasool Jakhro		**NIC No: 41409-7495417-1**	
Location/Address	Goth Ali khan Jakhro		
Education Level	Post Graduate ☐ Graduate ■ Metric ☐ Primary ☐ Others ☐ Illiterate ☐		
Marital Status	Married ■ Unmarried ☐	**No of Family Members**	13
Employment	Teacher in Govt School	**Monthly Income**	12000

What is the status of education facilities in the area?

Govt Schools are available in the surrounding area.

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Only one health unit centre in Jhimpeer.

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

No gas and electricity, wood used for the cooking

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, few family personals are working in FFC project. Opportunity for jobs and development of area.

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Most of the people are doing driving, helpers or labor works.

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

Locals are facing issues with their lands due to these project in jhimpeer.

Overall response (from the surveyor point of view)

Positive ■ **Negative** ☐ **No Response** ☐

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: Fida Hussain Shoro		**NIC No: 41409-6843902-7**	
Location/Address	**Jhimpeer**		
Education Level	Post Graduate ☐ Graduate ☐ Metric ☐ Primary ☐ Others ☐ Illiterate ■		
Marital Status	Married ■ Unmarried ☐	**No of Family Members**	08
Employment	Labor	**Monthly Income**	5000

What is the status of education facilities in the area?

Private school with less facilities is available in the area.

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer only in case of any major case we go to THATTA, HYDERABAD or KARACHI

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO RESPONSE

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive ☐ **Negative** ☐ **No Response** ■

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: M. Nabi Plari		**NIC No: N/a**	
Location/Address	Nooriabad		
Education Level	Post Graduate ☐ Graduate ☐ Metric ☐ Primary ■ Others ☐ Illiterate ☐		
Marital Status	Married ☐ Unmarried ■	**No of Family Members**	07
Employment	Labor	**Monthly Income**	8000

What is the status of education facilities in the area?

Primary School is available in the area and Govt Higher Secondary School in Jhimpeer.

How far is the nearby Health facility (Hospital/Health Centre) available to you?

No Health facility available in area.

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

No gas and electricity in the area, wood and gas cylinder used for homes

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Locals are living very poor life

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive ■ **Negative** ☐ **No Response** ☐

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: M. Rafiquee Brohi		**NIC No: 41409-6538785-5**	
Location/Address	**Jhimpeer**		
Education Level	Post Graduate ☐ Graduate ☐ Metric ■ Primary ☐ Others ☐ Illiterate ☐		
Marital Status	Married ■ Unmarried ☐	**No of Family Members**	07
Employment	Shop Keeper	**Monthly Income**	7000

What is the status of education facilities in the area?

Primary, Secondary and Higher Secondary schools are available in Jhimpeer

How far is the nearby Health facility (Hospital/Health Centre) available to you?

THATTA, HYDERABAD or KARACHI, one Govt basic health unit available in the area but in very bad condition

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Economics conditions are very critical, people are doing unskilled jobs.

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive ☐ **Negative** ■ **No Response** ☐

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: Gul Hasan Jakhro		**NIC No: 41409-4928505-7**	
Location/Address			
Education Level	Post Graduate ☐ Graduate ☐ Metric ■ Primary ☐ Others ☐ Illiterate ☐		
Marital Status	Married ■ Unmarried ☐	**No of Family Members**	5
Employment	Cycle repairing Shop	**Monthly Income**	6000

What is the status of education facilities in the area?

Schools are available

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Only one Govt basic Health Unit available in Jhimpeer other than few Private clinics are operational in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS & ELECTRICITY, Woods used in kitchen for cooking

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, As FFC, ZORLU and other companies are working in Jhimpeer so the jobs opportunities can be supportable

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Economical conditions are very bad, people are doing unskilled jobs, living very poor life.

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

No IDEA

Overall response (from the surveyor point of view)

Positive ■ **Negative** ☐ **No Response** ☐

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 04 14
Person Name: Waqar Ahmed Jakhro		**NIC No: 41409-2826983-9**	
Location/Address			
Education Level	Post Graduate ☐ Graduate ☐ Metric ☐ Primary ☐ Others ☐ Illiterate ■		
Marital Status	Married ☐ Unmarried ■	**No of Family Members**	5
Employment	Farmer	**Monthly Income**	4000

What is the status of education facilities in the area?
School is available
How far is the nearby Health facility (Hospital/Health Centre) available to you?
One Govt Hospital in Jhimpeer
Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?
NO GAS & ELECTRICITY
Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?
NO IDEA
What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects
NO IDEA
What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)
NO IDEA
Overall response (from the surveyor point of view) **Positive** ☐ **Negative** ☐ **No Response** ■
Name & Signatures of Surveyor **Sohail Ahmed**

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	04 / 04 / 14
Person Name: Nazeer Plari		**NIC No: 41409-4381795-7**	
Location/Address	**Nooriabad**		
Education Level	Post Graduate ☐ Graduate ☐ Metric ☐ Primary ■ Others ☐ Illiterate ☐		
Marital Status	Married ■ Unmarried ☐	**No of Family Members**	7
Employment	Milk Supplier	**Monthly Income**	6000

What is the status of education facilities in the area?

Schools are available

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

WF projects owners are taking their land which is very bad

Overall response (from the surveyor point of view)

Positive ☐ **Negative** ■ **No Response** ☐

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title:

M/s Tricon Boston 3 x 50MW Wind Power Projects

Date of Survey (DD/MM/YYYY)

04	04	14

Person Name: Jameel Palari

NIC No: 41409-5881881-1

Location/Address

Education Level

Post Graduate

Graduate ☐

Metric ☐

Primary ☐

Others ☐

Illiterate ■

Marital Status Married Unmarried

No of Family Members 11

Employment Milk Supplier

Monthly Income 6000

What is the status of education facilities in the area?

Schools are available

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Basic health unit and private clinics in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS AND ELECTRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 04 04 15

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Ghulam Ali Jakhro **NIC No: 41409-6774834-3**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 10

Employment Govt School Teacher **Monthly Income** 9000

What is the status of education facilities in the area?

Schools are available but system is very bad

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Basic Health Unit and few Private Clinics are available in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS & ELECTRICITY in the area, wood and gas cylinder used in the kitchen

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

YES, development will bring JOBS and BUSINESS options

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very poor, locals are illiterate and sardars are using them for unskilled works.

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

As far there was no effect from ZORLU and FFC but few days back few issues was raised with FFC

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 04 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Hashim Palari **NIC No: 41409-7930900-9**

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status	Married	Unmarried	**No of Family Members**	6
Employment	Police		**Monthly Income**	8000

What is the status of education facilities in the area?

Govt School are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Government and Private clinics are available in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

Wood and Gas cylinder used in kitchen, as GAS and ELECTRICITY not available in the area only in Jhimpeer

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

YES, jobs opportunity for the locals

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Most of the people are involved in unskilled works

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 04 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Meero Plari **NIC No: 41409-3714923-1**

Location/Address **Nooriabad**

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 7

Employment Self **Monthly Income** 7000

What is the status of education facilities in the area?

Government schools are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer Basic Health Centre is available no HOSPITAL in surroundings

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS and ELECTIRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 04 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Ghulam hussain Jakhro **NIC No: 41409-5494010-7**

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 8

Employment Non **Monthly Income**

What is the status of education facilities in the area?

Schools are available

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS AND ELECTRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

YES

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 04 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Arbab Burfat **NIC No: 41409-5643291-7**

Location/Address **Jhimpeer City**

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 6

Employment Self **Monthly Income** 6000

What is the status of education facilities in the area?

Govt Primary, Secondary and Higher Secondary Schools are available for Boys and Girls

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Govt Basic Health Unit and Private Clinics are available in the area. No Government Hospital in the area.

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

Yes in Jhimpeer electricity and gas is available

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, Development in the area will bring jobs opportunities

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Locals are doing unskilled jobs and living standards are very poor

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

No Idea

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: G.N. Palari **NIC No: 41409-1904193-1**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 9

Employment Non **Monthly Income**

What is the status of education facilities in the area?

Schools are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

No GAS & Electricity

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO idea

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

No Idea

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Siddiq Manganwaro **NIC No: 41409-3409876-7**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 9

Employment Milk Supplier **Monthly Income** 8000

What is the status of education facilities in the area?

Schools are available but education system is very critical

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer, no hospital in the area

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS & ELECTRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, lots of locals are working in WF-Projects which is good for locals

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very poor

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

No IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title:

M/s Tricon Boston 3 x 50MW Wind Power Projects

Date of Survey (DD/MM/YYYY) 05 04 14

Person Name: Sonah Khan Plari

NIC No: 41409-5099925-2

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status	Married	Unmarried	**No of Family Members**	6
Employment	Non		**Monthly Income**	

What is the status of education facilities in the area?

Schools are available

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Govt clinic is available in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS & ELECTRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO NEED OF PROJECTS IN our area

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very bad and no one is doing anything for locals

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

Lands are grabbing by companies

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: M/s Tricon Boston 3 x 50MW Wind Power Projects		**Date of Survey (DD/MM/YYYY)**	05 04 14
Person Name: Basheer Shoro		**NIC No: 41409-8873759-7**	
Location/Address			
Education Level	Post Graduate Graduate Metric Primary Others Illiterate		
Marital Status	Married Unmarried	**No of Family Members**	7
Employment	Police	**Monthly Income**	12000
What is the status of education facilities in the area?			
Schools are available but the system is very bad			
How far is the nearby Health facility (Hospital/Health Centre) available to you?			
Basic health clinic is available in Jhimpeer no government hospital in the area			
Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?			
NO GAS & ELECTRICITY			
Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?			
Opportunity for jobs and business			
What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects			
NO IDEA			
What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)			
NO IDEA			
Overall response (from the surveyor point of view) **Positive** **Negative** **No Response**			
Name & Signatures of Surveyor **Sohail Ahmed**			

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Rabnawaz Palari **NIC No: 41409-5879181-7**

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status	Married	Unmarried	**No of Family Members**	7
Employment	Driver		**Monthly Income**	6000

What is the status of education facilities in the area?

Govt schools for boys and girls are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer only

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO gas and ELECTRUCITY, WOOD and GAS cylinder used houses

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, Projects will bring better options for the locals

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very poor locals are involved in unskilled works and living standard is very poor

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Ali Khan Jakhro **NIC No: 41409-13578690-1**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 5

Employment Non **Monthly Income**

What is the status of education facilities in the area?

Schools are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Only Govt Basic Health Unit in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO, woods and gas cylinder

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Muhammad Palari **NIC No: 41409-7447839-1**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 9

Employment Non **Monthly Income**

What is the status of education facilities in the area?

Govt Schools in Jhimpeer and surrounding area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

In Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS and ELECTRICITY

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

NO IDEA

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Shokat Jakhro **NIC No: 41409-4595613-9**

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status	Married	Unmarried	**No of Family Members**	6
Employment	Labor in FFC project		**Monthly Income**	8000

What is the status of education facilities in the area?

Govt Schools are available in the area

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Basic health unit in Jhimpeer (NO HOSPITAL)

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS and ELECTRICITY, WOOD and GAS Calendars

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

Yes, these projects can remove the economical issues of Jhimpeer

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very Critical, locals are only involved in unskilled works, living standards and poor.

What would be the likely social-economic and environmental impact of a Wind power plant (e.g. on land, water, fauna and flora)

Till now no effect were observed from these projects.

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Sohail Ahmed

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Reeshma Jakhro **NIC No: N/a**

Location/Address

Education Level

Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 8

Employment House Wife **Monthly Income**

What is the status of education facilities in the area?

Govt Schools are available in the area but due to culture issues females are only allowed to study till primary

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Basic health unit only in Jhimpeer, Thatta, Hyderabad or Karachi.

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS and ELECTRICITY, WOOD and GAS Calendars from Nooriabad

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very Critical

What would be the likely social-economic and environmental impact of a Wind power plant (e.g on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Beena Shoaib

SOCIAL SURVEY FORM

Project Title: **Date of Survey (DD/MM/YYYY)** 05 04 14

M/s Tricon Boston 3 x 50MW Wind Power Projects

Person Name: Saswaee Shoro **NIC No: 41409-4521119-7**

Location/Address

Education Level Post Graduate

Graduate

Metric

Primary

Others

Illiterate

Marital Status Married Unmarried **No of Family Members** 8

Employment Farmer / House Wife **Monthly Income** 3,000

What is the status of education facilities in the area?

Govt Schools are available in the area but females are not allowed to study after the age of 9 to 12

How far is the nearby Health facility (Hospital/Health Centre) available to you?

Basic health unit only in Jhimpeer and two private clinic in Jhimpeer

Is electricity and sui gas available in your area? If No, What is the source of fuel used at your homes?

NO GAS and ELECTRICITY, WOOD and GAS Calendars from Nooriabad

Do you have any idea about a Wind power project? If yes what are your view about the need of a power project in your area?

NO IDEA

What are the current socio-economic conditions in the area? Occupational Modes/Living Standards/Cultural Aspects

Very Critical, females are also working in farms along with their husband, living standard are very backwards

What would be the likely social-economic and environmental impact of a Wind power plant (e.g on land, water, fauna and flora)

NO IDEA

Overall response (from the surveyor point of view)

Positive **Negative** **No Response**

Name & Signatures of Surveyor

Beena Shoaib

Annexure – IX

Snapshots during Social Survey

Snapshots of the area

Document Title:	Consultant Name:	Document No	Date of Approval
Initial Environmental Examination(IEE) Report of 50 MW Wind Power in Jhimpir Sindh Pakistan (Tricon Boston-Project Al	Renewable Resources (Pvt.) Ltd	RE2-131-139-001	April, 2014
	Project Sponsor: Tricon Boston Consulting Corporation	Document Issue 01	Page No 128

Villages around the project

21E

Social Due Diligence Report

History of Jhimpir

People of Jhimpir defined it as an old town of historical significance, rich in minerals and natural resources and a population of about 35000 – 40000 scattered in several goths/paras. Among its resources people counted Keenjhar Lake, the nearby hills that produce limestone, gypsum, dolomite stone, coal, etc. (of significance for industrial use including the steel mill). Jhimpir has variable topography e.g. Esso Manchhari is mountainous with more stones than trees and Palari is surrounded by devi forest. Dependence on natural resources is determined, as much by available natural resources as by the occupations of the tribes/castes living in each of the paras, for instance the residents of Palari graze animals, get their firewood from the bushes and work as wage labourers in the nearby coal mines. In Haji Jumman Dars and Haji Qasim Jakhro, people depend on livestock and graze them near the Lake, do agricultural labour and rely on commercial activities. Those in Solangi and Abbas Mir Beher and Manchhari are engaged in fishing, etc.

Occupation

Sources of Livelihood are Livestock, agriculture, teaching, business, fishing, laborer in coal mines, stone crushing, cattle farming and dairy etc.

Union Council (UC) Jhimpir

Area = 2013 Square Kilometer
Population = 40,000

Education

Primary Schools (Male) = 80
Primary Schools (Female) = 6
High School (Male) = 1
High School (Female) = 1
Higher Secondary School upto Intermediate level = 1 (For Boys only)---science

Health Facilities in UC Jhimpir

Basic Health Unit = 2
Family Welfare Centre= 1
Lady Health Worker= 43
Dispenser Clinic'= 4
Doctor (MBBS) Clinic = 7

Villages

The villages in the form of hamlets near the project area and neighboring wind farm locations are Dil Murad Palari Village, Karam Palari Village, Peeru Palari Village. Ibrahim Palari Village, Siddique Sarki Village, Motio Palari Village, Haji Palari village, Nawaz Palari Village, Saabo Palari Village

Ethnicity / Tribes in Jhimpir Wind Farm area

Palari and Chang are the major tribes living in different villages and hamlets in the area of Jhimpir. Beside these, Jakhro, Shoro, Khaskheli, Sarki and Brohi are the tribes living in the same area.

Languages

Palari, Jakhro and Shoro are **Sindhi** speaking while Chang tribe speaks **Balochi** and Brohi tribe speaks **Baravi**

Religion

Majority population is Muslim however Hindu population lives mainly in Jhimpir city.

Gender

Households in the vicinity of the project area are headed by men and no women are gainfully employed as skilled or unskilled workers. Families live jointly and share all productive resources such as land, and productive assets. Women are in charge of domestic management, and all external matters are handled by male household heads. Since it is not common in Pakistan for women to work in construction field, TBCC will have no gender target in terms of employment opportunities. TBCC as a policy will adheres to the principle of non-discrimination during recruitment of project workers and ensures the same at the EPC contractor and sub-contractor level.

Indigenous People

There are no indigenous people living in the Jhimpir area and therefore no impact on Indigenous population is expected. Most of the tribes in Jhimpir area has history of migration from others areas due to multiple reasons mainly related to flooding of their original land, food security etc

Impact of Tricon Boston Consulting Project A, B & C on local population and settlement.

The closest household is around 100 meters from the site boundary. A few households occasionally utilize a portion of the project site for grazing, depending on the growth of bushes which is very scarce. Aside from vast grazing grounds available in other nearby area, access will not be affected as the site will not be fenced (only the turbines) and will remain accessible to these households.

The houses constructed in the villages and hamlets are a mix of both concrete and temporary structures. Even permanent households are not occupied round the year and tribes do migrate to other areas temporarily mainly due to resource scarcity

Community engagement will be a permanent feature of Tricon Boston Consulting wind farm project and this engagement will be continuously done especially during construction and operation so that issues and concerns of the community can be timely addressed.

The villagers are supportive of the project and expects basic facilities and employment to be provided to them by TBCC. In addition, a grievance redress mechanism (GRM) has already been established by TBCC to handle community issues or grievances in relation to the Project and first stakeholder's engagement meeting has already been conducted.

TBCC is committed to adopt a good procedure in terms of monitoring EPC contractors and subcontractors on their compliance with the national laws and ensuring the EPC contractor and sub-contractor activities do not impact negatively the neighboring villages

TBCC is also committed to implement CSR activities which also satisfies the requirement stipulated in the lease agreements, i.e., TBCC to support improvement in the livelihood of local population in terms of supporting activities and inputs which can enhance quality of their livelihood. TBCC will engage Community Development/Liaison Officer in the implementation of its CSR activities and will coordinate with other wind farm operators to rationalize implementation of CSR activities to maximize available resources.