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FINAL REPORT



Environment and Social Impact Assessment Report

98.7 MW Wind Power Project, Nazeerabad, Telangana



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Table of Contents

1.	INTRODUCTION	1
1.1	Project Overview.....	1
1.2	Objectives and Scope of Work.....	4
1.2.1	Objectives.....	4
1.2.2	Scope of Work.....	4
1.3	Approach for the Study.....	5
1.4	Parties Contacted.....	5
1.5	Limitations of the Study.....	6
1.6	Report Structure	6
2.	ESIA PROCESS AND METHODOLOGY	7
2.1	Regulatory Review	8
2.2	Environmental and Social Appraisal of Site	8
2.2.1	Reconnaissance Survey	8
2.2.2	Land Use Mapping and Analysis.....	8
2.2.3	Baseline Environmental Monitoring	9
2.2.4	Ecological Survey.....	10
2.2.5	Social Perception Survey and Consultation	10
2.3	Impact Assessment	11
2.3.1	Impact Evaluation Criteria.....	11
2.3.2	Impact Significance Criteria	12
2.3.3	Formulation of Environment and Social Management Plan.....	13
3.	PROJECT DESCRIPTION.....	14
3.1	Layout of Project Site	14
3.2	Site Settings.....	17
3.3	Land Use.....	18
3.4	Wind Resource Assessment and Energy Production	24
3.5	Project Components	25
3.5.1	Turbine Components	25
3.5.2	Technical Details	27
3.5.3	Power Evacuation System.....	27
3.5.4	Access Roads	29
3.6	Land Requirement.....	29

3.6.1	Land Procurement Process	29
3.7	Project Implementation Mechanism	30
3.7.1	Land Procurement.....	30
3.7.2	Erection and Commissioning Contractor	30
3.7.3	Operation and Maintenance (O&M) Contractor	30
3.8	Project Development – Construction Phase	31
3.8.1	Site Development.....	31
3.8.2	Civil Works.....	31
3.8.3	Labour	32
3.8.4	Water and Wastewater.....	32
3.8.5	Waste Generation	32
3.9	Operation and Maintenance.....	33
3.9.1	Routine Operational Services.....	33
3.9.2	Preventive Maintenance	33
3.9.3	Breakdown Maintenance	34
3.9.4	Monitoring and reporting	34
3.9.5	Operation and Maintenance Staff	34
3.9.6	Water Requirement	34
3.9.7	Waste Water Generation	34
3.10	Current Status and Project Schedule	35
3.11	Environmental Settings.....	36
3.11.1	Climate and Meteorology	36
3.11.2	Wind Speed and Direction	37
3.11.3	Rainfall	37
3.11.4	Seismicity	37
3.11.5	Drought	38
3.11.6	Ground Water Resources.....	39
4.	LEGAL, POLICY AND ADMINISTRATIVE FRAMEWORK.....	40
4.1	Enforcement Agencies	40
4.2	Applicable Environmental and Social Laws, Regulations and Policies.....	45
4.3	IFC Performance Standards.....	51
4.4	IFC Categorization of Projects.....	55
4.5	Applicable ADB Policies and Requirements	56
4.5.1	Safeguard Policy Statement (SPS), 2009	56

4.5.2	Social Protection Strategy, 2001	58
4.5.3	Public Communications Policy 2011	59
4.5.4	ADB’s Environment Categorization of Projects.....	59
4.6	Applicable Environmental Standards	59
4.6.1	Ambient Air Quality.....	59
4.6.2	Water Quality Standards.....	60
4.6.3	Ambient Noise Standards	62
4.6.4	Noise Standards for Occupational Exposure.....	63
4.7	Applicable International Conventions.....	63
5.	ANALYSIS OF ALTERNATIVES AND SITE SELECTION	65
5.1	No project scenario	65
5.2	Alternate Methods of Power Generation	67
5.3	Statutory & Policy Requirements.....	70
5.4	Alternate Location for the Project	70
5.4.1	Identification of sites for WTG’s	70
5.5	Alternate routes for transmission lines	71
5.6	Conclusion.....	71
6.	SOCIO-ECONOMIC ENVIRONMENT.....	72
6.1	Approach and Methodology	72
6.1.1	Review of Secondary Information.....	72
6.1.2	Primary Data Collection, Stakeholder Identification and Consultation.....	73
6.2	Project Affected Villages	73
6.3	Demographic Profile of Study Area.....	74
6.3.1	Population	74
6.3.2	Sex Ratio.....	75
6.3.3	Social Stratification	76
6.3.4	Religious Demography	78
6.3.5	Status of Poverty Level.....	79
6.3.6	Status of Literacy Level	79
6.3.7	Land Use Pattern.....	82
6.4	Socio-Economic Profile of the Study Area	84
6.4.1	Workforce Participation.....	84
6.4.2	Occupation Pattern	88
6.5	Existing Social Infrastructure and Facilities.....	92

6.5.1	Education Facilities	92
6.5.2	Health Care Facilities.....	94
6.5.3	Road and other Transport Connectivity.....	95
6.5.4	Communication Facilities	96
6.5.5	Banking Facilities.....	96
6.5.6	Electricity Supply.....	97
6.5.7	Water Supply.....	97
6.5.8	Existing Traffic Conditions.....	97
6.6	Stakeholder Identification and Consultation	102
6.6.1	Stakeholder Identification.....	102
6.6.2	Details of Land Procured for the Project.....	103
6.6.3	Views expressed by Land Owners.....	111
6.6.4	Views expressed by Local Leaders of Gram Panchayats.....	117
6.6.5	Views expressed by Site Representatives of MVGoPL.....	118
6.7	Impact Assessment	119
6.7.1	Construction phase	120
6.7.2	Operation phase.....	123
6.7.3	Decommissioning Phase	132
7.	NOISE ENVIRONMENT.....	134
7.1	Identified Noise Receptors.....	134
7.2	Ambient Noise Levels.....	134
7.3	Impact Assessment	137
7.3.1	Construction Phase	137
7.3.2	Operation Phase.....	139
8.	ECOLOGICAL ENVIRONMENT	148
8.1	Methodology of Ecological Assessment	148
8.2	Ecological Diversity of the Area	149
8.2.1	Floristic Diversity of the Study Area.....	149
8.2.2	Floristic Species recorded in the Study Area.....	153
8.2.3	Faunal Diversity of the Study Area.....	155
8.3	Findings on Habitat	161
8.3.1	Natural Habitat.....	161
8.3.2	Modified Habitat.....	162
8.3.3	Critical Habitat	162

8.3.4	Invasive Alien/Non-native Species.....	165
8.4	Designated Area.....	166
8.5	Ecosystem Services	166
8.6	Impact Assessment	167
8.6.1	Construction Phase	167
8.6.2	Operation Phase.....	168
9.	OCCUPATIONAL HEALTH AND SAFETY.....	171
9.1	Construction Phase	171
9.1.1	Impacts.....	171
9.1.2	Mitigation Measures.....	172
9.1.3	Impact Significance	175
9.2	Operation and Maintenance Phase	175
9.2.1	Impacts.....	175
9.2.2	Mitigation Measures.....	175
9.2.3	Impact Value	177
10.	WATER, AIR AND SOIL ENVIRONMENT	178
10.1	Land Use.....	178
10.1.1	District.....	178
10.1.2	Study Area.....	179
10.2	Soil Profile	182
10.3	Air Environment.....	185
10.4	Water Environment	189
10.5	Impact Assessment - Construction Phase.....	193
10.5.1	Land Use.....	193
10.5.2	Soil Quality	194
10.5.3	Air Quality	195
10.5.4	Water Quality.....	196
10.6	Impact Assessment - Operation Phase	197
10.6.1	Soil Quality	197
10.6.2	Water Quality.....	198
11.	ENVIRONMENT AND SOCIAL MANAGEMENT PLAN	199
11.1	Introduction	199
11.2	Environmental and Social Management System	199
11.3	Organisational Structure (Environmental, Social, Health & Safety)	199

11.3.1	Roles and Responsibilities.....	200
11.4	Training of Personnel and Contractor.....	201
11.5	Monitoring and Audit.....	201
11.6	Documentation and Record Keeping.....	202
11.7	Proposed Environmental and Social Management Plan.....	202
11.8	Management Plans and Procedures.....	215
11.8.1	Traffic Management Plan.....	215
11.8.2	Crane Safety Plan.....	220
11.8.3	Stakeholder Engagement Plan.....	222
11.8.4	Grievance Redressal Plan.....	229
12.	CONCLUSION AND CATEGORISATION.....	235

List of Tables

Table 2-1: ESIA Approach and Methodology	7
Table 2-2: Impact Evaluation Criteria	11
Table 2-3: Impact Significance Criteria	12
Table 3-1: Village wise WTG details of the project	14
Table 3-2: Geographical Coordinates of Wind Turbine Generators	14
Table 3-3: Brief Description of project WTG Locations.....	18
Table 3-4: Average Wind Speed.....	24
Table 3-5: Technical Details of Proposed WTGs	27
Table 3-6: Component wise breakup of the land area required	29
Table 3-7: Implementation Schedule.....	35
Table 3-8: Meteorological Data based on observation from 1961 to 1990 for Hyderabad	36
Table 3-9: Average Annual Rainfall for Project Districts	37
Table 4-1: Relevant enforcement agencies and their functions.....	40
Table 4-2: Applicable Environmental and Social Legislations.....	45
Table 4-3: Ambient Air Quality Standards	60
Table 4-4: Primary Water Quality Criteria for Designated Best Use Classes	60
Table 4-5: Drinking Water Standards as per IS 10500, 2012	61
Table 4-6: Treated Sewage Discharge.....	62
Table 4-7: Ambient Air Quality Standards in respect of Noise	62
Table 4-8: Standards for Occupational Noise Exposure.....	63
Table 4-9: Relevant International Conventions applicable to the project.....	63
Table 5-1: Anticipated Month Wise Power supply Position for 2015-2016 for Telangana	65
Table 5-2: Telangana Demand Supply Projection (MU).....	65
Table 5-3: NCE Installed Capacity (vs) Potential	66
Table 5-4: Installed Capacity (in MW) of Power Stations in India	67
Table 5-5: Breakup of Renewable Energy Sources in India.....	67
Table 5-6: Installed capacity in Telangana.....	68
Table 5-7: Comparative analysis of various power generation options	68
Table 5-8: Environmental advantage and disadvantages of various electricity generating options....	69
Table 6-1: Administrative Areas within the Study Area.....	73
Table 6-2: List of villages falling within the Study Area	73
Table 6-3: Demographic Profile of the Districts within the Study Area.....	74
Table 6-4: Demographic Profile of the Mandals within the Study Area	74
Table 6-5: Demographic Profile of the Villages within the Study Area.....	75
Table 6-6: Sex Ratio present in the Villages within the Study Area.....	75
Table 6-7: SC and ST Population in the villages falling within the Study Area.....	78
Table 6-8: Religious Demography of the Population in the two Districts within Study Area	78
Table 6-9: District wise BPL status of Households within the Study Area	79
Table 6-10: Details of literate population in the villages within the Study Area	81
Table 6-11: Details of Land Use Classification of the Mandals within the Study Area	83
Table 6-12: Details of Land Use Classification of the Villages within the Study Area.....	83
Table 6-13: Breakup of Main and Marginal Workers in the Districts within the Study Area	85
Table 6-14: Breakup of Main and Marginal Workers in the Mandals within the Study Area.....	86

Table 6-15: Details of Workforce Participation in the Villages within the Study Area	87
Table 6-16: Breakup of Main and Marginal Workers in the Villages within the Study Area	88
Table 6-17: Occupation Pattern in the Districts within the Study Area.....	89
Table 6-18: Occupational Pattern in the Mandals within the Study Area	90
Table 6-19: Occupational Pattern in the Villages within the Study Area.....	90
Table 6-20: Details of schools present in the District within the Study Area	92
Table 6-21: Details of Educational Facilities in the Mandals within the Study Area	93
Table 6-22: Details of Educational Facilities in the Villages within the Study Area	93
Table 6-23: Details of Health Care Facilities in the Districts within the Study Area	94
Table 6-24: Details of Health Care Facilities in the Mandals within the Study Area	94
Table 6-25: Details of Health Care Facilities in the Villages within the Study Area.....	94
Table 6-26: Details of Banking Facilities in Mandals within the Study Area.....	96
Table 6-27: Traffic Monitoring Locations.....	98
Table 6-28: PCU factors adopted for traffic volume survey	98
Table 6-29: Traffic Volume Survey at T 1 – State Highway – 20 (Pargi Road).....	98
Table 6-30: Traffic Volume Survey at T2 - Khudwanpur Village Road	98
Table 6-31: Key Observations of Traffic Count	100
Table 6-32: Schedule for the Socio-Economic Survey and Stakeholder Consultation.....	102
Table 6-33: Details of Land Procured for Project.....	104
Table 6-34: Details of General Information provided by Land Owners.....	112
Table 6-35: Details on the Perception of the Project	114
Table 6-36: Details of Responses received from the Local Leaders.....	117
Table 6-37: Key Questions and Responses from MVGoPL’s Representative.....	118
Table 6-38: Impact Value of Construction Phase - Community/Social Issues	123
Table 6-39: ICNIRP exposure limits for general public exposure.....	125
Table 6-40: ICNIRP exposure limits for occupational exposure.....	125
Table 6-41: Details of Shadow Receptor Locations	126
Table 6-42: Results of Shadow Flicker Modeling	127
Table 6-43: Impact Value of Operation phase – Community/ Social Issues.....	132
Table 6-44: Impact Value of Decommissioning Phase- Community /Social issues.....	133
Table 7-1: Description of the Identified Noise Receptors.....	134
Table 7-2: Results of Noise Level Monitoring	137
Table 7-3: Typical sound level from various types of construction vehicles and equipment.....	138
Table 7-4: Impact Value-Noise Quality during Construction Phase.....	138
Table 7-5: Description of the Identified Noise Receptors.....	141
Table 7-6: Resultant Noise Levels at Receptor Locations	141
Table 7-7: List of WTGs within 2000 m of Receptor Locations	142
Table 7-8: Impact Value- Noise Quality during Operation Phase	146
Table 8-1: Details of Quadrat Locations.....	150
Table 8-2: Floristic Species Recorded in the Study Area.....	153
Table 8-3: Resident Avifauna associated with the Study Area	155
Table 8-4: Mammals associated with the Study Area.....	158
Table 8-5: Bat associated with the Study Area	160
Table 8-6: Reptiles associated with the Study Area.....	160
Table 8-7: Migratory Avifauna associated with the Study Area	162

Table 8-8: Critically Endangered/Endangered Mammals associated with the Study Area	164
Table 8-9: Critically Endangered/Endangered Birds associated with the Study Area	165
Table 8-10: Endemic / Restricted Range Species associated with the Study Area	165
Table 8-11: Invasive Alien/Non-native Species of the Study Area.....	165
Table 8-12: Crops associated with the Study Area	166
Table 8-13: Useful Species associated with the Study Area	167
Table 8-14: Impact Value – Construction Phase	168
Table 8-15: Impact Value – Operation Phase	170
Table 9-1: Impact Value- Occupational Health & Safety – Construction Phase	175
Table 9-2: Impact Value- Occupational Health & Safety – Operation Phase.....	177
Table 10-1: Land Use / Land Cover of Project Districts.....	178
Table 10-2: Land use Pattern in the Study Area	179
Table 10-3: Details of Soil Sampling Locations	182
Table 10-4: Results of the Soil Quality Analysis	184
Table 10-5: Details of Ambient Air Monitoring Locations	185
Table 10-6: Air Quality Monitoring Result in Study Area ($\mu\text{g}/\text{m}^3$)	187
Table 10-7: Details of Water Sampling Location.....	190
Table 10-8: Water Quality Monitoring Results	190
Table 10-9: Impact Value – Land Use.....	194
Table 10-10: Impact Value – Soil Quality	195
Table 10-11: Impact Value - Air Quality	196
Table 10-12: Impact value - Water Quality.....	197
Table 10-13: Impact Value - Soil Quality.....	197
Table 10-14: Impact Value - Water Quality	198
Table 11-1: Environmental and Social Management Plan	204
Table 11-2: Crane safety Plan	220
Table 11-3: Types of Stakeholders as per their interest and influence	222
Table 11-4: Categorization List of Key Stakeholders.....	223
Table 11-5: Interest Matrix of Stakeholders	224
Table 11-6: Summary of the Consultation Activities	227
Table 11-7: Summary of the Proposed Plan of Activities	228

List of Figures

Figure 1-1: Indicative Location of the Project area.....	3
Figure 3-1: Layout of the Project Site	16
Figure 3-2: Wind turbine and its components.....	26
Figure 3-3: Working of Wind Turbine	26
Figure 3-4: Map showing location of Substation for power evacuation from the Proposed Wind Farm	28
Figure 3-5: Map of Earthquake Zone showing project site.....	37
Figure 3-6: Drought Vulnerability Map of Telangana State showing project site	38
Figure 3-7: Mandal-wise categorization with respect to ground water development for Mahbubnagar.....	39
Figure 3-8: Mandal-wise categorization with respect to ground water development for Rangareddy	39
Figure 5-1: Source wise installed capacity	68
Figure 6-1: Decadal Growth of SC and ST Population in the two Districts of the Study Area	76
Figure 6-2: Decadal Growth of SC and ST Population in the Mandals within the Study Area.....	77
Figure 6-3: Literacy Level of the Districts within the Study Area.....	80
Figure 6-4: Decadal Growth of Literate Population in the Mandals within the Study Area	80
Figure 6-5: Land Use Pattern of Rangareddy District.....	82
Figure 6-6: Land Use Pattern of Mahbubnagar District	82
Figure 6-7: Details of Workforce Participation in the Districts within the Study Area	84
Figure 6-8: Details of Workforce Participation in the Mandals within the Study Area	86
Figure 6-9: Percentage Composition at T1 – State Highway - 20 (Pargi Road).....	99
Figure 6-10: Percentage Composition at T2 – Khudwanpur Village Road	99
Figure 6-11: Details of the Need Assessment undertaken during the Socio-Economic Survey	115
Figure 6-12: Effect of Shadow Flicker due to turbine operations.....	128
Figure 7-1: Map showing Noise Monitoring Locations	136
Figure 7-2: Monitored Noise Levels	137
Figure 7-3: Components and Total Sound Power Level of a Wind Turbine	139
Figure 7-4: Schematic of Flow around a Rotor Blade	140
Figure 7-5: Noise Map- Output of Noise Modelling Exercise.....	145
Figure 8-1: Map showing Ecological Survey Quadrat Locations	152
Figure 10-1: Land Use/ Land Cover of Rangareddy District	178
Figure 10-2: Land Use/ Land Cover of Mahbubnagar District	179
Figure 10-3: Land-Use Map of Study Area	181
Figure 10-4: Map showing Soil Quality Monitoring Locations in the Study Area	183
Figure 10-5: Soil Texture	184
Figure 10-6: Map showing Air Quality Monitoring Locations in the Study Area	186
Figure 10-7: Particular Matter – PM10	187
Figure 10-8: Particular Matter – PM2.5	188
Figure 10-9: Sulphur Dioxide (SO ₂).....	188
Figure 10-10: Oxides of Nitrogen (NO _x)	189
Figure 10-11: Map showing Water Quality Monitoring Locations in Study Area	192
Figure 11-1: Proposed Organisational Structure	200

List of Photos

Photo 3-1: A view of location proposed for NRB 35 falling in Khudwanpur Village	17
Photo 3-2: A view of the grazing activity near proposed turbine location.....	17
Photo 3-3 : View of the construction activity for the foundation at NRB 14.....	17
Photo 3-4 : View of a maize farming in the project area	17
Photo 3-5: A view of the foundation work completed at WTG no. NRB 49.	35
Photo 3-6: A view of excavation carried out at WTG no. NRB 5.....	35
Photo 6-1: Cotton cultivation in the villages within the study area	89
Photo 6-2: Maize cultivation in the villages within the study area.....	89
Photo 6-1: Consultations held with land owners.....	115
Photo 6-2: Consultations held with land owners.....	115

1. INTRODUCTION

Mytrah Energy (India) Limited (hereinafter referred to as “MEIL”), a wholly owned subsidiary of UK listed company Mytrah Energy Limited (hereinafter referred to as “MEL”) aims to own and operate 3000 MW of wind power assets over the next few years. From a standing start in late 2010, MEIL has built a portfolio of 550 MW wind power projects in India. These assets are spread across ten wind farms in six states - Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Mytrah Vayu (Godavari) Private Limited (hereinafter referred to as “MVGoPL”/ “Mytrah”), a wholly owned subsidiary of Mytrah Energy India Limited, plans to invest in a 98.7 MW wind power project at Nazeerabad in the state of Telangana (hereinafter referred to as “Project”).

Mytrah intends to carry out an Environmental and Social Impact Assessment (ESIA) study for the Project, in accordance with International Finance Corporation’s (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012; IFC’s Environment, Health and Safety Guidelines; ADB Safeguard Policy Statement, 2009 and Applicable Local, National and International Environmental and Social Legislations and has appointed AECOM India Private Limited (herein referred to as ‘AECOM’) to undertake this study. The aim of the study is to provide an assessment of the ability of the project to comply with the requirements of the specified reference framework¹ as required by financial investors. This ESIA report has been prepared on the basis of a reconnaissance survey, baseline environmental monitoring, review of secondary data and consultation with relevant stakeholders.

1.1 Project Overview

MVGoPL intends to invest in 98.7 MW wind power project which is spread across the following villages in Telangana State:

- Kadlapur, Madharam, Raghavapur, Khudwanpur, Chityal, Nagulapally, Rapole, Syedpally, Yabajiguda, Thondapally of Pargi Mandal, District Rangareddy
- Kervelly, Somangurthy, Thurkayenkepalle of Pudur Mandal, District Rangareddy; and
- Padmaram, Vanampally, Thummalapally of Kondurg Mandal, District Mahbubnagar.

The proposed project will involve:

- Procurement of private agricultural land by land team of the project proponent i.e. MVGoPL on willing buyer/ willing seller basis;
- Installation of 47 WTGs of 2.1 MW capacity each with a total generation capacity of 98.7 MW;
- Power evacuation to APTRANSCO (Electricity Transmission Company of the Government of Andhra Pradesh) substation at Pargi; and
- Construction of access roads both internal and external for transportation of construction material and equipment to the project site.

¹ International Finance Corporation’s (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012; Environment, Health and Safety Guidelines; ADB Safeguard Policy Statement and Local, National and International Environmental and Social Legislations.

Suzlon make S 97 (IEC Class – IIIA) Wind Turbine Generators (WTG) of 2.1 MW unit rated capacity have been proposed for the project. Micro-siting activity and estimation of annual energy was undertaken at the proposed site, based on which the total number of turbines for the project have been arrived at 47 to obtain 98.7 MW of power.

The proposed project is being developed by Suzlon Global Services Limited (hereinafter referred to as “Suzlon”), the Engineering, Procurement and Construction (EPC) Contractor who will also be responsible for obtaining necessary statutory approvals, erection and commissioning of WTGs, construction of internal roads, crane beds and transmission lines. A separate contract will be executed for operation and maintenance of the project between MVGoPL and Suzlon for a period of thirty one (31) years.

The proposed project site is located approximately 70 km southwest of Hyderabad town and is accessible by NH-7 via Pargi Road. Rangareddy Guda (belonging to south central railway, Hyderabad Deccan) is the nearest railway station at a distance of approximately 35 km and Hyderabad is the nearest airport at a distance of approximately 50 km from the site. The indicative location of the Project area has been provided in **Figure1-1**.

The land for the proposed project comprises of private agricultural land. The project area is characterised by black cotton soil. The site is located at an elevation of 650-700 m above mean sea level (amsl) having a flat terrain.

Status of project at the time of site visit (September 2015) is as follows:

- Land for all the 47 WTG locations was purchased, however registration process for 13 land parcels was underway;
- Excavation and point of common coupling (PCC) work was completed for turbine nos. NRB 14, NRB 15, NRB 02, NRB 31 and NRB 49;
- Excavation work was completed for turbine nos. NRB 58 and NRB 05;
- PCC was planned for turbine no. NRB 05;
- Excavation work was in progress for turbine nos. NRB 56, NRB 57, NRB 41 and NRB 34; and
- Foundation work for stub assembly was in progress for turbine no. NRB 14.

Figure 1-1: Indicative Location of the Project area



1.2 Objectives and Scope of Work

1.2.1 Objectives

This ESIA report identifies the key environmental and social issues associated with the wind farm development and provides mitigation measures to address these issues in project planning, construction, and operation & maintenance phase of the project. An Environment and Social Management Plan (ESMP) has been developed for the project which provides recommendations for management of environment and social aspects. The study also focuses on the requirements of the IFC's Performance standards; IFC's Environment, Health and Safety guidelines; ADB Safeguard Policy Statement and applicable Local, National, International Environmental and Social Legislations.

1.2.2 Scope of Work

This study has been undertaken to understand the Environmental and Social impacts associated with the project and also to suggest appropriate mitigation measures and management plans to prevent and minimize all impacts identified. The environmental and social assessment has been carried out against the following reference framework:

- The IFC Performance Standards for Environmental and Social Sustainability (2012);
 - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
 - Performance Standard 2: Labor and Working Conditions
 - Performance Standard 3: Resource Efficiency and Pollution Prevention
 - Performance Standard 4: Community Health, Safety, and Security
 - Performance Standard 5: Land Acquisition and Involuntary Resettlement
 - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
 - Performance Standard 7: Indigenous Peoples
 - Performance Standard 8: Cultural Heritage
- IFC's General EHS Guidelines and EHS Guidelines for Wind Power Projects, August 2015;
- ADB Safeguard Policies (2009) consisting of Environmental Safeguard, Involuntary Resettlement Safeguard and Indigenous Peoples Safeguard; and
- Applicable Indian national, state and local regulatory requirements.

The scope of work for the study includes:

- Reconnaissance survey and primary site assessment to assess baseline environmental and social conditions;
- Generation of primary baseline environmental data including ambient air quality, noise level, water quality, soil quality and traffic count;
- Assessment of impact of noise and shadow flickering on the community using WindPRO version 2.7 software;
- Collection of information on forestry, flora and fauna, and natural habitats and species of special conservation/scientific interest of the study area through secondary data and past study;
- Consultations with local community of the project area;

- Collection of additional environmental, social and demographic information from secondary sources;
- Identification and review of the applicable standards and identification of key issues;
- Evaluation of potential social impacts of the Project and its components (including associated facilities like, transmission line, access roads etc.); and
- Preparation of Environmental and Social Management Plan (ESMP) based on the findings of the ESIA with procedures for mitigation and monitoring of environment and social impacts on an on-going basis and to identify any impacts/mitigation requirements that may occur subsequent to the completion of the ESIA.

1.3 Approach for the Study

The approach and methodology applied for the execution of the impact assessment study is as provided:

- Review of relevant project documents in order to understand the project requirements;
- Regulatory review was undertaken to understand the applicable, local and national legislation and regulatory frameworks as well as international treaties and agreements signed by India. The review includes the relevant IFC's General Environment, Health and Safety Guidelines, IFC's Performance Standards 2012, ABD Safeguard Policies 2009 and all the applicable national and local regulations.
- A detailed environmental assessment of site and surrounding areas was undertaken through:
 - Reconnaissance surveys to understand site specific issues;
 - Baseline data collection of the site and study area with respect to ambient air quality, noise levels, water quality, soil quality and traffic density; and
 - Ecological assessment on flora and fauna of the site and study area through primary and secondary surveys.
- Collation of secondary information on social aspect of the site, supplemented by consultations with the local communities to understand community perception with regard to the project and its activities. The approach included:
 - Stakeholder mapping and Identification;
 - Focused group consultations with selected land losers and other impacted groups; and
 - Field surveys and data compilation.
- Assessment of impacts based on understanding of the project activities and existing baseline status; and
- Preparation of Environment and Social Management Plan.

1.4 Parties Contacted

The following parties were contacted during the course of the study:

- MVGoPL Representatives;
- Eco Services India Private Limited;
- Sarpanch of Syedpally, Khudwanpur and Madharam Gram Panchayats;
- Land sellers related to the project; and

- Telangana Biodiversity Department.

1.5 Limitations of the Study

The study undertaken is structured around the project information as provided by the project proponent, any significant changes in the proposed activities may result in variation of outcome. The environmental and social study is based on the documents made available, community consultations undertaken by AECOM and observations from the site survey conducted. Professional judgement and interpretation of facts has been applied for presenting inference from the collected information. Locations for turbine nos. NBR 66, NBR67, NRB68 and NRB69 could not be verified at the time of site visit due to lack of accessibility.

1.6 Report Structure

The structure of the report is as provided as below:

Chapter 2: describes the EIA Process and Methodology;

Chapter 3: outlines the Project Description;

Chapter 4: describes the applicable Policy, Legal and Administrative Framework;

Chapter 5: provides the Site Selection and Analysis of Alternatives;

Chapter 6: presents the Socio Economic Environment;

Chapter 7: presents the Noise Environment;

Chapter 8: presents the Ecological Environment;

Chapter 9: presents details of the Occupational Health and Safety;

Chapter 10: presents the Air, Water and Soil Environment;

Chapter 11: provides Environment and Social Management Plan; and

Chapter 12: establishes the Conclusion and Categorisation of project.

Annexes to the report include the following:

Annexure I: A sample of the questionnaire used for the consultation purposes

Annexure II: NOCs from respective Gram Panchayats

Annexure III: List of persons consulted during site visit

Annexure IV: Need Assessment Report

Annexure V: Detailed Noise Modelling Report

Annexure VI: Photolog – Ecological Survey

2. ESIA PROCESS AND METHODOLOGY

This section presents the detailed methodology adopted for carrying out the Environment and Social Impact Assessment (ESIA) study for the proposed wind power project. A brief overview of the methodology has been presented below:

- A regulatory review was undertaken in order to understand the applicable, local and national legislations, policies and regulatory guidelines;
- A detailed social and environmental assessment of site and the surrounding areas was undertaken through:
 - Reconnaissance surveys for all the turbine locations;
 - Discussion with the local community in the project villages to understand their perception about the project and identification of key issues pertaining to similar projects in the region;
 - Discussion with land sellers and company representative to understand the process of land procurement;
 - Collection of baseline data to assess ambient air quality, ambient noise level, traffic count, water quality and soil quality in the Project area through primary monitoring; and
 - Ecological assessment for the project area.
- Collection of secondary information on social aspects of the site through consultation with the local community to understand the community perception with regard to the project and its activities;
- Assessment of impacts based on understanding of the project activities and existing baseline status; and
- Preparation of Environment and Social Management Plan (ESMP).

A study area of 5 km from the Project boundary was considered for the evaluation of existing environmental status and potential impacts. A brief summary of the ESIA process and methodology adopted by AECOM for the proposed wind power project has been summarised in the following **Table 2-1**.

Table 2-1: ESIA Approach and Methodology

S. No	Methodology	Activities conducted
1.	Regulatory Review	<ul style="list-style-type: none"> • Desktop study of applicable national and local legislations; • Review of requirements under IFC Performance Standards, IFC’s EHS General Guidelines and Guidelines for Wind Energy; • Review of the requirements under ABD’s Safeguards Policies.
2.	Environmental appraisal of site	<ul style="list-style-type: none"> • Reconnaissance survey; • Land use mapping and analysis; • Baseline environmental monitoring covering : <ul style="list-style-type: none"> ➢ Ambient Air Quality; ➢ Ambient Noise; ➢ Water Quality; ➢ Soil Quality; and

S. No	Methodology	Activities conducted
		➤ Traffic Count.
3.	Ecological Survey	<ul style="list-style-type: none"> • Primary ecological survey of the project area; • Desktop review of secondary literature.
4.	Social Appraisal of site	<ul style="list-style-type: none"> • Social perception survey and consultation; • Questionnaire survey/Informal interviews; and • Analysis of district and village level Census data.

2.1 Regulatory Review

A desktop study was carried out to identify the environmental and social legislations applicable to the proposed project. The applicable requirements as per IFC's Performance Standards; IFC's General Environment, Health and Safety (EHS) Guidelines; IFC's EHS Guidelines for Wind Energy and ADB's Safeguard Policy Statement have also been identified.

2.2 Environmental and Social Appraisal of Site

An environment and social appraisal of the site was undertaken during site visit to understand the site settings, observe the land use pattern, identify receptor locations for noise and shadow flicker assessment and to establish the existing environmental status for ambient air, traffic, water, noise, soil and ecology in the study area. The villages from which land has been procured were defined as project villages. The villages falling within 5km of the project area and likely to be affected due to the Project and its associated facilities such as access roads, transmission lines and substation were identified as Project Influenced Villages. Information regarding the socio-economic profile of the project villages and perception of the community about wind power projects was also collated.

2.2.1 Reconnaissance Survey

A reconnaissance survey of all the 47 Wind Turbine Generator (WTGs) locations and associated facilities such as substation was carried out by a two member team of AECOM from 1st September 2015 to 3rd September 2015. The survey focussed on evaluation of existing land use of the site, its surroundings, identification of receptors such as settlements/households, culturally important sites and religious structures such as temples, mosques etc. located in and around the Project area. Subsequently, an ecological assessment was also undertaken by a two (2) member team from 14th September to 18th September, 2015 to assess the existing status of ecological resources in the project area.

2.2.2 Land Use Mapping and Analysis

Based on the geographic coordinates of the Project area, the satellite imagery were geo-registered and geo-referenced with respect to the bench marks and limited control points from global positioning system (GPS). A 2nd order polynomial transformation was used to achieve higher accuracy in geo-referencing.

Satellite images were processed in ERDAS IMAGINE for preparation of land use land cover using unsupervised classification technique. Major land use classes have been delineated such as agriculture land, fallow land, barren land, settlements, reserved forest, water body, canal and river. Reserved forest land was extracted from the available Survey of India (SOI) topo-sheets. The digital classified map was verified for the accuracy assessment for major land-use classes present in the study area and land use land cover map has been finalized.

2.2.3 Baseline Environmental Monitoring

For assessing the baseline status of the environment, primary monitoring was carried out in the study area in September 2015. The monitoring locations were identified within the study area based on factors such as sensitivity, land use, accessibility, etc. The collection and analysis was carried out by Eco Services India Private Limited, an ISO 9001:2008 certified company, based in Chennai. Eco Services is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL).

Baseline Ambient Air Monitoring

Two (02) locations for ambient air quality (AAQ) monitoring were identified in the Project area during the site survey. AAQ monitoring was carried out twice a week for two (02) weeks (from 10th September to 19th September, 2015) at both the locations. The details of the AAQ monitoring are presented in **Chapter 10**.

Baseline Noise Monitoring

An assessment of baseline noise quality was undertaken to establish the status of exposure of the major sensitive receptors. This assessment was accomplished by conducting a site-specific background-monitoring program and where appropriate, drawing comparisons to the applicable National Ambient Air Quality Standards in Respect of Noise (AAQSRN).

During the field survey, six (06) potential noise receptor locations were identified in the Project area and 24 hours continuous ambient noise monitoring was carried out at all these receptor locations. The details of the noise monitoring results are presented in **Chapter 7**.

Baseline Water Quality Monitoring

Two locations were finalised in the Project area for water sample collection for evaluation of water quality as per IS 10500:2012 standards. The water quality assessment has been discussed in detail in **Chapter 10**.

Soil Quality

Soil samples from two (02) locations in the study area were collected and analysed to understand the soil quality of the area. Details of soil sampling and quality are discussed in **Chapter 10**.

Traffic Density

Traffic density was monitored at two locations, State Highway (SH) -20 / Pargi Road and at Village Road (Khudwanpur) which are the main connecting roads to the project site and will be significant for the traffic movement during the construction phase with respect to movement of construction

material and machinery. The study was carried out during peak hours both morning and evening and the vehicles observed were two wheelers, three wheelers, four wheelers, six wheelers, bicycles and others (carts). The details of the traffic survey monitoring results are presented in **Section 6.5.8**.

2.2.4 Ecological Survey

A detailed ecological assessment of the Project area was carried out from 14th September to 18th September, 2015 as presented in **Chapter 8**. The assessment focussed on identification of floral and faunal species, sensitive habitats, endangered species and forestland and estimating the bio-diversity indices. The approach to the ecological assessment was as follows:

Onsite Data Collection

- Primary data on the flora and fauna of the study area was generated through quadrat-based quantitative surveys at thirteen (13) locations.
- For floral diversity assessment, a quadrat of approximately 20 m x 20 m was marked. The species of trees, as well as the number of individuals of each species, falling within this area were noted. A quadrat of approximately 5 m x 5 m was marked within this larger quadrat. The species of large and small shrubs, along with the number of individuals of each species, falling within this area were similarly noted. Smaller quadrats of 1 m x 1 m were employed for the herbs, both grasses and forbs.
- Faunal diversity was studied through both, direct evidence, in the form of visual sightings, and indirect evidence, such as calls, nests, burrows, droppings, scats, moults, tracks, etc. In the case of fauna, only occurrence at a given site was noted, without seeking to enumerate the individuals sighted. To enable the study to encompass as wide a range of local faunal species as possible, the timings of the site-studies were planned to collectively capture as many faunal activity-periods as possible, from early morning till late in the evening.
- The floristic and avifaunal profiles of the survey area were assessed in terms of:
 - species richness of the woody and non-woody floras, and the avifauna;
 - percentage frequency, abundance and density of each floral species; and
 - percentage frequency of each bird species.

Secondary Data Collection

Additional information was sourced from available published literature, governmental institutions and local residents of the survey-area.

2.2.5 Social Perception Survey and Consultation

Social perception survey and consultations were undertaken by AECOM representative during site visit to appraise the socio-economic status of the resident population within the study area, the concerns/issues of the local population and benefits/ expectations from the project.

A questionnaire with a list of open-ended questions was used to initiate the discussion process. Few land owners from the villages within the study area were interviewed along with the Sarpanch of Syedpally, Khudwanpur and Madharam Gram Panchayat. In addition, the site representative from MVGoPL was also contacted to enhance the overall understanding of the project and its implications on the surrounding areas.

Discussions were also carried out with the representative from MVGoPL to understand the procedure adopted for land procurement of private land. Details on the survey conducted have been elaborated in **Chapter 6**.

2.3 Impact Assessment

The assessment of impacts during the construction and operation of the Project has been carried out by developing an impact evaluation and significance criteria. The first step of the Impact Assessment involved identification of impacts based on the review of available project information; discussions with the local community; representatives of the project proponents and other sector specific professionals. The assessment of impacts has been carried out based on the range of potential impacts and extent of their severity on environment, ecology, socio-economic resources, demographics, livelihoods, as well as access and infrastructure issues. Mitigation measures for the identified impacts have also been proposed.

2.3.1 Impact Evaluation Criteria

The criteria used to assess impacts on various environmental and social aspects due to the Project have been presented in the following **Table 2-2**.

Table 2-2: Impact Evaluation Criteria

Criteria	Sub-Classification	Defining Limit	Remarks
Spread: refers to area of direct influence from the impact of a particular project activity.	Insignificant / Local spread	Impact is restricted within the foot prints of the Project boundary. For transmission line, when the impact is restricted within the right of way (RoW)	Except for ecology (which is defined as loss of vegetation only at site) or within the base of pylon and under the conductors
	Medium Spread	Impact is spread up to 2 km from the boundary of the Project area or within 500 m on either side of transmission line	Except for ecology (which is defined as loss of vegetation at site including large trees with limited disturbance to adjoining flora & fauna)
	High spread	Impact is spread up to 2 km to 5 km from boundary of the Project area or beyond 500 m on either side of transmission line	Except for ecology (which is defined as loss of vegetation at site and/or damage to adjoining flora and fauna)
Duration: based on duration of impact and the time taken by an environmental component to recover back to current state	Insignificant / Short Duration	When impact is likely to be restricted for duration of less than 1 year	The anticipated recovery of the effected environmental component within 2 years
	Medium Duration	When impact extends up to 3 years	With an anticipated recovery of the effected environmental component within 6 years
	Long Duration	When impact extends beyond 3 years	With anticipated recovery of prevailing condition to happen within 6 years or beyond or upon completion of the project life

Criteria	Sub-Classification	Defining Limit	Remarks
Intensity: defines the magnitude of Impact	Insignificant intensity	When resulting in changes in the environmental baseline conditions is minimal	However, it shall be reconsidered where the baseline values are already high
	Low intensity	When resulting in changes in the baseline conditions is experienced in the immediate surroundings	For ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival or habitat change
	Moderate intensity	When resulting in changes that alter the baseline conditions in the surrounding area	For ecology, it refers to changes that are expected to be recoverable
	High intensity	When change resulting in the baseline conditions are significantly modified	While for ecology, high intensity refers to changes that result in serious destruction to species, productivity or their habitat
Nature: refers to whether the effect is considered beneficial or adverse	Adverse	-	Harmful to Environment and Community
	Beneficial	-	Useful to Environment and Community

2.3.2 Impact Significance Criteria

It is necessary to gauge how significant an impact will be on the identified receptor(s) in order to devise mitigation measures to avoid or offset such impacts. For assessing the significance of the impact based on the aforementioned evaluation criteria, the following matrix was developed.

Table 2-3: Impact Significance Criteria

Spread	Duration	Intensity	Overall Significance	
			Adverse	Beneficial
Local	Short	Low	Insignificant	Insignificant
Local	Medium	Low	Minor	Minor
Local	Medium	Moderate		
Local	Long	Low		
Local	Long	Moderate		
Local	Short	Moderate	Moderate	Moderate
Local	Short	High		
Local	Medium	High		
Medium	Short	Low		
Medium	Short	Moderate		
Medium	Medium	Low		
Medium	Long	Low		
Medium	Medium	Moderate		
Medium	Long	Moderate		
High	Short	Low		
High	Short	Moderate		
High	Medium	Low		
High	Medium	Moderate		
High	Long	Low		
High	Long	Moderate		

Spread	Duration	Intensity	Overall Significance	
			Adverse	Beneficial
Local	Short	High	Major	Major
Local	Medium	High		
Local	Long	High		
Medium	Short	High		
Medium	Medium	High		
Medium	Long	High		
High	Short	High		
High	Medium	High		
High	Long	High		

2.3.3 Formulation of Environment and Social Management Plan

An Environment and Social Management Plan (ESMP) has been developed for the Project based on the impacts identified. The ESMP provides economically feasible control technologies and procedures to minimize any impact on environment and mechanism for continuous consultation and involvement of the community throughout the various stages of the Project.

3. PROJECT DESCRIPTION

This section of the report provides the layout, site settings of the project and details pertaining to procurement of land. It also provides a description of project components along with associated facilities.

The Project comprises of 47 WTGs of Suzlon make, S97 120 m hybrid tower WTG with rated capacity of 2.1MW each, spread across sixteen (16) villages falling within Rangareddy (RR) and Mahabubnagar (MBNR) districts of Telangana State. The proposed project site is located approximately 70 km southwest of Hyderabad town and is accessible by National Highway No. 7 (NH-7) via Pargi Road. The construction of the Project pooling substation is under progress and total area for the substation is 10 acre and 20 gunta². The Pooling substation is located in Kadlapur village which falls under Pargi Mandal.

3.1 Layout of Project Site

The site is spread across a length of about 17 km along the North to South direction and about 10 km along the West to East direction. The 47 WTGs are arranged in a scattered layout. **Table 3-1** presents the village wise WTG locations of the proposed project.

Table 3-1: Village wise WTG details of the project

S. No.	Name of the village	Mandal	District	Proposed number of WTG
1	Kadlapur	Pargi	Rangareddy	7
2	Karvelly	Pudur	Rangareddy	3
3	Madharam	Pargi	Rangareddy	5
4	Raghavapur	Pargi	Rangareddy	1
5	Khudawanpur	Pargi	Rangareddy	6
6	Padmaram	Kondurg	Mahabubnagar	4
7	Somangurthy	Pudur	Rangareddy	2
8	Nagulapally	Pargi	Rangareddy	4
9	Chityal	Pargi	Rangareddy	2
10	Rapole	Pargi	Rangareddy	2
11	Sayedpally	Pargi	Rangareddy	2
12	Yabajiguda	Pargi	Rangareddy	3
13	Thondapally	Pargi	Rangareddy	1
14	Thurkayenkepalle	Pudur	Rangareddy	1
15	Vanampally	Kondurg	Mahabubnagar	2
16	Thummalapally	Kondurg	Mahabubnagar	1
	Total			47

The proposed geographical co-ordinates of the turbines are as provided in **Table 3-2** below. **Figure 3-1** illustrates the map representing the physical features of the Project area.

Table 3-2: Geographical Coordinates of Wind Turbine Generators

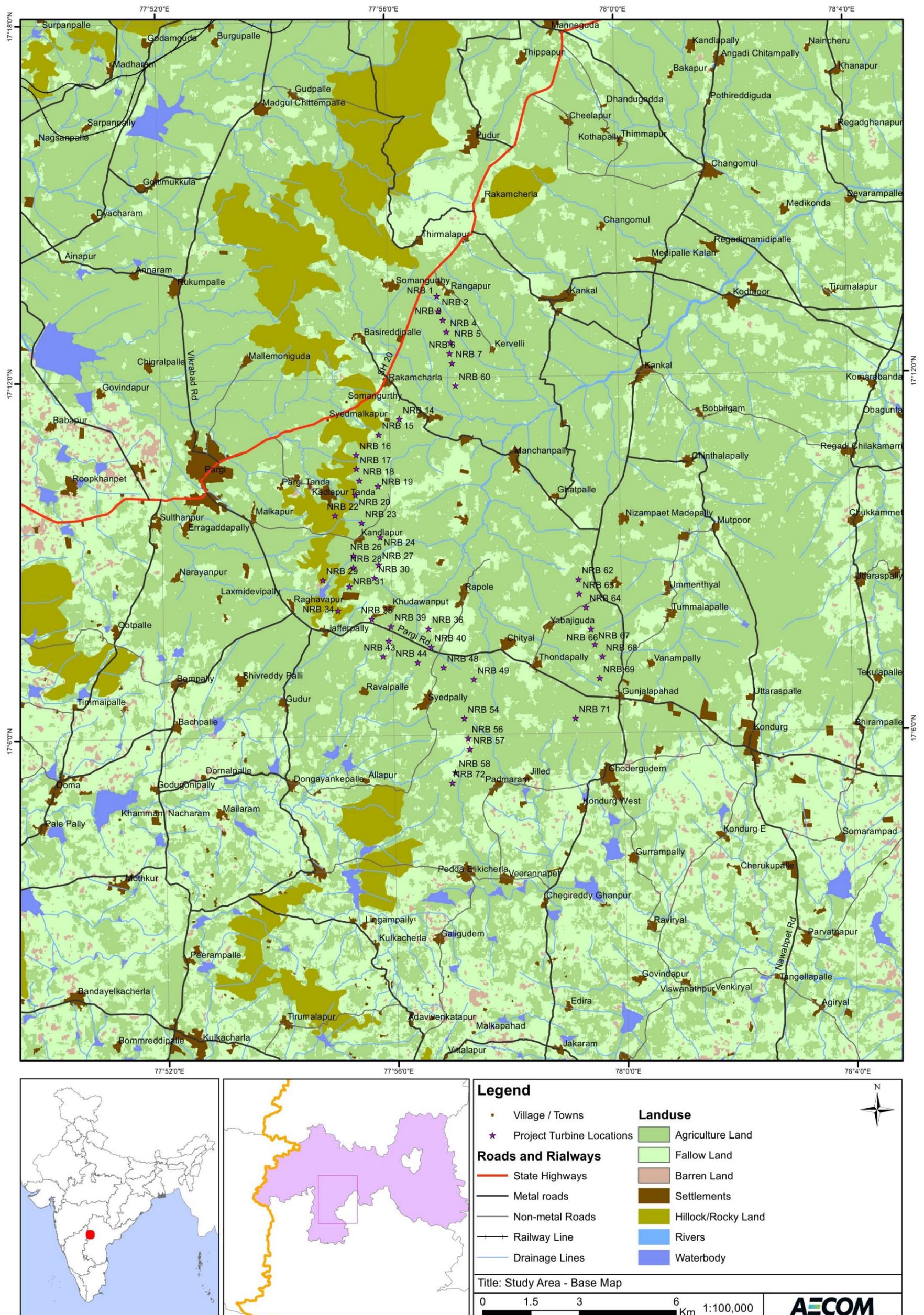
Sl. No.	Turbine ID	Coordinates		Land Type	Village Name
		Northing	Easting		
1.	NRB-1	1906604 m	813485 m	Private agricultural land	Somangurthy
2.	NRB-2	1906140 m	813529 m	Private agricultural land	Somangurthy

² Gunta is a unit which is typically used to measure the size of a piece of land. 40 gunta = 1 acre.

Sl. No.	Turbine ID	Coordinates		Land Type	Village Name
		Northing	Easting		
3.	NRB-3	1905866 m	813665 m	Private agricultural land	Kervelly
4.	NRB-4	1905493 m	813785 m	Private agricultural land	Kervelly
5.	NRB-5	1905163 m	813914 m	Private agricultural land	Kervelly
6.	NRB-6	1904823 m	813877 m	Private agricultural land	Madharam
7.	NRB-7	1904524 m	813955 m	Private agricultural land	Madharam
8.	NRB-15	1902306 m N	811688 m E	Private agricultural land	Madharam
9.	NRB-22	1899799 m N	810336 m E	Private agricultural land	Kadlapur
10.	NRB-23	1899571 m N	811158 m E	Private agricultural land	Kadlapur
11.	NRB-26	1898553 m N	810901 m E	Private agricultural land	Kadlapur
12.	NRB-28	1898190 m N	810900 m E	Private agricultural land	Kadlapur
13.	NRB-29	1897797 m N	809962 m E	Private agricultural land	Raghavapur
14.	NRB-31	1897602 m N	810782 m E	Private agricultural land	Khudawanpur
15.	NRB-34	1896846 m N	810425 m E	Private agricultural land	Khudawanpur
16.	NRB-35	1896591 m N	811478 m E	Private agricultural land	Khudawanpur
17.	NRB-39	1896362 m N	812070 m E	Private agricultural land	Khudawanpur
18.	NRB-41	1895917 m N	812006 m E	Private agricultural land	Khudawanpur
19.	NRB-43	1895433 m N	811825 m E	Private agricultural land	Khudawanpur
20.	NRB-48	1895090 m N	813699 m E	Private agricultural land	Sayedpally
21.	NRB-14	1902791 m N	812327 m E	Private agricultural land	Madharam
22.	NRB-16	1901676 m N	810985 m E	Private agricultural land	Nagulapally
23.	NRB-17	1901248 m N	810993 m E	Private agricultural land	Nagulapally
24.	NRB-18	1900887 m N	811088 m E	Private agricultural land	Nagulapally
25.	NRB-19	1900712 m N	811664 m E	Private agricultural land	Nagulapally
26.	NRB-20	1900432 m N	810968 m E	Private agricultural land	Kadlapur
27.	NRB-24	1899123 m N	811737 m E	Private agricultural land	Kadlapur
28.	NRB-27	1898275 m N	811689 m E	Private agricultural land	Kadlapur
29.	NRB-30	1897860 m N	811560 m E	Private agricultural land	Kadlapur
30.	NRB-36	1896293 m N	813227 m E	Private agricultural land	Rapole
31.	NRB-40	1895725 m N	813312 m E	Private agricultural land	Rapole
32.	NRB-44	1895247 m N	812896 m E	Private agricultural land	Sayedpally
33.	NRB-49	1894721 m N	814638 m E	Private agricultural land	Chityal
34.	NRB-54	1893515 m N	814338 m E	Private agricultural land	Sayedpally
35.	NRB-56	1892896 m N	814464 m E	Private agricultural land	Padmaram
36.	NRB-57	1892559 m N	814508 m E	Private agricultural land	Padmaram
37.	NRB-58	1891837 m N	814068 m E	Private agricultural land	Padmaram
38.	NRB-60	1903827 m N	814064 m E	Private agricultural land	Madharam
39.	NRB-62	1897826 m N	817873 m E	Private agricultural land	Thurkayenkepalle
40.	NRB-63	1897376 m N	817897 m E	Private agricultural land	Yabajiguda
41.	NRB-64	1896965 m N	818105 m E	Private agricultural land	Yabajiguda
42.	NRB-66	1896294 m N	818259 m E	Private agricultural land	Yabajiguda
43.	NRB-67	1895812 m N	818382 m E	Private agricultural land	Thummalapally
44.	NRB-68	1895433 m N	818620 m E	Private agricultural land	Vanampally
45.	NRB-69	1894764 m N	818532 m E	Private agricultural land	Vanampally
46.	NRB-71	1893521 m N	817783 m E	Private agricultural land	Thondapally
47.	NRB-72	1891511 m N	813976 m E	Private agricultural land	Padmaram

Source: MVGoPL

Figure 3-1: Layout of the Project Site



3.2 Site Settings

The proposed project site is located approximately 70 km southwest of Hyderabad City and is accessible by NH-7 via Pargi Road. The project area is characterised by rural setup. The site is located at an elevation of 650-700 m above mean sea level (amsl) having flat terrain with agricultural land. The project area is characterised by black cotton soil.

Two seasonal ponds, one close to NRB 48 near Syedpally village and one check dam approximately 600 m in southeast direction of the pooling substation and NRB 22 were observed in the project area. Khudwanpur village approximately 60 m in northeast direction from NRB 35, Kervelly village approximately 250 m in north direction from NRB 1, Kadlapur village approximately 500 m in south direction from NRB 23 and few individual households were identified as nearest receptors and the noise and flickering impact on these receptors are assessed in **Chapter 6** and **Chapter 7**. Naskal Reserved Forest and Somangurti Reserved Forest are around 4 km north-west of the proposed site. No operational wind farm or wind farm projects are present in the study area.



Photo 3-1: A view of location proposed for NRB 35 falling in Khudwanpur Village
Date: September, 2015

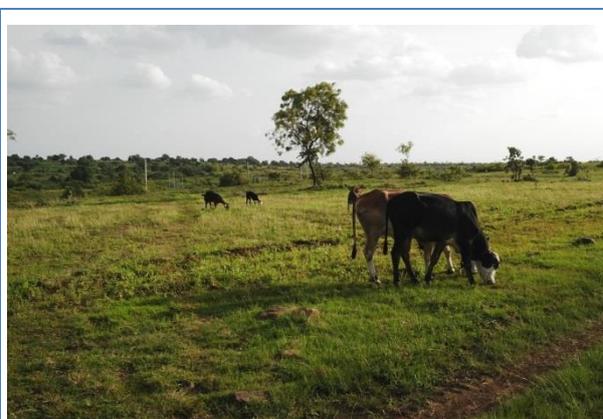


Photo 3-2: A view of the grazing activity near proposed turbine location for NRB 22
Date: September, 2015

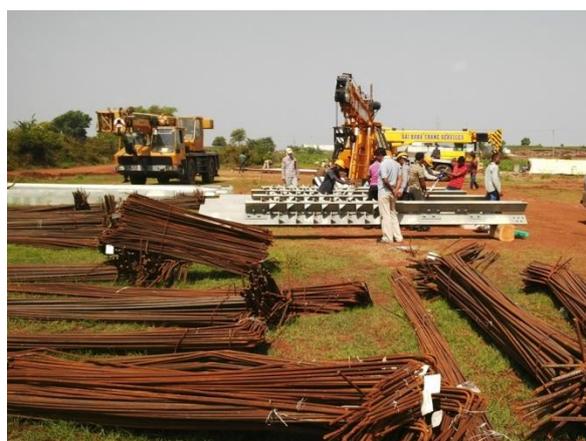


Photo 3-3 : View of the construction activity for the foundation at NRB 14
Date: September 2015



Photo 3-4 : View of a maize farming in the project area
Date: September 2015

3.3 Land Use

The land being procured for the proposed project predominantly comprises of private agricultural land which is being cultivated only during rainy season and for rest part of the year is used for grazing activity. Site surroundings also comprises of agricultural fields and fallow land (being used for cultivation only during rainy season and is used for grazing for remaining part of the year).

The entire project area is currently accessible by the local populace and there are no restrictions on movement of villagers and their livestock.

All the 47 WTGs are proposed to be located on private agriculture land which has been procured on willing buyer/ willing seller basis. In the project villages, most of the cultivable area covers only one season cropping pattern of Kharif crops and is dependent on rain water (monsoon) as the area lacks irrigation facilities. Maize and Cotton farming are some of the major crops cultivated in the area.

Table 3-3 provides the details of the land use and key observations for each WTG site as gathered during site survey.

Table 3-3: Brief Description of project WTG Locations

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
1	NRB 1	674	Fallow land	Accessible by village road, State Highway - 20 is around 500 m in the west direction	Turbine location is surrounded by agriculture land. Grazing activity was seen in the surroundings. Settlements were observed at approximately 300 m distance in the north and east direction from the proposed land. No water body was seen in the immediate vicinity.
2	NRB 2	670	Excavation and foundation work for the turbine was completed	Accessible by village road, State Highway - 20 is around 700 m in the west direction	Turbine location is surrounded by agriculture land. Grazing activity was seen in the site surroundings. Settlement was observed at approximately 100 m distance in the west direction from the turbine location. No water body was seen in the surroundings.
3	NRB 3	666	Fallow land	Accessible by village road, State Highway 20 is around 700 m in the west direction	Turbine location is surrounded by agriculture land. Grazing activity was seen in the site surroundings. Neither any settlement nor any water body was seen in the surrounding area.
4	NRB 4	663	Agricultural land with maize cultivation	Not accessible by village road. Access road to be developed. State Highway 20 is around 1.2 km in the west direction	Neither any settlement nor any water body was seen in the surrounding area.
5	NRB 5	662	Excavation completed and foundation work	Accessible by village road, State Highway 20 is	Turbine location is surrounded by agriculture land. Grazing activity was seen in the site surroundings.

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
			in progress	around 1.5 km in the west direction.	Poultry farm with few settlements was seen at around 30 m in the north and 200 m in the south direction from the turbine location.
6	NRB 6	660	Agricultural land with cotton cultivation	Approach road not present, at a distance of around 1.5 km from State Highway 20	Cotton and maize farming were seen in the surrounding area. Neither any settlement nor any water body was seen in the surroundings.
7	NRB 7	656	Agricultural land cotton cultivation	Approach road not present, at a distance of around 1.7 km from State Highway 20	Cotton and maize farming were seen in the surrounding area. Grazing activity was seen on site and surroundings during site visit. Neither any settlement nor any water body was seen present in the surroundings.
8	NRB 15	650	Excavation and foundation work for the turbine was completed	Accessible by village road, State Highway 20 is around 1km in the west direction.	Rain-fed agriculture field was seen adjacent to the proposed land; grazing activity was observed during site visit. Plywood factory was seen at distance of 430 m in North direction from the turbine location. Neither any settlement nor any water body was seen present in the surroundings.
9	NRB 22	666	Agricultural land with cotton cultivation	Accessible by village road, State Highway 20 is around 3 km in the North direction.	Pooling substation at a distance of ~60 m from the turbine location. Solar farm was seen around 350 m north direction. Neither any settlement nor any water body was seen present in the surroundings.
10	NRB 23	682	Agricultural field with cotton and maize farming	Approach road not present, turbine location at a distance of around 3.2 km from State Highway 20	Maize and cotton farming in surrounding area. Farm house being used only during cultivation season at distance of around 100 m in western direction from turbine location. Grazing activity was observed at site. No water body was observed in the surrounding area.
11	NRB 26	688	Agriculture field with cotton farming	Accessible by village road, State Highway 20 is around 2.5 km in the south direction.	Surrounded by agricultural land. Kadlapur village at around 350 m in north direction from the turbine location. No water body was seen.
12	NRB 28	683	Maize cultivation field	Accessible by village road, State Highway 20 is around 2.7 km in the west direction.	Surrounded by agricultural land. Kadlapur village at around 700 m in north direction from the turbine location. No water body was seen.
13	NRB 29	663	Turbine location is at a Hillock. Land is being	No approach road, Turbine location at a distance of ~1.5	Surrounded by maize and cotton field. Grazing activity was seen in the surroundings. Seasonal water

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
			used for maize farming	km from State Highway 20	body was observed at distance around 350 m in south direction of the turbine location. Farm house being used only during cultivation season is present at a distance of around 100m.
14	NRB 31	674	Excavation and foundation work for the turbine was completed	Accessible by village road. SH 20 is around 1.3 km in the south direction.	Excavation activity at site has been completed. Neither any settlement nor any water body is present in the surroundings. Steel plant was observed about 300 m in south direction of the turbine location.
15	NRB 34	672	Excavation work in progress	At a distance of ~0.7 km from SH 20. Accessible by village road.	Excavation activity at site was in progress. Cows and goats were seen grazing in the surroundings. Neither any settlement nor any water body is present in the surroundings. Jafferpally village approximately 700 m in south direction.
16	NRB 35	669	Levelling of the turbine location was completed	At a distance of ~130 m SH 20. Accessible by village road.	Site and surroundings are characterised by agriculture land. Grazing activity was observed in surrounding area. Khudwanpur village approximately 40 m in north direction. No water body is present in the surroundings.
17	NRB 39	669	Maize cultivation land	At a distance of ~120 m from SH 20. Accessible by village road.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Farmhouse approximately at 150 m distance in the southeast direction was seen. No water body is present in the surroundings.
18	NRB 41	670	Excavation work in progress on the day of site visit	At a distance of ~300 m from SH 20.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
19	NRB 43	680	Cotton cultivation field	Approach road not present, turbine location at a distance of 800 m from SH 20.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
20	NRB 48	676	Fallow Land	Approach road not present, turbine location at a distance of 300 m from SH 20.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings. Steel

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
					Plant approximately at distance of 400 m in northeast direction.
21	NRB 14	653	Excavation and foundation work for the turbine was completed	At a distance of ~1 km from road SH-20. Accessible by village road.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. No water body is present in the surroundings. Plywood Plant approximately at distance of 400 m in west direction. Madharam village is at distance Of 500 m in east direction from the turbine direction.
22	NRB 16	662	Cotton cultivation field	Accessible by village road, at a distance of ~1.2 km from SH-20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
23	NRB 17	655	Maize cultivation field	At a distance of ~1.5 km from SH-20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
24	NRB 18	662	Maize cultivation field	Approach road not present, turbine location at a distance of 1.7 km from SH 20.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
25	NRB 19	664	Maize cultivation field	Approach road not present, turbine location at a distance of 1.7 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Horse farms at approximately 500 m in south east direction. Neither any settlement nor any water body is present in the surroundings.
26	NRB 20	666	Field with maize cultivation	At a distance of ~2.5 km from SH-20	Pooling substation approximately 700 m in southwest direction. Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
27	NRB 24	674	Maize cultivation field	Approach road not present, turbine location at a distance of 3 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Kadlapur village at a distance of ~500 m, no water body is present in the surroundings.

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
28	NRB 27	682	Agricultural land with maize cultivation	Accessible by village road. At a distance of ~2 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
29	NRB 30	674	Fallow land	Accessible by village road. At a distance of ~2 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
30	NRB 36	665	Land being used in Maize farming	At a distance of ~600 m from village road	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Poultry farms and few temporary huts at approximately 350 m in south direction. No water body is present in the surroundings.
31	NRB 40	673	Fallow land	Accessible by village road. At a distance of ~150 m from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Poultry farms and few temporary huts at approximately 250 m in north direction. No water body was seen in the surrounding area.
32	NRB 44	681	Land being used in Maize farming	Approach road not present, turbine location at a distance of 500 m from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Farmhouse being used during cultivation period at approximately 400 m in north - east direction. No water body is present in the near vicinity.
33	NRB 49	674	Excavation and foundation work for the turbine was in progress	Accessible by village road. At a distance of ~700 m from SH 20	Site and its surroundings are characterised by agriculture land, grazing activity was seen in the surroundings. Labour camp present near the turbine location. Neither any settlement nor any water body is present in the surroundings.
34	NRB 54	688	Land being used in Maize farming	Accessible by village road. At a distance of ~1.7 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
35	NRB 56	681	Excavation and foundation work for the turbine was completed	Accessible by village road. At a distance of ~2.5 km SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
					settlement nor any water body is present in the surroundings.
36	NRB 57	680	Excavation and foundation work for the turbine was in progress	Approach road developed in the west direction at distance of ~200 m	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Small farm house present at distance ~ 100 m in south direction. Neither any settlement nor any water body is present in the surroundings.
37	NRB 58	672	Excavation and foundation work for the turbine was in progress	Accessible by the approach road developed by the Company	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
38	NRB 60	645	Cotton cultivation land	No approach road developed. Turbine is at distance of ~2 km from SH 20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
39	NRB 62	685	Maize cultivation field	No approach road developed. Turbine is at distance of ~250 m from village road	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
40	NRB 63	690	Maize cultivation field	No approach road, turbine is at distance of ~550 m west from village road	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
41	NRB 64	687	Land being used for maize cultivation	No approach road developed. Turbine is at distance of ~650 m west from village road	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
42	NRB 66	688	Land being used for maize cultivation	No approach road, turbine is at distance of ~950 m west from village road.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
43	NRB 67	690	Land being used for maize cultivation	No approach road, at distance of ~950 m west from village road.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.

SN	WTG No.	Elevation (amsl)	Existing Use of land/ Current Land Use of the Site	Accessibility	Site Surroundings
44	NRB 68	691	Maize cultivation alnd	No approach road developed. Turbine is at distance of ~550 m west from village road.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
45	NRB 69	691	Land with maize farming	No approach road developed. Turbine is at distance of ~550 m south from SH 20.	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
46	NRB 71	695	Fallow land	No approach road developed. Turbine is at distance of ~800 m south from SH 20.	Site and surroundings are characterised by agricultural land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.
47	NRB 72	674	Land with cotton farming	No approach road developed. Approach road development work in progress, at a distance of ~4.5 km from SH-20	Site and surroundings are characterised by agriculture land. Grazing activity was seen in the surroundings. Neither any settlement nor any water body is present in the surroundings.

Source: AECOM field survey

3.4 Wind Resource Assessment and Energy Production

Wind Resource Assessment of the area was carried out by Mytrah Vayu Godavari Pvt. Ltd. (MVGPL) and number and capacity of WTGs are arrived based on the results of the report. It was noted that average wind speed of the area is 6.76 m/s based on hourly mean values of wind speed observed at Kadlapur. Average monthly wind speed of the area is presented in **Table 3-4** below.

Table 3-4: Average Wind Speed

S. No	Month	Average Wind Speed (m/s)
1	January	6.59
2	February	6.58
3	March	6.61
4	April	5.96
5	May	6.67
6	June	8.17
7	July	8.42
8	August	7.09
9	September	5.79
10	October	6.01
11	November	6.42
12	December	6.78

3.5 Project Components

3.5.1 Turbine Components

A wind turbine is a structure that comprises of a tower, blades, a rotor hub, a generator and a transformer enclosed in a nacelle. A wind turbine traps the energy of moving wind, and converts the mechanical energy to electrical energy, thus, generating electricity. There are two types of wind turbines — vertical axis and horizontal axis. The more commonly used are the horizontal axis turbines. When a number of wind turbines are in a cluster, it is referred to as a 'wind farm'. A typical wind farm consists of turbines, access roads, transformers, office buildings, a grid connection point and transmission lines.

Tower: Tower is a vertical structure which supports the turbine and its auxiliary parts. The height of a tower is site-specific and depends on the rotor diameter and available wind at the site. The tower structure can be tapered, tubular steel or with a concrete base with steel upper sections. Sometimes, lattice towers are also used.

Blades: A typical modern wind turbine has three blades, although other designs are also available. The blades are usually made of fiber glass reinforced-poly-ester, epoxy resin or carbon fibre.

Nacelle: An enclosure which contains the main components of the turbine like the gear box, the generator and other auxiliary parts.

Rotor hub: Structure on which the blades of the turbine are attached. It circulates at a rate of 10 to 25 revolutions per minute (rpm). The speed of the rotor varies depending on the size of turbine and its design. It is further attached to a low speed shaft connected to the gearbox.

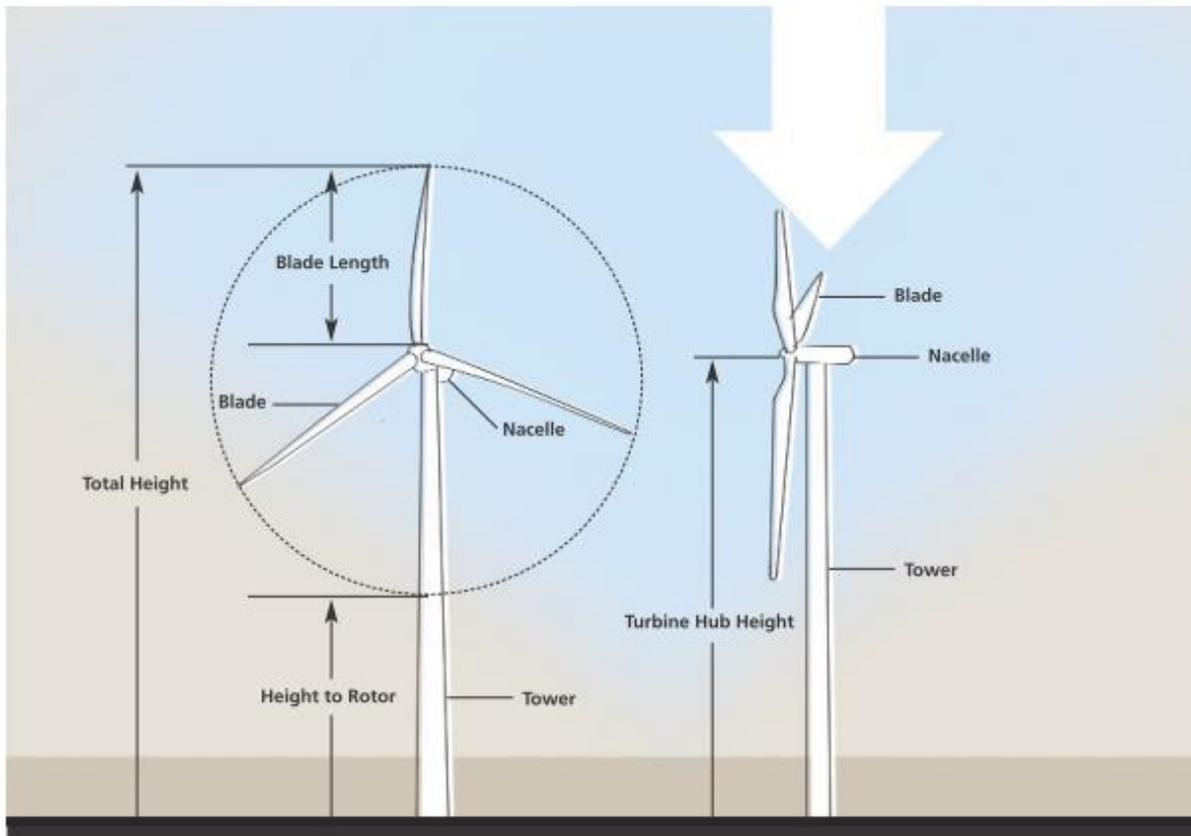
Gear box: It is enclosed in the nacelle. It is a vital component, which converts the slow rpm to a high speed ranging from 1,000 to 1,500 rpm.

Generator: It is also enclosed in the nacelle and converts mechanical energy to electrical energy.

Transformer: Its main function is to step-up medium voltage in between 10 kV to 35 kV depending on the grid's requirement.

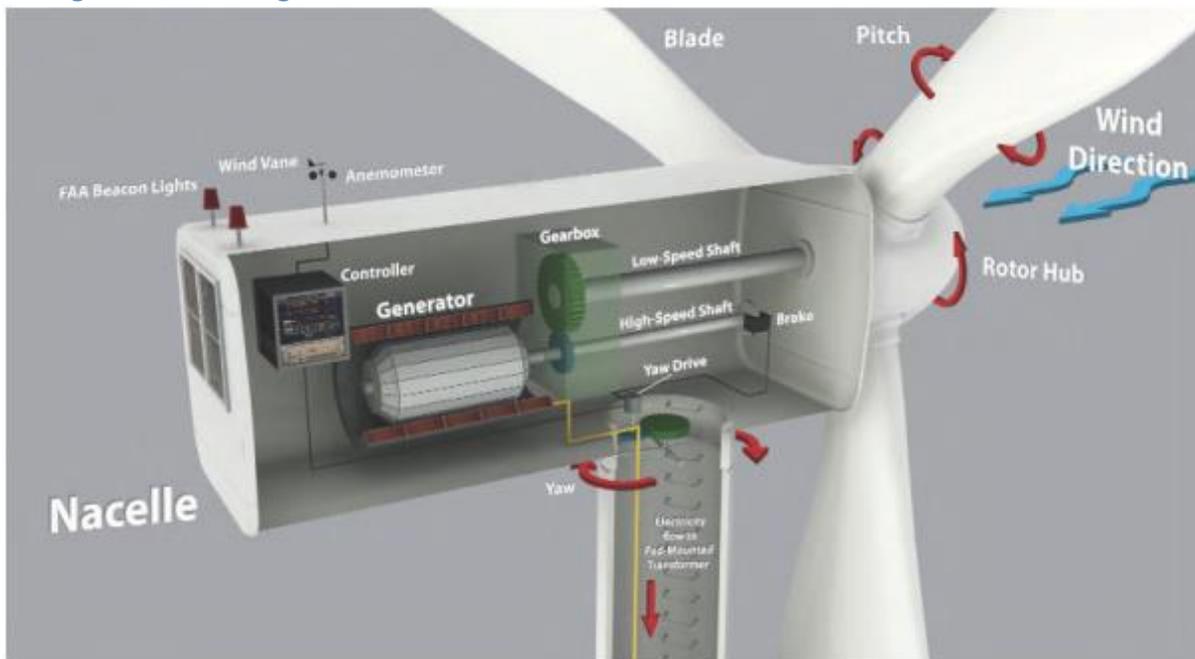
The major components of the turbine as mentioned above are illustrated in the **Figure 3-2** below. Working of wind turbine is presented in **Figure 3-3** below

Figure 3-2: Wind turbine and its components



Source: EIA guidelines, Wind Power by Centre for Science and Environment, New Delhi

Figure 3-3: Working of Wind Turbine



Source: EIA guidelines, Wind Power by Centre for Science and Environment, New Delhi

3.5.2 Technical Details

The key technical details of the proposed wind turbine generator are as provided in **Table 3-5**.

Table 3-5: Technical Details of Proposed WTGs

OPERATING DATA	
Rated Power	2100 kW
Cut-in wind speed	3.5 m/s
Rated wind speed	11 m/s
Cut-out wind speed	20 m/s
Rotor	
Rotor Diameter	97 m
Number of blades	3
Swept area	7386 sq. m.
Generator	
Frequency	50/60 Hz
Type	Asynchronous 3 phase induction generator with slip rings operated with rotor circuit inverter system (DFIG)
Tower	
Type	Tabular steel tower
Hub height	120 m
Blade	
Type	SB47

Source: Suzlon S97 Brochure

The S97 120m is world’s tallest Hybrid Tower designed to harness the wind energy across low wind sites. It is a combination of lattice and tubular structure which ensures higher yield and increased power output of 12-14% over at 90 meter tower. Salient features of the model are as described below:

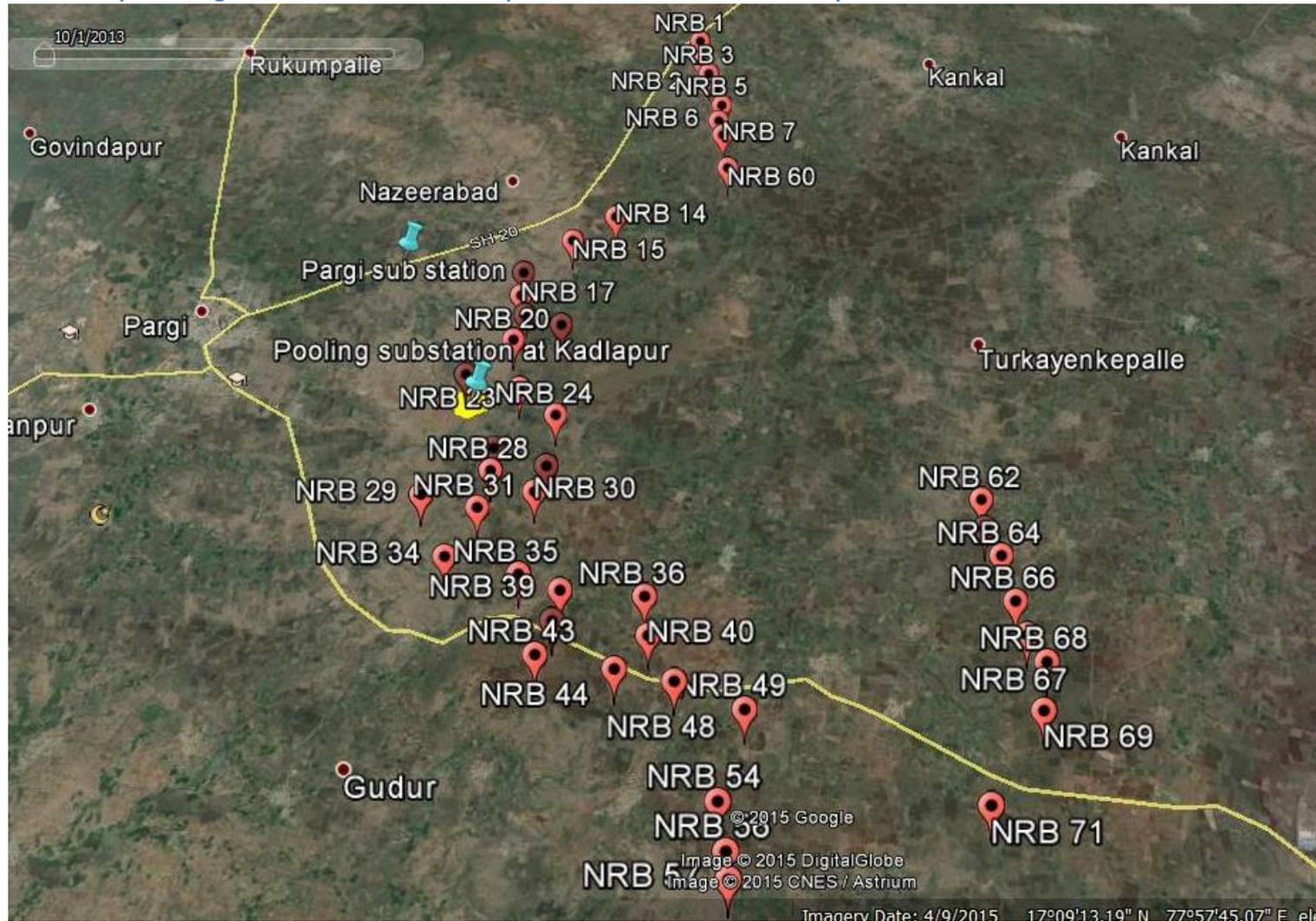
- 120 m hybrid tower with lattice structure at the base and the tubular upper section
- Increased hub height raises energy output and hybrid design reduces overall weight
- The 24 Sq. m base enhances stability and strength of the turbine structure
- Provision of lift and placement of the control panel at the intermediate platform improves operational safety and security
- Tower confirms to GL 2003 design guidelines

3.5.3 Power Evacuation System

The power generated by the respective wind turbines will be transmitted through single/ double circuit 33kV transmission lines up to Pooling Substation located at Kadlapur village, which is under construction. The power will then be stepped up from 33kV to 220kV at the Pooling Substation and transmitted through a double circuit 220kV transmission line to 220/132 kV APTRANSCO’s (Transmission Corporation of Andhra Pradesh Limited) Substation located at Pargi, at a distance of about 2 km from NRB 16 towards west.

Map showing location of pooling substation at Kadlapur and grid substation at Pargi with the proposed locations of WTGs is presented in **Figure 3-4** below.

Figure 3-4: Map showing location of Substation for power evacuation from the Proposed Wind Farm



Source: Google Earth

3.5.4 Access Roads

Establishment of access to the site will be one of the preliminary activities that have to be undertaken as part of construction process. Construction of new approach roads from the nearest existing Government road have been proposed for accessing the wind turbine locations. The internal and external approach roads of width 6 meter and length 16 km and 17 km respectively will be developed to enable movement of large wind turbine components.

In case required, widening and expansion of other existing village/Govt. roads shall also be undertaken during the project implementation.

3.6 Land Requirement

MVGoPL intends to develop 98.7 MW wind farm at Rangareddy and Mahbubnagar districts of Telangana and has procured private on willing seller/ willing buyer basis. Total land requirement for installation of WTGs will be around 57 hectares (ha.). Pooling substation at Kadlapur village is under construction on ~4.25 ha of private land. The entire project area comprises of private agricultural land or fallow land. The component wise break-up of the land required for the project is provided in below **Table 3-6**.

Table 3-6: Component wise breakup of the land area required

Project facilities	Land Area (ha)	Land Use Classification			Mode of Procurement
		Forest	Revenue	Private	
Wind Turbine	57	--	--	✓	Willing Seller/ Willing Buyer
Access Road (length)	4.5	--	--	✓	Willing Seller/ Willing Buyer
Substation/Switchyard/Administration Building	4.25	--	--	✓	Willing Seller/ Willing Buyer
Transmission Lines upto Pooling Sub Station (no of KMs)	3.4			✓	Willing Seller/ Willing Buyer

Source: MVGoPL

Land procurement for the project is being undertaken by the land team of MVGoPL.

3.6.1 Land Procurement Process

MVGoPL has procured ~57 ha of land from 16 villages falling under Rangareddy district and Mahbubnagar district of Telangana on willing seller/willing buyer basis.

Procurement of private land involves the following steps:

- Identification of land
- Negotiation with land owners
- Acquisition of land – execution of sale deed with land owners by the company

3.7 Project Implementation Mechanism

3.7.1 Land Procurement

Land procurement for the project is being undertaken by the land team of MVGoPL, who is also responsible for obtaining all the necessary approvals and NOCs.

3.7.2 Erection and Commissioning Contractor

Suzlon is the Erection and Commissioning Contractor for the proposed project. The scope of services for commissioning and erection include the following:

Commissioning

- Conducting pre-commissioning tests on each WTG as per approved Standard Operating Procedure (SOP);
- Commissioning of each WTG for the Project in presence of respective government authority officers and representatives of MVGoPL; and
- Commissioning of Unit Transformer, etc.

Erection

- Pre erection checks;
- Mobilize resources for erection of WTGs;
- Provide all the requisite support in terms of documentation, procedure, quality assurance plan, and guidance and supervision assistance;
- Maintenance of storage yard including security, transportation including loading and unloading of WTG and all accessories to the Location from the Storage Yard;
- Cleaning of nacelle, blades and towers preferably with mild detergent soap solution, prior to erection of the rotor;
- Assembly and erection of S 97_120 Suzlon 2.10 MW WTG at the Project Site;
- Erection of Unit transformer in the DP yards;
- Laying and termination of power cables between the Unit transformer and the WTG power Panel including earth strips; and
- Termination of SCADA cables and accessories in WTG and Control room end.

3.7.3 Operation and Maintenance (O&M) Contractor

MVGoPL has entered into an Operations and Maintenance (O&M) Agreement with Suzlon for operation and maintenance of the Project for 20 years. Supervisory/Management Role will be carried out by both Suzlon and MVGoPL. Scope of services includes:

- Operation of the project in compliance with SOPs, applicable laws and good industry practices;
- Provide operation and management services to MVGoPL, inter alia involving management and operation of (not involving spares/consumables but including labour and other required manpower) the WTGs;
 - shall provide suitable manpower for O&M Services which shall cover periodic preventive management, cleaning and upkeep of the Project;

- Preparation and submission of Monthly Performance Reports, consumption reports for major components, planned & unplanned maintenance reports, breakdown analysis reports;
- Provide technical assistance including checking of various technical, safety and operational parameters of the Equipment, trouble shooting and relevant technical services including root cause analysis for major components, power curve performance analysis & improvement; and
- Shall provide crane as and when required performance of O&M services.

3.8 Project Development – Construction Phase

The proposed project will involve transportation, erection and commissioning of the wind turbine generators and auxiliary components. Topographic surveys and geotechnical investigations is being carried out to ascertain the soil bearing capacity. The wind farm development will entail site levelling and site clearance activities, construction of civil structures, development of electrical connections, internal and external roads.

3.8.1 Site Development

The erection of wind turbines will require development of site which will involve Soil Testing, Site Levelling, construction of Approach Roads, construction of Crane Platform, development of existing village/Govt. roads suitable for transporting the WTG Components, etc. Majority of the proposed WTG locations constitute plain land that requires little levelling.

3.8.2 Civil Works

The major civil work would involve the following activities:

- Development of Village/Govt. roads, wherever required for transporting the WTG Components;
- Construction of Approach roads from nearest Village/Govt. road to respective WTG locations;
- Construction of WTG Foundations;
- Construction of DP Yards;
- Construction of Control Rooms;
- Construction of Foundations for Structure and Equipment and Cable Trenches at Substation.

The erection work would involve the following activities:

- Erection of WTG Components
- Erection of 33kV and 220 kV Transmission Lines
- Erection of Structures and Equipment at the Substation

The WTG towers will be initially segmented at the time of arrival at site and will require bolting works to put the tower together during installation. The erection of tower would require cranes and preparation of platforms for installing cranes. Crane platform will require an area of 0.25 to 0.3 ha which will be prepared soil, rock and gravel to support the weight of the equipment. The crane will undertake the lifting activities to erect the turbines; the nacelle will be installed atop the tower first followed by installation of generator, rotor and blades.

3.8.3 Labour

During construction phase, the labour requirement will range from 40-45 during normal operations and 85-90 workers for peak construction activities (assuming construction work at 4 WTGs simultaneously). MVGoPL has ensured that local villagers will be employed for unskilled jobs, while contract labour will be hired for skilled work. The contract labour will be provided rented accommodation in nearby villages (Pargi or Kadlapur) or labour camps with adequate facilities for drinking water and toilets will be set up. At the time of site visit, 15-20 contract labour seen at site was from near by village (Kadlapur, Khudwanpur, Jafferpally and Raghvapur). Although no significant influx of migrant population is expected, 30-35 skilled workers for mechanical works will be hired from outside. The skilled labour will be accommodated in rented accommodation in nearby villages (Pargi or Kadlapur).

3.8.4 Water and Wastewater

The domestic water demand (comprising of drinking and flushing) for the construction workers will be about 2 m³/day and 4 m³/day during normal and peak operations respectively (@ 45liter per capita per day (lpcd) for 45 personnel and 90 persons during normal and peak period respectively). Water requirement for concreting and curing activities will be around 80 m³ and 50 m³ per foundation respectively. Water requirement for construction activity will be sourced through authorised tankers while packaged drinking water through authorised dealer will be used for drinking purpose.

Waste water generation from the construction activities will be limited to washing and cleaning activities. Adequate number of portable toilets³ with septic tank and soak pits will be provided at site to facilitate the disposal of sewage generated.

3.8.5 Waste Generation

Different type of wastes generated during the construction of the wind farm will include following:

- Vegetation (land clearing);
- Excavation material;
- Scrap metal off-cut fabricated steel and reinforcing steel;
- General packing material;
- Movement of heavy machinery for site clearance, earth moving, transportation and erection of wind turbine components will generate waste oil, hydraulic oil, lubricants, paints, degreasers and gearbox oil;
- Cable cut offs (electrical installations);
- Domestic waste (construction labour and site staff).

The wastes mentioned above are products of the construction phase and it is not always practical to avoid creating these wastes. However, it is important that the use and disposal of these wastes is considered with the principles of ecologically sustainable development.

³ Usual Standard as 1 unit for 15 person sa per IFC EHS Guidelines

Waste avoidance and reduction will be implemented wherever practically feasible. Waste reduction strategies that will be employed include the following:

- Minimising the clearing of vegetation through careful planning and design of access roads and location of substation;
- Accurate estimation and ordering of construction and electrical materials to avoid excess waste and minimise associated costs, etc.; and
- Waste Management Plan at site will include waste avoidance & reduction, recycle & reuse storage of waste at designated area and disposal as per the norms. Hazardous waste and its storage, transportation and disposal have to be in accordance with the Hazardous Waste Management Handling and Trans-boundary Movement Rules, 2008 and amendments. The hazardous waste generated will be disposed through an approved vendor.

3.9 Operation and Maintenance

A dedicated Operation and Maintenance (O&M) facility for storing equipment and supplies required during operation shall be maintained. There shall be a workshop facility available at site to take care of regular maintenance requirement of the Wind Turbines. A tool room with sufficient stock of tools and spares as well as critical components will be maintained at the site.

Pooling substation at Kadlapur village will be equipped with supervisory control and data acquisition (SCADA) system and central monitoring system (CMS). This system provides two-way communication with each wind turbine. A SCADA system allows a central computer system to monitor and control each turbine's operation.

An O&M agreement has been signed with Suzlon to entrust them with responsibility of operation, maintenance and/or in accordance with accepted industry practices.

3.9.1 Routine Operational Services

Routine activities during operation phase include cleaning and upkeep of the equipment such as:

- Torquing;
- Nacelle and Tower head torquing and cleaning;
- Frequency Converter Panel and Low Tension Panel Maintenance;
- Site Maintenance; and
- Security.

3.9.2 Preventive Maintenance

Preventive maintenance involves use of materials and consumables such as lubricants and oils, electrical and mechanical parts etc., for preventive maintenance and upkeep of the equipment including transformer yard, greasing of main bearings, yaw bearing and blade bearings; topping up of hydraulic and transformer oil; painting of equipment; brake pads for main brakes and yaw brakes; oil and dry filters; batteries; carbon brushes; coolant; cleaning detergents and solvents; pitch Capacitors and all electrical panels.

3.9.3 Breakdown Maintenance

The breakdown repair work use sub-assemblies/equipment, components, spares and consumables in the event of any breakdown or suspected breakdown due to any reasons. Major breakdown maintenance anticipated for wind farms include repairs/replacement of Generator and Motors, Nacelle, Rotor Unit, Hub, Transformers, yard, equipment, Blades, Frequency Converter Panels and Control Panels, Tower Components and Electricals; and servicing of Anemometer, Wind vanes, wind sensors and other sensors, Limit switches, etc.

3.9.4 Monitoring and reporting

The following records will be maintained during operational phase:

- Data logging records for power generation, wind speeds, grid availability, machine availability, machine breakdown, etc.;
- Daily and Monthly performance reports;
- Monthly meter reading for State Electricity Board;
- Visual observation record of wind farm and its components;
- Record of visitors;
- Record of accidents/incidents;
- Record of work permits and tool box talks; and
- Records pertaining to Lock-out Tag-out of turbines under maintenance.

3.9.5 Operation and Maintenance Staff

During operation, about 15 – 20 technical persons and 10- 15 support staff will be stationed at site. The staff will be provided with accommodation at nearby villages (Pargi/Kadlapur) with transportation facility to reach site. Adequate security arrangements will be required for the security of the equipments and hence the security staff will be locally hired.

3.9.6 Water Requirement

Water requirement during operation phase will be limited to domestic water demand comprising of drinking and flushing purposes only (estimated to be 1.57 m³/day @45 LPCD⁴ for 35 personnel's on site). For drinking purpose, packaged drinking water will be made available 24X7 for all the workmen. For flushing purposes, water from tankers will be utilized which will be stored in overhead tanks, installed at project/site office.

3.9.7 Waste Water Generation

Waste water generation during the operation phase of the project will be limited to the domestic waste water from the toilets. Septic tanks with adequate capacity and soak pit arrangement shall be

⁴ Manual on norms and standards for EC of construction projects

maintained at the project site for managing the waste water generated. It is estimated that 80% of the water used⁵ during operation phase will be generated as waste water at site i.e. 1.26 m³/day.

3.10 Current Status and Project Schedule

Status of project at the time of site visit (September 2015) is as follows:

- Land for all the 47 WTG locations was purchased, however registration process for 13 was underway;
- Excavation and PCC work was completed for turbine nos. NRB 14, NRB 15, NRB 02, NRB 31 & NRB 49;
- Excavation work was completed for turbine nos. NRB 58 and NRB 05;
- PCC work was planned for turbine no. NRB 05;
- Excavation work was in progress for turbine nos. NRB 56, NRB 57, NRB 41 and NRB 34;
- Foundation work of stub assembly was in progress for turbine no. NRB 14; and
- Civil work for pooling substation was in progress.



Photo 3-5: A view of the foundation work completed at WTG no. NRB 49.

Date- September, 2015



Photo 3-6: A view of excavation carried out at WTG no. NRB 5

Date- September, 2015

Commissioning of all the 47 WTGs is expected to be completed by March 2016. Tentative implementation schedule of the project is detailed out in **Table 3-7** below.

Table 3-7: Implementation Schedule

S.N	Activity	Expected date of commencement	Expected date of completion
1	Land Procurement	Completed	Completed
2	Access Roads	May, 2015	December, 2015
3	Pooling station and transmission line	November, 2014	November, 2015
4	Foundation of WTGs	September, 2015	January, 2016

⁵ Central Public Health and Environmental Engineering Organization (CPHEEO)

S.N	Activity	Expected date of commencement	Expected date of completion
5	Erection of WTGs	October, 2015	March, 2016
6	Commissioning of WTGs	January, 2016	March, 2016

Source: MVGoPL

3.11 Environmental Settings

3.11.1 Climate and Meteorology

The Climate of the District is characterised by hot summer and is generally dry except during the South west monsoon season. The year may be divided into four seasons. March to May is the summer season, June to September constitutes the South West monsoon season, October to December forms the North East monsoon season and January to February is the winter season.

Climate data published by Indian Meteorological Department (IMD), for nearest met station at Hyderabad, for the period of 1961 to 1990 is given below in **Table 3-8**.

Table 3-8: Meteorological Data based on observation from 1961 to 1990 for Hyderabad

Month	Mean Temperature		Humidity (%)	Rainfall (mm)	Mean Wind Speed (m/s)
	Daily Max (°C)	Daily Min (°C)			
January I	28.7	15.2	74	4.7	6.7
II			37		
February I	31.9	17.7	64	7.5	7.5
II			29		
March I	35.4	21.0	53	14.9	7.5
II			24		
April I	38.1	24.4	50	20.2	8.5
II			25		
May I	39.0	26.1	49	37.5	12.0
II			26		
June I	34.4	23.8	70	106.8	18.7
II			50		
July I	30.9	22.6	79	168.9	18.9
II			62		
August I	29.9	22.1	81	157.9	17.2
II			66		
September I	30.5	22.0	80	173.0	11.3
II			64		
October I	30.7	20.1	73	90.4	7.3
II			53		
November I	28.9	17.0	70	23.3	7.1
II			46		
December I	27.9	14.8	72	6.8	6.3
II			42		
Total Annual Mean I	32.2	20.6	68	811.9	10.8
Mean II			44		
No. of Years	30	30	30	30	30

Source: IMD

3.11.2 Wind Speed and Direction

Winds in project area are generally light in winter and moderate to strong in the monsoon. The annual mean wind speed during 1961 and 1990 was measured to be 10.8 (m/s), as shown in table above. The most prominent wind direction is East during the months of October to January. During February to April, the predominant wind direction is South East while from May to September Northwest to West is the predominant wind direction.

3.11.3 Rainfall

Recent data of Rangareddy district for last five (5) years and Mahbubnagar district for seven (7) years does not show much variation in rainfall except for the year 2005 wherein higher rainfall was experienced, as shown in **Table 3-9** below. The average annual rainfall recorded in five years for Rangareddy district was reported as 831.14 mm and average rainfall for seven years recorded for Mahbubnagar district was 723.97 mm as shown in **Table 3-9** below.

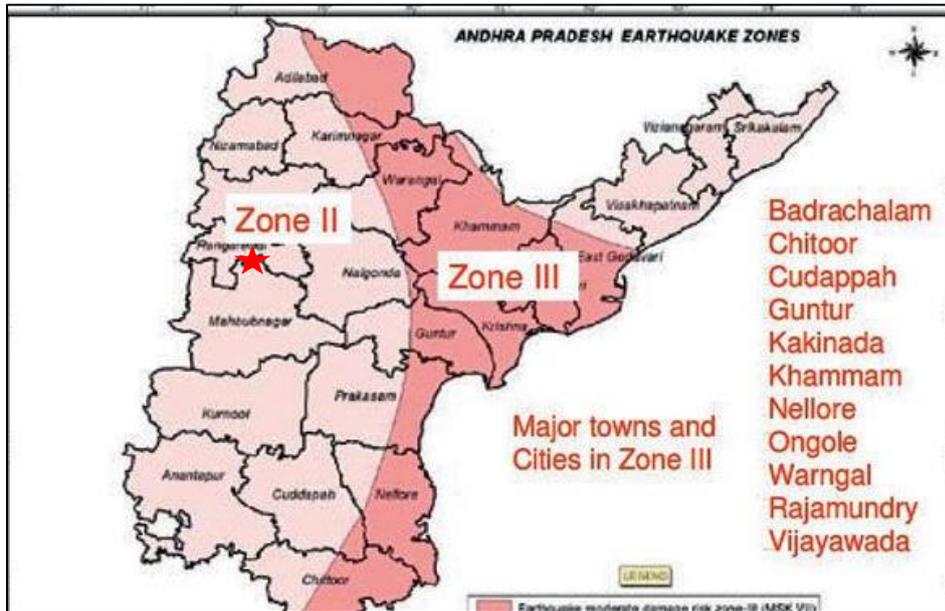
Table 3-9: Average Annual Rainfall for Project Districts

Rangareddy District													
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Annual
2004	23.8	5.8	14.2	37.7	47	34	234	81	148	104	0	0	729.1
2005	12.7	13.2	33.8	16.9	29.6	96	333	130	274	162	0	0	1101.3
2006	0	0	23.3	80.7	95.6	81	126	154	172	24	19.7	0	776.8
2007	0	0.1	0	19.4	29.9	140	42	183	190	35	25.2	0	664.4
2008	0	27.8	143	27.7	8.7	74	97	316	140	36	11.7	1.3	884.1
Monthly average	7.3	9.38	42.9	36.48	42.2	85	166	173	185	72	11.3	0.26	831.14
Mahbubnagar District													
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Annual
2004	16.6	0	0	15.2	26.2	30	98	30	99	108	0.4	0	422.8
2005	1.2	2	9	8.6	16.6	54	278	161	273	247	2.3	0	1052.3
2006	0	0	41.6	76.9	39	131	45	44	167	18	33.7	0	596.3
2007	0	0	0	2.7	19	230	104	163	253	43	32.9	0.1	847.5
2008	0	7	125	14.9	8.5	50	77	186	109	26	19	0.4	621.9
2009	0	0	7.1	4.2	23.2	60	42	143	212	229	25.6	0.2	745.7
2010	2.9	0	0	27.4	26.7	54	271	187	134	46	25	7.9	781.3
Monthly average	2.96	1.29	26	21.41	22.7	87	131	130	178	103	19.8	1.23	723.97

3.11.4 Seismicity

Proposed wind farm falls in two districts namely Rangareddy and Mahbubnagar of Telangana. Both the project districts lie in seismic zone II, i.e. low damage risk zone. The maximum intensity expected in this area would be around MSK VI. Map of earthquake zone showing the proposed site is presented below.

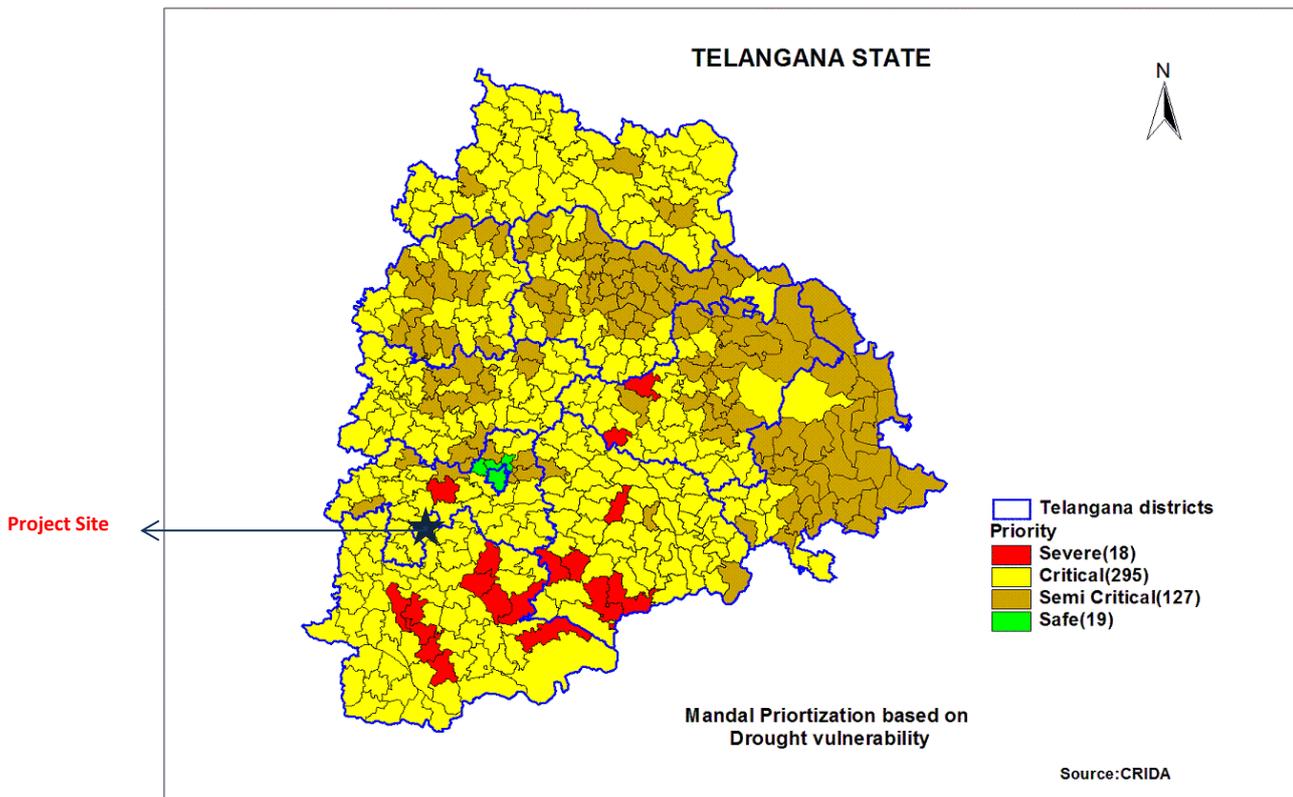
Figure 3-5: Map of Earthquake Zone showing project site



3.11.5 Drought

As per the audit report (Revenue Sector) for the year ended 31st March 2012, Rangareddy and Mahbubnagar districts of Telangana (project districts) are vulnerable to drought. Drought vulnerability map of Telangana State showing proposed project is presented in **Figure 3-6** below.

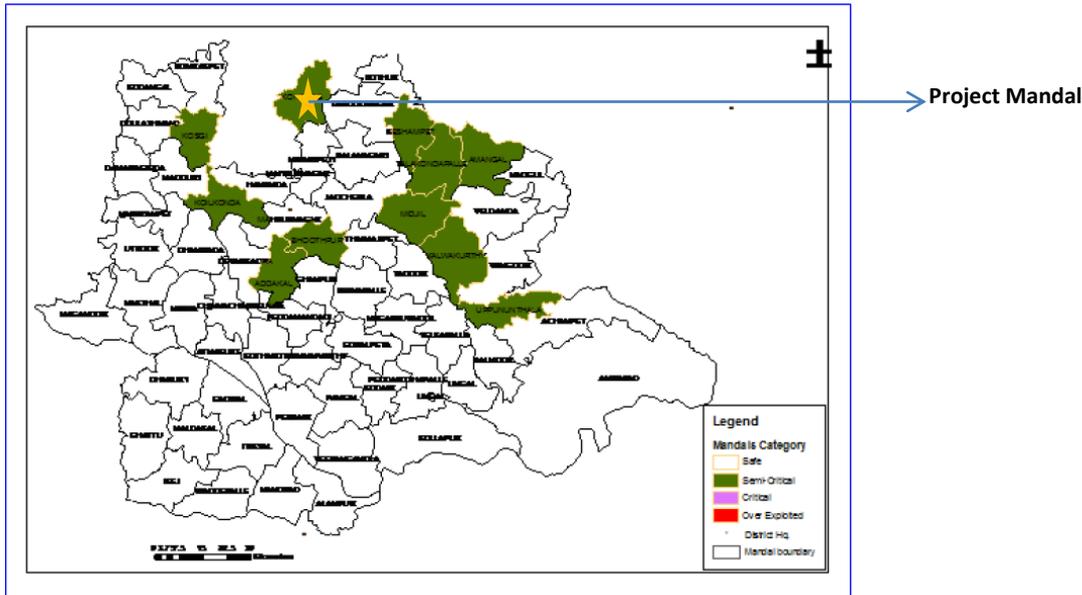
Figure 3-6: Drought Vulnerability Map of Telangana State showing project site



3.11.6 Ground Water Resources

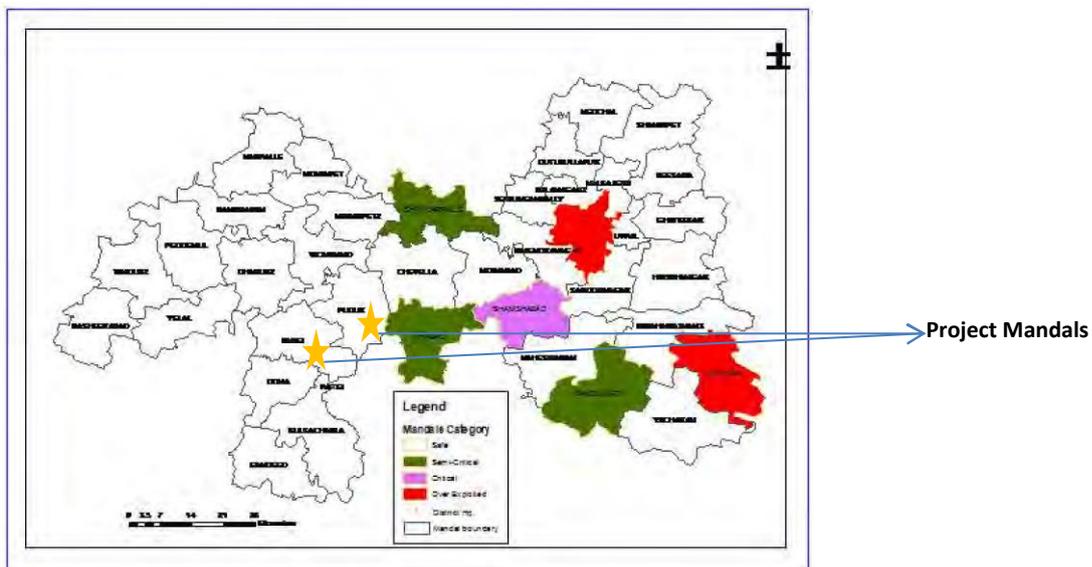
As per Ground Water Brochure of Mahbubnagar district, it falls under safe category with the average stage of development stands at 62% with 53 mandals falling under safe category and 11 under semi-critical category. Kondurg mandal, in which project lies comes under semi-critical category as presented in **Figure 3-7** below.

Figure 3-7: Mandal-wise categorization with respect to ground water development for Mahbubnagar



As per ground water brochure of Rangareddy district, the overall stage of ground water development in the district is 74%, and falls under safe category. Based on the ground water resource estimation, 1 mandal has been classified as Over-Exploited (OE), 4 mandals as Semi Critical and rest of mandals as Safe. Mandal Pargi and Pudur, project mandals falls in safe category as presented in Figure below.

Figure 3-8: Mandal-wise categorization with respect to ground water development for Rangareddy



4. LEGAL, POLICY AND ADMINISTRATIVE FRAMEWORK

This section outlines the legal framework and highlights the environmental and social regulations applicable to the Project. It broadly focuses on the:

- Enforcement Agencies;
- Applicable Environmental and Social Laws, Regulations and Policy;
- IFC Sustainability Framework, 2012;
- IFC EHS Guidelines for Wind Energy, August 2015 ;
- The IFC General EHS Guidelines;
- ADB Safeguard Policy Statement, 2009; and
- Applicable International Conventions/Protocols.

4.1 Enforcement Agencies

In India, the national level laws are formulated by the Ministry of Environment, Forests and Climate Change (MoEFCC) and state governments are required to consider these regulations as base level for implementation. The State Pollution Control Boards (SPCBs) are responsible for securing compliance under the Environmental Protection Act, 1986, the umbrella legislation regulating environmental issues in the country. The SPCBs are empowered by the Central Pollution Control Board (CPCB) to frame state specific environmental legislations for exercising the same or more stringent provisions as prescribed under the Act. A brief description of the relevant enforcement agencies both at central level and state level with respect to the institutional framework has been described in **Table 4-1**.

Table 4-1: Relevant enforcement agencies and their functions

S. No.	Agency	Functions
Central Level		
1.	Ministry of Environment, Forests and Climate Change (MoEFCC)	<p>The Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.</p> <p>The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being.</p> <p>The broad objectives of MoEFCC include the following:</p> <ul style="list-style-type: none"> • Conservation and survey of flora, fauna, forests and wildlife; • Prevention and control of pollution; • Afforestation and regeneration of degraded areas; • Protection of the environment; and • Ensuring the welfare of animals.
2.	Central Pollution Control Board (CPCB)	CPCB was created in September 1974 under the Water (Prevention and Control of Pollution) Act, 1974. Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. It serves

S. No.	Agency	Functions
		<p>as a field formation and also provides technical services to the Ministry of Environment, Forests and Climate Change of the provisions of the Environment (Protection) Act, 1986. Principal Functions of the CPCB are to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution, and to improve the quality of air and to prevent, control or abate air pollution in the country.</p> <p>The specific functions of CPCB include the following:</p> <ul style="list-style-type: none"> • Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air; • Plan and cause to be executed a nation-wide programme for the prevention, control or abatement of water and air pollution; • Co-ordinate the activities of the State Board and resolve disputes among them; • Provide technical assistance and guidance to the State Boards, carry out and sponsor investigation and research relating to problems of water and air pollution, and for their prevention, control or abatement; • Plan and organise training of persons engaged in programme on the prevention, control or abatement of water and air pollution; • Organise through mass media, a comprehensive mass awareness programme on the prevention, control or abatement of water and air pollution; • Collect, compile and publish technical and statistical data relating to water and air pollution and the measures devised for their effective prevention, control or abatement; • Prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devices, stacks and ducts; • Disseminate information in respect of matters relating to water and air pollution and their prevention and control; and • Lay down, modify or annul, in consultation with the State Governments concerned, the standards for stream or well, and lay down standards for the quality of air.
3.	The National Green Tribunal	<p>National Green Tribunal was constituted in 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues.</p> <p>The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations:</p> <ul style="list-style-type: none"> • The Water Act, 1974; • The Water Cess Act, 1977; • The Forest Conservation Act, 1980; • The Air Act, 1981; • The Environment Protection Act, 1986; • The Public Liability Insurance Act, 1991; and

S. No.	Agency	Functions
		<ul style="list-style-type: none"> The Biological Diversity Act, 2002
4.	Central Ground Water Authority	<p>Central Ground Water Authority was constituted under Section 3 (3) of the Environment (Protection) Act, 1986 to regulate and control development and management of ground water resources in the country.</p> <p>The Authority has been conferred with the following powers:</p> <ul style="list-style-type: none"> To regulate and control, management and development of ground water in the country and to issue necessary regulatory directions for the purpose.
5.	National Institute of Wind Energy (NIWE) erstwhile known as Centre for Wind Energy Technology (C-WET)	<p>NIWE has been established in Chennai in the year 1998, as an autonomous R&D institution by the Ministry of New and Renewable Energy (MNRE), Government of India. It functions with the following structure.</p> <ul style="list-style-type: none"> Research & Development unit: Its main focus towards novelty in developments of components as well as in sub-systems of wind turbines. Wind Resource Assessment Unit: The unit identifies resource rich regions in the country by conducting wind resource micro survey and offers its services to the wind farm developers. Testing Unit: To establish world class facilities in testing of complete Wind Turbine Generator Systems (WTGS) according to international standards (IEC) and Type Approval Provisional Scheme (TAPS-2000). Standards and Certification Unit: The unit carries out Provisional Type Certification of Wind Turbines as per the Indian Certification Scheme for Wind Turbines viz. Type Approval - Provisional Scheme - TAPS – 2000 (amended). Standards on Wind Energy are being developed by the unit. Information, Training & Commercial Service Unit: To establish and update the data bank and serve as finest information centre in wind energy by collecting, collating and analyzing the related information.
State Level		
1.	Telangana State Pollution Control Board (TSPCB)	<p>The Telangana State Pollution Control Board (TSPCB) is a statutory authority entrusted to implement environmental laws and rules within the jurisdiction of the State of Telangana, India. The Board ensures proper implementation of the statutes, judicial and legislative pronouncements related to environmental protection within the State. As per A.P. Re-organisation Act, 2014, Andhra Pradesh Pollution Control Board (APPCB) was bifurcated and TSPCB was constituted under Sec.4 of Water (Prevention & Control of Pollution) Act, 1974 and Section 5 of Air (Prevention & Control of Pollution) Act, 1981, on 7th July, 2014.</p> <p>The Board has the responsibility of implementing a series of Environmental Acts and Rules, either directly or indirectly as stated hereunder:</p> <ol style="list-style-type: none"> 4.1 Environment Protection Act; 4.2 Water Act; 4.3 Water Cess Act; 4.4 Air Act; 4.5 Hazardous Waste (Management, Handling and Trans boundary movement) Rules; 4.6 Bio Medical Waste (Management and Handling) Rules; 4.7 Municipal Solid Waste (Management and Handling) Rules; 4.8 Plastic Manufacture, Sale and Usage Rules; 4.9 Batteries (Management and Handling) Rules;

S. No.	Agency	Functions
		<p>4.10 Manufacture, Import and Storage of Hazardous Chemical Rules; and</p> <p>4.11 E-Waste (Management and Handling) Rules, 2011.</p>
2.	Telangana Forest Department	<p>Telangana Forest Department is one of the administrative divisions of Government of Telangana. It is headed by the Principal Chief Conservator of Forests. The primary function of this department is protection, conservation and management of forests in the Telangana State. It concerns on the entity of the human beings with the survival of each species in its habitat.</p> <p>The overall objective of the Telangana Forest Department is to conserve biodiversity and eco-systems of forests and wilderness areas to ensure water security and food security of the state. Wildlife and wildlife habitats should be conserved and sustainably managed to meet the social, economic, ecological, cultural, recreational and spiritual needs of the present and future generations of people in the state.</p>
3.	Transmission Corporation of Telangana Limited	<p>Andhra Pradesh State Electricity Board (APSEB) came into existence in 1959, was responsible for Generation, Transmission and Distribution of Electricity. Under Electricity Sector Reforms agenda, Government of Andhra Pradesh promulgated Andhra Pradesh Electricity Reforms Act, 1998. The erstwhile APSEB was unbundled into one Generating Company (APGENCO), One Transmission Company (APTRANSCO) and Four Distribution Companies (APDISCOMs) as part of the reform process.</p> <p>APTRANSCO came into existence on 1st February, 1999. From Feb 1999 to June 2005 APTRANSCO remained as Single buyer in the state-Purchasing power from various Generators and selling it to DISCOMs in accordance with the terms and conditions of the individual PPAs (Power Purchase Agreement) at Bulk Supply Tariff (BST) rates. Subsequently, in accordance with the Third Transfer Scheme notified by GOAP, APTRANSCO ceased to do power trading and has retained powers of controlling system operations of Power Transmission</p> <p>As per AP Reorganization Act 2014, APTRANSCO was divided into TSTRANSCO and APTRANSCO. Accordingly TSTRANSCO was established as a Company w.e.f 2nd June, 2014 for the State of Telangana.</p>
4.	Telangana Power Generation Corporation Limited	<p>Telangana Power Generation Corporation Limited has been incorporated under Companies Act, 2013, on 19th May 2014 and commenced its operations from 2nd June 2014. It is a power generating organization of Telangana.</p>
5.	Director Industrial Safety and Health	<p>The main objective of the Director, Industrial Safety and Health is to ensure safety, health, welfare and working conditions of workers working in factories and in construction works by effectively enforcing the provisions of the Factories Act, the Building & Other Construction Workers Act and others labour legislations. It is also to ensure the protection of rights of workers and to redress their grievances.</p>
6.	Telangana New and Renewable Energy Development	<p>The genesis of Non-conventional Energy Development Corporation of Andhra Pradesh Limited [NEDCAP] took place in the year 1986 with the help of Government of Andhra Pradesh. The sole objectives of NEDCAP are to:</p> <ul style="list-style-type: none"> • Generate electricity through renewable sources like wind and solar on

S. No.	Agency	Functions
	Corporation limited ⁶	<p>decentralized manner;</p> <ul style="list-style-type: none"> • Conserve energy in rural areas; • Import and adopt viable technology and machinery in the areas of Non-conventional energy sources and ensures post installation service; • Impart training and to promote research and development in the field of Non-conventional energy sources
7.	Telangana Labour Welfare Board ⁷	<p>The Labour Welfare Board is constituted under Andhra Pradesh Labour Welfare Fund Act., 1987 for the purpose of administering the Labour Welfare Fund. The Act came into force w.e.f. 01.05.1988. The Labour Welfare Board is a body having perpetual succession and a common seal with a power to acquire hold and dispose off property, both movable and immovable, and shall, by the said name, sue and be sued.</p> <p>The Labour Welfare Board shall be entrusted with the responsibility of administration of the Labour Welfare Fund. The main functions of the Board shall be are:</p> <ul style="list-style-type: none"> • Receive contributions and other amounts like unpaid accumulations, in claims compensation, etc. • Maintain accounts of the Welfare Fund • Implement various welfare schemes for the benefit of the Welfare Fund Contributors in the State • To carry out such other functions as are assigned to the Board by or under the Act.
8.	Transportation Department, Telangana	<p>The Transport Department functions under the provisions of section 213 of the Motor Vehicle Act, 1988. The Transport Department is primarily established for enforcement of the provisions of the Motor Vehicle Act, 1988, Andhra Pradesh. Motor Vehicles Taxation Act, 1963 and the rules framed there under. The major functions of the Transport Department are</p> <ul style="list-style-type: none"> • Enforcement of the Motor Vehicles Act and Rules; • Collection of taxes and fees; • Issuance of Driving Licences and Certificate of Fitness to Transport Vehicles; • Registration of Motor Vehicles and granting regular and temporary permits to vehicles. <p>The department also carries out road safety work by conducting awareness campaigns, pollution check of vehicles and enforce measures such booking speeding vehicles through laser guns and interceptor vehicles and detect drunken drivers through breath analysers.</p> <p>The Transport Department is regulated by the Government of Andhra Pradesh in terms of policy formulation and its implementation. The Department is administered by the Transport Commissioner who is the Head of the Transport</p>

⁶ On 2 June 2014, the north-western portion of the state of Andhra Pradesh was bifurcated to form a new state of Telangana. Laws enacted for Andhra Pradesh will continue to remain in force in Telangana till such time as the new state of Telangana enacts its own laws. Thus, information available in the public domain regarding Telangana cites Andhra Pradesh State laws as of now.

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S. No.	Agency	Functions
		Department.

4.2 Applicable Environmental and Social Laws, Regulations and Policies

The relevant environmental and social Acts and Rules pertaining to the Project and their applicability has been summarised in the following **Table 4-2**.

Table 4-2: Applicable Environmental and Social Legislations

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
Overview of Applicable Legislations of Government of India			
1.	The Environment (Protection) Act 1986 , as amended in April 2003; EPA Rules 1986 , as amended in 2002.	TSPCB MoEFCC CPCB	<i>MVGoPL shall ensure compliance under these Rules in order to maintain stipulated standards and environmental management through various supporting rules promulgated under the EP Act.</i>
2.	EIA Notification 2006 as amended till 2009 The EIA Notification specifies undertaking environmental impact assessment study and obtaining environmental clearance from Ministry of Environment and Forests or State Environment Impact Assessment Authority. The Schedule of the notification provides criteria for categorising projects into A and B categories based on the magnitude and scale of the impacts associated with the project and provides for incorporating environmental safeguards in the project planning phase.	MoEFCC (for Category A Project) SEIAA (for Category B Project)	Wind power projects are not covered under the 2006 EIA notification and are, therefore, exempt from the EIA process. <i>The EIA Notification is not applicable to the proposed project.</i>
3.	The Water (Prevention and Control of Pollution) Act, 1974 , amended in 1988 (hereafter referred as Water Act)	TSPCB	As per the revised classification of industries into Red, Orange and Green Category, issued by Central Pollution Control Board dated June 4, 2012 ⁸ , the solar power generation through solar photovoltaic cell, Wind Power & mini hydel power (<25 MW) are classified under Green Category Industries and require Consent to Establish and Consent to Operate under Water (Prevention and Control of Pollution) Act, 1974.

⁸ As per the 57 th Conference of Chairmen and Member Secretaries

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
			<p><i>However, it is recommended that the MVGoPL should obtain Consent to Establish and Consent to Operate under Water Pollution Act, 1974 from TSPCB.</i></p>
4.	<p>The Noise (Regulation & Control) Rules, 2000 as amended in October 2002</p> <p>As per the Environment (Protection) Act (EPA) 1986 the ambient noise levels are to be maintained as stipulated by the Central Pollution Control Board (CPCB) for different categories of areas like, commercial, residential and silence zones etc.</p>	TSPCB	<p>There will be generation of noise during construction activities and during operation of wind energy generators. The Rules require activity/processes generating noise to ensure that the ambient noise standards are within the prescribed Standards.</p> <p><i>The project is required to maintain the noise limits prescribed for residential (55 dB (A) for daytime and 45 dB (A) for night-time) areas. MVGoPL/ Mytrah, construction contractor and O&M contractor (Suzlon) shall ensure compliance under these rules to maintain stipulated standards.</i></p>
5.	<p>Hazardous Wastes (Management Handling and Trans boundary Movement) Rules, 2008 as amended up to 2009 under the Environment (Protection) Act, 1986</p>	TSPCB	<p>Wind power projects use different types of fluids for the smooth operation of the turbines. Primarily, three main types of fluid are used:</p> <ol style="list-style-type: none"> i. Generator cooling fluid is used as coolant (a mixture of glycol and water, similar to what is used in automobile radiators); ii. Lubricating oil is used in the gearbox (synthetic oil); iii. Hydraulic oil for operating the blade pitch system, yaw mechanism and rakes. To protect transformer from heating, mineral oil (transformer oil) is used as coolant. <p>According to Section 3 (ze) of the Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008: “Used oil” means any oil derived from crude oil or mixture containing synthetic oil including used engine oil, gear oil , hydraulic oil, turbine oil, compressor oil, industrial gear oil, heat transfer oil, transformer oil, spent oil and their tank bottom sludge.</p> <p>It clearly indicates that the used lubricating oil, hydraulic oil and transformer oil falls in hazardous waste category as per definition of</p>

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
			<p>“Used oil” under Section 3 (ze).</p> <p><i>MVGoPL to make an application in Form 1 and submit to the TSPCB to obtain an authorization of handling, packaging, storing and management hazardous waste such as used oil, oily cotton rags that would be generated during the operation of the project.</i></p> <p>After authorization is granted, the management shall maintain the record of hazardous wastes handled in Form 3 and prepare and submit to the State Pollution Control Board, an annual return containing the details specified in Form 4 on or before the 30th day of June following to the financial year.</p> <p>In case the waste is transported, proof of transportation shall be maintained in Form 11, 12 and 13 as given in the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008.</p> <p>All the hazardous waste generated due to the project shall be stored and disposed as per the requirements of the <i>Hazardous Waste Rules</i> i.e., on a paved surface in a designated area with adequate secondary containment, with adequate labelling and before it is disposed to an TSPCB approved vendor.</p>
6.	<p>Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005</p>	MoEFCC	<p>The proposed project will involve use of insulating material for wiring and electrical units. Some of the insulating materials may comprise of ozone depleting substances.</p> <p><i>MVGoPL shall ensure that all the insulation material used for wiring and electrical units used for the proposed project are free of ozone depleting substances.</i></p>
7.	<p>The Electricity Act, 2003 including Rules 1956 and 2005</p> <p>The Rules specify the general safety requirements for construction, installation, protection, operation and maintenance of electricity supply lines</p>	TSTRANSCO	<p>The Electricity Act, 2003 allows private sector projects to obtain distribution Licences from the State Electricity Regulation Committee and to have open access to the transmission lines. The license requires power generating companies to comply with the standards of performance specified in the Act.</p>

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
	and apparatus.		<i>MVGoPL shall obtain license as mandated under provisions of the Electricity Act and ensure that the health and safety requirements specified under the Rules are complied with.</i>
8.	<p>The Motor Vehicles Act 1988, as amended by Motor Vehicles (Amendment) Act 2000, dated 14th August 2000</p> <p>The Central Motor Vehicles Rules 1989, as amended through 29th June, 2012</p>	Transport Department, Telangana	<p>Every motor vehicle other than motor cycles of engine capacity not exceeding 70 cc, manufactured prior to the first day of March 1990, shall be maintained in such condition and shall be so driven so as to comply with the standards prescribed in these rules.</p> <p><i>MVGoPL shall ensure compliance of stipulated emission standards under Rule 115. It shall be ensured that all the project vehicles are in possession of valid Pollution Under Control (PUC) Certificate issued by authorised agencies.</i></p>
9.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	Department of Land Resources, Ministry of Rural Development	<p>The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act is applicable only when land acquisition involving rehabilitation and resettlement and compensation is carried out by appropriate Government for its own use, hold and control including for Public Sector Undertakings for public purpose and for public private partnership projects.</p> <p><i>The land procured for the project is private agricultural land. The land has been procured on a 'willing buyer/willing seller' basis wherein the project proponent has individually negotiated directly with the land seller and land prices have been determined above the prevailing market value.</i></p> <p><i>As no Government bodies have been involved in the land procurement process and the project does not come under the purview of public private partnership, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act does not get triggered.</i></p>
10.	The Contract Labour (Regulation and Abolition) Act, 1970	Chief Labour Commissioner	<i>MVGoPL shall ensure that the EPC contractor has a valid license under the Contract Labour (Regulation and Abolition) Act, 1970 for</i>

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
			<p><i>executing any work through contracted labour. Any other contractors or third parties to be involved in the construction works for the proposed project, if required, will also be engaged only subject to availability of valid license.</i></p> <p><i>MVGoPL shall also ensure that conditions like hours of work, fixation of wages and other essential amenities in respect of contract labour are provided and are in compliance with the standards.</i></p>
11.	The Trade Union Act, 1926	Directorate of Industrial Safety and Health, Telangana	<p>Provides procedures for formation and registration of Trade Unions and lists their rights and liabilities. It encompasses any combination, permanent or temporary, that gets formed to regulate relationship between workmen and their employers.</p> <p><i>MVGoPL shall ensure that there is no policy restricting association of workers union.</i></p>
12.	The Child Labour (Prohibition and Regulation) Act, 1986	Directorate of Industrial Safety and Health, Telangana	<p>The Act prohibits employment of children in certain occupation and processes. The Act also specifies conditions of work for children, if permitted to work.</p> <p><i>MVGoPL shall ensure that no child labour is engaged at site for construction or operation works either directly or by the sub-contractors. MVGoPL shall include a clause in the subcontractor agreements prohibiting employment of child labour for the proposed project.</i></p>
13.	Bonded Labour (Abolition) Act 1976	Directorate of Industrial Safety and Health, Telangana	<p>The act states that all forms of bonded labour stands abolished and every bonded labourer stands freed and discharged from any obligations to render any bonded labour.</p> <p><i>MVGoPL shall ensure no bonded labour is engaged at site for construction or operation works.</i></p>
14.	Minimum Wages Act, 1948	Directorate of Industrial Safety and Health, Telangana	<p>Requires the Government to fix minimum rates of wages and reviews this at an interval of not more than 5 years. Every employer shall be responsible for the payment to persons employed by him of all wages required to be paid under this Act.</p> <p><i>MVGoPL shall ensure payment of minimum</i></p>

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
			<i>wages as fixed by the government without any gender bias.</i>
15.	Equal Remuneration Act, 1976	Directorate of Industrial Safety and Health, Telangana	It is the duty of an employer to pay equal remuneration to men and women workers for same work or work of a similar nature. <i>MVGoPL shall ensure compliance to the requirements of the Act.</i>
16.	Workmen’s Compensation Act, 1923	Directorate of Industrial Safety and Health, Telangana	The Act requires if personal injury is caused to a workman by accident arising out of and in the course of his employment, his employer shall be liable to pay compensation in accordance with the provisions of this Act. <i>MVGoPL shall ensure compliance to the requirements of the Act.</i>
17.	Maternity Benefit Act, 1961 No employer shall knowingly employ a woman in any establishment during the six weeks immediately following the day of her delivery or her miscarriage. No pregnant woman shall, on a request being made by her in this behalf, be required by her employer to do during the period any work which is of an arduous nature or which involves long hours of standing, or which in any way is likely to interfere with her pregnancy or the normal development of the foetus, or is likely to cause her miscarriage or otherwise to adversely affect her health.	Directorate of Industrial Safety and Health, Telangana	<i>MVGoPL shall ensure that engagement of female workers if any during their pregnancy is in compliance with the requirements of the act.</i>
Overview of Applicable Policies of Government of India			
18.	National Environmental Policy 2006	TSPCB	The dominant theme of this policy is that while conservation of environmental resources is necessary to secure livelihoods and well-being of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resource. <i>MVGoPL shall ensure compliance to the requirements of this policy.</i>
19.	Andhra Pradesh Wind Power Policy, 2015	NREDCAP	The new policy for power generation from non-conventional sources of energy promotes wind power generation in the state with a view to meet the growing demand for power in an

S.N.	Applicable Legislation/Policy	Agency Responsible	Applicable Permits and Requirement
			<p>environmentally and economically sustainable manner.</p> <p><i>MVGoPL shall ensure compliance to the requirements of Andhra Pradesh wind power policy till the newly formed Telangana State develops its own policy.</i></p>

4.3 IFC Performance Standards

The IFC Performance Standards stipulates that any proposed project shall meet the following requirements throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts.

Performance Standard 1

PS 1 establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects;
- Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- The project proponent’s management of environmental and social performance throughout the life of the project.

Applicability

The PS 1 is applicable to projects associated with environment and/or social risks and/or impacts. Environmental impacts associated with the construction, operation, and decommissioning of wind energy facilities activities may include, among others, impacts on the physical environment (such as

noise or visual impact) and biodiversity (affecting birds and bats, for instance), generation of small quantity of hazardous waste due to operation of D.G sets on site. Due to the typically remote location of wind farm, the transport of equipment and materials during construction and decommissioning may present logistical challenges (e.g., transportation of long, rigid structures such as blades, and heavy tower sections).

PS 1 is thus applicable to the project; hence an Environmental and Social Impact Assessment (ESIA) study is required to be conducted prior to commencement of the project. MVGoPL also needs to develop and implement an Environmental and Social Management System to manage the risks associated with its operations.

Performance Standard 2

PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The objectives of the PS 2 are:

- To promote fair treatment, non-discrimination, and equal opportunity of workers;
- To establish, maintain, and improve the worker-management relationship;
- To promote compliance with national employment and labour laws;
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain;
- To promote safe and healthy working conditions, and the health of workers; and
- To avoid the use of forced labour.

Applicability

The applicability of PS 2 will be more important during the construction phase as operation phase will only have limited number of staff. It not only covers the main employees, but all employees/workers, even those working through contractors. Local people shall be given priority for engagement as construction workers. Skilled labour will be sourced from outside. Thus, rented accommodation for migrant workers engaged in the project shall be arranged in nearby villages and/or towns. However in case labour camps are provided at site, standards pertaining to campsites will be applicable. MVGoPL to ensure that construction contractor shall provide adequate provisions such as access to clean water, sanitary facilities and other necessary facilities at the labour camp and construction sites.

MVGoPL shall ensure provision of measures to prevent child labour, forced labour, and discrimination. Freedom of association and collective bargaining shall be provided. Wages, work hours and other benefits shall be as per the national labour and employment laws. The terms and conditions of employment shall conform to those prescribed under Human Resource (HR) Policy of Mytrah.

Performance Standard 3

This performance standard outlines approach to pollution prevention and abatement in line with internationally disseminated technologies and practices with the following objectives:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities; and
- Promote the reduction of emissions that contribute to climate change.

Applicability

MVGoPL shall assess the impacts and risks associated with the generation, release, and/or disposal of pollutants; use and storage of hazardous substances & other raw materials during the ESIA, planned as part of the ESMS, and implement them. Also the pollution control measures shall be planned and implemented right from the project conception stage. Practices like handling of hazardous waste, minimal release of waste, safe disposal of waste, waste water management etc. shall be considered prior to each phase. PS 3 is therefore applicable for the proposed project.

Performance Standard 4

PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its main stress is to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected Communities.

Applicability

This performance Standard is applicable to projects which entail potential risks and impacts to the health and safety of affected communities from project activities. The proposed project will involve transportation of large components such as rotor blades, tubular towers which may pose safety risks to the neighbouring communities. Impacts due to generation of noise and shadow flickering effect will be assessed on habitations that are close to project wind turbines. The PS 4 is therefore applicable for the proposed project.

Environmental and Social Management Plan will be developed for the project and considering the nature and scale of the project, a Traffic Management Plan and Emergency Response and Preparedness Plan will be formulated to minimize and manage the risks associated with the project activities.

Performance Standard 5

PS 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Its main aim is to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by providing compensation for loss of assets at replacement

cost and ensuring that resettlement activities are implemented with appropriate disclosure of Information, consultation, and the informed participation of affected persons and community.

Applicability

The PS 5 is applicable when there is physical and/or economic displacement because of the project.

The land for the proposed project comprises of agricultural land which has been procured on 'willing buyer/willing seller' basis. The conditions of the 'willing buyer/willing seller' has been followed by the project proponent in terms of directly negotiating with the land sellers, providing compensation based on the prevailing market value and providing opportunities to the land sellers for productive investment of sales income.

As no physical and /or economic displacement has taken place due to the land transaction process for the project, PS 5 is therefore NOT applicable for the project.

Performance Standard 6

PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. This standard is aimed to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Applicability

PS 6 is applicable to projects located in modified, natural, and critical habitats; or projects that potentially impact on or are dependent on ecosystem services or that include the production of living natural resources .

The proposed project-area contains a mosaic of natural and modified habitats which is supporting a variety of flora and fauna, and providing various ecosystem-services to the local communities.

The remnant patches of natural vegetation in the area are providing habitats to a fairly good diversity of wild fauna. These patchy natural habitats are also likely to be acting as wildlife corridors which connect the faunal populations inhabiting the region. The proposed project-area also contains critical habitats, in the form of potential roosting, foraging and nesting sites of some globally threatened, a few endemic and many migratory species.

The project installations and activities are likely to cause a moderate loss, degradation or fragmentation of these habitats and services through alteration or obstruction of natural ecological flows and the removal of natural vegetation. Thus PS 6 is applicable for the project.

Performance Standard 7

PS 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limit their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.

Applicability

This Performance Standard applies to communities or groups of Indigenous Peoples whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein.

The project area or its surroundings does not support indigenous people. No material degradation or adverse impact is expected on land resources on which indigenous peoples are dependent.

PS 7 is therefore NOT applicable for the proposed project.

Performance Standard 8

PS 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

Applicability

This PS is applicable when tangible forms of cultural heritage, unique natural features or tangible objects that embody cultural values and certain instances of intangible forms of culture are impacted or are proposed to be used for commercial purposes.

There are no culturally important sites in or around the project site. Hence, PS 8 is NOT applicable for this project.

4.4 IFC Categorization of Projects

As part of its review of a project's expected social and environmental impacts, IFC uses a system of social and environmental categorization. This categorization is used to reflect the size of impacts understood as a result of the client's social and environmental assessment and to specify IFC's institutional requirements. The following categories are used by the IFC:

- **Category A Projects:** Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented;

- **Category B Projects:** Projects with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures;
- **Category C Projects:** Projects with minimal or no adverse social or environmental impacts, including certain financial intermediary (FI) projects with minimal or no adverse risks;
- **Category FI Projects:** All FI projects excluding those that are Category C projects.

IFC therefore categorizes projects primarily according to the significance and nature of impacts. IFC defines the project's area of influence as the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project; areas potentially impacted by cumulative impacts from further planned development of the project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

4.5 Applicable ADB Policies and Requirements

4.5.1 Safeguard Policy Statement (SPS), 2009

Built upon the three previous safeguard policies on the Involuntary Resettlement Policy (1995), the Policy on Indigenous Peoples (1998) and the Environment Policy (2002), the Safeguard Policy Statement of ADB was approved in 2009. The safeguard policies are operational policies that seek to avoid, minimize or mitigate adverse environmental and social impacts including protecting the rights of those likely to be affected or marginalized by the developmental process. ADB's safeguard policy framework consists of three operational policies on the environment, indigenous peoples and involuntary resettlement. A brief detail of all three operational policies have been mentioned below:

Environmental Safeguard: This safeguard is meant to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision making process.

Applicability: *The proposed project involves generation of power from wind energy which is one of the cleanest sources of energy. However the construction and operational activities of the project might result in some adverse impacts on the environment which can be mitigated through implementation of appropriate mitigation measures. The Environmental Safeguard is thus applicable to the proposed project.*

Involuntary Resettlement Safeguard: This safeguard has been placed in order to avoid involuntary resettlement whenever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced

persons in real terms relative to pre- project levels; and to improve the standards of living of the displaced poor and other vulnerable groups.

Applicability: *The proposed project involved transfer of private cultivable land. The land was used for agricultural purposes and has been sold by the land seller on a 'willing buyer/willing seller' basis wherein negotiations for compensation has been undertaken by the Project proponent directly on an individual basis. The compensation of the land prices has been determined above the prevailing market value. No physical or economic displacement has been involved in this process. Therefore, adverse impact due to land procurement is not anticipated.*

Indigenous Peoples Safeguard: This safeguard looks at designing and implementing projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems and cultural uniqueness as defined by the Indigenous Peoples themselves so that they receive culturally appropriate social and economic benefits; do not suffer adverse impacts as a result of projects; and participate actively in projects that affect them.

Applicability: *The project area and its surroundings are not native to any indigenous people. No material degradation or adverse impact is expected on land resources on which indigenous peoples are dependent. Moreover, the project proponent has not procured any land belonging to any vulnerable community in the region. Therefore, adverse impact on indigenous peoples is not anticipated.*

Information, Consultation and Disclosure: Consultation and participation are essential in achieving the safeguard policy objectives. This implies that there is a need for prior and informed consultation with affected persons and communities in the context of safeguard planning and for continued consultation during project implementation to identify and help address safeguard issues that may arise. The consultation process begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle. It provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people and is undertaken in an atmosphere free of intimidation or coercion. In addition, it is gender inclusive and responsive and tailored to the needs of disadvantaged and vulnerable groups and enables the incorporation of all relevant views of affected people and other stakeholders into decision making. ADB requires the borrowers/clients to engage with communities, groups or people affected by proposed projects and with civil society through information disclosure, consultation and informed participation in a manner commensurate with the risks to and impacts on affected communities. For projects with significant adverse environmental, involuntary resettlement or Indigenous Peoples impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.

It was informed at the time of site visit that community around the vicinity of the project site has been informally informed about the proposed project. The community are aware of the Site Office premises and the concerned person to contact and are free to get in touch whenever required. However, no formal meetings have been undertaken by MVGoPL team to disseminate any project related information.

4.5.2 Social Protection Strategy, 2001

ADB has designed a set of policies and programs for social protection in 2001, that is, to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income. The basic aim of the Social Protection Strategy (SPS) is to assist individuals to break the cycle of poverty and enhance the quality of growth through adequate and developed social protection systems in the member countries of ADB. The type of risks covered through the SPS may be economic, environment or social/governance related.

The proposed project shall ensure that the requirements of the ADB's SPS are complied with. Priority shall be given to any identified vulnerable groups. Based on the gender analysis and status of women in the project area, measures for ensuring their overall development shall be taken up by the project proponent. MVGoPL shall comply with applicable labor laws in relation to the Project. Mytrah shall also take the following measures to comply with the core labor standards⁹;

- (a) carry out its activities consistent with the intent of ensuring legally permissible equal opportunity, fair treatment and non-discrimination in relation to recruitment and hiring, compensation, working conditions and terms of employment for its workers (including prohibiting any form of discrimination against women during hiring and providing equal work for equal pay to men and women engaged by MVGoPL);
- (b) no restriction to workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment;
- (c) engage contractors and other providers of goods and services:
 - i. who do not employ child labor¹⁰ or forced labor¹¹;
 - ii. who have appropriate management systems that will allow them to operate in a manner which is consistent with the intent of (a) ensuring legally permissible equal opportunity and fair treatment and non-discrimination for their workers, and (b) not restricting their workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment; and
 - iii. whose subcontracts contain provisions which are consistent with paragraphs (i) and (ii) above.

⁹The core labor standards are the elimination of all forms of forced or compulsory labor; the abolition of child labor; elimination of discrimination in respect of employment and occupation; and freedom of association and the effective recognition of the right to collective bargaining, as per the relevant conventions of the International Labor Organization.

¹⁰Child labor means the employment of children whose age is below the statutory minimum age of employment in the relevant country, or employment of children in contravention of International Labor Organization Convention No. 138 'Minimum Age Convention' (www.ilo.org)

¹¹Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

4.5.3 Public Communications Policy 2011

The Public Communications Policy (PCP) of ADB, originally formulated in 2005 and revised in 2011, is aimed at promoting improved access to information about ADB's operations related to funded projects. It endorses greater transparency and accountability to stakeholders involved in a project. The PCP establishes the disclosure requirements for documents and information related to projects. It mandates project-related documents normally produced during the project cycle to be posted on the web.

The Project Proponent shall ensure that the requirements of ADB's PCP are complied with. The Project Proponent shall engage regularly with the stakeholders identified for the project throughout the project life cycle with essential communications and information-sharing aspects intrinsic to the project to maintain greater transparency and accountability amongst the project's stakeholders. This will enable the stakeholders to better participate in the decisions that may impact/affect them during the project life cycle.

4.5.4 ADB's Environment Categorization of Projects

The project classification system of ADB is used to reflect the significance of potential environmental impacts understood as a result of the client's impact assessment and to establish ADB's safeguard requirements. The categories used by ADB are:

- **Category A Projects:** Projects which are likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented;
- **Category B Projects:** Projects with potential adverse environmental impacts that are less in number, generally site-specific, mostly reversible and readily addressed through mitigation measures;
- **Category C Projects:** Projects with minimal or no adverse environmental impacts;
- **Category FI Projects:** Projects which involve investment of ADB funds to or through a financial investment.

4.6 Applicable Environmental Standards

The applicable environmental standards for the proposed project have been discussed in the subsequent sections. The Central Pollution Control Board (CPCB) has specified National Ambient Air Quality Standards (NAAQS) for residential, commercial, industrial and sensitive zones. Ambient air quality will be a concern only during construction phase of the project. Noise standards notified by MoEF for different land uses will be followed.

In case of wind farm projects as there are no specific standards, general wastewater discharge is to be followed.

4.6.1 Ambient Air Quality

In India, the Central Pollution Control Board (CPCB) has specified National Ambient Air Quality Standards (NAAQS) for residential, commercial, industrial and sensitive zones for the country as a whole. Revised National Ambient Air Quality Standards (MoEF notification G.S.R 826(E), dated 16th November, 2009) have been presented below in **Table 4-3**.

Table 4-3: Ambient Air Quality Standards

S. No	Pollutant	Time Weighted Average	Concentration in ambient air for Industrial Area Residential, Rural & other Areas
1	Sulphur Dioxide(SO ₂)	Annual Avg*	50.0 µg/m ³
		24 hours**	80.0 µg/m ³
2	Oxides of Nitrogen as NO ₂	Annual Avg*	40.0 µg/m ³
		24 hours**	80.0 µg/m ³
3	Particulate matter (size less than 10µm)	Annual Avg*	60.0 µg/m ³
		24 hours**	100.0 µg/m ³
4	Particulate matter (size less than 2.5 µm)	Annual Avg*	40.0 µg/m ³
		24 hours**	60.0 µg/m ³
5	Lead (Pb)	Annual Avg*	0.5.0 µg/m ³
		24 hours**	1.0 µg/m ³
6	Carbon Monoxide (CO)	8 hours**	2.0 µg/m ³
		1 hour	4.0 µg/m ³
7	Ozone	8 hours**	100.0 µg/m ³
		1 hour	180.0 µg/m ³
		24 hours**	60.0 µg/m ³
8	Ammonia (NH ₃)	Annual Avg*	100.0 µg/m ³
		24 hours**	40.0 µg/m ³
9	Benzene	Annual Avg*	5.0 µg/m ³
10	Benzo(a) pyrene	Annual Avg*	1.0 ng/m ³
11	Arsenic	Annual Avg*	6.0 ng/m ³
12	Nickel		20.0 ng/m ³

Note:

*Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval

** 24 hourly / 8 hourly or 1 hourly monitored values as applicable shall be complied with 98 % of the time in a year.

However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

As per EHS guidelines of IFC of December 2008, “the ambient air quality standards are ambient air quality levels established and published through national legislative and regulatory process and ambient quality guidelines refers to ambient quality level primarily developed through clinical, toxicological and epidemiological evidences (such as those published by the World Health Organization)”.

4.6.2 Water Quality Standards

The designated best use classification as prescribed by CPCB for surface water is given in **Table 4-4** below.

Table 4-4: Primary Water Quality Criteria for Designated Best Use Classes

Designated Best Use	Class of Water	Criteria
Drinking water source without conventional treatment but after disinfections	A	1. Total coliform organisms (MPN/100 ml) shall be 50 or less 2. pH between 6.5 to 8.5 3. Dissolved Oxygen (DO) 6 mg/l or more, and 4. Biochemical Oxygen Demand (BOD) 2 mg/l or less
Outdoor bathing (Organised)	B	1. Total coliform organisms (MPN/100 ml) shall be 500 or less 2. pH between 6.8 to 8.5

Designated Best Use	Class of Water	Criteria
		3. Dissolved Oxygen 5 mg/l or more, and 4. Biochemical Oxygen Demand 3 mg/l or less
Drinking water with conventional treatment followed by disinfections	C	1. Total coliform organisms (MPN/100 ml) shall be 5000 or less 2. pH between 6 and 9 3. Dissolved Oxygen 4 mg/l or more, and 4. Biochemical Oxygen Demand 3 mg/l or less
Propagation of wild life and fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4 mg/l or more, and 3. Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, controlled waste disposal	E	1. pH between 6.0 and 8.5 2. Electrical conductivity less than 2250 micro mhos/cm, 3. Sodium Absorption Ratio (SAR) less than 26, and Boron less than 2 mg/l.
	Below E	Not meeting A, B, C, D & E Criteria

Note: MPN= Most Probable Number

Source: Central Pollution Control Board

Drinking water quality standards as per IS 10500, 2012 by Bureau of Indian Standards (BIS) is presented in **Table 4-5** below.

Table 4-5: Drinking Water Standards as per IS 10500, 2012

S. No	Parameters	Measurement Unit	IS 10500* specification for Drinking water (Desirable limit/ Permissible limit)
1.	pH Value	Unit	6.5-8.5 (No relaxation)
2.	Turbidity	NTU	1 (5)
3.	Colour	Hazen units	5 (15)
4.	Total Dissolved Solids	mg/L	500 (2000)
5.	Total Alkalinity (as CaCO ₃)	mg/L	200 (600)
6.	Nitrate	mg/L	45 (No relaxation)
7.	Chlorides (as Cl)	mg/L	250 (1000)
8.	Sulphate	mg/L	200(400)
9.	Calcium (as Ca)	mg/L	75 (200)
10.	Magnesium (as Mg)	mg/L	30 (100)
11.	Fluorides (as F)	mg/L	1.0 (1.5)
12.	Total Hardness (as CaCO ₃)	mg/L	200 (600)
13.	Arsenic (as As)	mg/L	0.01 (0.05)
14.	Iron (as Fe)	mg/L	0.3 (No relaxation)
15.	Copper (as Cu)	mg/L	0.05 (1.5)
16.	Mercury (as Hg)	mg/L	0.001 (No relaxation)
17.	Zinc (as Zn)	mg/L	5 (15)
18.	Total Chromium (as Cr)	mg/L	0.05 (No relaxation)
19.	Barium (as Ba)	mg/L	0.7 (No relaxation)
20.	Cadmium (as Cd)	mg/L	0.003 (No relaxation)
21.	Conductivity	mS/cm	--
22.	Total Suspended Solids (TSS)	mg/L	---
23.	Salinity	mg/L	---
24.	Oil & Grease	mg/L	---
25.	Dissolved Oxygen (DO)	mg/L	---
26.	COD	mg/L	---

S. No	Parameters	Measurement Unit	IS 10500* specification for Drinking water (Desirable limit/ Permissible limit)
27.	BOD	mg/L	---
28.	Phosphate	mg/L	---
29.	Lead	mg/L	0.01 (No relaxation)
30.	Total Coliform	MPN/100mg	10 (No relaxation)
31.	Faecal Coliform	---	---

*The figures in the brackets indicated permissible limit in absence of alternate source

As per IFC EHS guidelines, the treated sewage discharge shall meet the following guidelines:

Table 4-6: Treated Sewage Discharge

S. No	Parameter	Guideline Value
1	pH	6-9
2	BOD	30 mg/l
3	COD	125 mg/l
4	Total Nitrogen	10 mg/l
5	Total Phosphorus	2 mg/l
6	Oil & Grease	10 mg/l
7	Total Suspended Solids	50 mg/l
8	Total Coliform Bacteria	400 MPN/100 ml

Note: MPN= Most Probable Number

Source: General EHS Guidelines prescribed by IFC

4.6.3 Ambient Noise Standards

As per IFC EHS Guidelines, the hourly equivalent noise level (L_{Aeq}) for residential, institutional and commercial area shall be within **55 dB (A)** during daytime (0700-2200 hours) and **45dB (A)** during night time (2200-0700 hours).

Ambient noise standards notified by MoEFCC via gazette notification dated February 14, 2000 have been furnished in **Table 4-7**.

Table 4-7: Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

Note:

* Day time is from 6 am to 10 pm, Night time is 10 pm to 6.00 am;

** Silence zone is defined as area up to 100 m around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

4.6.4 Noise Standards for Occupational Exposure

Noise standards in the work environment are specified by Occupational Safety and Health Administration (OSHA-USA) which in turn are being enforced by Government of India through model rules framed under the Factories Act.

Table 4-8: Standards for Occupational Noise Exposure

Total Time of Exposure per Day in Hours (Continuous or Short term Exposure)	Sound Pressure Level in dB(A)
8	90
6	92
4	95
3	97
2	100
3/2	102
1	105
¾	107
½	110
¼	115
Never	>115

Note:

1. No exposure in excess of 115 dB (A) is to be permitted.
2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column (1), the permissible level is to be determined by extrapolation on a proportionate scale.

4.7 Applicable International Conventions

Environmental problems which migrate beyond the jurisdiction (Trans-boundary) require power to control such issues through international co-operation by either becoming a Contracting Party (CP) i.e. ratifying treaties or as a Signatory by officially signing the treaties and agreeing to carry out provisions of various treaties on environment and social safeguards. The relevant international conventions are as provided in **Table 4-9**.

Table 4-9: Relevant International Conventions applicable to the project

S. No.	International Conventions	Salient Features
1.	Montreal Protocol on Substances That Deplete the Ozone Layer (and subsequent Amendments)	India signed the Montreal Protocol along with its London Amendment on September 17, 1992 and also ratified the Copenhagen, Montreal and Beijing Amendments on March 3, 2003.
2.	UN (Rio) Convention on Biological Diversity	India is a party since February 18, 1994 by Ratification; Protocol - Party since September 11, 2003.
3.	Conventions on the Conservation of Migratory species of wild animals and migratory species	India is a contracting party to the convention on conservation of migratory species of wild animals and migratory species.
4.	Kyoto Protocol	The Kyoto protocol was signed by India in August 2002 and ratified in February 2005. The convention pertains to the United Nations framework on Climate Change. The 3 rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in

S. No.	International Conventions	Salient Features
		<p>December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary greenhouse-gas emission reduction agreements between industrialized and developing countries on the project level.</p> <p>The 1st period of the protocol implementation terminated in 2012. The 2nd period (2012-2017) is currently under operation. In the Doha Climate Change Conference in November 2012, nitrogen trifluoride (NF₃) was added to the list of greenhouse gases (GHGs) as identified under the protocol.</p>
5.	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals & Pesticides in international Trade was adopted by India at the Conference of Plenipotentiaries at Rotterdam in 1998
6.	International Labour Organization conventions	<p>India has also ratified many of the International Labour Organization conventions that are relevant to the Project including:</p> <ul style="list-style-type: none"> • C1 Hours of Work (Industry) Convention, 1919 (14:07:1921, ratified); • C5 Minimum Age (Industry) Convention, 1919 (09:09:1955, ratified): • C11 Right of Association (Agriculture) Convention, 1921 (11:05:1923, ratified): • C14 Weekly Rest (Industry) Convention, 1921 (11:05:1923, ratified); • C29 Forced Labour Convention, 1930 (30:11:1954, ratified) & C105 Abolition of Forced Labour Convention, 1957 (18:05:2000, ratified); • C100 Equal Remuneration Convention, 1951 (25:09:1958, ratified); • C107 Indigenous and Tribal Populations Convention, 1957 • C111 discrimination (Employment and Occupation) Convention, 1958 (03:06:1960, ratified)

5. ANALYSIS OF ALTERNATIVES AND SITE SELECTION

This section of the report presents the analysis of the alternatives considered for the Project. The following scenarios have been considered:

- Project versus No project Scenario;
- Alternate methods of power generation;
- Alternate location for the proposed project; and
- Alternate routes for transmission lines.

5.1 No project scenario

Energy requirement in Telangana was 47,428 MU in FY 2013-2014, of which only 44,946 MU could be met resulting in energy deficit of nearly 5%. Month wise power supply position for Telangana for 2015-2016 as per Load Generation Balance Report (LGBR) 2015-2016 is as presented in Table below:

Table 5-1: Anticipated Month Wise Power supply Position for 2015-2016 for Telangana

Month	Peak			
	Demand (MW)	Availability (MW)	Surplus (+)/ Deficit (-)	
			MW	%
April 15	7,552	6,151	-1,401	-18.6
May 15	7,127	5,954	-1,173	-16.5
June 15	6,757	5,542	-1,215	-18.0
July 15	7,404	5,496	-1,908	-25.8
August 15	7,971	6,185	-1,786	-22.4
September 15	7,782	6,573	-1,209	-15.5
October 15	8,154	6,141	-2,013	-24.7
November 15	7,002	5,683	-1,319	-18.8
December 15	7,367	5,786	-1,581	-21.5
January 16	7,904	6,000	-1,904	-24.1
February 16	7,870	6,001	-1,869	-23.8
March 16	8,223	6,116	-2,107	-25.6
Annual	8,223	6,573	-1,650	-20.1

Energy is expected to see an increase of around 11% for the period FY 2014-2015 to FY 2018-2019¹². Demand-Supply projections for the state of Telangana as per Report of Task Force for Energy by Government of Telangana have been presented in Table below.

Table 5-2: Telangana Demand Supply Projection (MU)

Particular	FY 2014-2015	FY 2015-2016	FY 2016-2017	FY 2017-2018	FY 2018-2019
Energy Requirement	54,998	63,047	67,902	77,164	84,496
Energy Availability	45,795	45,073	44,030	43,896	43,754
Energy Deficit	- 9,203	- 18,009	- 23,872	- 33,268	- 40,742
Energy Deficit (%)	- 16.7%	- 28.6%	- 35.2%	- 43.1%	- 48.2%

The current power supply scenario and the future forecasts indicate a progressive deficit in supply. In order to bridge this gap between the demand and supply, renewable/non-conventional sources of

¹² Report of Task Force on Energy, November 2014, Government of Telangana

power are required to supplement the conventional sources. The proposed project being a non-conventional source of power generation intends to contribute towards bridging the demand supply deficit as projected.

Telangana has large untapped Non-Conventional Energy (NCE) potential. Table below gives a comparison of the installed capacity as against the NCE potential in the state.

Table 5-3: NCE Installed Capacity (vs) Potential

Source	Potential (MW)	Installed Capacity (MW)	Installed Capacity % of the potential
Wind*	1500	0	0.0%
Solar	5000	79	1.6%
Biomass	100	72	72.0%
Bagasse	150	126	84.0%
Mini Hydel	200	38	18.8%
Waste based	100	38	38.1%
Total	7050	353	5.0%

Source: TSREDA * Indian Wind Power Association

The wind power generation capacity in India is 49,130 MW as per the official estimates in the Indian Wind Atlas (2010) by National Institute of Wind Energy (NIWE) erstwhile known as Centre for Wind Energy Technology (C-WET). The Indian wind energy sector has an installed capacity of 23,439.26 MW (as on March 31, 2015). In terms of wind power installed capacity, India is ranked 5th in the World. National Institute of Wind Energy (NIWE) published the Indian Wind Atlas in 2010, showing large areas with annual average wind power densities of more than 200 Watts/m² at 50 meter above ground level. The potential sites have been classified according to annual mean wind power density ranging from 200 W/m² to 500 W/m². Sites with Annual Mean Wind Density above 200 W/m² are considered suitable for wind power projects. There are 339 such sites identified in the country, out of which 32 sites are located in Andhra Pradesh with Nazeerabad site of Rangareddy (now in Telangana) is one of them. Annual mean wind power density (W/Sq. m) at 50 meter at the Nazeerabad site is 232.

As per the assessment of MNRE, the estimated gross potential is 8,968 MW in Andhra Pradesh (A.P)¹³. With a view to encourage investment and to promote wind power projects in Andhra Pradesh, the Govt. of Andhra Pradesh has announced a comprehensive policy and incentives to set up wind power projects in private sector. NREDCAP (New & Renewable Energy Development Corporation of Andhra Pradesh) is the single window clearance agency to sanction projects up to 20 MW capacity in the State and so far 233.72 MW capacity of projects by various private developers. Apart from these projects, NREDCAP has also established 7.55 MW capacity projects during the year 2011-12. The total installed capacity is 248.52 MWs as on June, 2012.

The proposed project presents an opportunity to utilize the potential for wind power generation. A “No Project Scenario” will not address the issue of power shortage. An alternative without the project is undesirable, as it would worsen the power supply-demand scenario, which would be a constraint on economic growth.

¹³ On 2 June 2014, the north-western portion of the state of Andhra Pradesh was bifurcated to form a new state of Telangana. Estimated gross potential of Andhra Pradesh includes Telangana also.

The Project being a wind power project will not lead in any CO₂ and SO₂ emissions during the operation phase. It does not deplete the natural resources and most importantly, only a small part of land will be permanently utilised by the turbines, ancillary facilities and access roads.

5.2 Alternate Methods of Power Generation

Wind energy is the most eco-friendly mode of power generation as it avoids any kind of emissions from the operation. There are no fuel requirements or large quantities of water for operation of the plant. The conventional sources of power (thermal power plants) have a very high environmental cost compared to non-conventional sources. The construction phase of thermal power plants are also longer than that of wind energy projects which requires short lead time to design, install, and start-up – a maximum of 2 months after micro-siting, approvals and land purchase.

India has an installed capacity of 275911.62 MW as of 31st July, 2015.¹⁴ Thermal power plants account for 69% of India’s installed electricity capacity followed by hydropower which accounts for approximately 15%, renewable energy¹⁵ for 13% and nuclear for about 2%. All India installed capacity in MW of power station as on 31st July 2015 is presented below in **Table 5-4** and **Figure 5-1**.

Table 5-4: Installed Capacity (in MW) of Power Stations in India

Particular	Capacity (in MW)	% of total
Coal Fired Thermal Power Plant	167707.9	61
Gas Fired Thermal Power Plant	22926.15	8
Diesel Fired Thermal Power Plant	993.53	0
Total Thermal Power Plant	191627.6	69
Nuclear	5780	2
Hydro	41997.42	15
Renewable Energy Sources (RES)	36470.64	13
Total	275875.6	100

Breakup of renewable energy sources installed in India as on 30th June 2015 is presented in **Table 5-5** below:

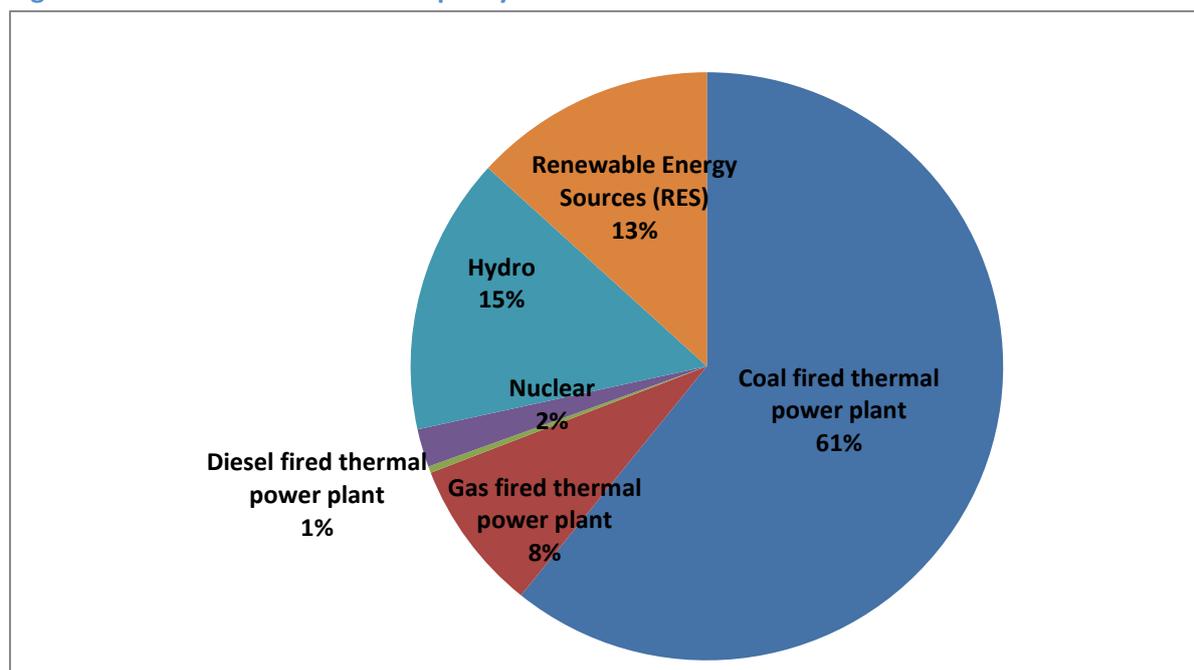
Table 5-5: Breakup of Renewable Energy Sources in India

Small Hydro Power	Wind Power	Bio Power		Solar Power	Total Capacity
		BM Power/Cogen.	Waste to Energy		
4101.55	23762.81	4418.55	127.08	4060.65	36470.64

¹⁴ “All India Installed Capacity (MW) of power stations”, Central Electricity Authority (CEA) website (http://www.cea.nic.in/reports/monthly/inst_capacity/jul15.pdf)

¹⁵ Renewable energy includes Small Hydro Project, Wind Energy, Bio Power (BM Power/ Cogen., Waste to Energy), and Solar Power

Figure 5-1: Source wise installed capacity



Source: Central Electricity Authority

Installed Capacity of power utilities in Telangana as on 31st July 2015 is presented in **Table 5-6** below.

Table 5-6: Installed capacity in Telangana

Thermal			Nuclear	Hydro (Renewable)	RES (MNRE)	Grand Total
Coal	Gas	Diesel				
5598.47	1697.75	19.83	148.62	2012.54	62.75	9539.96

Source: Central Electricity Authority

The various power generation options as discussed in the earlier section can be evaluated on the levelised cost of power generation which includes the capital and O&M costs, reliability of power generation in terms of plant load factor and the greenhouse gas (GHG) emission. The comparative analysis of various power generation options based on these factors has been presented in **Table 5-7**.

Table 5-7: Comparative analysis of various power generation options

Alternative	Cost (₹/kWh) *	Plant Load Factor **	Average Lifecycle GHG Emission (tonnes CO ₂ e/GWh)***
Coal	2.5	65-85%	888
Natural Gas	3.9	70-85%	500
Hydro	3.8	30-50%	26
Nuclear power	2.5-5.7	65-85%	28
Wind Energy	4.2	25-40%	26
Solar	15.3-17.1	10-15%	85

Source: * - LBNL, CERC, CSTEP & NPCIL

** - Renewable UK

*** - World Nuclear Association Report

The power generation options using conventional sources offer advantages such as lower levelised costs of power generation and higher plant load factors. The operation and maintenance of wind farms does not typically involve air emissions or effluent discharges. There are no fuel requirements or large quantities of water required for the operation of the plant. GHG emissions and other environmental pollution (stack emissions, ash management etc.) issues are also insignificant. Also, there are no significant social issues associated with wind energy projects.

India being a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) has formulated a National Action Plan on Climate Change (released in June 2008) to promote the development of renewable energy in the country. Telangana New & Renewable Energy Development Corporation Limited has been formulated to promote, develop, encourage and carry out consultancy, field research and experiments for implementation of non-conventional / renewable energy projects in the area.

Every mode of electricity generation offers various advantages and disadvantages with respect to operational cost, environmental impact, and other factors. In relation to GHG emissions, each generation method produces GHGs in varying quantities through construction, operation (including fuel supply activities), and decommissioning. **Table 5-8** highlights some of the advantages and disadvantages of various electricity generating options with GHG emissions. Coal fired power plants release the majority of GHGs during operation.

Table 5-8: Environmental advantage and disadvantages of various electricity generating options

Mode	Disadvantage	Advantage
Thermal Power Plant (Coal based)	<ul style="list-style-type: none"> • Consumption of large quantities of fossil fuel • Large quantities of water requirement for cooling • High volume of emissions from operation • Accumulation of flyash (for coal powered) • Upstream impact from mining • GHG emission estimated as 888 tonnes CO₂/GWh 	<ul style="list-style-type: none"> • Large scale production potential • Moderate period of commissioning •
Hydropower Plant	<ul style="list-style-type: none"> • Site specific, dependent on reservoir/river etc. • Downstream impact on flow • Long gestation period • Social and Ecological impacts 	<ul style="list-style-type: none"> • Inexhaustible fuel source • Limited environmental impact (air and water) • Can be reproduced on small scale • GHG emission estimated as low as 26 tonnes CO₂/GWh for run of river projects
Solar Power	<ul style="list-style-type: none"> • Large land requirement • Site specific to solar insolation 	<ul style="list-style-type: none"> • Pollution levels are insignificant • Inexhaustible source • GHG emissions as low as 85 tonnes

Mode	Disadvantage	Advantage
	<ul style="list-style-type: none"> • 	CO ₂ /GWh for the Production Chain
Wind Power	<ul style="list-style-type: none"> • Site specific (associated to wind pattern) • Involve issues like shadow flicker and noise generation and may pose impact on avifauna 	<ul style="list-style-type: none"> • Pollution levels are insignificant • • Inexhaustible source • GHG emissions as low as 26 tonnes CO₂/GWh for the Production Chain
Nuclear Power	<ul style="list-style-type: none"> • Less availability of fuel source • Hazards associated with radioactive material • • Long start-up period 	<ul style="list-style-type: none"> • GHG emissions as low as 28 tonnes CO₂/GWh

Source: International Atomic Energy Agency (IAEA), Comparison of Lifecycle Greenhouse Gas Emissions of Various Electricity Generation Sources (World Nuclear Association)

5.3 Statutory & Policy Requirements

The Ministry of New and Renewable Energy (MNRE) has announced Generation based incentive for Grid interactive Wind Power Projects, vide letter No.53/1/2008-E dated 23-7-2008. The Ministry will provide through Indian Renewable Energy Development Agency (IREDA), a generation based incentive of Rs.0.50 per unit (KWH) for a period of ten years to the eligible project promoters. However, the components of the scheme will be reviewed when projects aggregating to 49 MW, which are estimated to generate about 0.9 billion units of electricity are registered by IREDA.

5.4 Alternate Location for the Project

Wind energy projects are site specific and its feasibility depends on a number of factors which can be broadly categorized as wind resource assessment, land availability, cost of land and impact on community.

5.4.1 Identification of sites for WTG's

Nazeerabad station at District Rangareddy has wind density of 232 W/Sq. m. at 50 meter, thus is an ideal location for development of wind farm.

Independent wind resource assessment study for the site has been carried out to ascertain wind energy potential of the site. The long-term mean wind speed at the location of the site masts is predicted to be 6.76 m/s at a hub height of 90 m. The site was observed to be feasible for the proposed project.

The following additional criteria have been considered for site selection:

- The sites selected for the wind turbine generators does not fall under any reserved or protected forests;

- No environmentally sensitive features such as forests, archaeological sites are located in the immediate site surroundings;
- At present the project site is used mostly for farming of maize and cotton and grazing was seen carried out in the surroundings of the few WTG locations. The plot for wind farm is chosen such that minimal arable land is lost and the grazing areas will not be disturbed as only a small area around the wind farm will be fenced;
- Access roads of the project site can be used by the native inhabitants;
- Willingness of people to sell their land for the project; and
- The area does not have other wind farms in proximity to potential WTG locations, but on an overall project scale, the cumulative impact of the project for the resident local community is insignificant at best.

Therefore, considering all the above details of the location and site settings, the identified site was considered as a suitable option for the project.

5.5 Alternate routes for transmission lines

The 220 KV pooling substation is located at Kadlapur village for the power evacuation of entire 98.7 MW project. A 3.4 kilometre transmission lines will be developed from WTGs to pooling substation at Kadlapur. Power from Kadlapur will be evacuated to APTRANSCO (Transmission Corporation of Andhra Pradesh Limited) Pargi substation.

The route for the transmission line will be selected based on the following factors:

- Transmission line route will be planned to avoid any habitations along the route;
- No house or community structures will be located under the transmission line;
- Areas requiring extensive clearing of vegetation will be avoided;
- Selection of the transmission route shall avoid any environmental sensitive site if identified;
- Right of way/access roads will be shared with the common user of the substation.

The shortest possible route after considering the above factors will be selected for the transmission lines. Consideration of all the above factors will reduce the environmental and social footprint of the transmission line.

5.6 Conclusion

Power generation using conventional sources of power generation lead to greenhouse gas emissions and destruction of natural habitats. It is thus proposed to develop a wind power project at the site because of wind resource availability, incentives being offered by the government and low pollution levels associated with wind power generation.

6. SOCIO-ECONOMIC ENVIRONMENT

This section presents the baseline status of the socio-economic aspects in the Project area and the details of the stakeholder consultations carried out for the project.

6.1 Approach and Methodology

The scope of work as detailed out in the Proposal has been the guiding criteria for undertaking this Social Impact Assessment (SIA) study. The turbine location and associated facilities of the project falls in two districts namely, Rangareddy and Mahbubnagar of the state of Telangana. In order to undertake the primary survey and identify and consult stakeholders of the project, the locations of the turbines and its associated facilities¹⁶ was considered for the study¹⁷.

A structured questionnaire was prepared to undertake the focus group discussions and socio-economic survey of the project affected persons/families (land sellers). Besides the affected persons/families, other stakeholder groups were also consulted to understand the concerns, issues and interest that they might have on the project.

The approach that was adopted to conduct the Social Impact Assessment (SIA) study has been based on the following elements:

6.1.1 Review of Secondary Information

A detailed review and assessment of the secondary information for the two districts comprising locations of the turbines and associated facilities was undertaken. Review of documents was undertaken in order to attain a comprehensive understanding of the area in relation to its socio-economic characteristics. The following documents were assessed to supplement the desk based research:

- Primary Census Abstract (PCA) 2001;
- Primary Census Abstract (PCA) 2011;
- Village Directory (VD) 2001;
- Statistical Year Book of Telangana State, 2015;
- Socio-Economic Outlook of Telangana, 2015;
- Brief Industrial Profile of Rangareddy District, Micro, Small and Medium Enterprises (MSME), Government of India;
- Brief Industrial Profile of Mahbubnagar District, Micro, Small and Medium Enterprises (MSME), Government of India;
- District Statistics of Mahbubnagar District;
- Rangareddy District Handbook of Statistics, 2011;
- Education Statistics of Districts in Telangana, 2013-14; and

¹⁶ Associated facilities of wind turbines comprise access road, transmission line and polling sub-station that form the basis of a wind power project.

¹⁷ The study area has also been termed as the project affected villages as the land parcels for the turbine locations and associated facilities have been procured from these villages.

- Published reports, papers and articles available in the public domain on agriculture, health, local governance in the area.

6.1.2 Primary Data Collection, Stakeholder Identification and Consultation

Primary data on socio-economic status was collected from project affected persons/families belonging to the villages where the wind turbine and associated facilities of the project are proposed to be located. Apart from the baseline information, stakeholders were also broadly identified and consulted during this activity to outline their concerns and interest in the project. Interviews were conducted with local influential people, project affected persons/families and site representatives of the Project Proponent.

6.2 Project Affected Villages

As the study area falls within two districts of Telangana, the administrative area of the (mandals) study area have been provided in **Table 6-1**.

Table 6-1: Administrative Areas within the Study Area

District	Mandal
Rangareddy	Pargi
	Pudur
Mahbubnagar	Kondurg

The villages wherein the turbine location and associated facilities are situated have been selected as the study area. The list of villages which fall within the study area are provided in **Table 6-2**.

Table 6-2: List of villages falling within the Study Area

S. No.	District	Mandal	Village Name
1	Rangareddy	Pargi	Kadlapur
2			Madharam
3			Raghavapur
4			Khudwanpur
5			Nagulapally
6			Chityal
7			Rapole
8			Syedpally
9			Yabajiguda
10			Thondapally
11		Pudur	Kervelly
12			Thurkayenkepalle
13			Somangurthy
14	Mahbubnagar	Kondurg	Padmaran
15			Vanampally
16			Thummalapally