

UNDP/GEF Wind Energy Project

**Regional Environmental Assessment Study
of the Gharo Wind Corridor in Pakistan**

Section-3: Environmental Management Plan

September 2008



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1 Environmental Management Plan

1.1 *Project Overview*

The United Nations Development Programme (UNDP) of Pakistan, through its project “Sustainable Development of Utility Scale Wind Power Production – Phase I” is assisting the country tackle the existing policy and regulatory barriers and create an enabling investment environment for the private sector in wind energy production. One of the more important barriers identified to be tackled under this phase is the capacity building of environmental protection agencies to understand, oversee, and clear environmental impacts assessments (EIAs) for wind energy projects. To do so, UNDP requests commitment for support from the international consortium constituted by Taller de Ingeniería Ambiental, Eolic Partners and Halcrow Pakistan to conduct a Regional Environmental Assessment (REA) of the Gharo Wind Corridor. The REA shall lead to the design and formulation of an Environmental Assessment Framework and the consequent capacity building of major stakeholders involved at the federal, provincial and departmental levels to conduct standard EIAs for wind energy projects, standardise the associated impacts and mitigations and to devise monitoring strategies. In this context, an Environmental Management Plan (EMP) was done as a part of the REA for assisting the whole project on the following items:

- Deliver the results, achieve the purposes of the project and contribute effectively to the overall objective of the project.
- Manage the available resources efficiently.
- Monitor and report on progress.

All other stages in the project are therefore essentially supported by this report.

1.2 *The Environmental Management Plan*

This report proposes a strategy for strengthening environmental management within the Gharo Wind Corridor concerning the Wind Energy Project. The EMP includes measures to ensure that environmental impacts of proposed Wind Energy Project are adequately mitigated; general guidelines for long-term environmental monitoring; and considerations for institutional strengthening. The proposed plan have been based on the understanding of the sensitivity and behaviour of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industrial practices while operating in similar environments. The EMP satisfies the requirement of the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Procedures, 2000.

1.3 *Objectives of the EMP*

The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to outline standardised good practice to be adopted for all project works. The EMP is informed by the REA and has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponents for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project;
- Outlining mitigation measures required for avoiding or minimizing potential negative impacts assessed by the REA;
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the REA;
- Defining the requirements for communication, documentation, training & monitoring, and management and implementation of the mitigation measures.

1.4 *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

2 Legislation and Guidelines

The REA for the Gharo Wind Corridor has discussed in detail the national and international legislations and guidelines that are relevant to the project in **Chapter 2** of “Regional Environmental Assessment Study of the Gharo Wind Corridor in Pakistan”. A summary of these legislations, guidelines, conventions and corporate requirements is provided in **Table 2-1**.

It is expected that the project proponents will adhere to all the relevant national legislations, international conventions and the wind farm development guidelines as well as other international guidelines. The project proponents will also ensure conformance of its own staff and assigned contractors to these legislations and guidelines prior to start of the project activities.

Table 2-1: National and International Environmental Legislations and Guidelines

Legislation/Guidelines	Description
National Environmental Legislation/Guidelines	
Pakistan Environmental Protection Act (1997)	Basics legislative tool 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 2000.
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 / water mixed with oil shall be discharged into any port to which the

Legislation/Guidelines	Description
	Ports Act applies.
Sindh Fisheries Ordinance (1980)	The Ordinance provides for the issuing of a fishing licence or permit that are mandatory for fishing in public waters, for the sale or trade or processing of fish in markets and factories, for the declaration of sanctuary of any public water at any time and the related restrictions, for the disposal of wastes and sewerage that must be treated to prevent water pollution, for banning the use of explosives and toxic or poisonous agents in the fishing activities and, for restricting to sport fishing the use of fishing craft.
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, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. No protected forest is situated in the Coastal Gharo and Jhampir project areas however a number of reserve and protected forests are situated in Gharo Wind Corridor, especially along the River Indus
Antiquities Act (1975)	The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975. The act is designed to protect "antiquities" from destruction, theft, negligence", unlawful excavation, trades and exports.
Canal and Drainage Act (1873)	This Act prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.
Pakistan Penal Code (1860)	It authorises fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.
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.
National Environmental and Nature Conservation Strategies	
National Conservation Strategy	Before the approval of NEP the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.
Biodiversity Action Plan	The plan recognises EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity.

Legislation/Guidelines	Description
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, photovoltaics and wind energy. Over the short term, i.e. to mid-2008, technologies that are already in commercial use internationally are to be trialled through the mechanism of attractive power purchase contracts and partial risk coverage. In the medium term, that is until 2030, it is hoped to have installed at least 9700MW of capacity for renewable electricity in this way
National Maritime Policy (2002)	The Policy provides a management framework for broad guidelines on development, exploitation, conservation, protection and management of ocean resources to fulfil the national aspirations within an international framework.
Institutional Frame work	
Environment and Conservation	<p>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 unit established in 1992, is responsible for overseeing the implementation of the strategy.</p> <p>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 and initiation of legislations whenever necessary. It is thus the primary implementing agency in the hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces</p>
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 150 countries that have signed the UNCLOS.
United Nations Conference on	The UNCED is an international endeavour to find solutions to the complex problems of securing sustainable

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 marine areas) 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 Koyoto Protocol (1992)	The convention aims at stabilizing greenhouse gases (GHGs) concentration 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 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 including Pakistan to take all measures in support of the protection of atmosphere without any formal 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 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 18 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 (1973)	The convention requires Pakistan to impose strict regulation (including penalisation, 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 (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the proposed wind farm sites

Legislation/Guidelines	Description
International Environmental Guidelines	
World Bank Guidelines on Environment Environmental Assessment-Operational Policy 4.01. & Environmental Assessment Sourcebook, Volume I	The World Bank provides general guidelines for environmental assessments of development projects. These guidelines help prospective projects identify impacts they will have on various environmental receptors. 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 for Environmental Assessment of Energy and Industry Projects. An update on this source book in the form of Regional Environmental Assessment (REA) was made in June 1996. This EA Sourcebook Update describes REA in terms of its nature and purpose, advantages, operational context, 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 waste management policies with specific techniques for the prevention of air and water pollution for industries including wind energy projects. Project guidelines are presented for major pollutants as well as typical air emissions and water effluents from industry sector. The Handbook also provides 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.

3 Organizational Structure and Roles and Responsibilities

3.1 *Organizational Structure*

The proposed project will include the following organizations/actors:

- Proponents including various wind farm developers/promoters 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
- Wind farm Operation and Maintenance (O&M) contractor as executor of the EMP during the operational phase of the project.
- Wind farm Decommissioning contractors

These actors will have the following roles and responsibilities during the project.

3.2 *Roles and Responsibilities*

The World Bank's Strategic Country Environmental Assessment (2006) gives useful insights into the management of environmental impacts and institutional strengthening of the environmental paraphernalia in Pakistan. It calls for creation and strengthening of vital links between the Federal and Provincial EPAs¹, and the interactions of environmental agencies with local governments, judiciary, and citizenry. The assessment also suggests outsourcing and partnerships for supplementing the capacity building of institutions dealing with environmental issues. This assessment along with relevant guidelines will have particular repercussions for the proposed wind energy project.

3.2.1 *General*

a. Roles and Responsibilities of the Proponents

As project proponents and owners of the EMP, the wind farm developers/promoters will be responsible for ensuring the implementation of the EMP. The General Manager/CEO and/or highest ranking official of wind farm developers/promoters will be responsible for the overall environmental performance of the project. The wind farm developers/promoters will monitor the environmental performance of the project to

¹ Environmental pollution and ecology is included in the concurrent list according to the constitution of Pakistan which means that environment is both a Federal and Provincial issue. This shared responsibility raises important questions on the capacity building of institutions in the country.

ensure that the project is carried out in accordance with governing legislations, their relevant corporate policies and recommendations of this REA.

b. Roles and Responsibilities of Contractors

The wind farm developers/promoters 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.

3.2.2

Planning and Design of the Operation

a. Design of the Operation

Design and operations of the wind farm development have been described in **Section 4** of the REA report. Following approval of the REA, if any aspect of the operations or requirements of the REA need to be changed, the wind farm developers/promoters will categorise that change in accordance with the Change Management Plan provided in **Section 7** of this EMP and take appropriate measures thereof.

b. Approvals

Obtaining No objection Certificate (NOC) from Environment Protection Agency (either Federal or Provincial) will not absolve the proponent 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.

c. Contractual Provisions

Adherence to the requirements of the REA 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.

3.2.3

Implementation of the Operations

a. Coordination with Stakeholders

The wind farm developers/promoters 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 is maintained throughout the operation.

b. Environmental Management Systems

The wind farm developers/promoters and the contractors will ensure that the mitigation measures mentioned in the REA are adhered to and organisational HSE Management Systems implemented during various wind farm development projects.

c. Monitoring

The General Manager/Chief Executive Officer (CEO) of wind farm developers/promoters 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.

d. Approvals

The project contractors will be responsible for obtaining all relevant approvals from project proponent such as approvals for waste contractors, water source and others as specified in the environmental management and monitoring plan.

e. Trainings

The wind farm developers/promoters and its contractors and suppliers will be responsible for the training of entire staff involved in various project activities in an environmentally sound manner. Wind farm developers/promoters and its contractors and suppliers will be responsible for providing induction to their staff members on the REA, 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 in **Section 5**.

f. Communication and Documentation

For effective monitoring, management and documentation of the environmental performance during the operation all environmental matters will be discussed between proponents 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 wind farm developer and the contractors. Any issues that require attention of General Manager/Chief Executive Officer (CEO) will be communicated to them for action. The wind farm developers/promoters 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.

g. Operations Monitoring

The wind farm developers/promoters and their contractors will be responsible for effective monitoring for efficient operations of the wind farm and its auxiliary systems.

h. Restoration

The wind farm proponents will ensure that the sites are restored efficiently at the end of construction activities/decommissioning in accordance with the requirements of the REA and EMP and relevant standard industrial practices.

i. Minimum Distances

The REA specifies minimum distances to be maintained from environmental features including communities, water resources and archaeological sites etc. These minimum distances are provided in **Table 3-1**. The contractors shall ensure that these minimum distances are adhered to during the operation.

Table 3-1: Minimum distance from environmental receptors

Area/facility	Distance (km)		
	Community /town	Community water well	Archaeological or cultural site/monument
Wind farm	>2.5	>0.1	>2.5

4 Environmental Management and Guidelines on Mitigations

The Environmental Management and Monitoring Plan (EMMP) will be used as a management and monitoring tool for implementation of the mitigation measures identified by the REA. The Environmental Management and Monitoring Plan of the proposed project activities have been provided in **Table 4-1**.

A self explanatory EMMP matrix is provided below. It outlines the potential environmental issues and related receptors, evaluates the associate risks as high, medium, or low and suggests mitigation measures. In addition, the matrix focuses on general guidelines that would help the project achieve its goal of designing investment strategies for energy production and development that are environmentally and socially sustainable.

The wind farm developers/promoters will hold primary and overall responsibility for ensuring full implementation of the EMP.

Table 4-1: Wind Farm Environmental Impact Assessment and Mitigation Measures

(Potential Environmental Issue	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Localization	Community of Gharo	Wind Farm are determined by characteristics of wind (speed and number of hours)	Viability, concerning production and integration in energy structure of Pakistan.	M	<ul style="list-style-type: none"> Study the viability of possible localizations. 	P	x			
Visual intrusion	Communities of Gharo wind corridor	Wind turbines may be visible from a great distance.	Disturbance to the natural landscape. Modification in the skyline of the town/countryside.	M	<ul style="list-style-type: none"> Study of possible locations; Maintain distance of more than 2.5 km from any community Turbine colour schemes should be mainly “oysterr-coloured” (between white and grey) and progressive soft green-blue-white. 	P, C	x			
Land use conflict	Other potential users of land	Land taken by the wind farm may affect the future land use of the project area.	Inter & intra community conflicts; Competitive Livelihoods (grazing etc) Land degradation	H	<ul style="list-style-type: none"> Study potential uses of the land especially related to direct livelihoods; Community consultations; Uniform and just Compensation policies 	P	x			
Shadow flicker	Nearby residents	Under certain combinations of geographical position and time of day, the sun may pass behind the blades of wind turbines and cast a shadow. When the blade rotates the shadow will flicker causing nuisance.	Such flickers can be very distressing to the eye.	L	<ul style="list-style-type: none"> Study alternate locations; Maintain a distance of 2.5 km from any community 	P, C	x			

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Reflected light	Nearby residents	Under certain combinations of geographical position and time of day, the blades of wind turbines may reflect sunlight.	The reflected light can be distressing to the eye.	L	<ul style="list-style-type: none"> ■ Paint wind turbines with matt colours; ■ use neutral colour in the landscape 	P	x			
Mass movement	Communities of Gharo wind corridor and nearby residents	Mass movement caused by construction of new access road, service platform, etc	soil erosion, loss of productive, alteration to water quality, hazardous to human life, settlements and infrastructure.	M	<ul style="list-style-type: none"> ■ Minimum clearance of vegetation cover; ■ Restoration of the vegetation. 	C		x	x	
Access road	Communities of Gharo wind corridor and natural habitat.	Improvement of existing roads or/and new roads may be necessary to access to the wind farm and to the evacuation power line.	Endanger human and animals safety; Habitat segmentation;	M	<ul style="list-style-type: none"> ■ Restoration of the vegetation; ■ avoided disturbance to faunal corridors; ■ minimize dust by using sprinklers; ■ use of access road by locals should be clearly communicated; 	C		x	x	
Equipment movement	Soil properties, Reptiles, communities of Gharo wind corridor	Wind turbines installation required heavy equipment and transportation.	The use of heavy equipments affects the engineering properties of soil and can originate a compacted horizon in depth.	M	<ul style="list-style-type: none"> ■ Delimit area to restrict access of heavy equipments 	C		x		
Auxiliary constructions	Natural habitat.	Storing materials temporarily occupying the surroundings of work zones.	Breakage of branches, eutrophia, etc that can degrade the vegetation.	L	<ul style="list-style-type: none"> ■ Site specific study 	P		x		

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Construction noise	Residents of dwellings in the vicinity of the project site and access road to the site.	Noise from the construction equipment and construction-related traffic.	It can create public nuisance.	M	<ul style="list-style-type: none"> Project-specific acoustical analyses due to equipment used for drilling, pile driving, blasting, excavation, and hauling; Good practices in noise control measure 	P, C		x		x
Turbine noise	Residents of dwellings in the vicinity of the project site and access road to the site.	Noise from wind turbines includes aerodynamic noise from the rotor and mechanical noise from the gearbox, generator and other moving parts of the turbine.	This continuous noise can be distressing to the nearby residents.	M	<ul style="list-style-type: none"> Study of design and material of wind turbines; Wind turbines should be remarkably quiet; Use the latest guidance to assess the noise impact 	P, C	x		x	
Loss of habitat	Existing flora and fauna of Gharo	Construction in Gharo can result in loss of natural habitat.	Natural habitat of several species can disappear.	M	<ul style="list-style-type: none"> Identify flora and fauna habitat of the zone; restoration of vegetation 	P, C	x			
Avian collision with turbines	Resident and migratory birds of Gharo.	Produced by the collision with the wind turbine. The location close to water may enhance this concern.	It can result in injury to or death of birds, and can cause disturbance to the migration patterns	H	<ul style="list-style-type: none"> Study alternative wind turbine locations; Study of the bird's behaviour & characteristics; Periodic bird's counting & maintaining records; Mechanism such as daily routes for avoiding bird's injuries and rehab; Decommissioning of wind turbine which has more collisions during the first year; 	P, C	x		x	

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
					<ul style="list-style-type: none"> Alarm and stop system in critical moments 					
Disturbance to marine animals	Marine animals of the project area; Mangroves	Construction work close to the shoreline.	It can affect the habitat and breeding of marine animals.	M	<ul style="list-style-type: none"> Baseline of marine animals & mangroves; Study alternative wind turbine locations; Restoration of work sites 	P, C		x	x	
Disturbance to birds	Resident and migratory birds of Gharo.	Modifications of the ecosystem produced by the construction.	Wind turbines can affect the breeding, nesting, and feeding habitats of birds.	H	<ul style="list-style-type: none"> Study birds' habitats; Maintain safe distances from such habitats; Ecologically compensating areas. 	P, C	x	x	x	
Topography: slope stability	Landform surrounding the project area.	Installation of wind turbine could require modification of the hillside.	This may affect the stability of the slopes or hillsides.	M	<ul style="list-style-type: none"> Study quantification of affected areas; Topography restoration and re-vegetation. 	P, C	x	x	x	
Archaeological, heritage & religious sites	Archaeological sites of the project area, social organisation	Construction and development work on or near heritage sites such as shrines, graveyards and old relics.	Damage to such sites.	M	<ul style="list-style-type: none"> Study locations of heritage places and record the GPS locations; No activity on or near such sites; Consulting locals on construction near such sites; Consulting the archaeological department. 	P, C	x	x	x	
Hydrology	Water resources of the zone.	Can be produced by constructions in sensible areas.	It can modify drainage pattern, which can affect the quantity and quality of water resources.	M	<ul style="list-style-type: none"> Study interference of access road and building areas with drainage net; Study water quality and quantity (including storm water regimes); 	P, C	x	x		

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
					<ul style="list-style-type: none"> ■ Maintain the quality of the runoff to existing conditions by maximising storage and infiltration capacity of storm water runoff into underlying soils using vegetated swales and energy dissipation devices. 					
Interference with telecommunication systems: Electromagnetic Interference (EMI)	Telecommunication system of Gharo as most of locals rely on cellular services for communication	Can be produced by near fields effects, diffraction, and particularly the electromagnetic scattering of the metallic wind turbines blades.	It can interfere with nearby microwave and television communication systems.	M	<ul style="list-style-type: none"> ■ Study field action of both systems; ■ Use of non metallic turbines blades. ■ topographic screening between the receiver and the transmitter ■ Early identification of potential interference; existence of other tall structures in the vicinity of the receiver, direction of the rotor blades, blade material, rotational speed of the blades, and frequency of the transmitted signal 	P, C	x	x		

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Electrical connections between the turbines and the wind farm sub-station	Communities of Gharo wind corridor.	The Project involves construction of a substation and an electric power network usually by the use of underground cables for all connections between the turbines and the sub-station.	The electric and magnetic fields can have effects on human health.	M	<ul style="list-style-type: none"> ■ 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 earthing grid size to dissipate calculated fault currents; 	P, C		x	x	
Overhead electricity cable (disturbance to birds)	Resident and migratory birds of Gharo	The Project involves construction of an overhead electricity cable from the substation the wider network to the wind farm sub-station.	Disturbance to birds including electrocution, collisions, bird streamers, bird pollution, bird nesting, habitat destruction and other disturbances	H	<ul style="list-style-type: none"> ■ running power lines parallel is known to significantly reduce bird collisions to acceptable levels; ■ self-supporting pylon structures must be fitted with PVC or similar "Bird Guards"; ■ prioritise certain areas along the route where any hunting, poaching or disturbance of birds should not be tolerated; ■ Sections of cable must be marked with an appropriate marking device wherever passes through open grassland areas river crossings, wetland crossing, parallel to major rivers, past dams and through agricultural lands 	P, C	x	x	x	

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Overhead electricity cable: (disturbance to human habitat)	Communities of Gharo.	The Project involves construction of an overhead electricity cable from the substation to the wider network to the wind farm sub-station.	This issue has several impacts related with: Temporary access tracks to the site and between the turbines; Temporary construction components including a construction and storage areas; Presence of mast and cables in the landscape.	M	<ul style="list-style-type: none"> See access road and auxiliary construction mitigations. 	P, C	x	x	x	
Electromagnetic fields	Communities of Gharo	Electromagnetic fields are generated in the vicinity of all electrical equipment.	The electric and magnetic fields could have effects on human health. However, chronic exposure to 50 Hz electric and magnetic fields at the levels commonly found in the environment is not a proven health risk	M	<ul style="list-style-type: none"> The transmission cable from the substation to the grid connection and another tension element must follow WHO standards or national rules. 	P	x	x		
Aircraft safety	Air traffic of Gharo.	The wind farm could be a safety hazard for low-flying aircraft and aircraft landing and taking off at nearby airfields.	It can be a high risk for aircrafts.	L	<ul style="list-style-type: none"> Propose a safe distance from the airport; Lights in the highest point of the turbine. 	P, C	x			
Dust	Communities of Gharo wind corridor	Construction traffic on existing and new access road could result in the emission of dust.	It can be a public nuisance and a potential health hazard.	L	<ul style="list-style-type: none"> Study the potential level of concentration derived from the construction phase; Water-sprinkle dust generating materials. 	P, C		x		

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Public safety	Communities of Gharo wind corridor	Public safety issues associated with the proposed project could include traffic hazards, the structural integrity of the turbines, power transmission lines, and substations.	It can affect public safety	M	<ul style="list-style-type: none"> Registry of complaints and claims made by the community affected by the presence of wind farm 	P	x	x	x	x
Employment opportunities	Communities of Gharo wind corridor and adjoining districts	The wind farm will create temporary job opportunities in construction and permanent ones in operation phase.	Conflicts can arise if a group (women, immigrants, particular tribe) is discriminated.	H	<ul style="list-style-type: none"> Preference to locals for skilled and unskilled jobs; Uniform & just employment policy; Equip locals with skills; Fair employment ratio amongst tribes/villages; No gender, race, religion or disability based preferences; Awarding work services to local contracts; Ensure contractors employing local workforce; Expanding local direct & indirect livelihood base. 	P	x	x	x	
Cultural conflicts	Communities of Gharo wind corridor and nearby residents, local and non-local construction workers	Different cultural and social norms leading to conflict.	The influx of construction workers from other parts of the country and possible outside the country could result in conflicts.	M	<ul style="list-style-type: none"> Proponent/contractor to follow the EMP; Induction trainings on local norms and traditions; Non-interference in local political issues; Punitive measures for project employees unnecessarily meddling in local affairs 	P, C		x		

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
Tourism potential	Potential tourist in future, local tourist industry.	Modification to landscape & biodiversity of the area	Possible decrease in tourism.	M	<ul style="list-style-type: none"> Study local tourism patterns and its impacts on local livelihoods; Any loss to local livelihoods should be compensated by innovative measures, particularly employment opportunities to locals. 	P	x			
Global environmental effects	Global community, particularly Pakistan.	Production of renewable energy	Reduction in greenhouse gases and SO ₂ .	L	<ul style="list-style-type: none"> Quantify the reduction in greenhouse gases and SO₂ and its benefits; Periodic impact assessments and sharing of results with wider community 	P	x		x	x
Fuel handling, transport and storage	Handlers, transporters and users of fuel as well as communities through which it is transported.	Dependency on fuel is reduced.	Reduction in risks associated with fuel transport, handling and storage are reduced.	L	<ul style="list-style-type: none"> Evaluate the benefits 	P, C			x	
Pakistan and international economy	Stakeholders, investments and general population.	Energy production incomes, industry incomes, increasing development of the local population.	Wind farm energy incomes could not produce the optimal benefits to Pakistan population.	H	<ul style="list-style-type: none"> Study of the investment returns 	P		x	x	
PCBs residues	Communities of Gharo wind corridor	Used for machine work	Underwater pollution	M	<ul style="list-style-type: none"> Adherence to relevant chemical use policies & guidelines 	P, C			x	x
Fire protection	Natural habitat and Communities of	Electrical flashovers and accidents can produce fire. During the construction	Can produce loss of natural habitat and resources for population.	L	<ul style="list-style-type: none"> emergency and fire control resources plan; Vegetation treatment; 	P, C			x	

(Potential Environmental Issue)	Receptors	Justification	Evaluation of Risk	Level of impact @	Guidelines on mitigation @@	Responsibility	Phase			
							Design	Construction	Operation, Maintenance	Decommissioning
	Gharo wind corridor	phase and maintenance of power lines, some habitat destruction and alteration inevitably takes place. For example to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors..			<ul style="list-style-type: none"> ■ Selection of suitable vegetal species and management 					
Residues	Communities of Gharo wind corridor.	Produced by the construction and decommissioning of the wind farm.	It can modify the landscape and ecosystems of the zone.	M	<ul style="list-style-type: none"> ■ Establish periods and norms for cleaning; ■ Restore the landscape ■ General cleaning of the occupied areas. 	P, C		x		x
Non-shareholder stakeholders	Local communities	Local population can affect and are affected by project activities	Multi-dimensional risks can accrue: Income disparities between project workers and non workers; Disturbance to traditional uses of land; Conflict if project benefits are not shared with the locals.	H	<ul style="list-style-type: none"> ■ Constant public consultations and feedback mechanisms; ■ On-site complaint register ■ Community relations office; 	P	x	x	x	x
Civic amenities	Local communities	The principle of Sustainable development	No electricity in the project area; Scarce health & education facilities etc	M	<ul style="list-style-type: none"> ■ Provision of electricity or related benefit (potable water, for example) to the community 	P			x	

Notes:

* The level of impact has been drawn judgmentally from the REA and might alter from site to site.

@ (high=H, medium=M, Low=L)

@@ P: Proponent/Promoter, C: Contractors and subcontractors

5 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.

5.1 *Environmental Monitoring*

Environmental monitoring can be categorized into the following types;

- Compliance monitoring;
- Effects monitoring; and
- Post Project Monitoring.

5.1.1 *Compliance Monitoring*

Compliance Monitoring will be carried out to ensure compliance with the requirements of the REA and EMP. The wind farm developers/promoters and contractors will carry out the inspections on a routine basis. The EMMP provided in **section 4** 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, the wind farm developers/promoters 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 non-compliances, 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 REA 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 from **Tables 5-1 to 5-3**.

5.1.2 *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.

5.2 *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 organisations:

- 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 REA 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 REA and EMP. **Table 5-4** presents the training programme.

Table 5-1: Proposed Monitoring Program for the Gharo Wind Corridor*

Information (Environmental issue)	Frequency	Stage	Justification
Database of surveys to the population concerning landscape transformation	As required	Pre-Operation/Construction and Operation	Population participation
GIS Database of landscape transformation	Quarterly	Pre-Operation/Construction and Operation	Land use dynamic. Identify landscape transformation for further regional evaluation.
Survey of bird habitat to determine amount and pattern of use	Quarterly	Operation	Determination amount and pattern of use
GHG savings**	Quarterly	Operation	Notify environmental benefits of wind farm

*Responsibility of Relevant authorities

**GHG savings. There are several methodologies to calculate GHG savings related to wind farm, we suggest the methodology purpose by the United Nations Framework Convention on Climate Change (UNFCCC), see the attached document related to an example of a wind farm monitoring report in China concerning GHG savings.

Table 5-2: Proposed Pre-Operation/Construction Environmental Monitoring Program for each Wind Farm*

Information (Environmental issue)	Frequency	Stage	Justification
Monitor compliance of the construction activities	Weekly	Construction	-
Monitor areas adjacent to individual construction areas to ensure the site preparation and construction activities are not having an adverse impact on adjoining land	Weekly	Pre-operation /construction	-
Waste management			
Inspect/test excavated fill material for reuse suitability	As required	Construction	Check soil properties
Inspect waste receptacles to ensure that they are not being overfilled and are being collected on a regular basis	Weekly	Pre-operation /construction	Ensure site maintenance
Inspect construction zones to monitor for any unauthorized waste disposal activity	Weekly	Pre-operation /construction	Ensure site maintenance
Inspect the construction zones to monitor for any unauthorized waste disposal activity	Weekly	Pre-operation/cons truction	Ensure site maintenance
Inspect the construction site to evaluate the effectiveness of waste storage and collection practice	Weekly	Pre-operation /construction	Ensure site maintenance
Inspect the portable toilet facilities to ensure they are being emptied on a regular basis	Weekly	Pre-operation /construction	Ensure site maintenance
Monitor waste recycling and disposal procedures to ensure they are being complied with	Weekly	Pre-operation /construction	Ensure site maintenance
Flora and fauna			
Complete bird carcass searches at turbine sites and monitor turbine sites for bird use and movements.	Monthly	Pre-operation	Identify changes on bird activities
Field study to confirm the suspected absence of threatened bat species from the project area	Spring/Summer	Pre-operation /construction	Confirm absence of threatened species

Information (Environmental issue)	Frequency	Stage	Justification
Heritage and Archaeology			
Carry out archaeological monitoring of excavation activities associated with the construction works.	As necessary	Construction	Identify any additional archaeological material
Transportation and Traffic			
Monitor compliance with traffic management controls i.e. visual inspection of construction zones to ensure construction vehicles are using defined roads and access points	Ongoing	Construction	Ensure site safety
Program of road inspection prior to use, and on-going monitoring during construction activities	Weekly	Construction	Ensure access road and site tracks are maintained in safe and adequate condition
Hydrology and Water Quality			
Inspect all erosion and sedimentation control devices	Weekly and after rain events	Construction	Check effectiveness
Monitor and sample any overflow from sediment traps and basins	During any major spill event	Construction	Check for suspended sediment
Soil and Geology			
Detailed geotechnical investigation including testing for acid generating material within the bedrock	-	Pre-construction	Detailed design information
Inspection of soil compaction	As required	Construction	Ensure site maintenance
Inspection of soil contamination	As required	Construction	Ensure site maintenance
Air Quality			
Visually monitor dust generation from work zones to ensure that excessive dust is not being produced	Daily	Construction	Maintain air quality

*Responsibility: Contractor's supervisory staff

Table 5-3: Proposed Pre-Operation/Construction Environmental Monitoring Program for each Wind Farm*

Information (Environmental issue)	Frequency	Stage	Justification
Consultation			
Maintain database of comments, questions, complaints from residents and local community, and track response to ensure they are dealt with appropriately	As required	Operation	Population participation
Flora and fauna			
Complete bird carcass searches at turbine sites and monitor turbine sites for bird use and movement. Weekly routes in the farm (and power line) to recover injury birds Decommissioning of wind turbine which has more collisions during the first year.	Weekly in first year of operation and monthly again thereafter	Operation	Identify changes on bird activities
Waterbird movement survey	When lakes are full	Operation	Identify changes on bird activities
Traffic and transportation			
Monitoring of road conditions prior to use, to ensure access roads and site tracks are maintained in safe and adequate condition	Ongoing	Operation	Ensure site maintenance
EMI			
Monitor potential EMI to existing fixed radio links and television reception around the wind farm	As required	Operation	Potential for interference to existing services
Hydrology and Water Quality			
Inspect vegetated swales	Monthly	Operation	Ensure site maintenance
Inspect access tracks, drainage line crossings and areas around turbines	Monthly and after rainfall	Operation	Ensure site maintenance
Inspect rehabilitation work	Monthly	Operation	Vegetation has re-established, no erosion
Inspect wastewater management equipment to ensure it's operating correctly	Monthly	Operation	Ensure site maintenance
Soils and Geology			
Inspection of disturbed ground, particularly after rain, to identify any erosion problems	As required	Operation	Ensure site maintenance

* Contractor's supervisory staff

Table 5-4: Environmental Training Programme

Staff	Training Contents	Timings
Higher management staff of wind farm developers/promoters and the contractors	<ul style="list-style-type: none"> ■ Introduction to project REA and EMP. ■ EMP communication, documentation and monitoring and reporting requirements. 	Prior to start of any project activities
All site personnel (including locally hired staff)	<ul style="list-style-type: none"> ■ Site induction training on Health Safety and Environment system and requirements at wind farm. ■ Environmental sensitivities of the project area. ■ Communication of environmental problems to appropriate officers. ■ Waste disposal. ■ Oil/ Poly Chlorinated Biphenyls (PCBs) spill contingency plan spill contingency. 	<p>At the time of entering Wind farm area</p> <p>Prior to start of work</p>
Construction supervisors	<ul style="list-style-type: none"> ■ EMP communication, documentation and monitoring requirements. ■ Good construction practices. ■ Dust emissions control during construction phase. 	Prior to start of construction activities
O&M Contractor's supervisory staff	<ul style="list-style-type: none"> ■ EMP communication, documentation and monitoring requirements. 	Prior to start of wind farm operation
Drivers	<ul style="list-style-type: none"> ■ Road safety. ■ Road restrictions. ■ Vehicle restrictions. ■ Waste disposal. ■ Defensive driving. 	At the time of induction of drivers
Camp staff	<ul style="list-style-type: none"> ■ Camp operations. ■ Waste disposal. ■ House keeping. 	At the time of induction of camp staff
Restoration team	<ul style="list-style-type: none"> ■ Restoration requirements. ■ Oil/PCBs spill contingency plan spill contingency plan. 	Prior to start of restoration activities

6 Communication and Documentation

6.1 *Kick-off Meeting*

Prior to work commencement a meeting will be held on-site to discuss implementation of the EMP. The meeting will be attended by relevant management staff from wind farm developers/promoters and the contractors.

6.2 *Daily and Weekly Meetings and Reports*

Daily meetings will be held during the project activities to discuss the environmental conduct of the operations and any non-compliances recorded along with remedies. The meetings will be documented in the Weekly Environmental Report.

The weekly environmental report will be used to review the performance of the operation by reviewing the number of non-conformances and the environmental incidences that occurred during the reporting period, progress on daily action items and to list recommendations for additional controls, mitigation measures or monitoring requirements.

The report will be communicated to the wind farm developers/promoters management and senior members of the contractors. The report will include:

- Summary of weekly project activities.
- Non-compliances observed and mitigation measures taken or required.

6.3 *Social Complaints Register*

The wind farms developers/promoters site representative will maintain a register of complaints received from local communities and measures taken to mitigate those concerns. All community complaints received will be sent to the wind farms developers/promoters management for further action.

6.4 *Change Record Register*

All changes to the EMP or the project will be handled through the Change Management Plan provided in **Section 7** of the EMP. These changes will be registered in a Change Record Register.

6.5 *Photographic Record*

The wind farms developers/promoters will ensure that a photographic record including the following is maintained;

- All areas used by the project activities; before use, during use and after restoration.

- Key non-compliances
- Key project activities

6.6 *Environmental Reporting*

The requirements related to environmental reporting after approval of the REA are as follows:

- After receiving approval from Sindh EPA, the wind farms developers/promoters will acknowledge acceptance of the conditions of approval by executing an undertaking in the form prescribed in Schedule VII of the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000.
- At the end of the construction phase, the wind farm developers/promoters will obtain a confirmation from Sindh EPA that the requirements of the REA and the conditions of approval have been duly complied with. The Sindh EPA in granting the confirmation of compliance may impose any additional controls regarding the environmental management of the project or the operation, as it deems necessary.
- The wind farm developers/promoters will prepare and submit an annual report each year to Sindh EPA summarizing the production details, any modifications or extensions, details of the effects monitoring and environmental performance of the wind farm operation.

7 Change Management Plan

The REA 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.

7.1.1 *Changes to the EMP*

The REA and the EMP have been developed based on the best possible information available at the time of the REA 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.

7.1.2 *Changes to the Operation*

The change management system recognizes three orders of changes.

a. 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.

b. 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.

c. 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 minimise 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.

Date of Publication

02 September 2008



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