Environment and Social Due Diligence Report (Appendix 4A)

August 2017

IND: Clean Energy Finance Investment Program –Orange Anantapur Wind Power Pvt. Ltd.

Prepared by

Indian Renewable Energy Development Agency for the Asian Development Bank

Annexure 4

Copy of ESIA Report

Environment and Social Impact Assessment for 100 MW Wind Power Project in Nimbagallu

The ESIA Study

The Client has appointed Kosher Climate India Private Limited to conduct the Environmental and Social Assessment (ESIA) report, as per the requirements laid down by (IFC) & Equator Principles. The report has been prepared to the requirements of the aforesaid reference framework relating to the environment, social issues/risks and occupations health and safety matters, in addition to complying with Indian laws and regulations.

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Quality Control/Quality Assurance

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The following professionals were engaged in preparation of the report with specific inputs as mentioned below:

Name of Professional	Responsibilities
Anil Kumar	Reconnaissance site survey, environmental baseline analysis, stakeholder consultation, impact assessment, preparation of management plans
I Siva Rama Krishna	Flora and fauna studies
Dr. Latha	Social baseline data collection and analysis, stakeholder consultation, environmental baseline analysis
Vamsi Krishna	Overall execution and delivery
Team Labs	Noise modelling and impact assessment, shadow flicker modelling and assessment of results, Land use mapping

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1) EXECUTIVE SUMMARY

Orange Renewable has proposed to establish a 100 MW wind power project in Anantapur district of Andhra Pradesh. The current project shall be developed by Orange Anantapur Wind Power Pvt. Ltd. (ANPWPL) which is a fully owned subsidiary of Orange Renewable.

In addition to project development, ANPWPL is conscious about its responsibilities towards the environment and community around its operational capacity and committed to improve the environmental and social performance of its projects as well. Therefore, to achieve its objectives, ANPWPL intends to carry out an Environmental and Social Impact Assessment (ESIA) study for the Project, in accordance with International Finance Corporation (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012 and Equator Principles.

As the ANPWPL is seeking financial assistance from the financial institutions, for setting up the wind power project, 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 framework.

ANPWPL has appointed Kosher Climate to undertake the Environmental and Social Impact Assessment (ESIA) of the project as per the requirement of International Finance Corporation (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012 and Equator Principles, Health and Safety guidelines and applicable other national/international rules and regulations. This current ESIA report has been prepared on the basis of a reconnaissance visit to the site, environmental monitoring, data analysis, consultations and discussions with relevant stakeholders.

Under the regulatory compliance of EIA Notification 2006, Environmental Clearance (EC) is not required by Wind energy projects in India. The ESIA is thus being undertaken as an internal management tool. Hence, if any part of the report is used for compliance purpose, the consulting company (Kosher Climate) must be intimated.

2) INTRODUCTION

2.1 Project Brief

Orange Renewable Power Private Limited formerly known as Orange Powergen Private Limited (Hereinafter referred as "ORANGE RENEWABLE") was incorporated in the year 2010 for implementation of renewable energy projects across the country is promoted by Singapore based AT Holdings Pte. Limited, which has diversified investment portfolio across different sectors and geographies and has made investments in oil and gas, Engineering-Procurement-Construction (EPC), hospitality, real estate and renewable energy companies.

"ORANGE RENEWABLE" has been established to develop and operate renewable energy projects in the field of wind, solar, biomass and small hydro and has an expert team of approximately 150 professionals which specializes in project development, capital mobilization, contract awards & management, project management and power plant operations.

"ORANGE RENEWABLE" has a portfolio of about 500 MW wind energy projects either operating or under implementation in different geographies of 5 states across the country through its various special purpose vehicles (SPVs) or wholly owned subsidiaries.

"ORANGE RENEWABLE" is developing a 100 MW wind power project near Uravakonda, Anantapur District, Andhra Pradesh. For this purpose, has been established a special purpose vehicle (SPV) under the name, Orange Anantapur Wind Power Pvt. Ltd. (ANPWPL).

This "100 MW wind power project by ANPWPL is the focus of current study. The wind farm will be located on a relative moderate elevation plateau at 460-487m above mean sea level (MSL) with a total area of 160 acres.

ANPWPL is seeking financial assistance from banks, for setting up the wind power project. ANPWPL has appointed Kosher Climate India Private Limited to conduct the Environmental and Social Assessment (ESIA) report, as per the requirements laid down by (IFC), World Bank, Equator Principles and other national & international environmental legislations. The guidelines followed are listed:

- Performance Standards and guidelines of International Finance Corporation as:
  - Performance Standard 1 (PS1): Assessment and Management of Environmental and Social Risks and Impacts.
  - Performance Standard 2 (PS2): Labour and Working Conditions
  - Performance Standard 3 (PS3): Resource Efficiency and Pollution Prevention
  - Performance Standard 4 (PS4): Community Health, Safety, and Security
  - Performance Standard 5 (PS5): Land Acquisition and Involuntary Resettlement
  - Performance Standard 6 (PS6): Biodiversity Conservation and Sustainable Management of Living Natural Resources
  - Performance Standard 7 (PS7): Indigenous Peoples
  - Performance Standard 8 (PS8): Cultural Heritage
- IFC General Environment, Health and Safety EHS Guidelines
- EHS Guidelines for Wind Energy;

- EHS Guidelines for Power Transmission and Distribution
- Equator Principles, June 2013
- Applicable National Regulatory Requirements

2.2 Project Overview

ANPWPL (SPV of Orange Renewable) is developing a 100 MW wind power project near Uravakonda in Anantapur district of AP. The site is approximately 59 km in North-West direction form Anantapur. The project site spreads across an area of 8 kms and falls in five villages' viz. Amidyala, NImbagallu, Mopidi, Indravathi and Renumakulapalli of Uravakonda Mandal in Anantapur District of Andhra Pradesh, India. The project site lies in South-West direction of Uravakonda which is situated on SH – 32 (Anantapur to Ballari). The main access roads to the wind farm are "Uravakonda – Rayadurgam Road" and "Uravakonda -Kanekal Road".

The project site comprises largely of fallow agricultural land, part of which is being used by locals for farming during rains. Land use of the land selected for WTGs as per government records is agricultural for which certificate of conversion to Non Agricultural (NA) land use has been obtained.
The wind farm will be located on a table top plateau at an elevation of 460-487m above mean sea level (MSL) and will require a total area of 160 acres which includes land for WTGs installation and another ~20 acres which will accommodate internal access roads and transmission lines till pooling station.
ANPWPL has contracted Renewables to provide turnkey solutions for micro-siting, wind resource analysis, supply, erection, commissioning and operation & maintenance of the project WTGs. The project will involve installation of 50 number of WTGs of Gamesa Make G97, 104, 2 MW each WTG, totalling to a capacity of 100 MW.

M/s Topview infrastructures Pvt. Ltd., sub-contractor of Gamesa, acting as land aggregators for the project will be responsible for acquiring the land after paying the proper compensation to the original land owner, based on Agreement to Sale (ATS) and Power of Attorney (POA) by the original land owner. Gamesa will obtain all the necessary approvals and then transfer the same to ANPWPL. It will also be responsible for construction of internal roads, crane beds and transmission lines.

The power generated from the wind farm shall be transmitted to state govt. 220kV/400kV (sub-station) situated at Uravakonda for which ANPWPL shall sign a power purchase agreement with Andhra Pradesh Southern Power Distribution Company Limited (APSPDCL) at wind preferential Tariff as determined by Andhra Pradesh Electricity Regulatory Commission (APERC) from time to time for the specified control period.

The project will involve the following activities:

- Procurement of land through Land aggregator
- Installation of 50 wind turbines with a unit generating capacity of 2 MW each, totalling a generation capacity of 100 MW;

- Electrical connection will require feeder underground cable from the turbines, to the distribution transformers and a connection to the substation.
- Construction of access roads and internal roads
- Power evacuation at 220/400 kV Uravakonda substation

2.3 Implementation Progress

The status of project implementation as on November 30, 2015 is as follows:

- Wind Resource Assessment completed;
- Micro-siting has been completed;
- WTG land acquisition completed for 80% locations with demarcations and pathway finalization in progress;
- Soil testing completed for all the site being purchased;
- Pooling Substation and zero point storage yard completed;
- Approach and internal roads completed to WTG clusters and in some clusters to individual WTGs;
- WTGs Foundations completed at twenty sites
- Erection of tower and stringing underway to the PSS (Evacuation);
- Site office of ANPWPL established and Project staff mobilization completed

Figure 2-1: Indicative Project locations (Map showing the Anantapur District)

The project activity is located in Anantapur District of Andhra Pradesh state, India

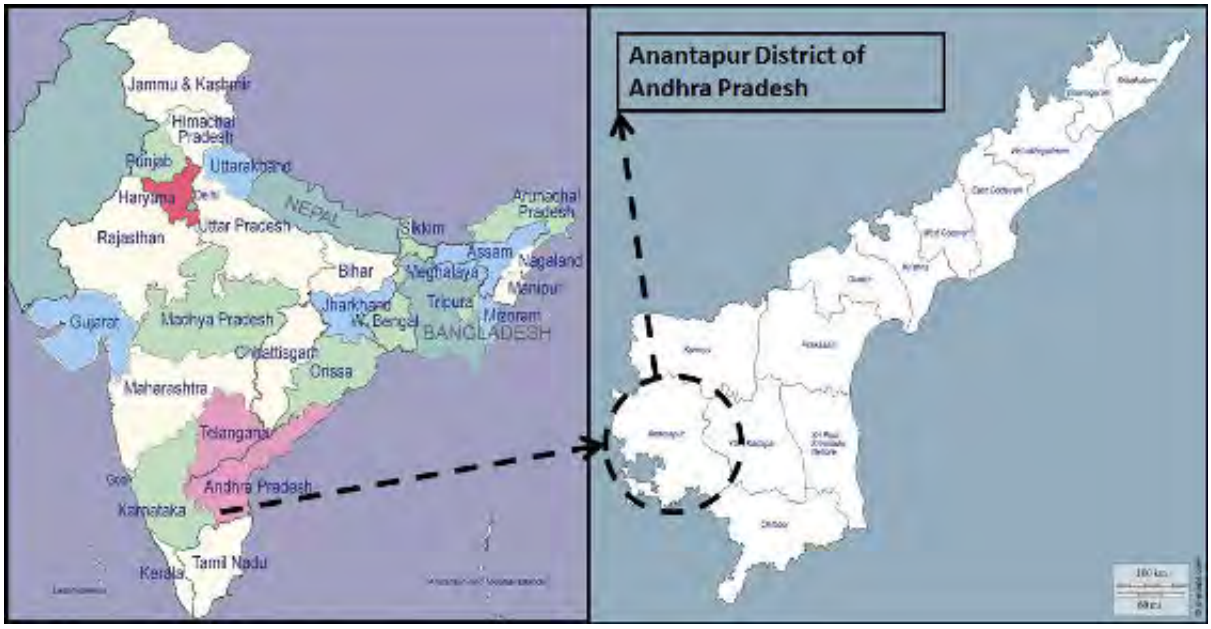


Figure 2-2: Master Drawing indicating all land survey numbers and settlements & water bodies

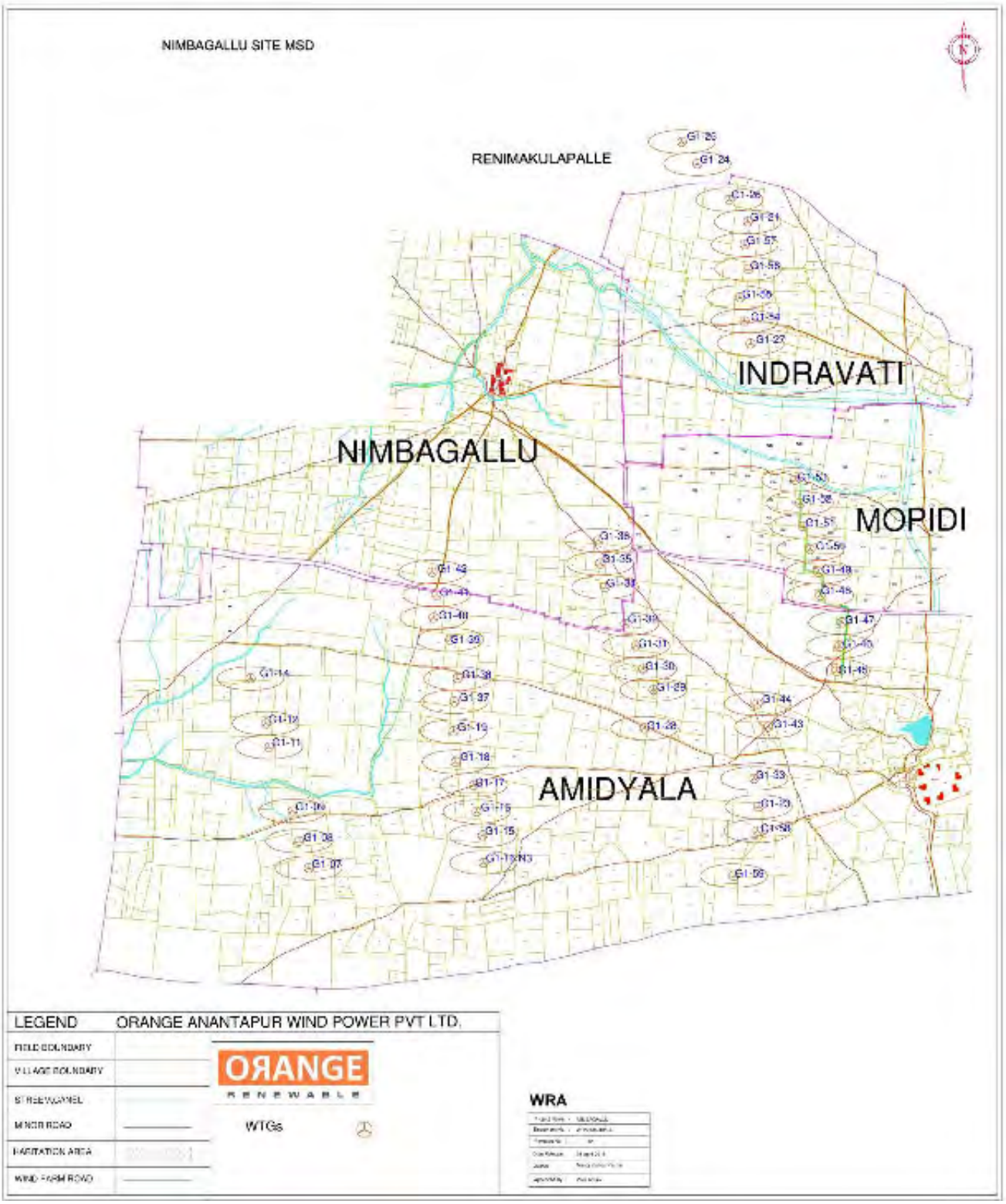
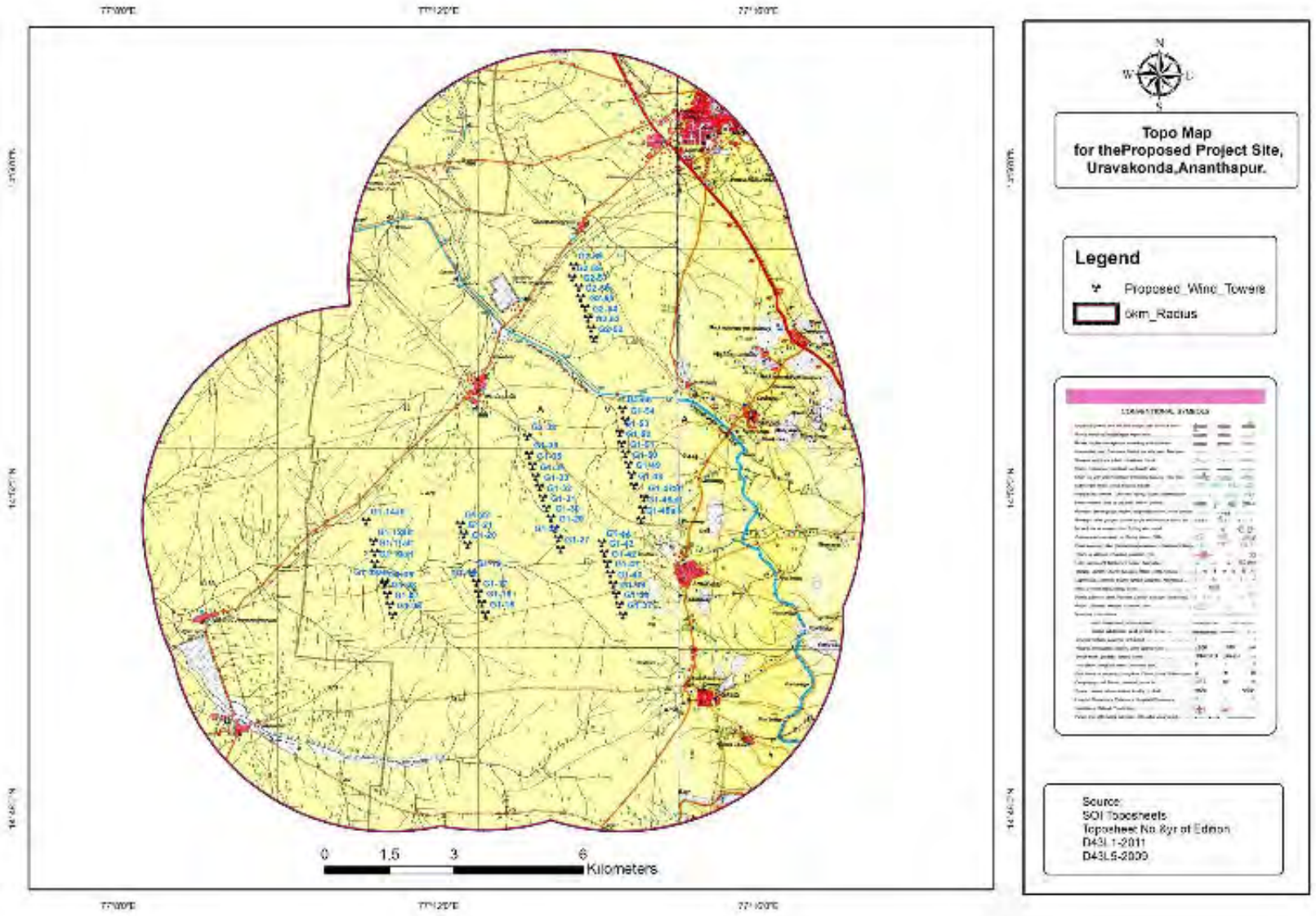


Figure 2-3: Map showing location of individual WTGs



2.4 Scope Of This Study

A detailed scope of work was provided by the client who specifically included the following:

- **A detailed environmental and social assessment of project site and surrounding areas**:
  - Reconnaissance survey of project components as all 50 Turbine locations, PSS, GSS, internal as well as external connecting transmission lines, storage yard, batching plant, site and labour camps of all the contractors/subcontractors involved in the project;
  - Land use mapping of project site and surrounding areas;
  - Environmental and social survey of surrounding areas, project affected villages and community, discussion with local community to understand their perception about the wind projects and to identify their social needs and issues in the region;
  - Assessment of labour camp and working areas and subsequently discussion with workers/labour to find out whether the contractors/subcontractors are compiling the requirements of applicable labour laws and EHS guidelines;

- **Collection of Environmental and social baseline data**

The ESIA will require primary and secondary data on environmental and social parameters/conditions within the project site. The baseline data generation will include the monitoring of environmental & social parameters of the project area as well as affected villages.
Physical environment (Climate & Meteorology, temperature, Rainfall, wind speed and direction, ambient air quality, regional meteorology, Ambient noise quality, Soil quality, Surface and ground water quality, Geology, Hydrology, Drainage and land use etc.)

  - Biological environment – Ecological survey of project site and surroundings to collect primarily data on flora and fauna of the area. Collection of secondary data through various sources as forest dept. or other relevant authorities;
  - Ecological sensitivity (NP, Wildlife sanctuary and other protected areas if any);
  - Socio – economic environment (General Socio economic and demographic profile of the study area, Education & Literacy, Economic and livelihood pattern, Basic amenities etc.)

- **Policy, legal and Administrative framework**

Desk based study of the applicable regulatory framework which shall be complied during the project life. The report shall define the applicable state/national/international regulatory framework and their compliance. The framework shall focus on:

  - Applicable local/state/national/international enforcement agencies
  - Applicable local/state/national/international laws, policies and regulations on environment and social structure
  - IFC Performance standards
  - Equator principles
  - IFC EHS Guidelines for wind power projects
  - Categorization of project
  - Applicable environment standards
  - Applicable international conventions

- **Impact assessment and mitigation measures**

The impact assessment is based on qualitative and quantitative methods and asses the positive and negative impacts of project to its stakeholders. This will include the following:

- Environmental impacts
- Ecological impacts
- Social impacts including shadow flicker and noise assessment with modelling
- Cultural Impacts
- Community impacts
- Occupational health & safety impacts including road and traffic safety
- Impact matrix

- **Stakeholder Mapping**
  - Consultation and disclosure requirement for the project
  - Categorization
  - Approach and methodology for analysis
  - Analysis

- **Analysis of Alternatives**
- **Grievance Redressal Mechanism –** Development of GRM method, proceeding and communication structure.
- **CSR –** To identify the need based requirements of local communities form the project.

- **Development of a user friendly Environmental and social management plan**

  The ESMP has the following:

  - Social, environmental, health & safety management system
  - Organization roles & responsibilities
  - Contractors management
  - ESMP review and management
  - Inspection, monitoring and audit
  - Reporting & review
  - Documentation and record keeping
  - ESMP during construction and operation phase
  - Environmental monitoring plan during construction and operation, if applicable

- **Emergency response program**
- **Traffic safety and management plan**
- **Re – Vegetation plan**

2.5 Purpose of the Study

The current study is embarked to assess the Environmental & Social impacts of the project activity based on the requirements of the International Finance Corporation (IFC) Guidelines. Apart from IFC guidelines the study also assesses the project's compliance to all the guidelines as listed in the chapter 4 of this report. Appropriate mitigation measures and environmental and social management plans have been suggested to restrain and reduce all impacts identified during the Assessment Study.

2.6 Objective of the Study

The study has been undertaken to fulfil the objectives as listed below:

- To describe the proposed project and associated works together with the requirements for carrying out the proposed developments;
- To define the elements of existing baseline conditions prevailing in the study area;
- to identify and describe elements of community and environment likely to be affected by the proposed developments and/or likely to cause adverse impacts to the proposed project;
- to identify the aspects of project which may have impact on sensitive receptors and quantify the same with reference to the significance of impacts;
- to identify and quantify any potential losses or damage to flora, fauna and natural habitats;
- to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
- to identify the impacts and propose the provision of mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the developments arising from the Study;
- to design and specify environmental monitoring and audit requirements, if necessary, to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted;
- To document the stakeholder consultation during the study;
- To develop plans for the management and monitoring of impacts, including plans for on-going stakeholder engagement;

2.7 Limitations of the Study

The ESIA study is a valiant effort to address key issues pertaining to the project including surface water, hydrogeology, ecology, air quality, noise quality and socio-economics aspects. The study has been conducted based on standard approaches and best suited methodology which can be practically implemented. These approach and methodology are scientifically driven; however, the end analysis is heavily dependent on the limitation of data/information available and implementation status of the project. Below a few limitations in the study are highlighted:

- Tentatively identified site tend to change in case of any technical difficulty which cannot be assessed or included in the report.
- The progress at the site was limited and evacuation arrangements were not fully planned; hence the reconnaissance survey could not cover the transmission lines.
- Only select land sellers could be consulted, which may not be an ideal sample to assess or representative of others.
- Social Impact Assessment was limited to 50-100 families per village and Sarpanch/secretary of the Village. A number of Government officials could not be reached given the schedule and their non-availability.
- Consultation with subcontractors was limited to the ones engaged. A number of sub-contractors will be engaged as the implementation progresses.

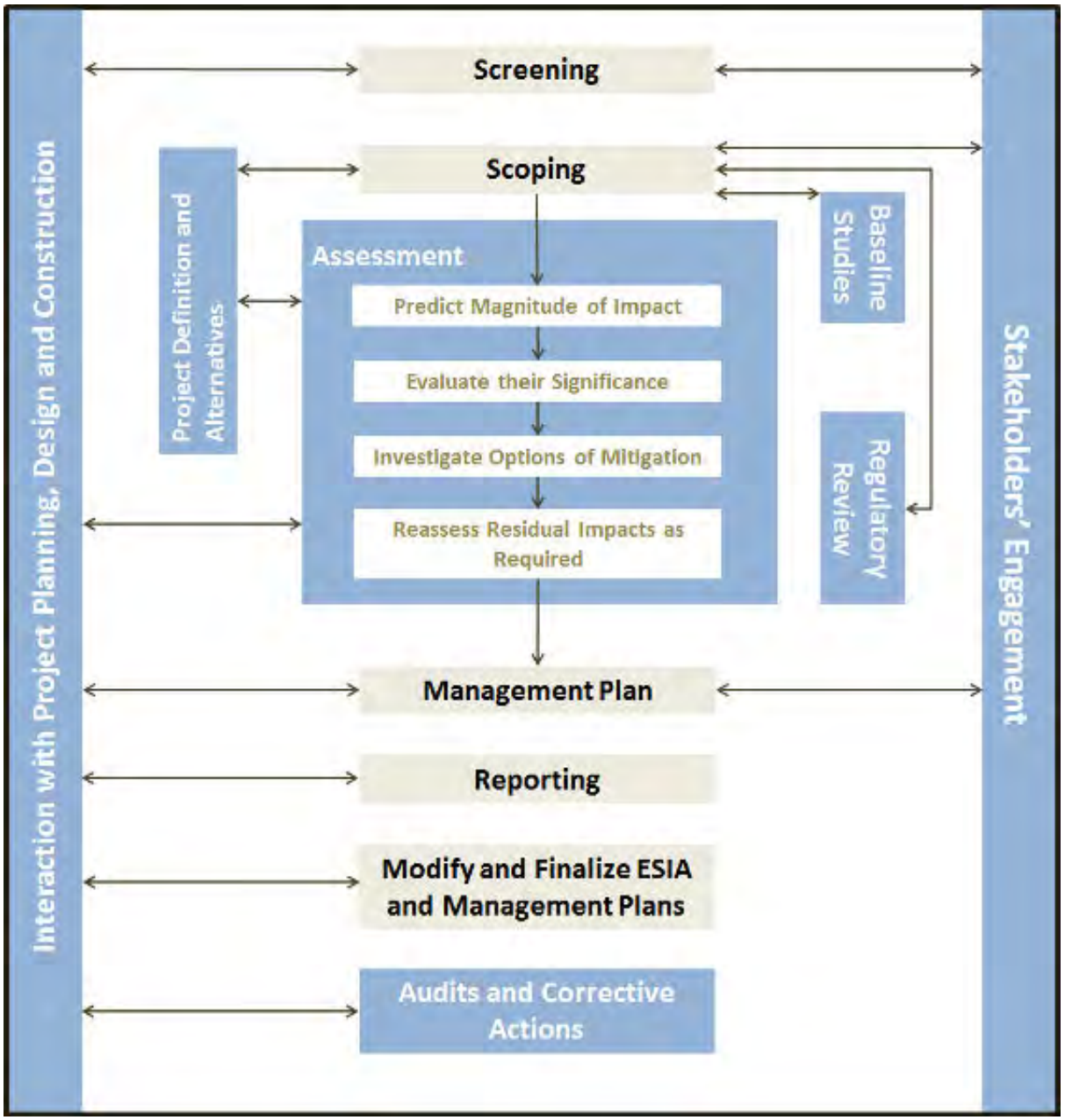
ESIA is an iterative process and the Proponent must adopt a process of continual improvement in managing and/or mitigating adverse environmental impacts arising from the project. The EMP will be used as a basis of environmental management and should be improved and refined periodically.

2.8 Approach and Methodology

This Section summarises the key stages of the ESIA process undertaken by Consultant. As such, it presents the approach that has been adopted for the execution of this ESIA and defines the methodology that has been used for the collection of baseline data and mainly for the assessment of impacts.

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

Figure 2-4: Schematic of Approach and Methodology



The steps adopted in the execution of current ESIA study are as detailed below:

a. Documents Review:

A detailed list of information was provided to the developer based on which all required documents were collected. The documents were studied to understand and plan the approach. A detailed list of information during the course of study from developer has been included as Annexure I.

b. Discussion with Client & Contractor:

Detailed discussions were held between consultant, Client and the contractor for

understanding the progress and plan of the project activity.

c. Regulatory review:

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 Environment, Health and Safety Guidelines, Social Protection Strategy, Gender Policy requirements, World Bank guidelines and Equator principles and all other as listed in the ***chapter 4*** of this report.

d. Scoping of Study:

The scoping study is intended to enable the developer to identify and address the key issues at the start of the ESIA process, and allow for early recognition of these issues in the design of the project. Scoping helps to focus the ESIA on the key environmental and social issues.

The Scoping Report documents the scoping study activities associated with the ESIA process. One of the main objectives of the scoping study is to identify the potentially significant environmental issues relating to the implementation, operation and decommissioning of the proposed development that will need to be addressed as part of the ESIA.

e. Preliminary Site Visit:

A preliminary site visit was conducted for three days in the project site area which included:

- Understanding of the project layout
- Primary Biodiversity survey
- Discussions with the contractor to understand the project spread

f. Environmental Baseline Data Collection:

A detailed environmental assessment of site and surround areas was undertaken through:

- Understanding significance of impacts on biodiversity and natural resource management;
- Reconnaissance survey of the study area was done to ascertain prevailing features of the biophysical and social environments;
- Baseline data collection of the site and study area with respect to water and soil quality, ambient air and noise quality was conducted between 23rd of Aug 2015 to 30th of Aug 2015.
- The GIS mapping of the study area was developed to present details on land use land cover pattern, forest/ vegetation cover, road access, settlements around site, water bodies, drainage pattern, spot heights and contours;
- Information on geology, meteorological conditions, water and ecological resources, socio-economic status etc. was collected from secondary sources and
- Ecological assessment on flora and fauna of the site and study area through primary and secondary surveys. The site visit for biodiversity was conducted between 24th Aug 2015 to 26th Aug 2015 and was repeated on 07th September 2015.

g. Social Consultations:

A detailed social assessment of site and surround areas was undertaken through:

- Reconnaissance surveys to understand site specific issues was conducted between, 24th Aug 2015 to 26th Aug 2015 it included understanding the local conditions and factoring of all possible areas which the project will effect or be effected in-turn.
- Further, detailed social survey was conducted from 02nd of Sep 2015 to 09th of Sep 2015 which covered all the identified areas under preliminary survey.
- Government policies and engagement of communities was understood.
- Availability of human resource and possible impact of the local man power.
- Impacts pertaining to land aggregation on marginalized communities, local population and heritage sites.
- Impact of possible HSE issues related to construction, erection and operation of the project activity.
- Discussions with the local community and identification any key issues;
- 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 details of stakeholder's mapping and consultation is provided under the ***chapter 6*** of this report.

h. Impact Assessment:

Based on the result of the baseline survey the assessment of potential impacts of the project on the characteristics of environmental and social conditions is identifies.

The range of potential impacts and extent of their severity on environment, ecology, socio-economic resources, demographics, livelihoods, as well as access to infrastructure issues is drawn based on the actual and foreseeable activities. Mitigation measures for the identified impacts are also presented in this part of the study for preparation of Environment and Social Management Plan.

i. Preparation of Environment and Social Management Plan:

An Environment and Social Management Plan has been developed based on the outcome of the impact assessment and suggested mitigation measures. These measures will be adopted by the project proponent to implement during construction and operation of the project activity.

2.9 Agencies Contacted

The Study involved interaction with a number of individual and organizations for collection of primary and secondary information pertaining to the site area. These Agencies were either contacted through meeting, telephonic conversation or written communications.

- ❖ Survey of India in Bangalore;
- ❖ Divisional Forest Office, Anantapur;
- ❖ India Meteorological Department, Meteorological Centre, Bangalore;

- Land and Revenue Department, Anantapur;
- Directorate of Census Operations in Bangalore;
- Local Panchayats, Sarpanchs and Village Secretary;
- Nagaraj, local co-ordinator and Land Aggregator;
- Accion Fraterna Ecology Centre;
- Sri Krishnadevaraya University, Anantapur;

2.10 Report Structure

The remaining sections of the report include the following:

Section 3: Description of Project;
Section 4: Policy, Legal and Administrative Framework;
Section 5: Analysis of Alternatives;
Section 6: Stakeholder Mapping;
Section 7: Description of Environment (Physical, Metrological, Biological Environment and Socio-Economic baseline);
Section 8: Anticipated Impact Assessment and Mitigation Measures;
Section 9: Environmental & Social Management Plans
Section 10: Grievance Redressal Mechanism
Section 11: Corporate Social Responsibility (CSR) Plan
Section 12: Impact Summary, Conclusion and Recommendation
Section 13: Annexures

Annexes to the report include the following:

Annexure I:	List of Documents Reviewed and collected from ANPWPL
Annexure II:	List of Land Owners (Finalized till December 2015)
Annexure III:	Noise Modelling (ISO 9613-2 General) Noise Sensitive Receptor
Annexure IV:	Shadow Flicker Analysis for Individual Shdaow Receptor
Annexure V:	Sample Format Used for Social Consultation- Local Community
Annexure VI:	Sample of Format Used for Social Consultation- Village Head
Annexure VII:	Photo-documentation of the study area & WTG Profiling

3) PROJECT DESCRIPTION

3.1 Overview:

The following chapter provides details of project and a complete overview of the proposed project plan in terms of technical details, designs and dimensions. The technical details have been presented based on the information project by ANPWPL. In due course of implementation, there may be ground challenges which may contribute to slightly alteration, which ideally should have any

significant impact on the outcome of this report. The project is being developed by Gamesa on Turnkey basis as per the agreement with ANPWPL.

A typical wind power project comprises of the following components:

- Wind turbines mounted on towers,
- An electrical collection system, and
- Transmission /interconnection facilities.

Besides these the associated facilities may include access roads, Operation and Maintenance facilities, and Meteorological tower/s.

The power generated from the project will be evacuated into the Southern Grid at Uravakonda Substation. A Power Purchase Agreement (PPA) is to be signed with the APDCL for sale of power generated from the project activity.

The Uravakonda substation (220/400kV) is located in Uravakonda Mandal which is approximately 8.0 km away from the project's pooling substation (33/220kV) at Nimbagallu Village. The power will be evacuated via a 220KV Moose DC line.

3.2 Site Setting:

The project site falls in the villages of Amidyala, NImbagallu, Mopidi, Indravathi and Renumakulapalli of Uravakonda Mandal in Anantapur District of Andhra Pradesh, India. The site is spread across a distance of approximately 6 km from North West to South East and also spread across a distance of approximately 9 km from South West to North East. The site is located on Karnataka Plateau which an average elevation of 600-890 meters above mean sea Level. The various features observed around the site area are as provided in the table below.

Photograph 3-1: Indicative Site Setting of the project site

Table 3-1: Site setting for individual WTGs:

Reference to within 300m with exception of Land Type, Land Use, Trees which are limited to the project land. This is due the reason that these parameters beyond the project land has near to none or low significance.

S. No	WTG No	Latitude	Longitude	Elevation (m)	Land Type	Land Use	Nearest Settlement (500m radius)	Structure use (Resident /storage/ vacant/other) (<500m)	Distance and direction from WTG(m)	Village name with distance and direction from WTG (m)	Water body Vicinity (<500m) with direction	Heritage Site Vicinity (km)with direction	Land use in Directions				Access Road (y/n)
													North	East	West	South	
1	G1-07	16.4197	73.5719	473	Plain	Farmland	None	None	NA	Amidyala(6000m)(E)	None	None	C.L	C.L	C.L	C.L	N
2	G1-08	16.4225	73.5617	470	Plain	Farmland	None	None	NA	Amidyala(6000m) (E)	None	NA	C.L	C.L	C.L	C.L	N
3	G1-09	16.4257	73.5547	471	Plain	Farmland	None	None	NA	Amidyala(6000m) (E)	None	NA	C.L	C.L	C.L	C.L	N
4	G1-11	16.4324	73.5301	466	Plain	Farmland	None	None	NA	Amidyala(6300m) (E)	None	NA	C.L	C.L	C.L	C.L	N
	G1-12	16.4349	73.5268	473	Plain	Farmland	None	None	NA	Amidyala(6300m) (E)	None	NA	C.L	C.L	C.L	C.L	N
	G1-14	16.4397	73.5108	470	Plain	Farmland	None	None	NA	Amidyala(6500m) (E)	None	NA	C.L	C.L	C.L	C.L	N
	G1-15	16.4231	73.7548	471	Plain	Farmland	None	None	NA	Amidyala(6000m) (E)	None	NA	C.L	C.L	C.L	C.L	N
5	G1-16	16.4256	73.7483	480	Plain	Farmland	None	None	NA	Amidyala(4050m) (E)	None	NA	C.L	C.L	C.L	C.L	N
6	G1-17	16.4284	73.7456	481	Plain	Farmland	None	None	NA	Amidyala(4050m) (E)	None	NA	C.L	C.L	C.L	C.L	N
7	G1-18	16.4309	73.7265	476	Plain	Farmland	None	None	NA	Amidyala(4100m) (E)	None	NA	C.L	C.L	C.L	C.L	N
8	G1-19	16.4341	73.7241	474	Plain	Farmland	None	None	NA	Amidyala(4200m) (E)	None	NA	C.L	C.L	C.L	C.L	N
9	G1-20	16.4202	73.7557	473	Plain	Farmland	None	None	NA	Amidyala(4400m) (E)	None	NA	C.L	C.L	C.L	C.L	N
	G1-21	16.4257	73.5547	473	Plain	Farmland	None	None	NA	Indravathi(2800m)(NW)	None	NA	C.L	C.L	C.L	C.L	N
10	G1-23	16.4509	73.7016	483	Plain	Farmland	None	None	NA	Amidyala(1260m)(E)	None	NA	C.L	C.L	C.L	C.L	N
	G1-24	16.4349	73.5268	470	Plain	Farmland	None	None	NA	Renimakulapalli(1450m)(N)	None	NA	C.L	C.L	C.L	C.L	N
	G1-25	16.4962	73.9643	470	Plain	Farmland	None	None	NA	Renimakulapalli(1250m)(N)	None	NA	C.L	C.L	C.L	C.L	N

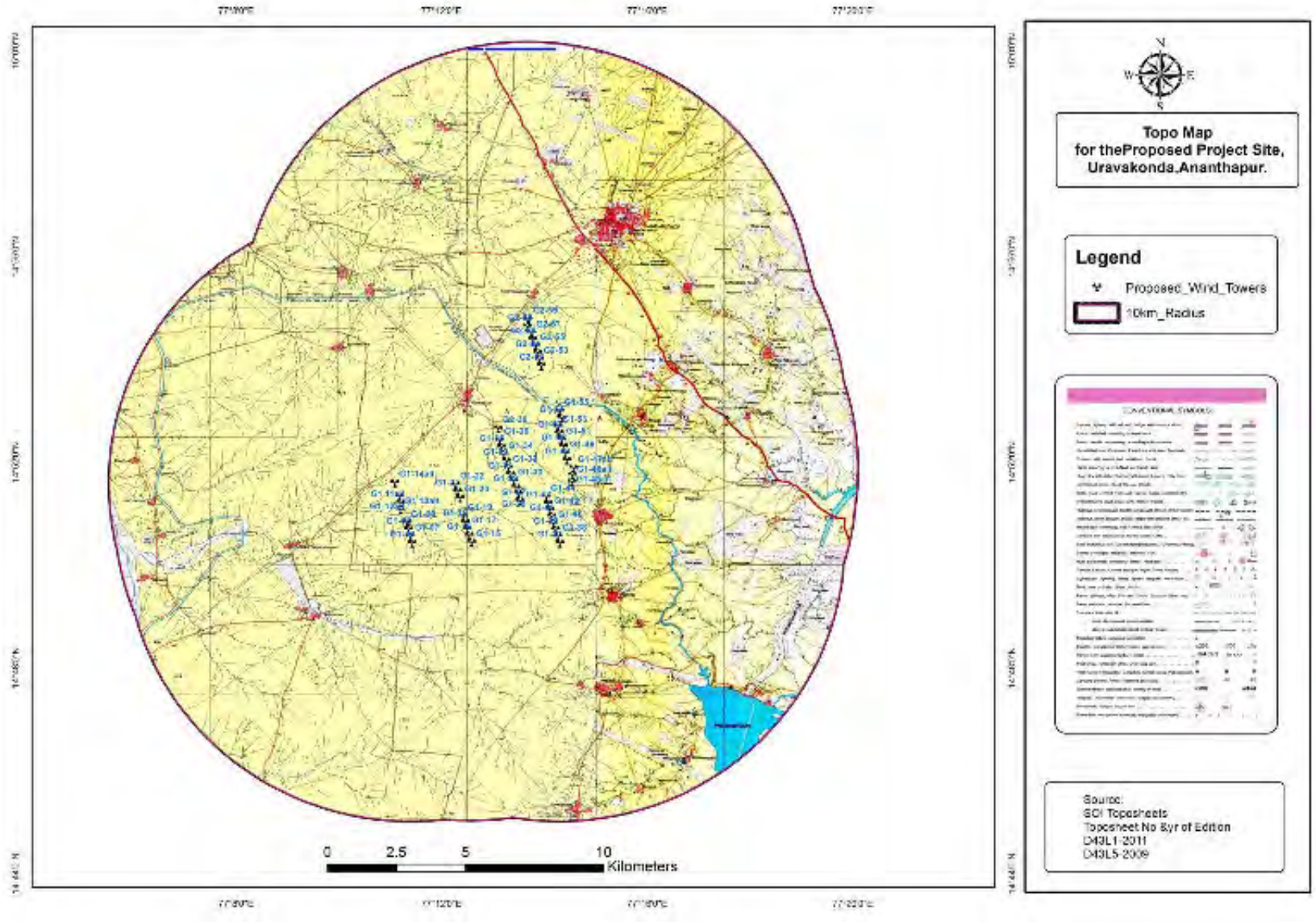
	G1-26	16.4901	74.0145	469	Plain	Farmland	None	None	NA	Renimakulalpalli(1650m)(N)	None	NA	C.L	C.L	C.L	C.L	N
11	G1-27	16.4749	74.0365	473	Plain	Farmland	None	None	NA	Indravathi(1800n)(E)	None	NA	C.L	C.L	C.L	C.L	N
12	G1-28	16.4344	73.925	482	Plain	Farmland	None	None	NA	Amidyala(2600m)(E)	None	NA	C.L	C.L	C.L	C.L	N
13	G1-29	16.4385	73.9344	482	Plain	Farmland	None	None	NA	Amidyala(2750m)(SE)	None	NA	C.L	C.L	C.L	C.L	N
14	G1-30	16.4406	73.9235	478	Plain	Farmland	None	None	NA	Amidyala(2900m)(SE)	None	NA	C.L	C.L	C.L	C.L	N
15	G1-31	16.4431	73.9161	479	Plain	Farmland	None	None	NA	Amidyala(2600m)(SE)	None	NA	C.L	C.L	C.L	C.L	N
16	G1-32	16.4454	73.9048	474	Plain	Farmland	None	None	NA	Amidyala(2750m)(SE)	None	NA	C.L	C.L	C.L	C.L	N
17	G1-33	16.4291	74.0404	482	Plain	Farmland	None	None	NA	Amidyala(1350m)(E)	None	NA	C.L	C.L	C.L	C.L	N
18	G1-34	16.4493	73.8834	474	Plain	Farmland	None	None	NA	Nimbagallu(2300m)(N)	None	NA	C.L	C.L	C.L	C.L	N
19	G1-35	16.4517	73.8782	474	Plain	Farmland	None	None	NA	Nimbagallu(2300m)(N)	None	NA	C.L	C.L	C.L	C.L	N
20	G1-36	16.4542	73.8764	468	Plain	Farmland	None	None	NA	Nimbagallu(1800m)(N)	None	NA	C.L	C.L	C.L	C.L	N
21	G1-37	16.4372	73.725	473	Plain	Farmland	None	None	NA	Nimbagallu(3300m)(N)	None	NA	C.L	C.L	C.L	C.L	N
22	G1-38	16.4397	73.7282	473	Plain	Farmland	None	None	NA	Nimbagallu(3100m)(N)	None	NA	C.L	C.L	C.L	C.L	N
23	G1-39	16.4437	73.7203	487	Plain	Farmland	None	None	NA	Nimbagallu(3100m)(N)	None	NA	C.L	C.L	C.L	C.L	N
24	G1-40	16.4460	73.703	485	Plain	Farmland	None	None	NA	Nimbagallu(3100m)(N)	None	NA	C.L	C.L	C.L	C.L	N
25	G1-41	16.4484	73.7063	482	Plain	Farmland	None	None	NA	Nimbagallu(3100m)(N)	None	NA	C.L	C.L	C.L	C.L	N
26	G1-42	16.4509	73.7016	483	Plain	Farmland	None	None	NA	Nimbagallu(3100m)(N)	None	NA	C.L	C.L	C.L	C.L	N
27	G1-43	16.4346	74.0551	482	Plain	Farmland	None	None	NA	Amidyala(1450m)(E)	None	NA	C.L	C.L	C.L	C.L	N
28	G1-44	16.4370	74.0438	483	Plain	Farmland	None	None	NA	Amidyala(1550m)(E)	None	NA	C.L	C.L	C.L	C.L	N
29	G1-45	16.4404	74.1268	479	Plain	Farmland	None	None	NA	Amidyala(1300m)(S)	None	NA	C.L	C.L	C.L	C.L	Y
30	G1-46	16.4430	74.1301	479	Plain	Farmland	None	None	NA	Amidyala(1500m)(S)	None	NA	C.L	C.L	C.L	C.L	Y
31	G1-47	16.4455	74.1329	477	Plain	Farmland	None	None	NA	Amidyala(1700m)(S)	None	NA	C.L	C.L	C.L	C.L	Y
32	G1-48	16.4484	74.1097	477	Plain	Farmland	None	None	NA	Mopidi(2900m)(NE)	None	NA	C.L	C.L	C.L	C.L	Y
33	G1-49	16.4509	74.108	475	Plain	Farmland	None	None	NA	Mopidi(2850m)(NE)	None	NA	C.L	C.L	C.L	C.L	Y
34	G1-50	16.4532	74.0995	474	Plain	Farmland	None	None	NA	Mopidi(2850m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
35	G1-51	16.4557	74.0918	473	Plain	Farmland	None	None	NA	Mopidi(2800m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
36	G1-52	16.4581	74.0885	471	Plain	Farmland	None	None	NA	Mopidi(2850m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
37	G1-53	16.4606	74.0833	469	Plain	Farmland	None	None	NA	Mopidi(2850m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
38	G1-54	16.4773	74.0302	471	Plain	Farmland	None	None	NA	Indravathi (N)	None	NA	C.L	C.L	C.L	C.L	Y

39	G1-55	16.4798	74.0254	471	Plain	Farmland	None	None	NA	Mopidi(2850m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
40	G1-56	16.4828	74.0343	469	Plain	Farmland	None	None	NA	Mopidi(2850m)(E)	None	NA	C.L	C.L	C.L	C.L	Y
41	G1-57	16.4854	74.0305	470	Plain	Farmland	None	None	NA	Mopidi(2700m)(E)	None	NA	C.L	C.L	C.L	C.L	
42	G1-58	16.4236	74.0439	482	Plain	Farmland	None	None	NA	Amidyala(1250m)(E)	None	NA	C.L	C.L	C.L	C.L	N
43	G1-59	16.4189	74.0189	487	Plain	Farmland	None	None	NA	Amidyala(1400m)(E)	None	NA	C.L	C.L	C.L	C.L	N

C.L: Crop Land

HL Canal: Tungabhadra HL canal

Figure 3-1: Physical Features around the Site

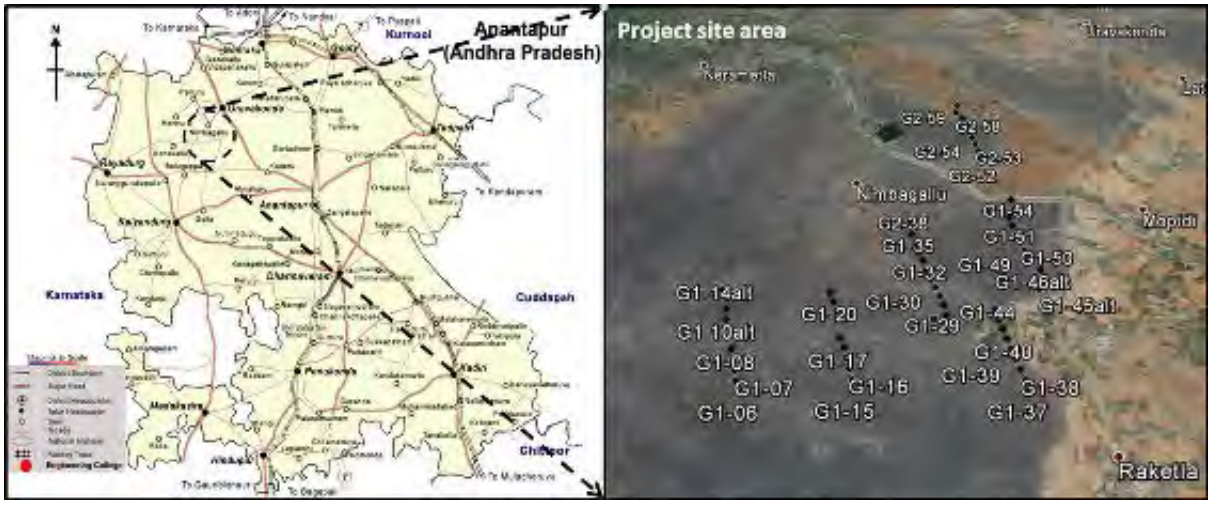


3.3 Location Description and key feature of the project site:

The location of the project is in one of the most arid regions in Andhra Pradesh. Anantapur has been the centre of various studies for of arid and unfavourable farming conditions. Its lack of water and unfertile soil has been key factor behind one of the lowest yield per acre with the national standard. The region has open barren lands which are treeless and made by mix of black soil and poor red soil. The yield particularly in the farming land is very low and large portions of farming lands are left uncultivated due to lack to yield and unavailability of water source. There is no forest land in the project site.

The site area is rural with sparsely located villages amongst plains and undulating terrain. The site is located at a distance of approximately 60 km from Anantapur district headquarters. The nearest railway station is at Guntakal town (40km) and the nearest Airport at Bangalore (250 km). The project area is undulating terrain with plateaus mostly vast spread of cultivated lands. The project region largely composed of plains and undulated lands.

Figure 3-2: Project Site and WTGs Location



3.4 Project Components:

The project is wind power plant and hence the key most components of the project are WTGs, substation and Transmission Lines. Being a wind project it is spread over a large area and hence the internal roads also make an important part of the project. During the conception and construction of the project a number of other components are to be considered for evaluations. The other components of the project will also include:

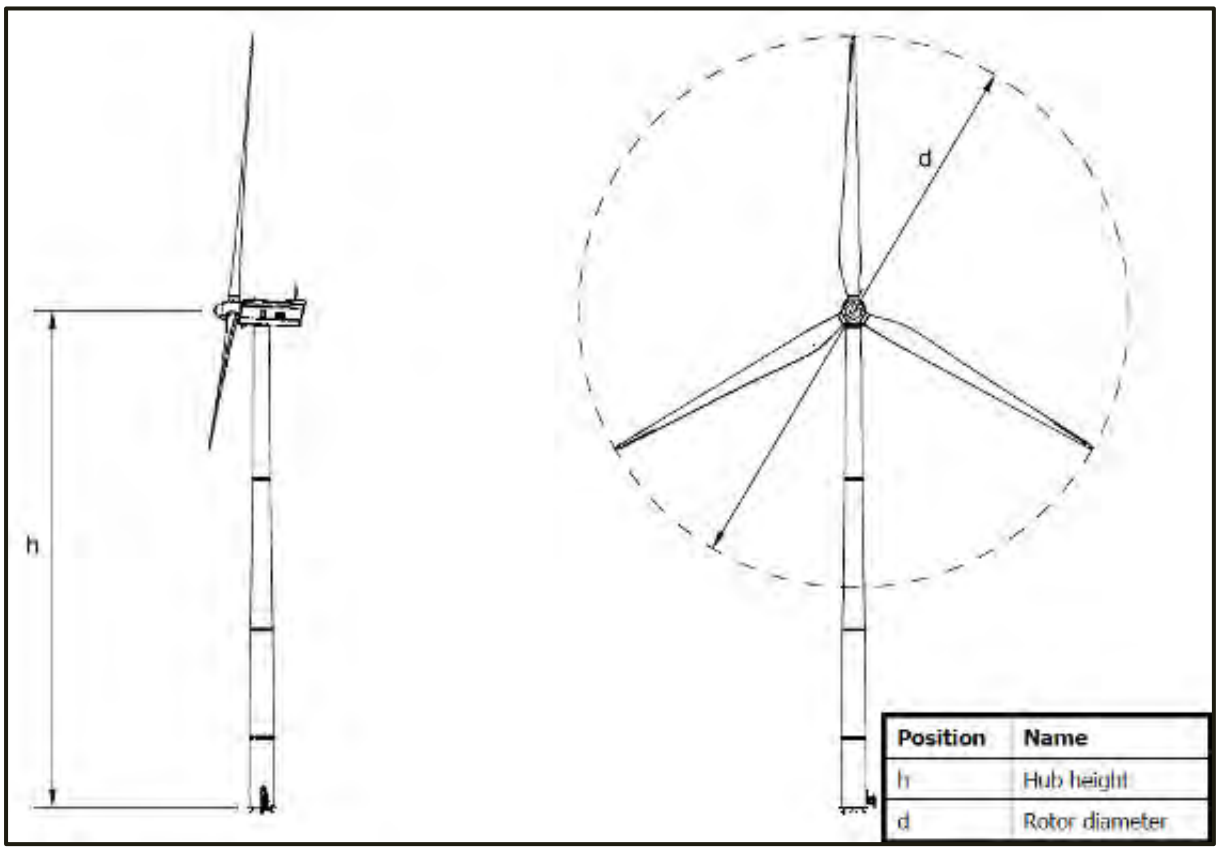
- Wind Turbine Generators (WTGs)
- Pooling Substation
- Transmission Line
- Road Network till individual WTGs
- Temporary Storage Yards (2 at Amidayala and 1 at Nimbagallu)
- Permanent Storage Facility
- Batching Plant

3.4.1 Wind Turbine Generators

The Wind Turbine Generator (WTG):

The project activity plans to commission 50 WTGs of Gamesa G97 model each with a capacity 2MW, hub height of 104m and rotor diameter of 97m. A wind turbine consists of three major mechanical components: tower, nacelle, generator and rotor. These are described in the following subsections:

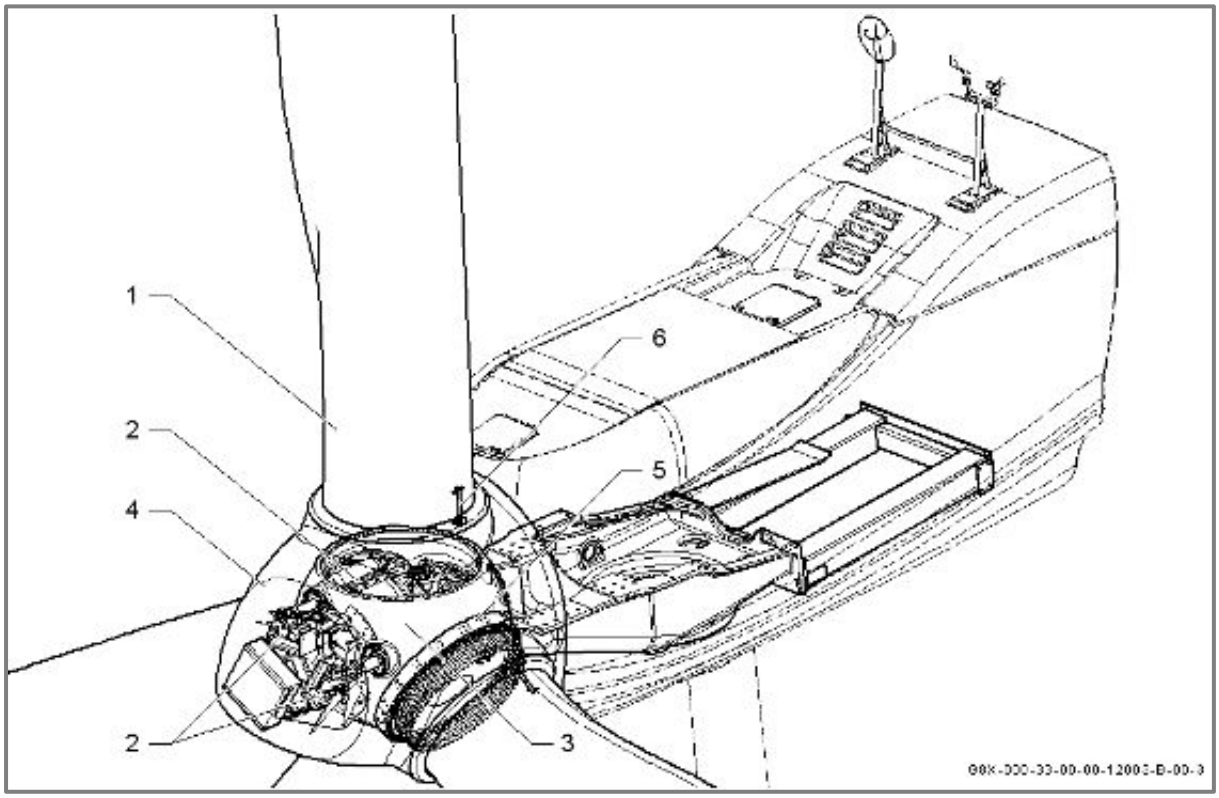
Figure 3-3: Digramatic presentation of WTG



Rotor

The rotor of the Gamesa G97 consists of three fiberglass blades that extend out of the hub. The rotor is mounted to a driveshaft within the nacelle (as defined below) to operate upwind of the tower. Hydraulic motors within the rotor hub feather each blade according to the wind conditions, which enables the turbine to operate efficiently at varying speeds.

Figure 3-4: Diagramatic presentation of Rotor

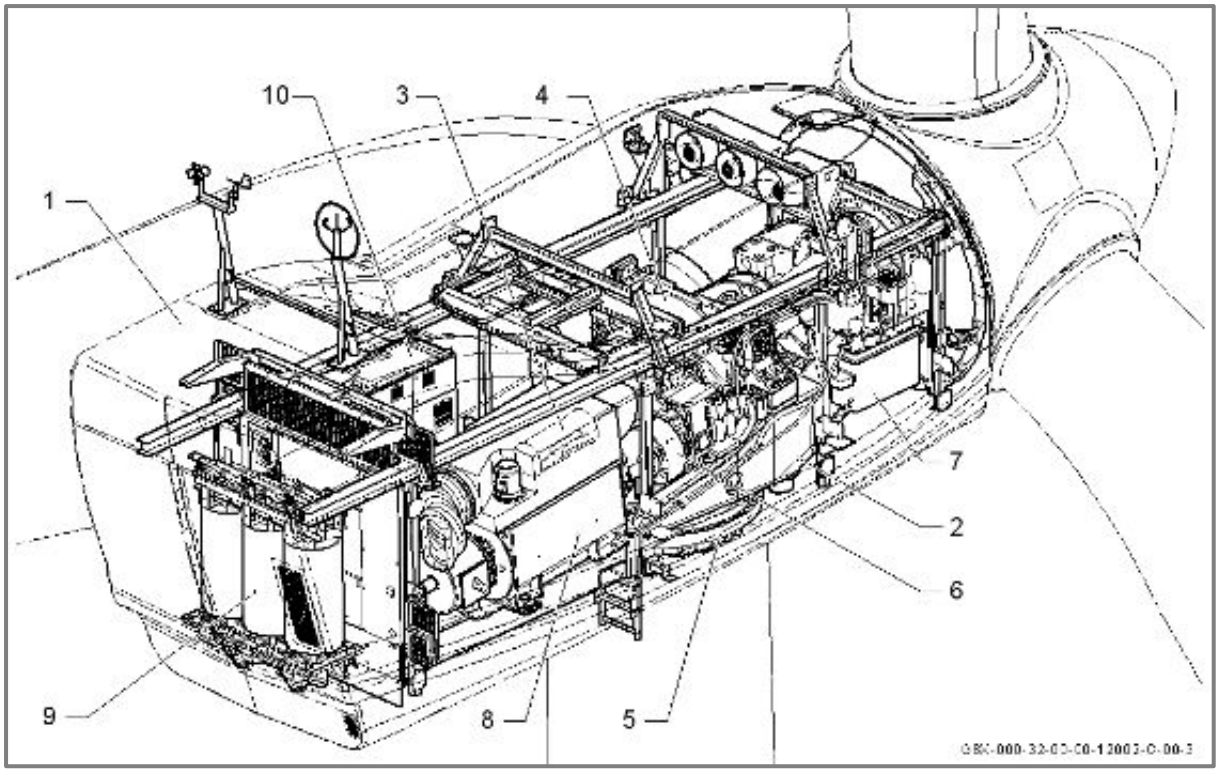


Position	1	2	3	4	5	6
Name	Blade	Pitch control system	Hub	Cone	Blade bearing	Lightning system

Nacelle

The nacelle is a large housing that sits on top of the tower behind the rotor. It houses the main mechanical components of the wind turbine: drive train, yaw system and its accessories, etc. The cover protects the wind turbine components within the nacelle from exposure to meteorological events and external environmental conditions. It is made of composite resin and reinforced with fiberglass. There are two skylights on the roof allowing sunlight to enter during the day and providing additional ventilation and access to the exterior, where the wind measuring instruments and the lightning rod are located. The nacelle contains a 1000 kg service crane inside.

Figure 3-5: Digramatic presentaion of Nacelle



Position	1	2	3	4	5
Name	Cover	Frame	Main shaft	Gearbox	Yaw system
Position	6	7	8	9	10
Name	Mechanical brake	Hydraulic unit	Generator	Transformer	Cabinets

Tower

The tower supports the nacelle and rotor. The tower in G97 is made up of 4 steel sections. The tower will have an access door and an internal safety ladder and/or elevator to access the nacelle.

Table 3-2: Technical Specification of G97:

General	
Wind Turbine Class	IIIA
Power	2000 kW
Hub Height	104m
Type	Direct Drive Horizontal Axis Wind Turbine with variable rotor
Power Regulation	Independent electromechanical pitch system for each blade
Survival wind speed	52.5 m/s
Design Lifetime	25 Years
POWER	
Rated power	2000 kW

Average Annual Wind speed	7.5 m/s
Turbulence Intensity I15%	18 m/s
Reference 10 minute wind speed	37.5 m/s
Survival wind speed	52.5 m/s
GENERATOR	
Type	Doubly-fed with coil rotors and slip rings
Rated power	2.0 MW
Voltage	690 V AC
Frequency	50Hz/60Hz
Protection class	IP 54
Power Factor	0.95 CAP – 0.95 IND throughout the power range
ROTOR	
Diameter	97 m
Swept area	7390 sq.m
Speed range (variable)	9:19 rpm
BLADE	
Material	Composite material with fiberglass, carbon fibre and pre-peg
TOWER AND FOUNDATION	
Hub height	104 m
Design	Tubular, Four sections
Foundation type	Floating foundation
GEAR BOX	
Type	1 Planetary stage & 2 Parallel stage
Ratio	1:106.8 (50 Hz), 1:127.2 (60 Hz)

3.4.2 Pooling Substation (Power Evacuation) & Transmission Line:

Pooling substation is being built by the Gamesa to evacuate power from the project activity. The 33/220 KV Pooling Substation is located at Nimbagallu village to the north-west of the site, connected through single/ double circuit 33 kV transmission lines. At the Pooling Substation, the power will then be stepped up from 33kV to 220 kV and transmitted through a double circuit 220kV transmission line to Andhra Pradesh Southern Power Distribution Company Limited (APSPDCL) substation (Uravakonda Substation) located at around 8.0 km from the pooling substation.

The Uravakonda substation is being built by the APSPDL and is expected to be completed just before the project commissioning. The 220kV transmission line and Pooling Substation may also be used to evacuate power form other project which may come up in the region.

Based on the toposheet and satellite imagery study of the location of the transmission line, no sensitivities, such as forest land; settlements or river crossings are located along the RoW.

Details of the Pooling Substation and Transmission Line:

- Erection of 220/33 KV pooling station at Nimbagallu Village with 4 number of 60/80 MVA transformers;
- Apart from the transformers in the substation and each WTG has its own transformer in the nacelle;

- Erection of 220 kV DC Line (8.0 km) to 400/33 kV Uravakonda substation from Pooling Substation;

The below photographs shows the Pooling substation under construction (220kV/33kV):

Photograph 3-2: Picture*: *Pooling Substation under Construction

Source: Site Survey

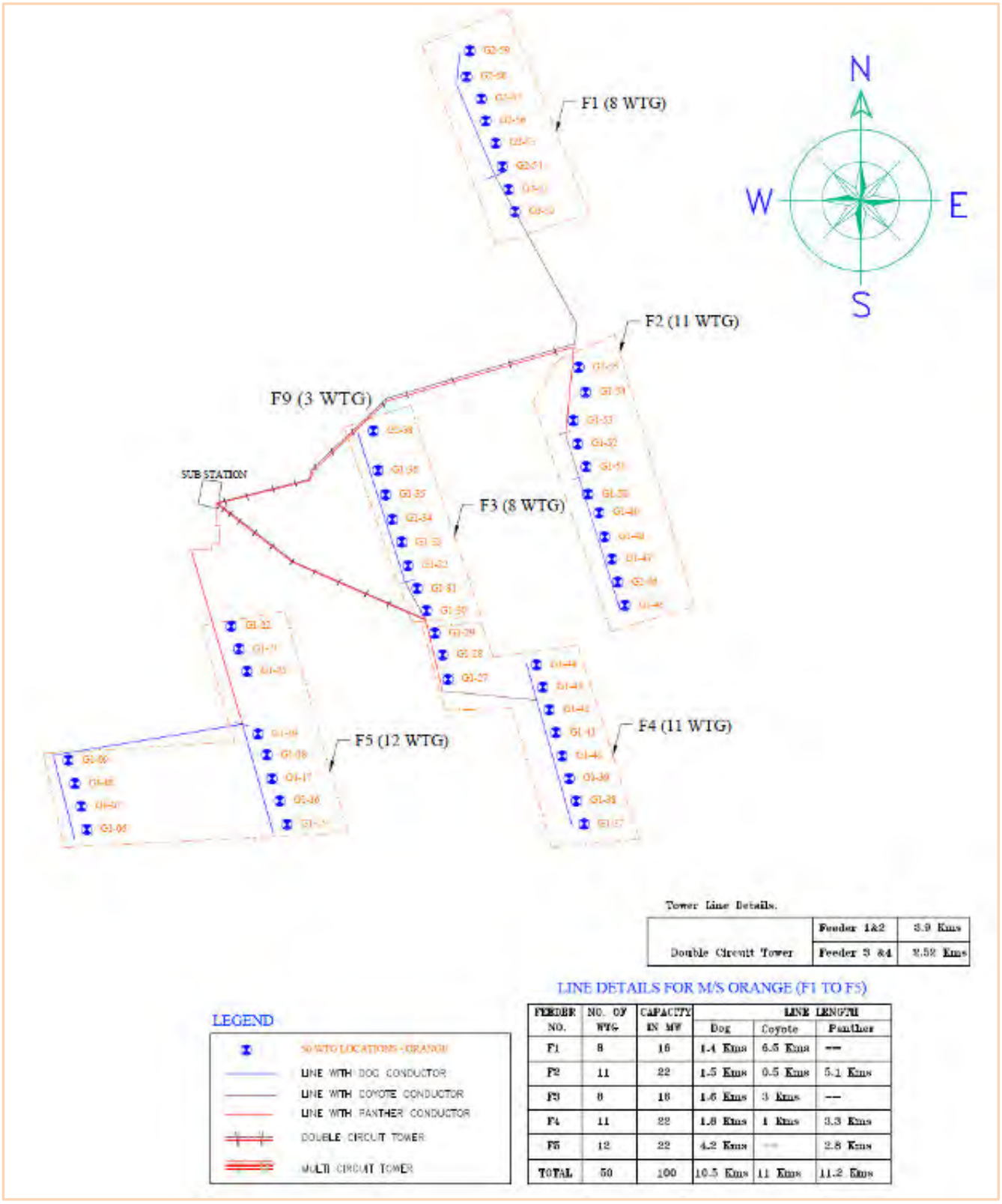
The below photographs shows the Uravakonda Substation under construction (400kV/220kV):

Photograph 3-3: Picture: Substation of Uravakonda

Source: Site Survey

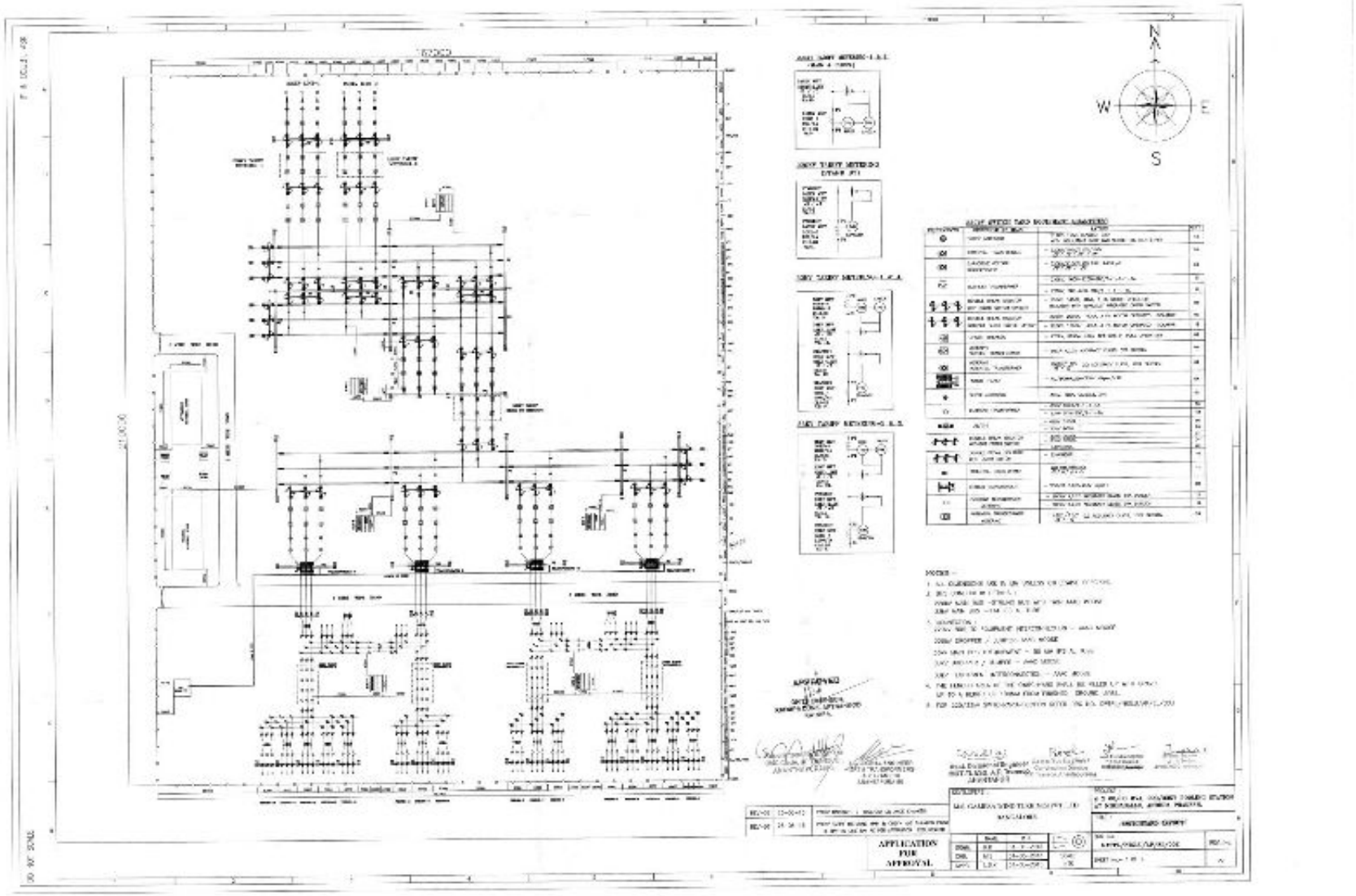
The Diagram below shows the Transmission line drawn to the evacuation point of Nimbagallu Pooling substation (220kV/33kV):

Figure 3-6: Diagram: Transmission lines to the Pooling Substation



Note: Some of the WTG locations depicted in this map have been revised and actuals can be found in project layout diagram

Figure 3-7: 220 kV/33 kV Switchyard and Metering Diagram



3.4.3 Access Road

The project activity is not very far from the existing road networks, however, it is to be noted that for reach to individual WTGs there is a need to construct internal roads and reinforce the existing roads to prevent impact from the movement of heavy vehicles. The roads will be planned with a width of 7m to 12m along the normal course and of 22m along the curves to enable movement of large wind turbine components. The acceptable supporting or load capacity of the Wind farm access roads has been agreed at at-least 2kg/sqcm (approx. 0.2 mpa) and the internal access roads will be at-least 4kg/sqcm (approx. 0.4 mpa), at wearing course level. In total the access road will be spread over a length of about 11 km and with an approximate width of 7m.

Roads for Access to the Project Site:

The site is accessible via Bellary-Uravakonda-Anantapur NH167 which is principal road connecting the project site to both Anantapur and Bellary. All the key project equipment is brought to the site from this road connection. Establishment of access to site will be one of the preliminary activities that will be undertaken as part of construction process. Two approach roads, with length of 2.5 km and 3.1 km each, have been proposed for accessing the cluster of WTGs locations. Besides the approach roads there will be internal roads for access to each turbine location and associated facilities within the wind farm area.

Figure 3-8: Representation of Material movement to site and Accessibility.

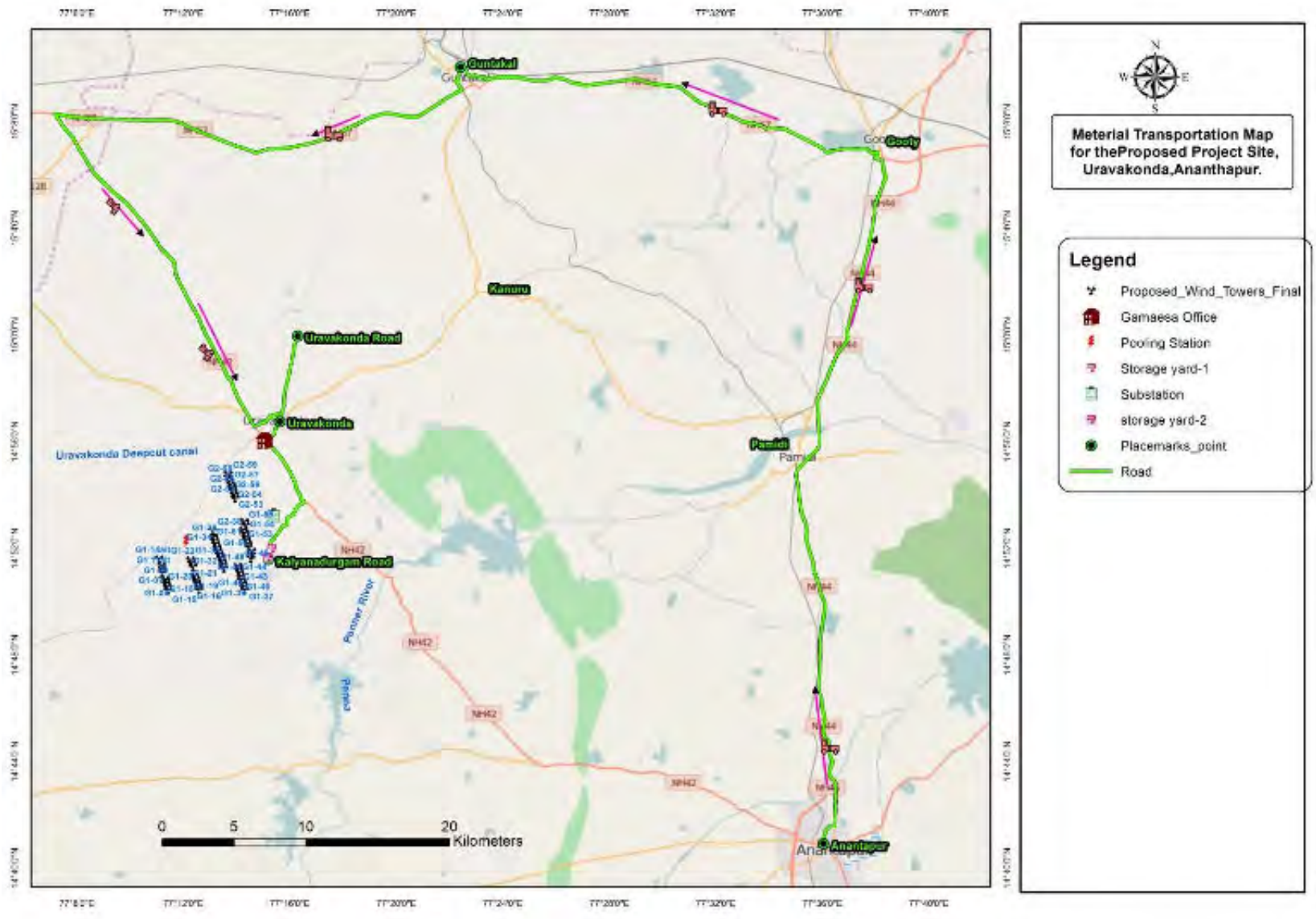
Photograph 3-4: Picture: Access Road to the Pooling Substation and Storage Yard in Mopidi

Source: Site Survey

Photograph 3-5: Picture: Internal Access Road to the WTGs & Truck carrying Material via these kachha roads to Site

Source: Site Survey

Figure 3-9: Representation of Material Transportation Map



Permission for usage of all the main roads is being obtained by Gamesa for the construction of the project activity. The local Gram Panchayats have been approached for obtaining their agreement over the issue of modifications to the existing roads passing through villages. The access route to individual WTG points has begun at one of the WTG clusters and is yet to be planned for all other 4 clusters.

3.4.4 Storage Yard

The project activity needs to store project equipment, machinery and raw material during the construction phase and after commissioning even during the operation phase for maintenance of spares. Currently, Gamesa has leased enough land for storage of material and mechinary at site. Appropriate arrangements will have to be made during the operation phase for storage of material in-line with the methods suggested in this report.

Photograph 3-6: Picture: Storage Yard of Gamesa

Source: Site Survey

3.5 Summary of Activities

In any wind power project the activities can be demarked as:

- Conceptualization/Planning Phase
- Construction Phase
- Operation/Production Phase
- Decommissioning/Dismantling

3.5.1 Conceptualization Phase:

This is the foremost step in the way of investment in the project activity. It involves everything from planning of the right technology to finalization of the contracts. The activities in conceptualization can be summarized as:

- Identification of potential sites suitable for a wind power project.
- Feasibility study of the auxiliary factors influencing the project
- Choice of right technology (Gamesa G97 IIIA)
- Securing approvals from local/relevant government bodies
- Signing key project agreements like PPA, Turnkey agreements, O&M agreements etc.

The project has been conceptualized due to the availability of required evacuation infrastructure at

the project site and availability of required land at desired locations.

3.5.2 Construction Phase

The project construction is in progress and the status of the project can be found in **section 3.10** of this chapter. Construction phase is the most active phase in the project's life cycle. It can also be termed as the phase with possibly noteworthy impact. The construction activities will have the following stages:

- Development of access roads
- Site development activities like site levelling, removal of ground vegetation and any obstructions in movement of material.
- Installation of temporary and/or permanent meteorological towers
- Installation of wind turbine and associated facilities
- Construction of underground and/or overhead electrical collection lines to connect turbines to the collection substation
- turbine foundations and erection
- switch yard structure and equipment foundations including power transformer and control room cum administration building
- Synchronization and commissioning of the WTGs
- Security kiosks, collection substation, fencing and drainage etc

3.5.3 Operation & Maintenance

Wind projects require a dedicated Operation and Maintenance (O&M) facility for storing equipment and supplies required during operation. An O&M agreement has been signed with Gamesa which entrusts them with responsibility of maintenance and repairs. The Power Purchase Agreement will be executed before start of the project operation. Gamesa is ISO14001 and OSHA 18001 certified company with established EHS procedures. The site will be under 24 hours on site monitoring under the supervision of technically skilled and experienced staff to look after the O&M requirements of the project activity. A storage yard sufficient stock of tools and spares as well as critical components will be maintained at the site.

The typical maintenance and repair activity during operation phase involves preventive and breakdown maintenance of Wind turbines and/or the related equipment in accordance with the safety management plans and procedures as applicable and/or in accordance with accepted industry practices.

3.5.4 Decommissioning

Decommissioning activities depend on the proposed subsequent use of the site, but they typically consist of removal of infrastructure. The life of the project activity is 25 years and depending on the conditions of equipment and applicable regulation at the end of project's life cycle, the developer will decide whether to decommission the project activity.

- ❖ Remove above-ground collection system including substation and point of connection, transmission lines and poles.
- ❖ Removal of the WTGs
- ❖ Partial removal of wind turbine foundations;

Once all of the turbines and ancillary facilities are removed, the remaining decommissioning work will consist of shaping and grading the areas to, as near as practicable, the original contour prior to construction of the wind turbines. All areas, excluding the access roads will be restored to, as near as practical, their original condition with native soils. Possible re-vegetation with native species will be carried out be contribute to the local environment.

3.6 Resource Management

3.6.1 Construction Phase

3.6.1.1 Man Power:

This is the single most import resource which is to be managed well to ensure compliance to local and international regulations. During construction of the project a total of 80-100 workers will be required during normal functions while peak construction activities will require 150-200 workers. Most of the unskilled labours required for construction activities are hired locally from surrounding villages. However, the majority of skilled labourers are brought from the state of Kerala, Jharakhand, West Bengal, etc. The workers coming from outside will be lodged in rented accommodation in nearby towns or in the labour camps set around the project site. The details of labour camps and facilities have been provided under the table in this section. Adequate facility for drinking water and sanitation are provided at the construction site.

Table 3-3*: Manpower requirements of Mamatkheda and its contractors in construction phase*

S. No	*Contractor*	*Assignment*	*Total Manpower*	*Interstate labourers*	*Current Manpower*	*Labour Camp Facility*	*EHS/Facilities /Sanitation Condition*
1	*TopView*	*Civil Construction*	*60*	*20*	*45*	*At Batching Plant*	*Acceptable*
2	*ABG Electrical*	*PSS Erection*	*30*	*10*	*20*	*At site near PSS*	*Acceptable*
3	*DKD Engineers*	*Internal Line Work*	*-*	*-*	*-*	*-*	*-*
4	*PVR Construction*	*EHV Line*	*30*	*25*	*25*	*Nearby Village*	*Unknown*
5	*PRV Construction*	*DP-Yard*	*40*	*20*	*35*	*Accommodation in Village*	*Good*

6	*Sanco Erection*	*WTG Erection*	*25*	*10*	*Not Yet*	*Not Yet*	*-*
7	*Wind Care India*	*WTG Erection*	*20*	*10*	*Not Yet*	*Not Yet*	*-*
8	*Sri Shiridi Sai Agency*	*Equipment Transport*	*variable*	*variable*	*Not applicable*	*Not applicable*	*-*
9	*NTC*	*Material Transport*	*variable*	*variable*	*Not applicable*	*Not applicable*	*-*
10	*KALAIVANI*	*Material Transport*	*variable*	*variable*	*Not applicable*	*Not applicable*	*-*
11	*Gamesa*	*Turnkey*	*10*	*10*	*10*	*Private Housing*	*Good*

As the total number of labourers may continuously vary along the period of construction the numbers in the table above are indicative. The current manpower however is the account of workers present at site at the time of site visit by consultant.

3.6.1.2 Labour Camps at Project Site

Photograph 3-7: Photographs of Labour camps

Source: Site Survey

Source: Site Survey

The main contractor in the project activity is Gamesa, however, Gamesa has subcontracted most of the jobs to sub-contracts who are responsible for various jobs such as; civil work at the PSS, electrical work at the PSS, transmission lines, foundation for WTGs, erection of WTGs etc.,. The subcontractors

have hired skilled labourers from other states and have made their stay arrangements at rented accommodation in nearby towns or in the labour camps established by them. The representative photographs of the labour camps can be seen above.

The migrant groups are hired by the sub-contractors based on the type of tasks and for shorter time periods ranging from 2 to 4 months. It is evident from the table below that almost half of the workers engaged by most the contractors are locals (except for PVR).

Majority of the local labourers are employed for unskilled work. The water requirements at labour camps are met through purchase of water canes, water tanker facility (private contractor engaged for sourcing water). Food is cooked at the labour camps itself and all the camps have designated kitchen and cook for this purpose.

3.6.1.3 Water Requirement

Large volume of water will be required during the construction of the project activity. The construction activity has already been started at the site and water for the civil construction is sourced individually by the subcontractors through contracting authorized taker water suppliers. Water will also be sourced from the bore wells to pump ground water by taking permission from local panchayat/well owner (as in case of PRV). The water required for construction will be arranged by the construction contractors through authorised tanker water suppliers.

There is one storage tank constructed near the batching plant site which is used to store water for construction activities. The water requirement during the construction phase has been provided in the table below

Table 3-4: Water requirement

Activity	WTG	DP Yard	EHV	33kV Pole	220/66/132kV Tower
Water required in KL	45 KL	1KL/Loc	1KL/Tower	5KL/Km	4KL/tower

Photograph 3-8: Water Tanker for transportation to site and overhead drinking water tank at labour camp

Source: Site Survey

3.6.1.4 Raw Material:

The construction period of a wind power project is relatively short however; it does require significant quantities of raw material for the construction and erection of each WTG. Raw materials like Cement, steel, sand, stone and admixture will be required. The total estimated quantity for the raw materials for the project activity in per WTG basis is provided below:

Table 3-5: Raw material & Quantities Required

S.no	Item	Per WTG	DP yard	33 kV pole	220/66/132 kV/Tower
1	Cement	122 Tons	1.75T/Loc	11.5 Ton/Km	18 tons
2	Grouting cement	1975 kg	--	--	--
3	Sand	550 Units	2 Units/Loc	4 units/km	5units/tower
4	20 mm Aggregate	47 Units	1.5 units/Loc	7units/km	7 units/tower
5	10 mm Aggregate	35 Units	--	--	--
6	Steel	36 MT	--	5 Ton/km	2.8tons/tower
7	Admixture	90 Ltrs	--	--	--

Photograph 3-9: Picture: Storage of Raw Material at Site

Source: Site Survey

3.6.1.5 Power Requirement

The project activity being constructed has no grid connectivity and solely depends on the power generated from DG sets to meet the requirement of power during construction. The DG sets are arranged by individual subcontracts. These DG sets can be moved along the course of work from one location to another. The electricity generation will be used for the construction activity, at the batching plant and at the labour camps.

Fuel Requirement

The fuel requirement comes from the usage of vehicles at the site and through usage of DG sets. The approximate 3kWh/litre of diesel. The fuel shall be procured by individual sub-contractor and storage if such fuel at site shall meet the prescribed local regulations.

Photograph 3-10: Picture: Movable DG sets for site & fixed DG sets at Batching plant & Labour camps

Source: Site Survey

Source: Site Survey

3.6.1.6 Safety

All the places of work and storage such as batching plant, site office, storage yard, heavy construction machinery shall be equipped with security round the clock. A working fire fighting system shall be available throughout the period of construction. The worker must be aware of its usage and regular drills must be carried to ensure preparedness. The location of such fire fighting equipment must be at places easily accessible.

3.6.1.7 Machinery

During the site visit these there were a number of equipment and machinery spotted at the site and storage yards. The key equipment spotted were heavy duty concrete pump, concrete mixer, tippers, diesel generators and excavators etc. The list of equipment/machinery used during the project construction and operation phases is as listed below:

3.6.2 Operational Phase:

3.6.2.1 Man Power

Technical Staff

The operation and maintenance of wind turbines will be outsourced to the equipment suppliers. The site will have 15-20 personnel's at site including maintenance and monitoring staff during the operation phase. Most of the staff will be residing in rented accommodation in and around the villages of project site. Table 3.8 below gives the break-up of the staff requirement during O&M phase.

Security

Adequate security arrangements will be required to watch and ward the Wind Farm and the Equipment. About 15 security staff will be available at site to undertake watch and ward activities. The security staff will be hired locally.

Table 3-6: Estimated Staff Requirement

Staff	Normal Period	Peak Period
O&M staff	15	20
Security Staff	15	--

3.6.2.2 Spares, Tools & Raw Material:

The O&M team will maintain all possible spares and tools required for efficiently executing their job. Consumable materials required as a part of the preventive maintenance such as lubricants and oils, minor/low value electrical and mechanical parts etc, shall be stocked.

Procurement of equipment, components, spares and consumables in the event of any breakdown or will be done form recommended sources only.

3.6.2.3 Fuel Requirement:

The project activity will not maintain any DG sets after the commissioning of the project activity and hence the fuel requirement will be restricted to usage in vehicles at the site maintained by O&M team. There will be oil required for servicing of WTGs, however, it shall be accounted under consumables and stored separately.

3.6.2.4 Power Requirement:

As described earlier once the project is commissioned there will no requirement of DG sets at the sites. Unlike other technologies, a wind power project does not need any axillary power for operating.

3.7 Benefits of The Project

Unlike conventional power plants a wind power project generates clean energy and has minimal impact both during its construction and operation. The project draws minimal from the natural system and generates maximum output. Wind power project come along a number of benefits to the environment, economy and the local population. The Ministry of Environment and Forests, Govt. of India has stipulated the following indicators[1] for sustainable development in the interim approval guidelines. These are guidelines for assessing the sustainability of a Clean Development Mechanism (CDM) project however, as there are set national guidelines for a wind power project, the current project is being evaluated on the same parameters:

a) Social well-being
b) Economic well-being
c) Environmental well-being
d) Technological well-being

These project activity contributions towards the sustainable development are as follows;

Jobs: The project during the course of construction is expected to create more than 150 jobs. Post construction the project will continue to engage around 40 personnel. More than 50% of the manpower used during construction phase will be local workers.

Better price of Land: The project activity offers as much as three folds the market price to the land seller and also encourages the land sellers in case a job opportunity. This fact has been affirmed during the social consultation process.

Land Use: A typical WTG will use less than 1 acre permanently and less than 2.5 acres per WTG during the construction phase. The remainder of the land can be used for a variety of other productive purposes, including livestock grazing, agriculture etc.

Local Business: The project provides opportunity to the local vehicle leases for long term. It also helps the villages to get revenue of their houses by renting them at desired price during the construction phase. Hence, the project can diversify the economies of rural communities, by creating opportunities during its construction and operation.

[1] http://envfor.nic.in/sites/default/files/cc/cdm/criteria.htm

Strengthening Local Grid: India being a power deficit country needs more power project to be added to the grid to help its industries and farmers. Power generated from this project activity will help strengthen the local grid and encourage small scale industries.

Clean fuel source. Wind energy doesn't pollute the air like power plants that rely on combustion of fossil fuels, such as coal or natural gas. The current gird emission factor for the Southern grid is 0.982 tonne of CO_2/MWh. The project by not generating any emissions will help reduce the carbon intensity of the Indian power grid.

Price Stability: Being a wind project activity the electricity price is not linked to the fuel price of exchange rates. The price of power is not expected to rise in most plausible scenario. The price of electricity from fossil fuels and nuclear power can fluctuate greatly due to highly variable mining and transportation costs. Project like the current wind project can help buffer these costs because the price of fuel is fixed and free.

Conserves and Keeps Water Clean: The wind power project does not produce any particulate emissions that contribute to mercury contamination in our lakes and streams. Wind energy also conserves water resources. For example, producing the same amount of electricity through a coal power project can have serious impact on the local water bodies.

Technology: ANPWPL has engaged Gamesa for supply of one the most advanced WTGs available in market. Infact, the project is one of the first to order a g97 IIIA with 104m hub height. This encourages other companies to invest in more advanced cleaner technologies.

Conclusion: The project after commissioning will play an important role in helping to meet the country's increasing demand for electricity, reducing CO2 emissions and contributing to its economic growth and to the sustainable development of the local communities.

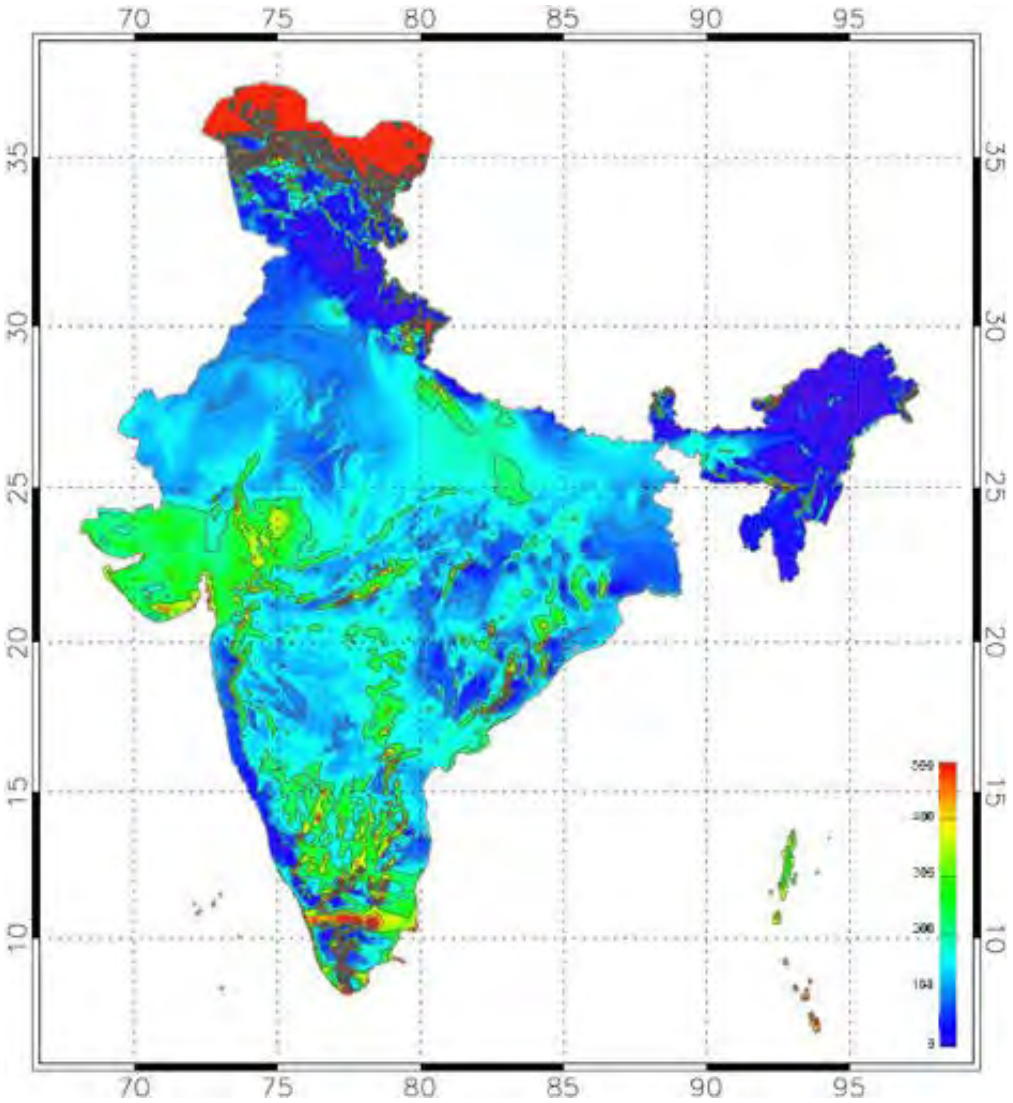
3.8 Energy Assessment:

The government of India has envisaged commissioning a total cumulative capacity of 60,000 MW of wind energy by 2022. The installed capacity of wind power as of March 2015 was 23,434 MW. The project activity falls under high wind potential regions. The wind power generation capacity in India is 49,130 MW as per the official estimates in the Indian Wind Atlas (2010) by the Centre for Wind Energy Technology (C-WET). The potential is calculated with respect to 2 per cent land availability at windy locations and pertains to a 50 meter hub height level of the wind turbines. Presently large wind turbines with higher hub height in the range of 80-100 meter with large rotor diameters up to 120 m are available in the Indian market. Conceding technological advancement and higher wind speeds at higher hub heights, the potential of 49,130 MW at 50 meter level if extrapolated at 80 meter standard hub height, the projected wind potential using the same land availability will be in the order of 1,02,788 MW.

NIWE (earlier C-WET) has assessed India's wind power potential at 100m hub height with scientific rigor and based on authentic latest available data-sets of wind as well as land geologically spread across India. The wind potential sites have been classified according to annual mean wind power density ranging from 200 W/ m^2 to 500 W/ m^2. As seen in the map below India has good potential for wind power generation as many areas have more than 200 W/ m^2 of wind density.

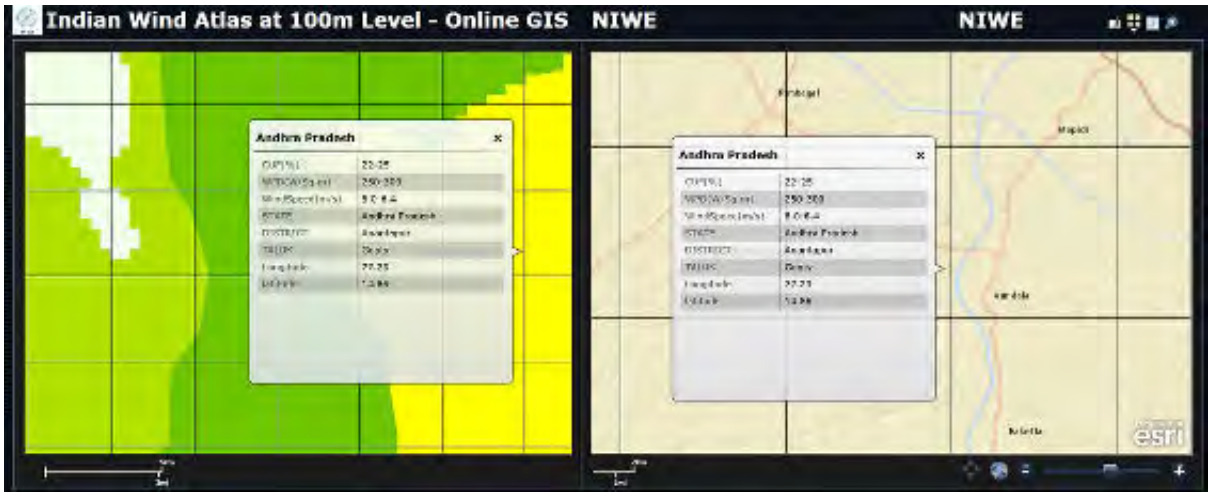
The below map shows wind density throughout India.

Figure 3-10: Figure: Wind Power Density Map of India



Source: NIWE

Figure 3-11: Below **map presents the potential of the wind site as the NIEW online GIS mapping.**



Source: NIWE

3TIER has conducted a wind resource assessment of the Nimbagallu project, located in Andhra Pradesh, India. This study was conducted for a total 156 WTG sites (Gamesa G97 2MW+MaxPower wind turbines at 104m), for a total capacity of 312.0MW. However, in the current project activity includes only 50 of these WTGs. The project is located in agricultural plains and adjacent to an additional 45 Gamesa G97 2MW external turbines.

The data for arriving at the wind potential was drawn from six wind masts ranging from 80m to 120 m of height. All the masts were located within or in surrounding areas of the project site. The location and data from each tower is presented in the below table:

Table 3-7: Wind Potential Recorded at six Masts

	Elcon-M4104	G057	G145	G159	G247	Vyasapuram-CWET
Latitude	14.88276°	14.87126°	14.89312°	14.90941°	14.88025°	14.88574°
Longitude	77.15031°	77.18945°	77.24437°	77.18091°	77.14189°	77.16482°
Time Series Start	2012 May 14	2011 May 08	2012 Dec 10	2013 Feb 02	2014 Mar 12	2011 Aug 31
Time Series End	2014-Jun-27	2015-Mar-31	2015-Mar-31	2015-Mar-31	2015-Mar-31	2012-Sep-01
Observed 20 m Wind Speed	5.79	–	–	–	–	5.92
Observed 50 m Wind Speed	6.51	6.62	6.39	6.34	6.48	6.76
Observed 65 m Wind Speed	–	6.80	6.73	6.65	–	–
Observed 74 m Wind Speed	–	6.96	–	–	–	–
Observed 78 m Wind Speed	–	–	–	–	–	7.09
Observed 80 m Wind Speed	7.02		6.89	6.93	6.91	7.10
Observed 90 m Wind Speed	–	7.32	6.99	7.03	6.52	–
Observed 104 m Wind Speed					7.23	
Observed 110 m Wind Speed	–	–	–	–	7.21	–
Observed 120 m Wind Speed	–	–	–	–	7.40	–
Average Shear	0.15	0.16	0.16	0.19	–	0.13
Hub Height 104 m Wind Speed	7.32	7.49	7.15	7.23	7.23	7.37
Long-term 104 m Wind Speed	7.15	7.32	7.04	7.15	7.22	7.28
Long-term 104 m Adjustment Factor	97.7%	97.7%	98.5%	98.9%	99.9%	98.9%
Mean Turbulence Intensity	9.1%	8.2%	9.1%	9.0%	8.6%	8.5%
Characteristic Turbulence Intensity	11.4%	10.5%	11.2%	11.1%	10.5%	10.6%

Source: WRA report

The wind resource assessment yields an unwaked project-average long-term wind speed estimate, at hub height, of **7.17m/s**. The long-term mean gross generation estimate yields a capacity factor of 42.3%. Loss factors are considered, leading to a net capacity factor of 31.1%. Following uncertainty assessment of wind speed measurement and modelling, probabilities of exceedance were calculated. 20-year P75 and P90 cases yield project-average energy values of **258.8GWh** and **245.3GWh**, respectively.

Source: WRA Report

The total project uncertainties, represented as a percent of the P50 estimate are presented in Table below as a function of energy.

Table 3-8: Quantification of Uncertainty Factors

Parameters	1-year	10-year	20-year
Measurement	2.2%	2.2%	2.2%
Vertical Extrapolation	1.5%	1.5%	1.5%
MOS Correction	2.0%	2.0%	2.0%
Climate Variability	4.6%	2.3%	2.1%
Spatial Modelling	5.0%	5.0%	5.0%
Power Modelling	4.4%	4.4%	4.4%

Total Uncertainty	8.7%	7.8%	7.7%

Source: WRA Report

Considering the uncertainty listed in the table above the below table presents the probability of exceedance levels associated with the P50 project estimate. It provides results in terms of project average capacity factor (%). The table also shows the net P50, P75, and P90 values for each calendar month.

Table 3-9: Details of Estimated Generation

Parameter	1-year	10-year	20-year	20 -Year											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gross-P50	42.3	42.3	42.3	--	--	--	--	--	--	--	--	--	--	--	--
Net-P50	31.1	31.1	31.1	52.4	43.1	45.3	43.4	84.3	139.1	142.0	124.7	64.3	30.7	33.9	46.5
Net-P75	29.2	29.4	29.4	49.0	40.2	42.6	40.9	79.9	133.1	135.6	118.4	60.0	28.3	31.3	43.1
Net-P90	27.6	28.0	28.0	45.9	37.6	40.1	38.6	75.9	127.8	129.8	112.7	56.0	26.1	29.0	40.1
Net-P95	26.6	27.1	27.1	--	--	--	--	--	--	--	--	--	--	--	--
Net-P99	24.7	25.4	25.5	--	--	--	--	--	--	--	--	--	--	--	--

Source: WRA Report

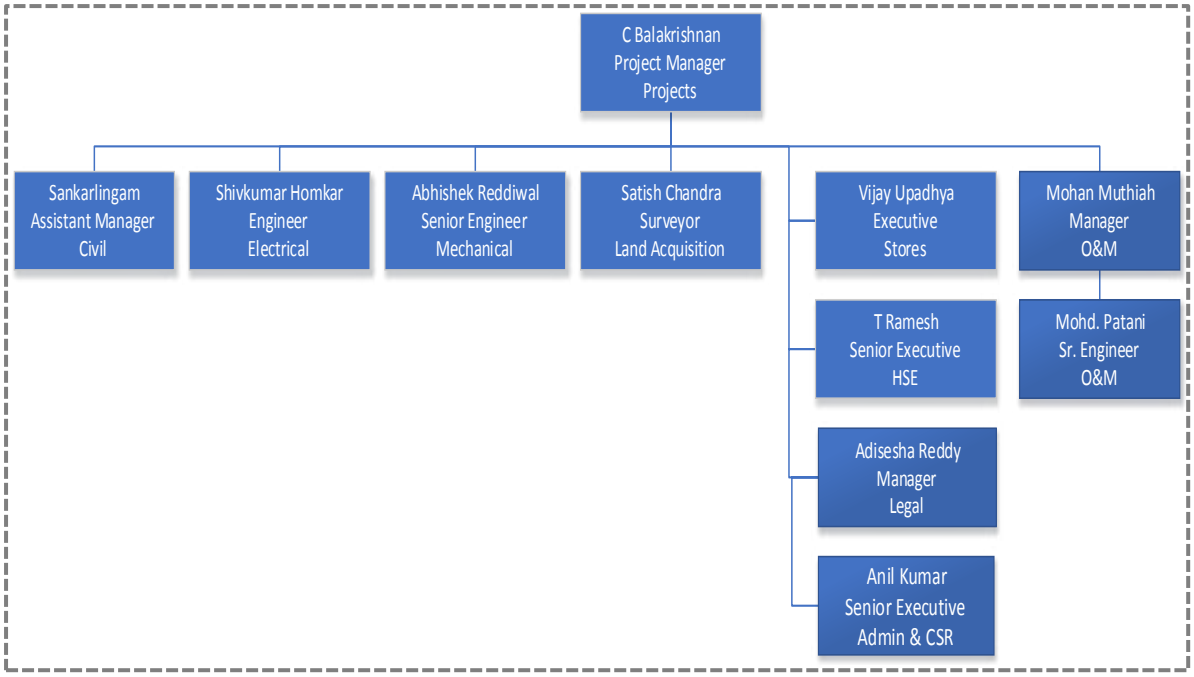
3.9 Organizational Structure

The will be through the Chief Executive Officer (CEO) of ANPWPL, will be responsible for overall management and coordination of the project under whom there is the Site Project Manager; who is responsible for overseeing the individual activities at the site. Apart from the Site In-charge the CEO is supported by project EHS-Head. There are various department sharing dedicated responsibilities and tasks; which are in-turn headed by ground level officers. The EHS-Head, in close association with the Site In-charge will overview, monitor and control the EHS activities at project site. During construction phase, the contractors will be controlled by the Site Manager. The project site will have an EHS Supervisor for handling EHS issues and also interact with local community. The main contractor (Gamesa) also has a dedicated EHS team and site personnel who share the same responsibilities with the EHS team of ANPWPL.

The entire EHS team will be responsible for the effective implementation of the Environmental and Social Management Plan (ESMP) through review and periodic updation, ensuring availability of resources and institutional arrangements, imparting training and awareness program in a scheduled manner, complying with IFC Performance standard and World bank guidelines as detailed in the *chapter 4* of this report. The team will also ensure adherence to national legislative requirements and prepare and maintaining requisite documents related to EHS.

The below organizational chart highlights the reporting structure and delineates individual responsibilities.

Figure 3-12: Organizational Structure of ANPWPL (at Site)



Source: ANPWPL

Currently Gamesa being the major contractor has engaged individual sub-contractors for specialized jobs. Gamesa has a Contractor Management System (CMS) in place which defines issues pertaining to compliance to regulations and HSE. Currently, at Gamesa, the Site Manager is the person who is responsible for the overall actions at site.

3.10 Tentative Project Schedule

The project activity under is construction phase having completed the construction of PSS, 24 number of foundations, 16 number of reinforcements and few km of 220/33 kV line as of December 2015. The tentative schedule of the project activity is presented below:

Table 3-10: Progress & Schedule of Activities

Chronology Of Events	Status	Target/Dates
Approval from NEDCAP (to Gamesa)	Completed	03rd July 2014
Completion of DPR	Completed	May 2015
Wind Resource Assessment	Completed	10th June 2015
Placement of the Purchase Orders	Completed	--
Land Purchase Completion	On-going	June 2015- Dec 2015
Land Development	On-going	June 2015 – Dec 2015
WTGs Foundations	On-going	July 2015 – Jan 2016
Access Roads Development	On-going	June 2015- Feb 2016
Pooling substation Civil & Electrical completion	Completed	December 2015
Pooling substation Testing and Commissioning	On-going	January 2016
Internal 33kV line	On-going	March 2016

Line from PSS to Uravakonda Sub station (220/400kV)	On-going	February 2015
WTGs Commissioning	On-going	March 2016
Signing of PPA with EB	Planned	**March 2016**

Table 3-11 Table: The detailed construction schedule:

Activities		Jun-15				Jul-15					Aug-15				Sep-15				Oct-15					Nov-15				Dec-15				Jan-16					Feb-16				Mar-16				
		W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 5	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 5	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 5	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	
Logistics	Moving WTGs								4	4			4	4				4	4			4	4			4	4			5	5													**50**
WTG Material Availability @ Site	Anchor Bolt			9				9				9							9					9				5																**50**
	Nacelle Plan												4	4			4	4				4	4			4	4			4	4				5	5								**50**
	Blade Plan												4	4			4	4				4	4			4	4			4	4				5	5								**50**
	Tower Plan												4	4			4	4				4	4			4	4			4	4				5	5								**50**
	Control Panels															4		3			5			5			5			6			6			6		6		4					**50**
Civil Works	Land Pathway	5			5				5				5				5				5		5			5			5			5												**50**
	External Roads																																												**50**
	Excavation & PCC		1	1	1	2	2	2	2	2	2		2		2		2		2		2		2	2	2	2	2	2	2	2	2	2	2	2	1								**50**
	Foundation Concrete					1	1	2	2	2	2	2	2		2		2		2		2		2		2	2	2	2	2	2	2	2	2	2	2	2	2							**50**
Construction	Tower Erection													1	2	1	2	1	2	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2				**50**
	Rotor Erection													1	2	1	2	1	2	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2				**50**
	Crane Mobilisation												1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2				
	DP Yard														1	2	1	2	1	2	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2				**50**
	Pre - Commissioning																	4		3			5			5			5			6			6			6		6		4			**50**
Electrical	Internal Line (33kV)																	4		3			5			5			5			6			6			6		6		4			**50**
	EHV Line																																											**50**
	Substation - Construction																																											**50**
	Substation - Commissioning																																											
	Bay Extension - APTRANSCO																																											**50**
	EB Commissioning																																											
	WTG Commissioning																																			#			6		6		4		**50**

Source: Gamesa

The status of approvals and clearances for the proposed Project is given as under:

Table 3-12: Status of Consents and Approvals for Project

S. No	Type Of Clearance/ Approval	Authority	Status
1	Project Allotment	Non-conventional Energy Development Corporation of Andhra Pradesh Limited (NEDCAP)	Received
2	C-WET Certification for Wind Turbine Model and Manufacturer	Centre for Wind Energy Technology (C-WET) (*Now NIWE*)	Received
3	Approval for Construction of Pooling Substation	Transmission Corporation of Andhra Pradesh	Received
4	Power Evacuation Approval	Transmission Corporation of Andhra Pradesh	Received
5	Forest Clearance	Ministry of Environment and Forests (MoEF)	Not required as no forest land is involved
6	Environment Clearance	Ministry of Environment and Forests (MoEF)	Exempted as Wind farms are considered environmentally friendly and non-polluting
7	CEIG Drawings Approval	Non-conventional Energy Development Corporation of Andhra Pradesh Limited (NEDCAP)(Single Wind Clearance Policy in AP)	Required before charging of line. To be initiated after/ during the construction of the Transmission lines
8	Interconnection Approval	Non-conventional Energy Development Corporation of Andhra Pradesh Limited (NEDCAP)(Single Wind Clearance Policy in AP)	Will be received after charging of lines
9	Power Purchase Agreement	Transmission Corporation of Andhra Pradesh	Commissioning and PPA set to happen side by side.

Typical Process for PPA and Tenure

With a view to streamline the process for setting up for renewable energy projects and to enable speedy processing of certain approvals associated with development of wind and solar power projects, a 'Single Window Clearance' mechanism has been implemented. The PPA is executed at a fixed price for exclusive sale of electricity to the Board for a period of 25 years from the date of commissioning. The wind power projects will have guaranteed sale of generation under the wind power policy and PPA.

Source: APERC

3.11 Corporate Policies

3.11.1 Corporate Policies of ANPWPL:

ANPWPL is part of the Orange Renewable Power Private Limted which is under the umbrella of the Holoding company “Orange Renewabel Holding Pte Ltd. Orange has defined Corporate HR policies and EHS team to implement EHS plans. The EHS team of ANPWPL ensures that the contracts engaged are of repute and follow required Health and safety guidelines as set forwards by national and International standards. In the project scenario, Gamesa is the key contract as the project execution has been complete handed over under the turnkey mode of development. It is further to be noted that the role of Gamesa is even more crucial as the project Operation and Maintenance (O&M) will be further under the control of Gamesa.

3.11.2 Corporate Policies of Gamesa

Gamesa is a global technological leader in the wind industry, with a footprint in 54 countries. With 21 years' experience and close to 33,500 MW installed; Gamesa also caters to wind turbine's operation and maintenance services, that manages for more than 20,600 MW.

Gamesa is part of the leading international sustainability indices: FTSE4Good and FTSE4Good IBEX, Ethibel Excellence, Cleantech Index, S&P Global Clean Energy Index and Global Challenges Index, among others.

Gamesa is included in specialized ratings in the fields of renewable energy, sustainability and the fight against climate change, like Cleantech Index, Global Challengex Index and S&P Global Clean Energy Index.

According to the Corporate Reputation Monitor (MERCO) report, Gamesa rose to No. 39 in 2012 from No. 48 in 2011. The report, which assesses companies' corporate reputations, has become a leading benchmark for reputation rankings worldwide since its launch 12 years ago. For the 2012 edition, MERCO polled approximately 1,500 company executives, 658 industry experts, news outlets and more than 3,000 members of the public. In addition to its overall score, Gamesa ranked No. 27 among the most responsible corporate citizens and companies with the best corporate governance.

Gamesa is also certified with:

ISO 9001:2008 Certificate for Quality Management System from TUV Rhineland, Germany

ISO 14001:2004 Certificate for Environmental Management Systems from from TUV Rhineland, Germany

BS OHSAS 18001:2007 Certificate for Occupational Health & Safety Management Systems from TUV Rhineland, Germany

The Corporate Policies of Gamesa are listed below:

- Preserving the health and safety of our entire workforce is given utmost importance. Continuously improving management systems and processes ensure health and safety of employees and contractors.
- Preserving the environment and maximizing energy efficiency are key in the way of business.
- Designing the operations, products and services in a way as to minimize their impact to the environment throughout their lifecycle, preventing the transfer of environmental impacts from one stage to another, or from a category of impact to another, and achieve high quality standards.
- Ensuring availability of requisite personnel with necessary skills and knowledge at disposal all the time.
- Complying with zero tolerance for negligence in matters involving health and safety, the environment or quality.
- Proactively take steps for preventing the environmental pollution.
- Promoting wellbeing and supporting creation and maintenance of a healthy work environment and lifestyle habits.
- Pursuing innovative technical advances for the wind energy market.
- Maintaining the validity of this policy through regular reviews and updates that improve our ability to achieve maximum customer satisfaction

Gamesa has set up Emergency response system and the following instructions are always displayed in the notice board. It highlights the communication channel followed by the Gamesa staff in case of an emergency. This also reflects the compliance with H&S aspects even by the contractors/sub-contractors engaged by Gamesa/ANPWPL.

Figure 3-13: Gamesa Emergency Communication Channel

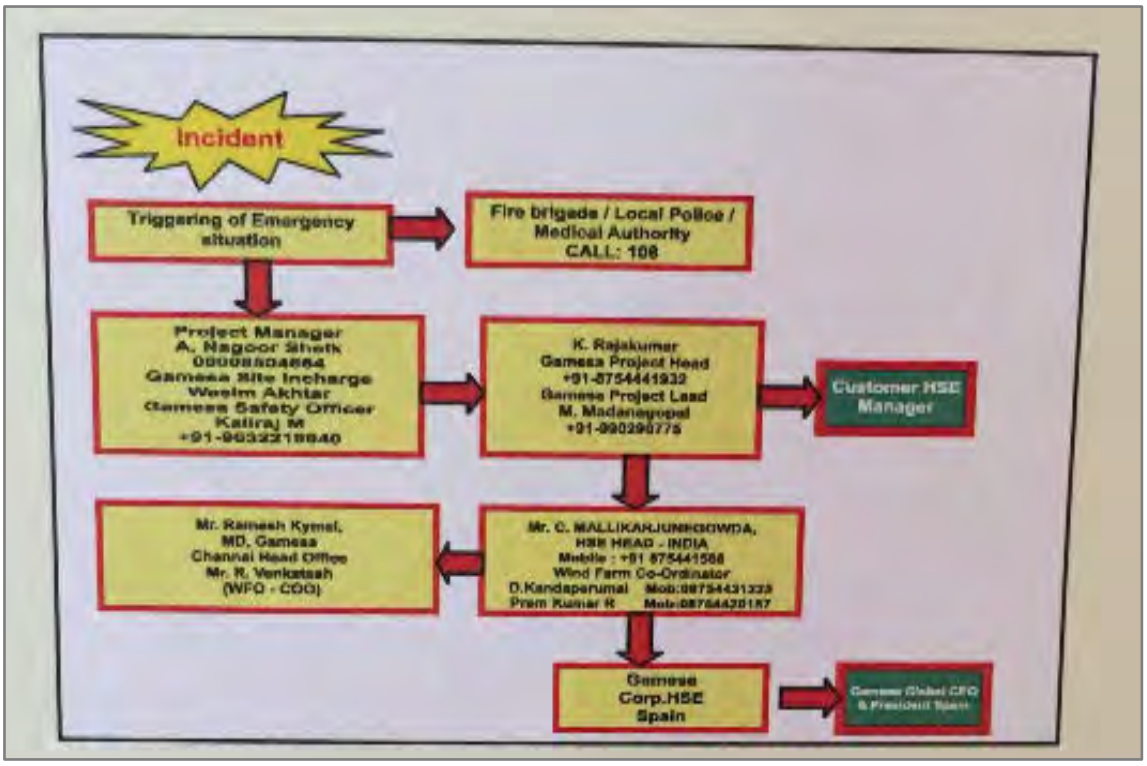
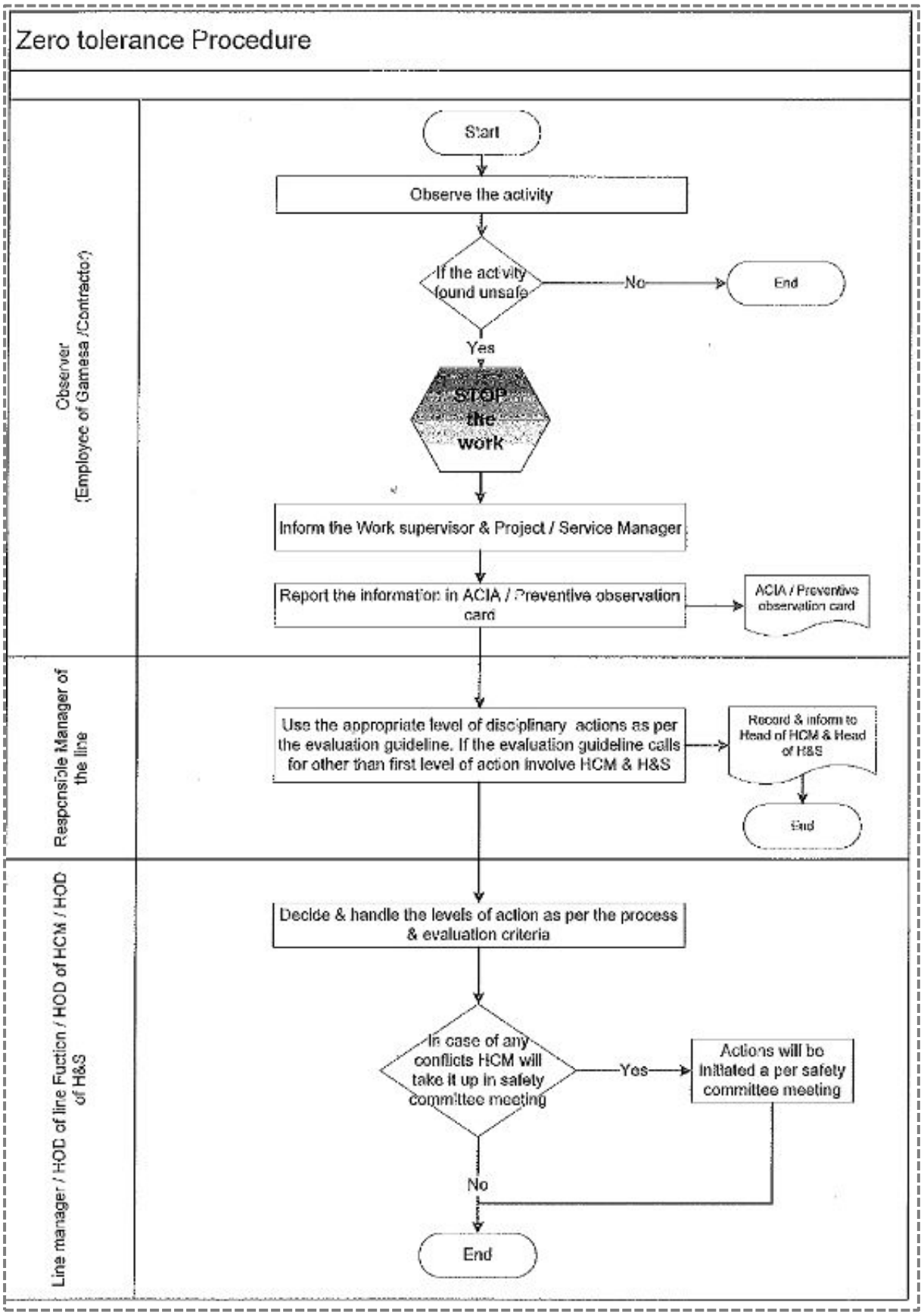


Figure 3-14: Gamesa Zero Tolerance Policy Framework



Source: Gamesa

4 POLICY, LEGAL, AND ADMINISTRATIVE FRAME WORK

4.2 Introduction:

Wind Power project has been one of the least regulated sector is the power industry. However, with the wake of environmental & social consciousness, even wind projects have started to come under the scrutiny. However, it is to be noted that wind power projects in Indian do not need to secure an Environmental Clearance irrespective of its size.

This chapter of the study section highlights the environmental and social regulations applicable to the Project. The proposed Project is covered under several environmental legislations. The current chapter focuses on:

- Institutional Framework responsible for implementation of the regulations.
- All applicable international legislations applicable to the project.
- Applicable environmental and social regulations and policies in the state of Andhra Pradesh and India
- Applicable Environmental Standards and other International conventions

4.2 Enforcement Agencies of Relevant to the Project:

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in the following sub-sections.

Table 4-1: Applicable Enforcement Agencies

Agency	Functions
Ministry of Environment and Forests (MoEF)	Article 48A obligates the Union and the State Governments to endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. Similarly, Article 51A(g) lays stress on protection and improvement of the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures as a fundamental duty of every citizen of this country. The Ministry of Environment and Forests (MoEF) is responsible for the implementation and enforcement of the Environment Protection Act, 1986, and Rules issued under the Act. Under sections 3 and 5 of the EP Act, 1986. The Ministry issues Environmental clearance and Forest clearances as well to applicable projects.
Central Pollution Control Board	The primary purpose of the Central Pollution Control Board (CPCB) is implementing provisions of the Water (Prevention and Control of Pollution) Act, 1974. CPCB works towards control of water, air and noise pollution, land degradation and hazardous substances and waste management. The specific functions of CPCB are as follows: • Prevent pollution of streams and wells; • Establish and keep under review quality standards for surface and

	groundwater and for air quality; • Planning and execution of national programme for the prevention, control and abatement of pollution through the Water and Air Acts; and • The CPCB is responsible for the overall implementation and monitoring of air and water pollution control under the Water Act, 1974, and the Air Act, 1981
National Institute of Wind Energy (NIWE); (earlier Centre for Wind Energy Technology (C-WET))	Research & Development Wind Resource Assessment Unit Standards and Certification Unit R&D Testing unit. NIWE has clear designated and approved high wind zone which must be developed for any wind site.
Indian Renewable Energy Development Agency Limited (IREDA)	IREDA is responsible for issuing Generation Based incentive (GBI) to wind power projects. The main objectives of IREDA is to promote, develop and extend financial support to specific projects and schemes for generating electricity through new and renewable sources and conserving energy through energy efficiency.
New and Renewable Energy Development Corporation of Andhra Pradesh (NEDCAP)	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: • To generate electricity through renewable sources like wind and solar on decentralized manner; • To conserve energy in rural areas; • To import and adopt viable technology and machinery in the areas of Non-conventional energy sources and ensures post installation service; and • To impart training and to promote research and development in the field of Non-conventional energy sources
Transmission Corporation of Andhra Pradesh Limited (APTRANSCO)	The erstwhile Andhra Pradesh State Electricity Board which 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. APTRANSCO came into existence on 1.02.1999.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 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.
National Green Tribunal	The National Green Tribunal has been established on 18.10.2010 under the National Green Tribunal Act 2010. The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations: • 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 • The Biological Diversity Act, 2002

	IT functions 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.
Panchayats	The local Panchayats are empowered with management of local resources like forests, groundwater, common land and infrastructure like roads, buildings etc
District Administration for Acquisition of Land, Anantapur (Collector's Office)	The private land required for the project is being purchased on willing- buyer-willing seller basis. The District administration will be involved in the case of any diversion of revenue land for the proposed project. The private land purchase process by the land aggregator will also be regularized by the revenue department.
State Labour Department	All issues pertaining to implementation of labour laws in any establishment, shop or factory
MOTA	Ministry of Tribal Affairs (MOTA): MOTA was constituted in October 1999 with the objective of providing more focused attention on the integrated socio-economic development of the most under-privileged sections of the Indian society namely, the Scheduled Tribes (STs), in a coordinated and planned manner. The Ministry of Tribal Affairs is the nodal Ministry for the overall policy, planning and coordination of programmes for development of STs15. The functions of the Ministry involve – (i) Tribal Welfare-Planning, Policy formulation, Research and Training; (ii) Tribal development including scholarships to STs; (iii) Promotion of voluntary efforts in development of STs; (iv) Administrative Ministry with respect to matters concerning Scheduled Areas.
Director Industrial Safety and Health	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.
Petroleum and Explosives Safety Organisation (PESO)	The PESO is under the Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, Government of India. The Chief Controller of explosives is responsible to deal with provisions of: • The Explosive Act 1884 and Rules, 1983, • The Petroleum Act 1934 and the Rules 2002, • The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000, 2004; • Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment 2000.
Transport Department, Andhra Pradesh	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 the Enforcement of the Motor Vehicles Act and Rules, Collection of taxes and fees and issuance of Driving Licences and Certificate of Fitness to Transport Vehicles; Registration of Motor Vehicles and granting regular and temporary permits to vehicles. 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.

Other international standard for regulation of wind power projects such as IFC Performance standards, Equator Principles, and IFC EHS Guidelines for wind power project are not described in the table above as the same are detailed in the following sections of this chapter.

4.3 Applicable Laws, Policies and Regulations on Environment and Social Structure

	Applicable Environmental Legislation/Regulation		
	1	***The Environment (Protection) Act; 1986 and Environment (Protection) Rules 1986 and amendments*** The salient provisions of the Act include but not limited to the following: • Restrict or prohibit industries, operations or processes in specified areas; • Undertake environmental impact assessment for certain categories of industries to inform the decision making in approval of new or expansion projects; • Restrict or prohibit handling of hazardous substances in specified areas; • Protect and improve the quality of the environment and prevention, control and abatement of environmental pollution; • Lay down standards for the quality of the environment, emissions or discharges of environmental pollutants from various sources; • Lay down procedures and safeguards for the prevention of accidents, which may cause environmental pollution; • Bar on filling of any suit or legal proceedings against the Government or officials empowered by it for action taken in good faith, in pursuance of the Act; and • Bar of jurisdiction to Civil Court to entertain any suit or proceedings in respect of anything done, action taken or directions issued by the Central Government or any other authority empowered by it, in pursuance of the Act.	***Applicable in Phases*** *Pre-Construction* *Construction* *Operation* *Decommissioning* ***Applicability:*** The project must ensure compliance under the rules to maintain stipulated standards and environmental management through various supporting rules promulgated under the Act which guides on the permissible limits for ambient air quality, water quality and noise limits (laid down by CPCB based of Environmental Protection Act.
	2	***EIA Notification 2006 as amended till 2009*** • As per schedule to the notification, projects or activities are categorised as i.e. A or B, based on their threshold and likely spatial extent of potential impacts on human health and natural and manmade resources. • All Category A' projects or activities require Environmental Clearance from Environmental Impact Assessment Authority (EIAA) constituted at MoEF, Government of India. • The EIAA will issue Environmental Clearance based on recommendations of the Expert Appraisal Committee (EAC), while projects under Category _B1' (Category B is subdivided into B1 and B2 categories as per description given below under Stage I - Screening) require prior Environmental Clearance from State /Union territory Environment Impact Assessment	***Applicable in Phases*** *None* ***Applicability:*** Being a wind power projects, the current project is exempted from requirement of obtaining environmental clearance

		Authority (SEIAA), based on recommendations of a State level Expert Advisory Committee (SEAC)	
	3	***Manufacture Storage & Import of Hazardous Chemicals (MSIHC) Rules 1989 and Amendment 2000*** • These rules apply to the activities, which involve handling, storage and import of hazardous chemicals as specified in Schedule 1 of the Rules. The indicative criteria are specified in the Part 1 of the same schedule. • The rule also applies to the industrial activity involving isolated storage in the quantities mentioned in Schedule 2. • The MSIHC Rules also require provision for the proper storage and handling of chemicals. Definition and classification of the chemicals as dangerous/hazardous is specified under the MSIHC Rules and listed in Schedules 1, 2 & 3. • The information on various requirements and clearances under the MSIHC Rules has to be furnished to the SPCB office.	***Applicable in Phases*** *Construction* *Operation* ***Applicability:*** The project activity may not require any quantity of explosives during construction activities. In case there is any usage/storage of explosive at site, it will be under proper license from Chief Controller of Explosives.
	4	***Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005*** • As a party to the Vienna Convention on the protection of the ozone layer and the Montreal Protocol, India has released the Ozone Depleting Substances (Regulation) Rules 2000 pursuant to the Environment (Protection) Act, 1986. • Rules regulate production, consumption, export, import, sale, purchase and use of ozone depleting substances in specified time bound programme in line with the Montreal Protocol. • The Rules subject many activities to prior registration or to obtaining a license from the relevant authorities. Of the 20 chemicals controlled under the amended Montreal Protocol, India uses and produces seven (7) ODSs. These include – Chlorofluorocarbons (CFC-11, CFC-12, and CFC-113), Carbon tetrachloride (CTC), Methyl Chloroform (MCF), and Halons (H-1211, and H-1301).	***Applicable in Phases*** *Construction* ***Applicability:*** ANPWPL to ensure that all insulation material used for wiring and electrical units, solvents and degreasing substances used in the welding, preparatory works for metals parts prior to painting and corrosion protection are free of ozone depleting substances.
	Applicable Pollution Control Legislation/Regulation		
	1	***The Air (Prevention and Control of Pollution) Act, 1981 Including Rules 1982 and 1983*** The Act assigns powers and functions to the CPCB and the SPCBs for prevention and control of air pollution and all other related matters.	***Applicable in Phases*** *None* ***Applicability:***

		• The State Government, in consultation with the SPCB has the powers to set standards for emissions from automobiles, impose restrictions on use of certain industrial plants and prohibit emissions of air pollutants in excess of the standards laid down by the SPCB. It can also make an application to the court for restraining persons from causing air pollution. • In addition, it also has the power of entry and inspection, power to obtain information and power to take samples of air emissions and conduct the appropriate follow up. The CPCB, as well as the SPCBs are eligible for contributions from the Central as well as the State Government, respectively, to perform their functions appropriately. • The Act also allows for appropriate penalties and procedures for non-compliance. • The Act prohibits the construction and operation of any industrial plant without the consent of SPCBs.	The project activity falls under the jurisdiction of APPCB. Under the Andhra Pradesh Wind Power Policy 2015 and CPCB "revised classification of Industrial Sectors" (dated 7th March 2016) wind power projects are **exempted**[2] from obtaining NOC/Consent for Establishment from PCB.
	2	***Noise Pollution (Regulation and Control) Rules, 2000*** As per the Noise Pollution (Regulation and Control) Rules 2000, every operating facility is required to take all possible steps to meet the ambient noise level standards prescribed in the Rules. The rules prescribe maximum permissible values of day and night time noise levels for zones A, B, C and D representing industrial, commercial, residential and silence zone respectively.	***Applicability:*** ANPWPL will stick to the Noise limits as set out under the regulation. For details of the various standards refer to further details provided under continuing sections of this chapter. ANPWPL to ensure compliance to the Noise standards for the residential area in the proximity of the project.
	3	***The Water (Prevention and Control of Pollution), Act, 1974 including Rules, 1975 (as amended up to 1988)***	***Applicable in Phases*** *None*

[2] http://nedcap.gov.in/PDFs/WIND_POWER_POLICY.pdf & http://kspcb.gov.in/CPCB-Classicfication-Of-Industries.pdf

		• The Act assigns functions and powers to the CPCB and SPCBs for prevention and control of water pollution and all related matters. Subject to the provisions of the Act, the functions and powers of CPCB as well as the SPCBs have been delineated individually and with respect to each other. • This Act provides for the prevention and control of water pollution and maintaining or restoring good water quality for any establishment.	***Applicability:*** The project activity falls under the jurisdiction of APPCB. Under the Andhra Pradesh Wind Power Policy 2015 and CPCB "revised classification of Industrial Sectors" (dated 7th March 2016) wind power projects are **exempted** from obtaining NOC/Consent for Establishment from PCB.
	4	***Hazardous Waste Management, Handling and Trans Boundary Movement Rules 2008 as amended.*** The rule states the requirement for handling and managing wastes categories as hazardous under the schedule. It lays down requirement for: • Authorisation for collection, reception, storage, transportation and disposal of hazardous wastes • Filing of annual return under the rules • Other compliance under the rules • Authorisation by Central Pollution Control Boards to vendors accepting waste/used oil • Liability of the occupier, transporter and operator of a facility: The occupier, transporter and operator of a facility shall be liable for damages caused to the environment resulting due to improper handling and disposal of hazardous waste listed in schedules to the Rules; • The occupier and operator of a facility shall also be liable to reinstate or restore damaged or destroyed elements of the environment; • The occupier and operator of a facility shall be liable to pay a fine as levied by the State Pollution Control Board with the approval of the Central Pollution Control Board for any violation of the provisions under these rules	***Applicable in Phases*** *Construction* ***Applicability:*** The proposed project will generate waste oil (lubricant, hydraulic, etc) from construction machinery and equipment during construction phase. It will generate transformer oil during operation phase. The hazardous wastes have to dispose through approved recyclers only.
	Applicable Forests & Wildlife Resources Legislation/Regulation		
	1	***Forests (Conservation) Act, 1980 and Rules 1981***	***Applicable in Phases***

		The Act restricts the powers of the State in respect of de-reservation of forests and the use of forestlands for non- forest purposes. An advisory committee has been created to oversee the implementation of the statute. The FCA is relevant for the power the project, and for passage of transmission through forest areas, since it would involve use of forestland for "non-forest" purposes. According to Section 2 of the Act " prior approval of the Central Government is required for: • De-reservation of a reserved forest • Use any forest land for any non -forest purpose. • Assign any forest land to any private person or entity not controlled by the Government • Clear any forest land of naturally grown trees for the purpose of using it for reforestation	*Not Applicable* ***Applicability*** The proposed project does not involve any diversion of forest land.
	2	***The Wildlife (Protection) Act, 1972*** • The Act provides for protection to listed species of flora and fauna and establishes a network of ecologically important protected areas. • It empowers the Central and State Governments to declare any area to be a Wildlife Sanctuary, National Park or a closed area. • There is a blanket ban on carrying out any industrial process or activity inside any of these protected areas. • In case forestland within the protected areas network is to be diverted for any non-wildlife use, a no objection has to be obtained from the Indian Board of Wildlife and the State Legislature, before the final consideration by MoEF. • The schedules categorize animals, birds, and plants. Schedule I lists endangered species of mammals, reptiles, amphibians, birds, crustaceans and insects. Any possession, transportation etc. of these species without prior permission is offence under the Act	***Applicable in Phases*** *Pre-Construction* *Construction* *Operation* *Decommissioning* ***Applicability*** There is no Wildlife Sanctuary or National Park in the vicinity of project site. If any protected/ endangered flora or fauna (as listed in Schedules of WP Act, 1972) are found in the project area conservation measure will be taken. The current region was identified to have spotted Black Buck –Schedule I. More details are provided in the

			chapter 9 of this report.
	Applicable Land and Social Legislation/Regulation		
		The Land Acquisition Act, 1894 The Act lays down procedures for acquisition of land, including notification, payment for damages, hearing of objections, declaration of the intended acquisition, enquiry into measurement, values and claims and award by the competent authority and finally taking possession of the land. The key features include: • Preliminary notification for land proposed for acquisition; • Clearing of objection within 30 days of the notification and the provision for hearing of all objections; • Declaration of intended acquisition award; • Reference to court if award is not accepted and hearing in court; • Apportionment of compensation and dispute settlement regarding the same; and • Payment of compensation for land value, trees and structures	***Applicable in Phases*** *Pre-Construction* *Construction* ***Applicability*** The land type involved in the project is all private land. ANPWPL to ensure that the land conversion procedures be completed from Agriculture type before transfer of land under its name. In case any revenue land is diverted through the relevant department, Land acquisition act is triggered. For the transmission lines, current land acquired for roads shall be used, so invoking of the LA Act 1894 does not arise. For any unavoidable pole locations on Private land necessitated due to alignment will be addressed by paying suitable compensation through negotiations.
		The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007 The act vests the forest rights and occupation in forest land in forest dwellers (ST and other traditional forest dwellers) who have been residing in forests for generations but whose rights could not be recorded. The act provides a framework for recognising the forest rights and the nature of evidence required for such recognition and vesting of forest land	***Applicable in Phases*** *Pre-Construction* *Construction* ***Applicability:*** The site does not include any forest area

	Applicable Health and Safety Legislation/Regulation		
	Explosives Act, 1884 and Explosives Rules, 1983 This is an act to regulate manufacture, use, sale and transport of explosives. A license is granted for manufacture, trade and/or use of explosives under the Explosives rules 1983 only after a NOC from District Administration.	***Applicable in Phases*** *Construction* ***Applicability*** The project activity has no scheduled blasting. However, ANPWPL to ensure that the construction contractor obtains required license and NOC prior to any blasting activity (if any)
	The Petroleum Act, 1934 and the Petroleum Rules Provide procedures and safety measures to be taken up for handling, storage and transportation of petroleum products. The Rules define the quantity and class of petroleum for which prior permission from the concerned authorities are required. The storage requiring prior licences are as following: Petroleum class A (having flash point less than 23ºC) not intended for sale of the total quantity in possession does not exceed 30 litres. Petroleum Act, 1934, Section 8); Petroleum class B (having flash point from 23 to 65ºC) if the total quantity in possession at any one place does not exceed 2,500 litres and none of it is contained in a receptacle exceeding 1,000 litres; (Petroleum Act, 1934, Section 7); Petroleum class C (having flash point above 65 to 93ºC) if the total quantity in possession at any one place does not exceed 45,000 litres (Petroleum Act, 1934, Section 7).	***Applicable in Phases*** *Pre-Construction* *Construction* *Operation* *Decommissioning* ***Applicability:*** Fuel storage at site for operation of machinery beyond the mentioned quantity will trigger the act
	Gas Cylinder Rules and Static and Mobile Pressure Vessels (Unfired) Rules, 1981 The rules were framed to restrict handling and transportation of gas cylinders and provide procedures and approvals for manufacturing detail of the cylinder including the reference of safety relief devices, its manufacturing and usage specification. The rules also describe labelling of cylinders by colour to identify the type of gas present in the cylinder	***Applicable in Phases*** *Construction* ***Applicability*** The use of gas cylinders will be limited during the construction phase only; as welding activities will require use of gas cylinders at site. However, the quantities at site at any time will be limited. ANPWPL shall ensure safe

			handling of cylinders as per the rules
		The Indian Factories Act, 1948 and State Rules The Indian Factories Act was promulgated in 1948, to ensure general welfare of the industrial workers. It requires that a general policy with respect to H&S of the workers at work in the form of a written statement and which has to be brought to the notice of the workers. The Act defines factory as any premises including the precincts thereof- whereon ten or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on, or whereon twenty or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on without the aid of power, or is ordinarily so	***Applicable in Phases*** *Construction* *Operation* ***Applicability*** Wind farm will fall in the definition of factory as the number of employees in the proposed project will be more than 20 (direct and indirect). However, due to lack of clarified in the guideline, ANPWPL need not be comply to obtain a factories licence.
	Applicable Labour Legislation/Regulation		
		The Child Labour (Prohibition and Regulation) Act, 1986 • A child is defined as a person who has not completed 14years of age. The Act prohibits employment of children in certain occupation and processes (part II, Section 3). • The Act also specifies conditions of work for children, if permitted to work. These include a working day of maximum of 6 hours a day (including rest), no work period exceeding 3 hours at a stretch, and no overtime (Section 7). The Act requires maintenance of a register for employed children (Section 11). • The Constitution of India (Part III, Article 24 - Fundamental Rights) describes that no child below the age of fourteen years shall be employed to work in any factory or engaged in any other hazardous employment	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability:*** The Project developer will ensure that no child labour is engaged at the site by contractors/subcontractors; directly or indirectly during the construction or operation of the project activity.
		The Bonded Labour (Abolition) Act 1976 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 (Ch II, Section 4)	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability*** OWPPL to ensure that no bonded labour is engaged at site for

			construction or operation works
		The Trade Union Act, 1926 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	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability*** It is to be ensured that none of the policies of ANPWPL restricts the association of workers
		Minimum Wages Act, 1948 • Minimum Wages Act, 1948 requires the Government to fix minimum rates of wages and reviews this at an interval of not more than 5 years. The Payment of Wages Act, 1936, amended in 2005. Every employer shall be responsible for the payment to persons employed by him of all wages required to be paid under this Act. • As per the Equal Remuneration Act 1976, 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	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability:*** The minimum wage set out for the state of Andhra Pradesh is INR180/day, ANPWPL must ensure payment of minimum wages as fixed by the government without any gender bias
		Workmen's Compensation Act, 1923 The Act requires that, 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.	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability*** Any injury to workers employed during the course of construction and operation must be compensated as per the compensation set out by the Act. ANPWPL to ensure compensation for personal injury caused to any worker.

		Maternity Benefit Act, 1961 • The act states that 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	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Availability*** The requirement as set out in the law must be followed during the complete course of project construction and operation and decommissioning.

As per the EIA Notification (2006) and its amendments, the wind farm project does not require any environmental clearance from the Ministry of Environment and Forests (MoEF) or the Andhra Pradesh State Environmental Appraisal Authority.

However, as per the Central Pollution Control Board's (CPCB) latest guidelines for Directions u/s 18(1) (b) of Water (P&CP) Act, 1974 and Air Act (P&CB), 1981 and latest OM dated 7th of March 2015 regarding Classification of Industries into Red, Orange, Green and White Category for Consent management, the Project falls under White Category 35-"Solar power generation through solar photovoltaic cell, **wind power** and mini hydel power (<25MW)". However, superseding this, the government of Andhra Pradesh in addition to making the approval process a ***"Single Window Clearance"*** has also *provided exemption to wind power projects from the need to acquire any PCB Clearance*.

The key permits that have been received for the Project include:

Project allocation from the "Non-conventional Energy Development Corporation of Andhra Pradesh Limited" (NEDCAP) dated 3rd July 2014 for setting up the project activity.

Power Evacuation Approval from "Transmission Corporation of Andhra Pradesh" for setting up the DC line to the 440/220kV Uravakonda Substation. (Please Refer ***Annexures***)

4.4 IFC Performance Standards

The Performance Standards (PS), 2006, established stipulates that the project shall meet the following throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Social and Environmental Assessment and Management System;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Pollution Prevention and Abatement;
- Performance Standard 4: Community Health, Safety and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management;
- Performance Standard 7: Indigenous Peoples; 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. A brief on the requirements as laid down in the performance standards is described in the following subsections:

	IFC Performance Standards		
	1	**PS 1: Social and Environmental Assessment and Management Systems** The PS-1 underscores the importance of Social and Environmental Assessment and Management Systems for managing social and environmental performance throughout the life cycle of the Project and runs through all subsequent PSs. The main objectives of PS - 1 include: Identify and assess environmental and social impacts in the project's area of influence. • Avoid, minimize, mitigate or compensate for adverse impacts • Ensure that affected communities are engaged on issues that may affect them • Promote improved environmental and social performance through effective • management systems The IFC Performance standard describes the PS 1 that "an effective environmental and social management system (ESMS) is a continuous process to be initiated by the management and would involve communication between organisation, its workers and local communities directly affected by the Project".	***Applicability:*** ANPWPL is required to carry out "Environmental Social Impact Assessment (ESIA) study before the start of the project and develop, implement and inculcate project specific environmental and social management system (ESMS). This plan has been described under the ***chapter 9*** of this report. ANPWPL proposes to address the risks by a management system through involving: • Environmental and Social Action Plan • Management program; • Identified EHS staff; • Training for security and safety workers; • Community engagement/grievance redressal; • Monitoring; and • Reporting.

	2	**PS 2: Labour and Working Conditions** 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 PS 2 is guided by the various conventions of International Labour Organization (ILO) and outlines the minimum requirements of working conditions, protection to the workforce (including issues of child and forced labour) and ensuring occupational health and safety of both its employees' as well as non-employees' working through contractors. The objectives of the PS 2 are: To promote the 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. • To avoid the use of forced labour. As per PS 2, guideline asserts "Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize a project".	***Applicability:*** The project activity employs highest number of works (directly/indirectly) during is construction phase and the same is considered to be most important period for implementation of PS 2. It not only covers the main plant employees, but all employees/workers, even those working through contractors. No migrant workers will be engaged for the project, therefore standards pertaining to campsites will not be applicable. ANPWPL shall provide adequate provisions access to clean water, sanitary facilities and other necessary facilities at the construction sites. The project proponent will formulate HR policies and procedures and grievance redressal mechanisms for management of worker relationship. ANPWPL shall ensure 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

	3	**PS 3: Pollution Prevention and Abatement** The PS 3 lays the approach to resource efficiency and pollution prevention in line with internationally disseminated technologies and practices with objectives to: • avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities; and • To promote more sustainable use of resources, including energy and water. • To reduce project-related GHG emissions.	***Applicability:*** The project activity being a wind power plant will have minimal impact in terms of resources and emissions; however, the project developer shall plan and implement pollution control measures right from the conception stage. Practices like minimal release of waste, handling of hazardous waste, safe disposal of waste, waste water management etc. shall be considered prior to each phase. Generation of waste from the project will be limited mainly to construction phase. This would include construction waste water, waste oil, construction debris etc. Operation phase will have very small quantity of waste from used waste oil/transformers oil. Increase in noise with age of turbines can also lead to noise pollution and needs to be monitored. This report has assessment of impacts and risks associated with the generation, use, storage, release, and/or disposal of pollutants and the further sections details ways to manage any impacts.

	4	**PS 4: Community Health, Safety and Security** Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. The PS 4 concentrates on the responsibility that must be undertaken by the client to avoid or minimize the risks and impacts to the community's health, safety and security that may arise from project activities. The objectives underlines under PS4 are: • To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. • 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. The performance standard details out the proponents responsibility to avoid or minimise the possible risks and impacts to community health, safety and security that may arise from project activities.	***Applicability:*** As described in the description it is clear that the applicability of PS4 would be more relevant during the construction phase due to movement of heavy machinery/vehicles and thus shall result in preparation of an Action Plan to be disclosed to the community. The project activity at all the locations has a good distance from nearest villages and hence minimal or no impact of Shadow flicker and Noise levels. Considering the nature and scale of the project, a Traffic Management Plan will be formulated to minimise and manage the risks associated with the project activities on the local community. Additionally, the siting of the project WTGs was carried out in accordance with the Micro-Siting Guidelines and the WTG model need to have valid type approval, including power curve certification, from designated international Test Stations and Classification Societies here under the Type Approval Provisional Scheme – 2000 (TAPS) introduced by C-WET (Refer Sl. No. 17). An Emergency Preparedness & Response Plan/Procedure also need to be formulated and implemented by the contractor to this regard.

	5	**PS 5: Land Acquisition and Involuntary Resettlement** The objectives of this PS are to: • To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. • To avoid forced eviction. • 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 (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • To improve, or restore, the livelihoods and standards of living of displaced persons. • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites. Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. This PS does not apply to resettlement resulting from voluntary land transactions (i.e., market transactions in which the seller is not obliged to sell and the buyer cannot resort to expropriation or other compulsory procedures if negotiations fail). The impacts arising from such transactions shall be dealt with as under PS1, though sometimes, when risks are identified, the project proponent may decide to adhere to PS 5 requirement even in willing buyer-seller cases.	***Applicability:*** All the project location fall under farming lands which do not have any structures of settlements. The land sellers interviewed had large portions of land at their disposal and hence the project does not attract any resettlement. Moreover, the purchase of land for the proposed project was through direct negotiations between owners and land aggregators with no obligation on the seller. There is no loss of assets or access from the project. There will be no physical resettlement and relocation of people as the project area is not inhabited.

		Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.	
	6	**PS 6: Biodiversity Conservation & Sustainable Natural Resources Management** Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems." This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle. • To protect and conserve biodiversity. • To maintain the benefits from ecosystem services • 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 or are dependent on ecosystem services or that include the production of living natural resources. The proposed project is not located in close proximity to any protected area. The ESIA study will determine the significance of impacts on the ecology of the project area. The project area does not fall in any eco-sensitive zones or critically endangered habitat. The project can coexist with ecosystem with almost no damage to living natural resources as the site region is almost tree less. Due to lack of any air emissions or liquid discharges during operation phase, no adverse impacts to biodiversity or living natural resources are anticipated. The implementation of the actions necessary to meet the requirements of PS6 shall be managed through the suggested mitigation measures. The operation phase of the proposed project shall ensure protection of fauna and flora of the site and

			the surrounding areas.
	7	**PS 7: Indigenous Peoples** Performance Standard 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 limits 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. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than nonindigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases. The PS 7 highlights how Private sector projects can create opportunities for Indigenous Peoples to participate in, and benefit from project related activities that may help them fulfil their aspiration for economic and social development.	***Applicability:*** The project area or its surroundings does not support indigenous communities like tribes, ethnic minorities, aboriginals etc. Scheduled Tribe (ST) population as classified by Government of India do not qualify as indigenous population, as per IFC PS -7, as ST have merged with the mainstream population and share local customs, traditions, social and legal structure. They speak the same dialects and are equally dependent on the surrounding natural resources as the general population. Moreover it is evident from the ***chapter 7*** of this report that the population of ST community in the region is extremely limited and project has not made any land purchase with the community so far. In case of any land purchase from the community, it will be ensured that the family find employment in the project construction/operation. Hence, the project does not anticipate any impact to any indigenous population.

	8	**PS 8: Cultural Heritage** Performance Standard 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. The two main objects as set out under PS 8 are: To protect cultural heritage from the adverse impacts of project activities and support its preservation To promote the equitable sharing of benefits from the use of cultural heritage	***Applicability:*** PS 8 is applicable when tangible/intangible forms of cultural heritage are impacted due the activities in the project region. The project study area has no cultural heritage importance which can be impacted due to the project. Hence, PS8 is not applicable for this project.

4.5 Equator Principles (by the Equator Principles Financial Institutions)

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EP apply globally, to all industry sectors and to four financial products 1) Project Finance Advisory Services 2) Project Finance 3) Project-Related Corporate Loans and 4) Bridge Loans.

Compliance with the Equator Principles (EP) is a requirement of many commercial banks for new project financing with total capital costs of US$10 million or more[3].

Currently 82 Equator Principles Financial Institutions (EPFIs) in 36 countries have officially adopted the EPs, covering over 70 percent of international Project Finance debt in emerging markets.

There are a total 10 guidelines under the Equator Principles which are listed below:

1. Review and Categorisation
2. Social and Environmental Assessment
3. Applicable Environmental and Social standards
4. Environment and Social Management System and Equator Principles Action Plan
5. Stakeholder Engagement
6. Grievance Mechanism
7. Independent Review
8. Covenants
9. Independent Monitoring and Reporting
10. Reporting and Transparency

Principle 1: Review and Categorisation

When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of IFC.

Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts

Within the IFC, the wind project activity is a category B project – which implies a "project with potentially limited adverse environmental or social impacts that are few in number, generally site specific, largely reversible, and readily addressed through mitigation measures".

Principle 2: Social and Environmental Assessment

[3] http://www.equator-principles.com/resources/equator_principles_III.pdf

For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.

The project activity has been assessed and assessment documentation is made comprehensively to be adequate and accurate by doing objective evaluation and presentation of the environmental and social risks and impacts.

Principle 3: Applicable Environmental and Social Standards

The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.
The EPFI will require that the Assessment process evaluates compliance with the applicable standards as follows:

1) The Assessment process evaluates compliance with IFC PS and EHS Guideline
2) The Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.

The project activity has evaluated all the local National and international conventions, laws and regulations applicable to the project activity. The details of same were presented in the previous sections of the same chapter.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS).

Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.

Hence, in accordance with the requirement of IFC PS and EP, an Environmental and Social Management Plan has been drafted as a part of the ESIA study for the proposed project under the ***chapter 9*** of this report. The ESMP plan specifies appropriate plans and procedures which requires to be implemented during various phases in order to prevent, control and mitigate any potential environmental and social risks.

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an on-going process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders.

The project activity is categorized under "Category B", with no potential adverse impacts on the neighbouring Community. The project activity has undertaken social consultation at a household level. The social consultation of the project involved consulting random houses and land seller and nearby village representatives to establish the socio-economic condition of the area. This social consultation also helped to understand any community concern that might be associated with the proposed project, particularly related to loss of land, livelihood, resource requirement etc.

Taking into the factor laid in the principle the consultation meeting details are provided under the ***chapter 6*** of this report.

Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.

The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern.

Considering the requirement under this Principle, the project proponent has designed the CSR programmes which maintain regular dialogue with communities through its activities in the project region.

Principle 7: Independent Review

For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.

The project activity to get the compliance of the project's compliance to the requirement of Equator Principles.

Principle 8: Covenants

This guideline underlines the importance of incorporation of covenants linked to compliance.

For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects.

Furthermore for all Category A and Category B Projects, should to comply with the ESMPs and Equator Principles AP, to provide periodic reports in a format agreed with the EPFI and at the time of decommissioning, decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

The project to ensure communication with EP and convey their plans to EPFI. Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible.

Principle 9: Independent Monitoring and Reporting

To assess Project compliance with the Equator Principles and ensure on-going monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.

The client to ensure that is engages with EPFI.

Principle 10: Reporting and Transparency

The following client reporting requirements are in addition to the disclosure requirements in Principle 5.

For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online

- The client will publicly report GHG emission levels during the operational phase for Projects emitting over 100,000 tonnes of CO2 equivalent annually.

The Client will make an extract of the ESIA summary to be available at the site office. Further the project does not fall under the category of emissions over 1,00,000 tCO2. ***However, the project emissions if any will be listed publically in the reports of CDM under Kyoto Protocol.***

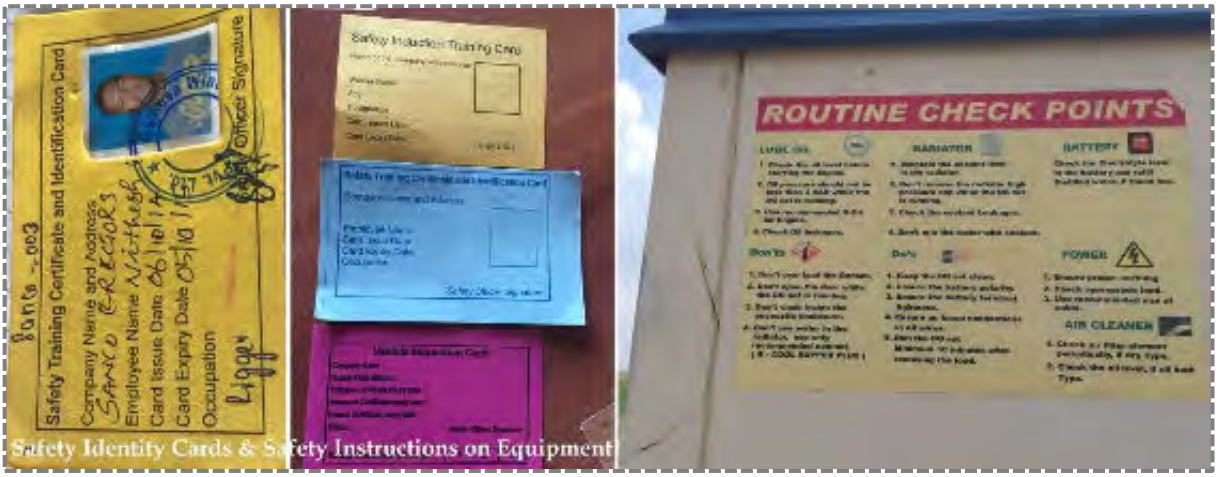
4.6 EHS Guidelines of IFC

The Equator Principle 3 requires follow up of the environmental, health and safety requirements as per the following guidelines:

1. Environmental, Health, and Safety General Guidelines released by IFC on 30th of April 2007
2. Environmental, Health, and Safety Guidelines Wind Energy released by IFC on 7th of August 2015

Picture of Safety Instructions and Policies followed at site is presented below.

Photograph 4-1: Safety Identify Cards & Instructions on Equipment



Source: Gamesa

Photograph 4-2: Safety Instructions & Policies

Source: Gamesa

Photograph 4-3: Picture: Safety Instructions & Policies

Source: Gamesa

The following Table lists the topics which are covered by the IFC EHS General Guidelines and the Management Plans which will have to be implemented by ANPWPL.

S. No	Guidelines	Applicability	Remark/ Management plans to be implemented
1	**Environmental**		
1.1	Air Emissions and Ambient Air Quality	Yes	The project activity does not generate any emissions and hence the Air emission part of the guideline is not applicable to the project activity. However, for the Ambient Air Quality, the study involves baseline air quality monitoring. ANPWPL should repeat the tests at regular intervals.
1.2	Energy Conservation	No	-
1.2	Wastewater and Ambient Water Quality	Yes	The project activity does not generate waste water directly as a result of its operation but during construction; it will however result in generation of sanitary sewage. The sludge from the facilities is to be disposed off; in line with the local regulatory requirements.
1.4	Water Conservation	Yes	The project in in capacity will do everything possible to prevent any wastage of water and implement wherever possible measure to conserve the usage of water.
1.5	Hazardous Materials Management	Yes	The project may use very limited quantity of material which is stipulated to be Hazardous. At all times the storage facilities will maintain the list of Inventory and Material Safety Data Sheet.
1.6	Waste Management	Yes	The project in general during its construction will not have any waste generation except some used oil which shall be handed over to approved recycler.
1.7	Noise	Yes	The project operation will generate Noise and vibrations but will be ensured to be under regulations as laid out under the national standards. The details of the standard are provided under the upcoming sections of this chapter.
1.8	Contaminated Land	No	The extremely limited amounts of materials which are of potential to contaminate land makes this very rare possibility. However, the contractor shall inculcate in its EHS plan to include Soil material management plan.
2	**Occupational Health and Safety**		
2.1	General Facility Design and Operation	Yes	In the design of facilities related to the project the following aspects of this guideline shall be induced. It guides the following: • The building structures should be in compliance with the National Building Codes • Ample space for the employees Emergency exit signs • Fire alarm system Fire and emergency alarm system • OHS plan for wind storms SOP for process shut-down • Lavatory facilities with hot and cold running water, soap, and hand drying devices

			• Adequate supplies of potable drinking water should be provided • Clean Eating Area should be available for employees • Natural lighting supplemented with artificial illumination should be used to light up the workspace • Emergency lighting should be installed upon failure of principal artificial lighting. • Passageways for pedestrians and vehicles within and outside buildings should be segregated and provide for easy, safe, and appropriate access. Measures to prevent unauthorized access to dangerous areas should be in place. • Qualified first-aid can be provided at all times. • Standard Operating Procedure (SOP) for dealing with cases of trauma or serious illness up to the point at which patient care can be transferred to an appropriate medical facility. • Sufficient fresh air should be supplied for indoor and confined work spaces. • The temperature in work, rest room and other welfare facilities should, during service hours, be maintained at a level appropriate for the purpose of the facility.
2.2	Communication and Training	Yes	The project main contractor and ANPWPL both have a dedicated team to implement OHS procedures. This guidelines recommends: • OHS training to be provided to all the employees and immediately to any new recruits. • Adequate training and information enabling the workers to understand work hazards prior to commencement of new assignments • A visitor orientation and control program should be established to ensure visitors do not enter hazard areas unescorted • Basic occupational training program and specialty courses should be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. • Hazardous areas (electrical rooms etc.), installations, materials, safety measures, and emergency exits, etc. should be marked appropriately • All vessels that may contain substances that are hazardous should be labelled as to the contents and hazard, or appropriately colour coded. • Communication of hazard codes and any information of the hazardous materials stores, handled, or used at the facility to emergency services and security personnel.

			During the project site assessment, visit to all sub-contractors and main contractor's work place were made and were found to be compliant to most of the conditions.
2.3	Physical Hazards	Yes	The Client to ensure that Standard Operating Procedures exists for all the work related activities. The worker must be aware about these SOP at any point of time. No personnel without the knowledge of SOP be allowed in the premises and vicinity of any project equipment. The guidelines details: • Periodic medical hearing checks should be performed on workers exposed to high noise levels • No employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. • Marking all energized electrical devices and lines with warning signs Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance Establishing "No Approach" zones around or under high voltage power lines • SOP for implementation of safe defensive driving for drivers of company vehicles. • SOP for working in extreme weather conditions. • These OHS problems should be minimized or eliminated to maintain a productive workplace by implementing a healthy working environment. • Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than two meters. • Work area light intensity should be adequate for the general purpose of the location and type of activity
2.4	Chemical Hazards	No	The project activity does not involves use of any chemicals
2.5	Biological Hazards	No	The project activity does not involves use of any Biological agents
2.6	Radiological Hazards	No	The project activity does not involves use of any Radioactive material
2.7	Personal Protective Equipment (PPE)	Yes	Any person entering the project zone must be equipped with Personal protection gear. No one without sufficient safety gear will be provided access to the project's site including WTGs, storage yard and PSS.
2.8	Special Hazard Environments	Yes	Under this category anyone working in confined space or working in lone conditions is covered. Any operation in confined space must be avoided and for working under lone

			conditions it must be ensured that the personnel is well trained and must contact team every hour.
2.9	Monitoring	Yes	It is of key importance to monitor and record the activities at site to prevent any mishaps and prevent any recurrence of unfavourable conditions. The Monitoring program should include safety inspection, testing and calibration of equipment along capabilities and training of the workers at all times. All incidents, accidents, potential dangerous occurrences must be recorded in a register.
3	**Community Health and Safety**		
3.1	Water Quality and Availability	Yes	The project to maintain adequate and clean water for all the workers present at site. At any point of time there should be 100 litres of water per person per day. For the purpose of drinking water the guidelines by WHO for Drinking water to be followed.
3.2	Structural Safety of Project Infrastructure	Yes	By engaging in good structural safety practices most of the accidents can be avoided. Local building code or International Code Council should be followed for set of any structure.
3.3	Life and Fire Safety (L&FS)	Yes	The project in its implementation must follow local building code, local fire department regulations, local legal/insurance requirements and international L&FG standards. It must be ensured that standard procedures are followed to avert any man made risk. The evacuation from any building must be clear of any blockage.
3.4	Traffic Safety	Yes	The drivers engaged in the project activity must be aware and trained to follow safe driving skills. Any practices such as sheltering under vehicles must be avoided and driver to ensure to check surrounding of the vehicles before moving from a stationary position.
3.5	Transport of Hazardous Materials	Yes	The project will follow compliance with local laws and international requirements applicable to the transport of hazardous materials.
3.6	Disease Prevention	Yes	The health of worker must be checked at regular intervals of time and a health working atmosphere is to be created. The local communities must be made aware of positive health practices and ways to prevent contracting disease.
3.7	Emergency Preparedness and Response	Yes	Project should have an Emergency Preparedness and Response Plan that is commensurate with the risks of the facility.
4	**Construction and Decommissioning**		
4.1	Environment	Yes	All other factors during the construction and decommissioning phase will be similarly covered under the ESMP. In additional to the plan mentioned earlier, in this guideline soil

			erosion should be considered and preventive measures like re-vegetation carried out.
4.2	Occupational Health and Safety	Yes	Same as above
4.3	Community Health and Safety	Yes	Same as above

The project activity being a wind power project specifically applies the "Environmental, Health, and Safety Guidelines Wind Energy" released by IFC on 7th of August 2015. The key requirements stated in the guidelines have been discussed in the table below:

Compliance to EHS for Wind Energy

S. No	Guidelines	Applicability	Remark/ Management plans to be implemented
1.1	**Environmental**		
1.11	Landscape, Seascape, and Visual Impacts	Yes	The visual impacts of the project activity are associated landscape of the surrounding area. The factors influencing are colour, height, and number of turbines etc. Local community to be consulted over location of WTGs in case these are in vicinity of settlements.
1.12	Noise	No	The project to ensure adherence to national or international acoustic design standards for wind turbines (e.g. International Energy Agency, International Electro technical Commission etc). The noise from the project is mostly during the operation phase as the construction is carried out for a very short period of time and Noise is well within limits. The micro siting of the WTGs location should be done to avoid any region of settlements. The project is well distanced from nearby settlements.
1.13	Biodiversity	Yes	Wind Energy has the potential for direct/indirect impact on biodiversity. Such impacts will include bird and bat collision-related fatalities; bat fatalities due to the potential impact of pulmonary barotrauma; displacement of wildlife; habitat conversion/degradation. To counter these impact project has to conduct site selection accounting for known migration pathways or areas where birds and bats are highly concentrated. Configure turbine arrays to avoid potential avian mortality. For prevention of soil erosion and conservation of water implement appropriate storm water

			management measures. This would also avoid logging of water in small pools which can attract birds and bats.
1.14	Shadow Flicker	Yes	Shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow. The project activity location has the advantage of having very few settlements within the reach of 1km. The details of shadow flicker analysis can be seen in Annexure of this report.
1.15	Water Quality	Yes	The installation of turbine foundations, underground cables, access roads, and other ancillary infrastructure may result in increased erosion, soil compaction, increased run-off, and sedimentation of surface waters. Measures to prevent and control these issues are to be taken including re-vegetation in the project site. The project site has very less to no vegetation and hence, its impact in this scenario may be limited. However, securing the soil excavated and preventing soil erosion is a part of the project ESMP.
1.2	**Occupational Health and Safety**		
1.2.1	Working at heights	Yes	Working on a WTG may be a very challenging and risky task in itself if proper safety measures are not taken. The details are provided under the previous table in addition to which while working on WTGs it must be ensured that the personnel is secured with a belt, takes break while climbing, takes the climb only when in good health and must always be watched by someone.
1.2.2	Lifting Operations	Yes	Lifting operations are an integral component of the construction of any wind energy facility. While carrying out any lifting operation the following things must be considered: - All information about the loading component - All information about the lifting equipment - Supervisors present at operation must be well trained - Prevent unauthorized access to the zone while lifting operation underway. - Ensure good weather conditions.
1.3	**Community Health and Safety**		
1.3.1	Blade Throw	Yes	A failure of the rotor blade can result in the “throwing” of a rotor blade which may effect the public safety. The overall risk of such an event is extremely low. The project site has no settlements in the vicinity and hence, the risk from this adversity is unaccounted.
1.3.2	Aviation (Aircraft Safety & Aviation Radar)	Yes	Wind turbine blade tips, at their highest point, can reach up to 180 meters and in the future may exceed this height as the technology evolves. ANPWPL to ensure that the WTGs are

			visible from far distance at night by installation of appropriate signal system. The nearest airport to the project activity is around 250km and there are no runways nearby. Hence, there is no need for a formal approval from Aviation authority. There are no radar in the vicinity of projects.
1.3.3	Electromagnetic Interference	Yes	The project activity is distributed over an area of around 60 sq. km. and hence the layout of the project will have minimal impact on the any telecommunication system including televisions.
1.3.4	Public Access	Yes	Safety issues may arise with public access to wind turbines (e.g., unauthorized climbing of the turbine) or to the wind energy facility substation. The project activity will have clear signs of danger and will engage security guards at the WTGs to prevent unauthorized access.
1.3.5	Abnormal Load Transportation	Yes	Traffic and transportation issues to consider in siting wind energy facilities are largely covered within the General EHS Guidelines. The main challenge with respect to wind energy facilities lies with the transportation of oversized or heavy wind turbine components (blades, turbine tower sections, nacelle, and transformers) and cranes to the site. Measures will be taken to transport the equipment during non-peak hours only and by way of roads which can potentially accommodate the load. The broadening of any roads required will be planned and carried well in advance.

4.7 Categorization of the Project

IFC has designed a system of environmental and social categorization to assess a project's expected impacts. Projects are assigned a category of A, B, or C, in descending order of environmental and social sensitivity, or FI, in the case of financial institutions that on-lend to clients who may present environmental and social concerns. The categories of projects are as defined below:

Table 4-2: Categorization of Project Types

Category A Projects
Projects expected to have significant adverse social and/or environmental impacts that are diverse, irreversible, or unprecedented.
Category B Projects:
Projects expected to have limited adverse social and/or environmental impacts that can be readily addressed through mitigation measures.
Category C Projects:
Projects expected to have minimal or no adverse impacts, including certain financial intermediary projects.
Category FI Projects:
Investments in Financial Intermediaries that themselves have no adverse social and/or environmental impacts but may finance subprojects with potential impacts

The 100 MW wind power project has limited adverse environmental and social impacts that are generally site specific and can be readily addressed through the proposed mitigation measures. Hence the project can be categorised as a **Category B** project, as per IFC's institutional requirement.

The rationale for categorisation being:

- The project activity does not involve any physical displacement.
- The project being wind power project does not have significant adverse impacts associated with the construction or operation;
- The project uses existing roads and construction of internal roads is restricted to minimal.
- Land selected for the proposed WTGs is a farm land with severely limited production capacity per year; with each acre of land not yielding more than 3 -4 bags of jonna/legume.
- The project is not located in any of the ecologically sensitive zone

Wind power projects due to its spread and limited resource requirements usually have minimal or no adverse social or environmental risks. During operation of the project, impacts are mostly positive as it provide renewable energy and does not generate any gaseous, solid and liquid wastes. One of the major impacts are faced during the construction phase of the project activity in the form of dust generation, soil erosion, noise generation and traffic congestion of the route hauling during transport and storage of the construction materials. These impacts can be very well managed by the methods as prescribed in the ESMP of this study and by following standard practices.

4.8 Applicable Environment Standards

Through the modified direction by CPCB dated 7th March 2016, the industrial sectors are categorized in order of contribution to environmental pollution. Through this revised categorization the project falls under "White category" which would not require obtaining CTE & CTO.

The guideline states that *"There shall be no necessity of obtaining the Consent to Operate'' for White category of industries. Intimation to concerned SPCB / PCC shall suffice"*. However, would need to comply with the national and international guidelines as set forward by CPCB and IFC. The Central Pollution Control Board (CPCB) has stipulated different environmental standards w.r.t. ambient air quality, noise quality, water and waste water for the country as a whole under EP Act, 1986.

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

4.8.1 Ambient Air Quality

National Ambient Air Quality Standards (NAAQS), as notified under Environment (Protection) Rules 1986 and revised through Environment (Protection) Seventh Amendment Rules, 2009

Table 4-3: Ambient Air Quality Standard in India

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO_2), µg/m^3	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO_2), µg/m^3	Annual * 24 Hours **	40 80	30 80	-Jacob & Hochheiser modified ($NaOH$-$NaAsO_2$) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM_{10}, µg/m^3	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m^3	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O_3) , µg/m^3	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m^3	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m^3	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH_3), µg/m^3	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C_6H_6), µg/m^3	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP)	Annual *	01	01	-Solvent extraction followed

Particulate phase only, ng/m^3				byHPLC/GC analysis
Arsenic (As), ng/m^3	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m^3	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

NOTE: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

As the project is in rural/residential set up, NAAQS for rural/residential area will be applicable for the project.

IFC Air Emissions and Ambient Air Quality Standards

The IFC/WB General EHS guidelines on Air emissions and ambient air quality, specifies that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence World Health Organization (WHO) Ambient Air Quality guidelines as represented in the table below:

Table 4-4: WHO Ambient Air Quality Standard

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]		
	Averaging Period	**Guideline value in µg/m^3**
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: WHO

4.8.2 Water Quality Standards

As per the Bureau of Indian Standards, (IS 10500: 2012) drinking water shall comply with the requirements given in table below:

Table 4-5: Drinking Water Quality Standard in India

S. No	Substance/Characteristic	Acceptable Limit	Permissible Limit in Absence of Alternative Source
1	Colour, Hazen units, max	5	15
2	Odour	Unobjectionable	-
3	Taste	Agreeable	-
4	Turbidity, NTU, max	5	5
5	pH value	6.5 - 8.5	No Relaxation
6	Total hardness (as CaCO3) mg/l, max	200	600
7	Iron (as Fe) mg/l, max	0.3	No relaxation
8	Chlorides (as Cl) mg/l, max	250	1000
9	Free residual chlorine, mg/l, min	0.2	1
10	Dissolved solids mg/l, max	500	2000
11	Calcium (as Ca) mg/l, max	75	200
12	Magnesium (as Mg) mg/l, max	30	100
13	Copper (as Cu) mg/l, max	0.05	1.5
14	Manganese (as Mn) mg/l, max	0.1	0.3
15	Sulphate (as SO4) mg/l, max	200	400
16	Nitrate (as NO3) mg/l, max	45	No relaxation
17	Fluoride (as F) mg/l, max	1	1.5
18	Phenolic compounds (as C6H6OH) mg/l, max	0.001	0.002
19	Mercury (as Hg) mg/l, max	0.001	No relaxation
20	Cadmium (as Cd) mg/l, max	0.003	No relaxation
21	Selenium (as Se) mg/l, max	0.01	No relaxation
22	Arsenic (as As) mg/l, max	0.01	0.05
23	Cyanide (as CN) mg/l, max	0.05	No relaxation
24	Lead (as Pb) mg/l, max	0.01	No relaxation
25	Zinc (as Zn) mg/l, max	5	15
26	Anionic detergents (as MBAS) mg/l, max	0.2	1
27	Total Chromium (as Cr) mg/l, max	0.05	No relaxation
28	Polynuclear aromatic hydrocarbons (as PAH) g/l, max	0.0001	No relaxation
29	Mineral Oil mg/l, max	0.5	No relaxation
30	Pesticides mg/l, max	Absent	0.001
31	Radioactive materials: a) Alpha emitters Bq/l, max b) Beta emitters pci/l, max	0.1 & 1.0	No relaxation
32	Total Alkalinity (as CaCO3), mg/l, max	200	600
33	Aluminium (as Al) mg/l, max	0.03	0.2
34	Boron, mg/l, max	0.5	1

35	Ammonia (as total ammonia-N). mg/l, max	0.5	No relaxation
36	Barium (as Ba), mg/l, max	0.7	No relaxation
37	Chloramines (as Cl2), mg/l, max	4	No relaxation
38	Silver (as Ag), mg/l, max	0.1	No relaxation
39	Sulphide (as H2S), mg/l, max	0.05	No relaxation
40	Molybdenum (as Mo), mg/l, max	0.07	No relaxation
41	Nickel (as Ni), mg/l, max	0.02	No relaxation
42	Polychlorinated biphenyls, mg/l, max	0.0005	No relaxation
43	Trilomethanes: a) Bromoform, mg/l, max b) Dibromochloromethane, mg/l, max c) Bromodichloromethane, mg/l, max d) Chloroform, mg/l, max	0.1 & 0.1 & 0.06 & 0.02	No relaxation
	Bacteriological Quality		
1	All water intended for drinking: a) E. coli or thermo tolerant coliform bacteria	Shall not be detectable in 100 ml sample	-
2	Treated water entering the distribution system: a) E. coli or thermo tolerant coliform bacteria b) Total coliform bacteria	Shall not be detectable in 100 ml sample	-
3	Treated water in the distribution system: a) E. coli or thermo tolerant coliform Bacteria b) Total coliform bacteria	Shall not be detectable in 100 ml sample	-

The below picture reflects one key source of water in the region which is a recently (few years ago) constructed canal in the region.

Photograph 4-4: Tungabhadra High Level Canal near the Project Site

Source: Site Survey

The designated best use classification as prescribed by CPCB for surface water is as given in table below:

Table 4-6: Primary Water Quality Criteria for Designated-Best-Use-Classes (CPCB)

Designated Best Use	Class	Criteria
Drinking Water source without conventional	A	• Total Coliforms Organism MPN/100 ml shall be 50 or less

Designated Best Use	Class	Criteria
treatment but after disinfection		• pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20° C, 2 mg/l or less
Outdoor Bathing (Organized)	B	• Total Coliforms Organism MPN/100 ml shall be 500 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20° C, 3 mg/l or less
Drinking Water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100 ml shall be 5000 or less • pH between 6 and 9 • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20° C, 3 mg/l or less
Propagation of Wild Life and Fisheries	D	• pH between 6.5 and 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia • Biochemical Oxygen Demand 5 days 20° C, 2 mg/l or less
Irrigation, Industrial Cooling, Control Waste Disposal	E	• pH between 6.5 and 8.5 • Electrical Conductivity at 25 C micro mhos/cm, maximum 2250 • Sodium Absorption Ratio, Maximum 26 • Boron, Max. 2 mg/l
	Below E	• Not meeting any of the A,B,C,D & E

Source: CPCB

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

Table 4-7: Treated Sewage Discharge Guideline IFC

S No	Parameter	Guideline Value
1	pH	06-09 pH
2	BOD	30 mg/l,
3	COD	125 mg/,
4	Total Nitrogen	10 mg/l
5	Total Phophorus	2 mg/l
5	Oil and Grease	10 mg/l,
6	Total Suspended Solids	50 mg/l
7	Total Coliform bacteria	400 MPN/100 ml

The above values are not applicable to centralized, municipal, waste water treatment systems which are included in EHS Guidelines for water and Sanitation. MNP stands for “Most Probable Number”

4.8.3 Ambient Noise Standards

As per EHS guidelines of IFC, for residential, institutional and educational area, the one hourly equivalent noise level (Leq hourly) for day time is 55 dB (A) while the Leq hourly for night time is prescribed as 45 dB(A).

Noise standards notified by the MoEF vide gazette notification dated 14 February 2000 based on the *A- weighted* equivalent noise level (L_{eq}) are as presented in the table below:

Table 4-8: Ambient Noise Standards

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 is10.00 pm to 6.00 am;**Silence zone is an area comprising not less than 100 meters around premises of hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones. Source: Noise Pollution (Regulation and control) Rules, 2000)

The project activity would fall under the category of Residential Area Day and Night Limits for Noise to be 55dB and 45dB respectively.

4.8.4 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 4-9: 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

- *No exposure in excess of 115 dB(A) is to be permitted.*
- *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.*

4.9 International Conventions & Legislations

Various policies released by the Government of India from time to time needs to be addressed while undertaking the projects. Some of the policies (including sector specific) have been discussed briefly in the subsequent sections

	Applicable International Conventions/Legislation/Regulation		
		Convention on Biological Diversity (CBD), commonly Biodiversity Convention International legally binding treaty opened for signature at the United Nations Conference on Environment and Development (UNCED) in 1993. The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. India is committed to prepare national biodiversity strategy and action plan, national biodiversity reports on implementation of convention	***Applicable in Phases*** *Pre-Construction* *Construction* *Operation* *Decommissioning* ***Applicability:*** The Project activity being a wind project has minimal impact in the biological diversity of the project region. Further, the details of Bio-diversity are provided in the ***chapter 7*** of this report.
		Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Multilateral treaty, drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Trade in foreign birds is restricted by CITES.	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability*** India is a signatory to CITES. ANPWPL that all of its affiliates in the project must discourage such trade in all forms.
		Conventions on the Conservation of Migratory species of wild animals and migratory species Intergovernmental treaty, concluded under the aegis of the UNEP, concerned with the conservation of wildlife and habitats on a global scale. It is the only global convention specializing in the conservation of migratory species, their habitats and migration routes. The treaty aims to conserve	***Applicable in Phases*** *Construction* *Operation* *Decommissioning*

		terrestrial, aquatic and avian migratory species throughout their range.	***Applicability*** India is contracting party to the convention on conservation of migratory species of wild animals and migratory species from 01.11.1983
		Montreal Protocol on Substances That Deplete the Ozone Layer (and subsequent Amendments) The Montreal Protocol rules regulate production, consumption, export, import, sale, purchase and use of ozone depleting substances in specified time bound programme.	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability:*** India signed the Montreal Protocol along with its London Amendment on 17-9-1992 and also ratified the Copenhagen, Montreal and Beijing Amendments on 3rd March, 2003.
		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 3rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in 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.	***Applicable in Phases*** *Construction* *Operation* *Decommissioning* ***Applicability*** The project activity is eligible for the benefits of CDM under Kyoto Protocol. The project has taken steps to secure these benefits.

Other international standard for regulation of wind power projects such as IFC Performance standards, Equator Principles, and IFC EHS Guidelines for wind power project are not described in the table above as the same are detailed in the following sections of this chapter.

5 ANALYSIS OF ALTERNATIVES

The alternatives analysis for the wind project as a standard includes analysis of project existence, location, technology and evacuation plan. An analysis of alternatives for the proposed wind power project is discussed in the following section. The variables as described are chosen to be:

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

5.1 No Project Scenario;

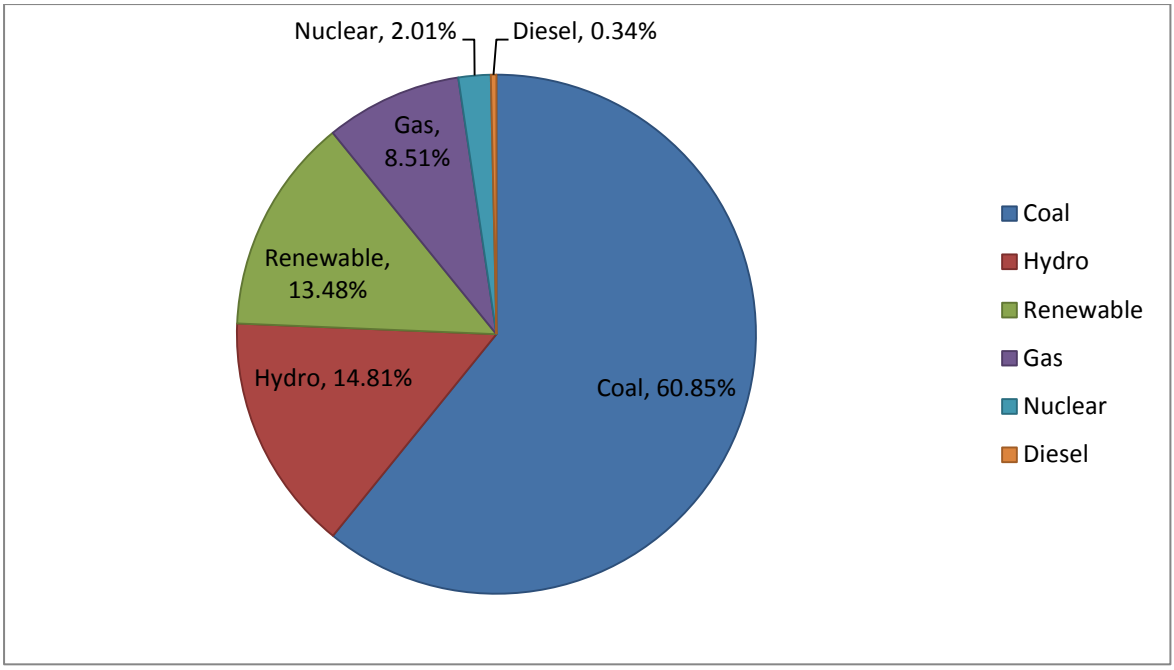
It is a hypothetical scenario where the project would not have been conceived. It is interesting to note that India to fuel is economy and growth needs more power than ever before.

India is a developing country with significant shortage of electricity. Hence, a scenario where the project is not conceived is an unfavourable scenario.

Currently, as of February 2016 India has a total installed capacity of 288,005 MW (Central Electricty Authority[4]) of which only 38,821 MW is renewable energy. The major (200,740MW) of the installed capacity comes from very old and inefficient Coal, Oil & Gas power projects. Currently, in India, emissions associated with generation of each MW of electricity is in the range of 950kg of CO2. Hence, it is clear that our national power generation is highly carbon intensive and India must focus on a shift towards renewable energy to help mitigate climate change. There is no better alternative than implementation of renewable power projects. The power mix in India is presented in the following table.

Figure 5-1: Power Generation Technologies share in India

[4] http://www.cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-01.pdf



The nature of power deficit suffered by the country is evident from the fact that Central Electricity Authority in its latest Load Generation Balance Report (LGBR) has estimated that for the year 2015-16 the total deficit is in the range of 24,077 Million Units, which works out to be more than 2.1% of total electricity demand.

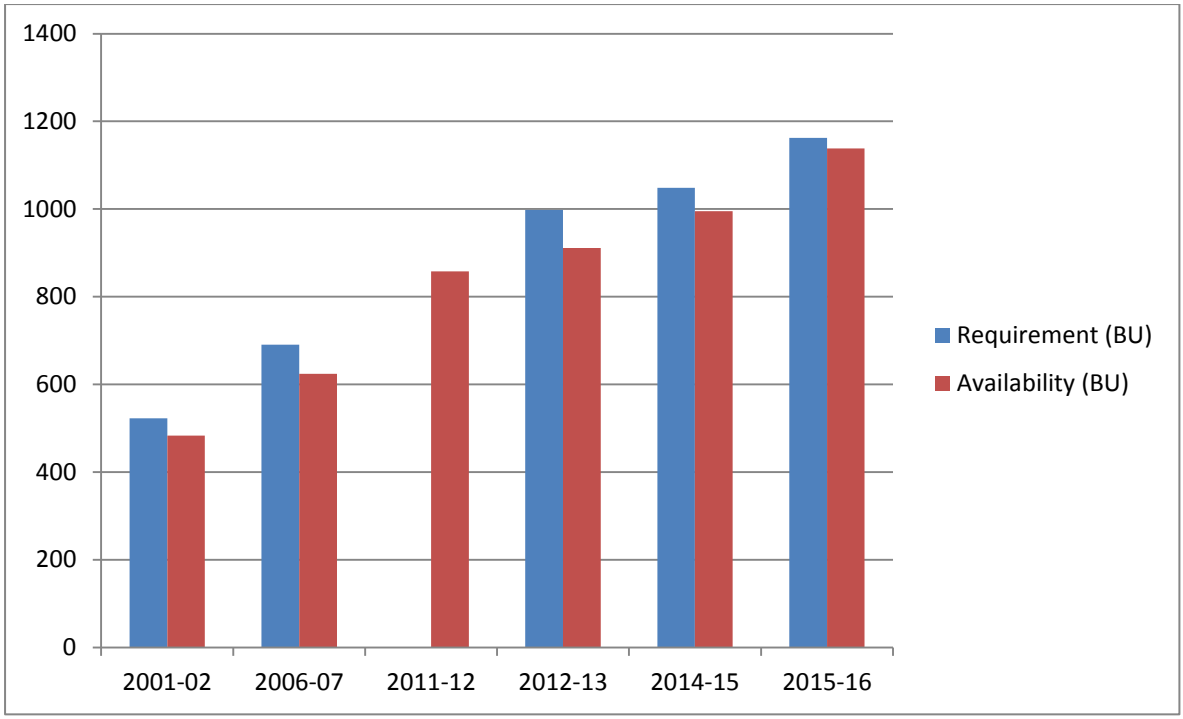
Apart from this even the peak demand will continue to suffer in the coming years as currently in the year 2015-16, there was more than 4,108 MW shortage of the peak time requirement. This deficit is set to continue as the demand for power is increase like never before.

The historic Power Supply position in India can be seen in the table below:

Table 5-1: Historic Power Supply Condition in India

Year	Requirement (BU)	Availability (BU)	Surplus (+)/Deficit (-) (%)	Demand (MW)	Met (MW)	Surplus (+)/Deficit (-) (%)
2001-02	522.54	483.35	-7.50	78441	69189	-9252
2006-07	690.59	624.50	-9.60	100715	86818	-13897
2011-12	937. 20	857.89	-8.50	130006	116191	-13815
2012-13	998.11	911.21	-8.70	135453	123294	-12189
2014-15	1048.67	995.16	-5.10	147815	144788	-3027
2015-16	1162.42	1138.34	-2.10	156863	152754	-4108

Figure 5-2: Historic Power Supply Condition in India (units in BU)



5.2 Power Scenario in Andhra Pradesh

The power scenario in the state of Andhra Pradesh is not very different from the national trend, as it also has been facing power deficit and is steering towards attaining. The state of Andhra Pradesh was bifurcated in the year 2014 and the installed capacity of the state was shared in a ratio of 53.89 and 46.11 among the newly formed state Telangana and Andhra Pradesh with exceptions of Tamminapatnam (300MW), Simhapuri (450MW) and Tanir Bhavi (220MW), which are retained with Andhra Pradesh. The Installed capacity of Andhra Pradesh as of November 2015 is tabulated below:

Table 5-2: Installed capacity of Andhra Pradesh

Anticipated Power Supply Position in the Country during 2015-16

State / Region	ENERGY				PEAK			
	Require-ment	Availab-ility	Surplus(+)/ Deficit (-)		Require-ment	Availab-ility	Surplus(+)/ Deficit(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Andhra Pradesh	54,864	48,216	-6,648	-12.1	7,622	6,720	-902	-11.8

As of March 2016 the state of Andhra Pradesh still has slight deficit as recorded to be 6648 MU for the last financial year 2016-16.

In order to meet the gap in the demand and supply renewable/non-conventional sources of power will be 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.

The total installed wind power capacity in the state of Andhra Pradesh is about 1062 MW as on

February 2016. The estimated potential in the state is valued at 14,497 MW. The proposed project is 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.

The proposed project using wind to generate electricity reduces CO_2 and SO_2 emissions. It does not deplete the natural resources and most importantly only a small part of land will be permanently utilised by the turbines, equipment and access roads. Therefore, existing land use of the site i.e., animal grazing land, can continue unaffected.

5.3 Alternate Location for the Proposed Project Site

The selection of the right site is one of the most crucial factors in the viability of any project and more for a wind power project. The NIWE has mapped most of the potential sites with high wind potential. For any project to get approval it must be located in a site identified by NIEW.

Later secondary studies are done to identify wind velocity and wind power density in the area. The area falls in the region with wind speed between 200-300 W/m^2. Further, the capacity of the project is 100MW and there are not many sites which can accommodate such a project and provide adequate evacuation facility as well.

Currently in Andhra Pradesh most of the sites are being explored and the chances of finding an equally good site are bleak as many of the site have been identified by other investors in the region. The factors which were considered to be advantageous for the site are:

- NIWE approved site for pre identified wind density.
- Availability of Substation within vicinity of the project
- Sufficient availability of land for sale and willingness of land owners as most of the land is very low yielding or uncultivated.
- No settlements within 500 meters of the WTGs location and very limited within 1km of distance.
- No ecological sensitive receptors within the radius of 10 kms from the project location.
- No settlements nearby which will have attracted additional approvals from Government bodies.

Keeping in view of the above factors an alternative location for the project activity is not readily available.

Location of Individual WTGs and Facilities:

The project activity has 50 WTGs locations fixed and location of PSS, access roads and transmission lines has also been finalized. However, there is little flexibility when it comes to individual WTGs location. The locations are selected based on micro siting and in case of unfavourable conditions or obstacles; some locations can be slightly modified without impacting the potential generation capabilities of the project. The location change for the WTGs will be considered if any of the WTGs

locations has any negative impact including; ecological sensitive receptors in vicinity, Noise or shadow flicker impact, land available with marginalized farmers or any other socially driven impact.

5.4 Alternate Methods of Power Generation

The end product of the project activity is generation of electricity and there are number of alternative technologies available for investment with the same output and similar capacity.

However, while making to choose an alternative method of power generation the applicability criteria should match the qualities of the current project. The chosen parameters are:

1) Should be implementable to the proposed capacity of the project (100 MW)
2) Reliability of generation (Capacity Utilization Factor)
3) Economic Viability (cost of generation and moderate investment)
4) Environmental impact
5) Social impacts.

Based on these above criteria the below technologies have been evaluated:

Mode	Advantages/Disadvantage	Criteria Evaluation
Coal Power Plant	**Advantages**: Cost of investment per MW basis makes it attractive investment Large scale production potential Cost per unit works out the be relatively inexpensive **Disadvantage** High impact on local population from pollution (fly ash) Global impact in form of increased Global warming. Large quantities of water requirement for cooling system High fossil fuel consumption Impact of mining devastates natural terrain and has long lasting negative impact on environment;	Power generation by coal based power plants helps to strengthen the economy by providing cheaper electricity but, fails in other two parameter of our evaluation criteria i.e, environmental and social well-being.
Oil Based Power Plants	**Advantages**: Cost of investment per MW basis makes it attractive investment. Compact generators and quicker implementation Large scale production potential **Disadvantage** Slightly lesser emissions when compared to Coal but still will have high Global impact in form of increased Global warming. Significant quantities of water requirement for cooling system (if not air) High consumption of fossil fuel based NG Upstream impact from oil exploration	Power generation by Oil based power plants are only backup to meet peak demand and does not even make a good economic sense and the fuel prices (Diesel/Naphtha) are high. It also fails in other two parameter of our evaluation criteria i.e, environmental and social well-being.

Natural Gas Power Plant	**Advantages**: Cost of investment per MW basis makes it attractive investment Large scale production potential Compact generators and quicker implementation Cost per unit works out the be relatively inexpensive **Disadvantage** Lesser emissions than Oil and Coal based power plants but still will have high Global impact in form of increased Global warming. Significant quantities of water requirement for cooling system (if not air) High consumption of fossil fuel based NG Upstream impact from oil exploration	Power generation by NG based power plants to strengthen the economy by providing cheaper electricity but, fails in other two parameter of our evaluation criteria i.e, environmental and social well-being.
Nuclear Power	Out of evaluation as the regulation would not allow a private company to implement nuclear power plant.	None
Biomass	**Advantages**: Uses renewable fuel No net additional of carbon dioxide to the atmosphere. **Disadvantage** Large area of land required to grow fuel. Capacity cannot be increased beyond some capacity due to limitation of fuel in vicinity. Burns organic matter which may add to the fertility of soil.	This is not taken for evaluation as it is not possible to have a 100 MW biomass power project in any identified region in India on a sustainable basis.
Hydropower Plant	**Advantages**: Uses renewable fuel Low cost of unit power generation No net additional of carbon dioxide to the atmosphere. **Disadvantage** Large area of land required may be required for similar capacity project (submergence). May involve severe social impact by resettlements. Long gestation period Unseen barriers such as unseen difficulties in civil construction due to non-supportive terrain.	The project activity though passes in economic sense and limited environmental issues when compared to conventional coal power; but losses severely when a large scale (>100MW) project may involve resettlements and has large submergence area.

Solar Power	**Advantages**: Uses renewable fuel Peak generation matches the peak hour demands. No net additional of carbon dioxide to the atmosphere. **Disadvantage** Large area of land required may be required for similar capacity project. Low capacity utilization factor. While the panels are environmentally friendly, the manufacturing process requires large amounts of energy.	This method of power generation matches the current project activity is all ways except that: It needs large patch of land at one single location (2.5 times the project) PLF if significantly lower. The parent company of ANPWPL is evaluating the options of implementing solar power projects as well, however, at the current location, such single piece of land may not be available hence, it is considered to be not suited for this particular set of conditions.
Wind Power	**Advantages**: Uses renewable fuel No water or negligible amounts required for operation No net additional of carbon dioxide to the atmosphere. **Disadvantage** Large area of land required may be required for similar capacity project. The location has to be very specific to the individual WTGs. Generation is totally seasonal and hence, the consumers of this power are limited. Most favourable sale method is through preferential tariff by the Nodal agencies.	Wind power plant is the project under study and it can be said that it just suits right to the location and all other site specific factors in the region.

5.5 Statutory and Policy Requirements

Apart from the above it is to be noted that the government policies and other advances plays a major role in deciding on the investment into wind power project.

India is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and has as part of its obligations released under National Action plan on Climate Change the government has to promoted investments in renewable energy sector including wind, hydro, solar and biomass projects. National Action Plan for Climate Change envisaged 4% contribution by Renewable Energy in the Indian power mix by 2010 and further to be increased by 1% every year to reach 15% by 2020 Thus RPOs were introduced in the country with mandatory annual targets being notified by CERC and SERCs for different DISCOMs and bifurcated between solar and non-solar category. Further, the RPO targets under solar category were proposed to be gradually increased to reach 3% in FY 2022 from 0.25% in FY 2012.

The National Electricity policy, 2005 stipulates several conditions to promote and harness renewable energy sources. The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the State Electricity Regulatory Commissions by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee

The following fiscal and tax incentives have been offered by the Central and State government for promotion of wind power projects

- Generation Based Incentive (GBI): MNRE had introduced GBI scheme. Under the scheme, presently, a GBI of Rs. 0.50 per unit of electricity fed into the grid will be provided to wind electricity producers for a period of ten years with a maximum incentive of Rs. 1 crore per MW
- Renewable Purchase Obligation: The Electricity Act, 2003 requires in section 86(1)(e), the state commission to specify renewable purchase obligation (RPO) for the obligated entities.
- Preferential Tariff: The NTP provides DISCOMs to procure power from renewable energy sources at a preferential tariff in order to promote such projects. Preferential Tariff in case of the project activity works out to be 4.83 Rs/kWh
- Renewable Energy Certificates: The REC certificates are provided to renewable project from generating electricity. It will enable the RE producer and distributor to engage in trading within a specified band. However, there are a number of restrictions on the eligibility and technical constrains in trade. The project does not fall in eligibility criteria if it opts for preferential tariff.
- Concession on import duty on specified wind turbine components;
- 10 year income tax holiday for wind power generation projects;
- 100% exemption from excise duty on certain wind turbine components;
- 100% FDI investment allowed in renewable energy generation projects;

Government of Andhra Pradesh has also a number of benefits declared for wind power projects through its Wind Power Policy. These benefits which are available to wind power project being implemented in Andhra Pradesh are listed below:

Power Evacuation: Wind power projects will be exempted from paying the supervision charges to APTransco/Discom towards the internal evacuation infrastructure within the wind farm site and up-to pooling sub-station.

APTransco/Discom will dispose the proposals for the technical feasibility for evacuation within 14 days from the date of receipt of application.

Transmission and Distribution charges for wheeling of power: There will be no T&D charges for wheeling of power generated from wind power projects, to the desired location/s for captive use/third party sale within the State through grid.

Energy Banking: Banking of 100% of energy shall be permitted during all 12 months of the year. Banking charges shall be adjusted in kind @ 2% of the energy delivered at the point of drawal. (April to March)

Open Access: Intra-state Open Access clearance for the whole tenure of the project or 25 years whichever is earlier will be granted.

Electricity Duty: All wind power projects are exempted from paying Electricity Duty in case of sale of power to APDiscom.

Deemed Public Private Partnership (PPP) Status: Deemed PPP status shall be provided for projects coming up under Category I and have entered into a PPA with APDiscom for sale of power.

Non Agriculture Status: Deemed Non-Agricultural (NA) status for the land where wind power projects will be accorded, on payment of applicable statutory fees.

Deemed Industry Status: Generation of electricity from wind power projects shall be treated as eligible industry under the schemes administered by the Industries Department and incentives available to industrial units under such schemes shall be available to the wind power producers.

Must run status: Injection from wind power projects shall be considered to be deemed scheduled subject to prevailing regulations/grid code of appropriate commission.

Pollution Clearance: Wind power projects will be exempted from obtaining any NOC/Consent for establishment under pollution control laws from AP Pollution Control Board.

5.6 Alternative Technologies within Wind:

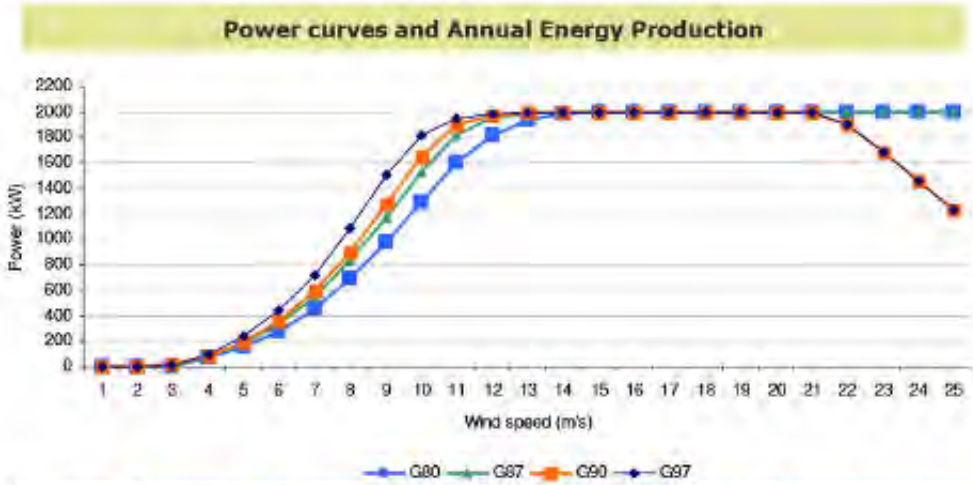
Gamesa G97 IIIA: The project activity is installing the Gamesa's G97 IIIA WTGs which employ one of the most advanced technologies in their WTGs and hence are capable of giving reliable power generation from the machines. The fact is also evident form the fact that Gamesa has made a generation guarantee of 30% PLF/year form the project.

Credentials: The G97 IIIA by Gamesa is one of the most advanced WTG available in the market today. Below are some of the unique features of G97 IIIA:

- New optimized blades are thick roots and light body made of fibre glass and carbon fibre using re-impregnation methods.
- Increased hub height of 104 m, which is one of the tallest available in the market at the time of finalizing supply order.
- New airfoil technology reduces noise from the WTG
- New Nacelle improves continuous & quicker cooling

Power curve:

Figure 5-3: Figure & Table showing Power Curve comparison of various models



AEP	6,5	7	7,5	8	8,5	9	9,5	10
G80	100%	100%	100%	100%	100%	100%	100%	100%
G87	114%	113%	112%	111%	110%			
G90	121%	119%	117%	116%	114%			
G97	134%	131%	127%					

Weibull k=2, standard density and wind speed at hub height

Form the above it is clear that ANPWPL has taken the decision of engaging Gamesa after thoroughly evaluating the capacities of its latest WTG (G97 IIIA).

5.7 Alternate Route for Transmission Line

The project activity has transmission lines from the WTGs to the 33/220 KV Pooling Substation (PSS) which is located in Nimbagallu and from Nimbagallu the 220/400 kV line to the Uravakonda substation.

From individual WTGs to the PSS power will be transmitted through Dog, Coyote, Panther and Double Circuit lines ranging from 0.5km to 11.2 kms. Please refer to diagram of internal transmission lines under ***chapter 3***.

The approach for identification of route for transmission line has been based on the following factors:

- Transmission line route has been planned to avoid any habitations along the route
- No house or community structures are located under the transmission line
- Areas of dense vegetation, or places requiring extensive clearing of vegetation are avoided
- Right of way/access roads will be shared with the common user of the substation wherever possible

The finalization of route for the transmission lines is was based on the above factor and is also the shortest possible route.

5.8 Conclusion

The project site conditions and criteria for investment makes the project unique in itself and hence does not has a convincing viable alternative. The conditions of land availability, high wind density, less water availability, absence of eco sensitive zones make is apt for implementation of a wind power project.

6 STAKEHOLDER MAPPING AND ENGAGEMENT

6.1 Stakeholder Identification

The stakeholders for the project should be prioritized by identifying direct (those who have a direct interest or influence on the project) and indirect stakeholders whose interest is indirect. Stakeholders need to be identified based on potential impact from all related facilities associated with the project including associated facilities, transport routes etc. The characteristics that have been taken into consideration while mapping the stakeholder constitutes the following:

- Stakeholders who will be affected by the potential environmental and social impact;
- Stakeholders who might help to enhance the project design;
- Stakeholders who oppose or support the project changes, if any;
- Department of government which are relevant to the project; and
- Stage of the project development in which stakeholder to be engaged.

In the consultation preparedness part or job, first all the stakeholders were studied and understood to be categorized based on relation to the project and their influence on the project. The following stakeholders have been identified for the proposed wind farm.

Table 6-1: Identified Stakeholders

S. No	Type	Description	Stakeholders
1	Direct Internal Stakeholders	Direct internal stakeholders comprise the parent company or the project proponent and the employees of the company that are directly controlled by the parent company	ANPWPL Employees of ANPWPL
2	Direct External Stakeholders	Direct external stakeholders comprise the project affected people, local communities, third party contractors, supply chain and financial intermediary who are directly affected by the project activities but are not directly controlled by the project proponent.	Land Sellers EPC Contractor (Gamesa) Other Lenders Local population residing in nearby villages
3	Indirect External Stakeholders	Indirect external stakeholders comprise those stakeholders whose interest even though are indirect they fall within the external group such as those involved in institutions or agencies concerned with managing the resource or those who depend at least partially on the	Sub- Contractors hired by Gamesa Contracted Workers Local Government Authorities (District Collector (Anantapur), Sarpanch of the village etc) Regulatory Authorities like,

		business generated by the resource	APDCL, APERC, NREDCAP Local Media Local NGOs & Civil Societies Other Industries

6.2 Stakeholder Analysis (Categorization)

Stakeholder analysis supports project developers in their assessment of the project environment and their negotiating position, and it can help them to make decisions regarding stakeholder involvement. After identification of relevant stakeholders, they are analysed in terms of their importance during the project life cycle and has been categorized into stakeholders who need to engage regularly, important players and stakeholders of low significance. The stakeholders has been analysed in table below (**Categorization of Stakeholders based on Significance)**.

Table 6-2: Stakeholders' Categorization

Caterogy	Stakeholders relevant to the project	Justification
Important Players	Gamesa	Gamesa scope of work for the project is under turnkey arrangement where in Gamesa is responsible for literally almost everything related to the project construction and will also continue to assist in operation. Hence, Gamesa is of high importance and project will have significant impact on Gamesa and vice versa.
	Land Sellers	The project region has marginalized farmers (less than 2 bigha or <1 acre) as well as wealthy landlords (above 50 acres). Purchase of land form marginal land owner has been cautiously avoided to avoid landlessness for any family. The project region is a known low yield region and hence sale of land may result is desirable revenue generation for a family. These factors makes the impact of project high on land sellers as it can lead to landlessness to marginal farmer or it generate good revenue for the seller. A wise investment of such income can help improve livelihood.
Stakeholders required to engage regularly	Local population residing in nearby villages	The project region has very low rainfall and unfertile soil. The population of SC/ST are less than 10% of the population who hold comparatively very less land. The influence of the project is limited to land usage, employment, EHS aspects etc. Whenever and wherever possible, ANPWPL shall prefer to engage local community in jobs during construction and operation of the project.
	Contracted workers (Local)	The project region is predominantly dependent on agriculture for livelihood. However, the village of Indravathi is mostly landless and villagers are day labourers and skilled labourers as well. AS there is availability of required manpower within the project

		region, the contractor will prefer to engage them during the construction of the project activity.
	Contracted Migrant Labourers	The project has equal proportion of non-local labourers at the site who are man from the state of West Bengal, Bihar, Uttar Pradesh and Kerala. The migrant labourers are brought to the site as most of them are skilled labourer like; welder, fitter, helper, line fitter, line helper, mason. The labourers from other states are provided, accommodation and food, medical facilities. The treatment of migrant labourers is protected under labour laws and their treatment and safety will have impact on the project and vice versa.
	Gram Panchayat	Gram Panchayat are the governing body in every village. They are actively involved in development activities in their respective villages. Apart from this they are responsible to reaching out and resolve any dispute in the village. The project may need NOC from the Panchayats for activities which involves usage of common resources. The panchayat will play important role in CSR activities and implementation of Grievance Redressal plan. Further, it will also be responsible for resolving any future disputes related to the project in their village. It is recommended that the Gram Panchyat be engaged frequently.
	Local NGOs & Civil Societies	There a number of NGOs and Societies in the project region. Anantapur district is hub of operation for number of NGOs working towards, water conservation and alternative methods of irrigation. NGOs should be considered key partners in implementation of CSR plans.
Stakeholders with low significance	Vulnerable Communities	The population of vulnerable communities such of Scheduled tribes is very limited in the region and makes insignificant portion of the land holders. They also work as agricultural labourers and make their earning through odd jobs. They are dependent on common resources for most of their essential needs (sanitation facility & water). Purchase of land may have impact on them as it may result in loss of job for agricultural labours, but considering the distrusted patches of land required it is assumed that it will have insignificant impact. They can benefit temporarily from the project construction by getting jobs.
	Agricultural Labourers	Most of the agricultural labourers are landless due to which they work in the fields of other farmers. They may also belong to vulnerable communities. Purchase of land may have impact on them as it may result in loss of job for agricultural labours, but considering the distrusted pacths of land required it is assumed that it will have insignificant impact. Jobs from the project may help them temporarily. The sub-contracts engaged by Gamesa should be instructed to prefer people from vulnerable communities, marginalized farmers and agricultural labourers.
	Employees of ANPWPL	ANPWPL has its office in Delhi and a local office in the

		district headquarters of Anantapur. The project will result in generation of employment and the type of jobs will all be permanent as the project lifetime after commissioning is considered to be 25 years. The employees of ANPWPL will have insignificant impact on the project
	Sub- Contractors hired by Gamesa	The sub contracts hired by Gamesa will have to engage in operation as per the guidance of Gamesa and will be responsible to follow all recommendation favouring a sustainable development.
	Local Government Authorities (District Collector)	The district collector role in the project will be restricted to land use change and procurement of revenue land (if any). It will also be involved in the matters which may give rise to litigations.
	Regulatory Authorities like, APDCL, APERC, NEDCAP	These bodies will have one time impact on the project as the approval and allocation are mostly applicable for the project lifetime.
	Other Industries	The project activity is surrounded by other wind project locations and many upcoming wind projects as well. There are other industries apart from wind and one hydro project in vicinity of few kms. These will have no direct impact on project. The PSS many have other project be connected to it, however, the monitoring of electricity will be defied in the PPA.
	Local Media	In the project location, there are mostly Telugu language newspapers in circulation and television is another source of news/information/entertainment. The local media may play a good role is dissemination of information about the project, however, on a micro scale the project reach will be good enough and may not need any media involvement.

Meeting with Various Stakeholders

Photograph 6-1: Consultation with Gamesa Team

Source: Site Survey

Photograph 6-2: Consultation with Contractors

Source: Site Survey

Photograph 6-3: Consultation with Land Sellers

Source: Site Survey

Photograph 6-4: Consultation with Local Villagers

Source: Site Survey

Photograph 6-5: Consultation with Farmers

Source: Site Survey

Photograph 6-6: Consultation with Local Labourers

Source: Site Survey

Photograph 6-7: Consultation with Marginalized Farmers & Vulnerable Groups

Source: Site Survey

Photograph 6-8: Consultation with Migrant Labourers

Source: Site Survey

Source: Site Survey

Photograph 6-9: Consultation with Sarpanch

Source: Site Survey

Photograph 6-10: Consultation with Women Stakeholders

Source: Site Survey

6.3 Stakeholders' Consultation and Disclosure Requirement

6.3.1 Disclosure Requirement:

The International guidelines are increasing emphasizing the involvement of local communities in the project. It is to be noted that the study has been designed considering the requirements of Social Engagement laid under Equators' Principle and IFC Performance Standard. The below table presents overview of the public disclosure and stakeholder consultation applicable to the study. Some of the guidance not applicable to this particular project and are repetitive are not listed:

S. No	International Standard	Reference Guidance	Description
1	Equators Principle	Principle 5: Stakeholders' Engagement	The project will require the client to demonstrate effective Stakeholder Engagement as an on-going process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. It in turn refers to IFC Performance Standards.
2	Equators Principle	Principle 10: Reporting and Transparency	The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.
3	IFC PS-1	Assessment and Management of Environmental and Social Risks and Impacts	Community engagement is to be undertaken with the affected communities and provide the affected communities with an opportunity to express their views on the project risks, impacts, and mitigation measures, as well as allow the proponents to consider and respond to them. Establish a Grievance Redressal Mechanism, which will allow the affected communities' concerns and grievances. Engage stakeholders' who are not effected but have interest in the Project and established relationships with local government, civil society organizations, etc.
4	IFC PS-2	**Labour and Working Conditions**	Engage the workers, their organization and the applicable government body to have them comply rights of those involved.
5	IFC PS-4	**Community Health, Safety and Security**	Emergency plans should be developed in close collaboration and consultation with potentially Affected Communities and other stakeholders and should include detailed preparation to safeguard the health and safety of workers and the communities in the event of an emergency.
6	IFC PS-5	**Land Acquisition and Involuntary Resettlement**	Engagement of displaced families as described under PS-1. Development of a grievance mechanism in the development stage itself which will be compliant with Performance Standard 1.

As described in the table above it is of key importance under the IFC PS Guidelines and Equators' Principles to conduct social consultation and disclosure:

A stakeholder is any group or individual who may affect or be affected either directly or indirectly by a specific project. Stakeholder engagement process is essential for identifying the stakeholders associated with the project and building a responsive relationship with them for successful management of project's environmental and social impacts. Stakeholder Engagement Plan (SEP) needs to be developed and shall shave two important components:

Disclosure of Information
Stakeholder Consultation

6.3.2 Process of Information Disclosure

This is supposed to be a very important activity by the client as disclosure of information rleveant to the project progress and activities will help communities and other stakeholders to understand the risks, impacts and opportunities of the project. It is the responsibility of ANPWPL to ensure that such information is accessible to the local community which in turn can help in important imputs of suggestions by the local community member to mitigate any unseen impacts. Further as per the guideline 10 of Equators Principle is necessary for ANPWPL to keep a summary of the project ESIA study available for access online. The client to ensure disclosure of the following information to the local communities:

- The duration of Project Construction and operation.
- Key impacts and risks associated which can influence communities and also possible mitigation measures which can be engaged;
- Details of stakeholder engagement process;
- The grievance mechanism (Detailed in a separate ***chapter 10***)

ANPWPL apart from undertook public disclosure and stakeholder consultation at two levels, one being at Nimgagallu village inviting everyone at the venue and a diffused consultation where a team visited every village and took note of their opinion. The team has received positive response from the locals. People responded that they don't have any problem with the proposed development however; they also expressed their expectation of job opportunities. Evidence of Invitation printed in Newspaper is provided as an **Annexures** to this report.

6.3.3 Stakeholder Engagement

Engagement of stakeholders is a continuous process which should began at the earliest stage of project planning and continues throughout the life of the project. As per the "Equators Principle Guidelines 5" the process of stakeholders' engagement should be free of manipulation, interference and to be conducted on the basis of timely, relevant, understandable and accessible information. The aspect of conducting stakeholders' consultation is to make them a partner in the project from the pre-construction, construction phase till the project operational phase.

The project activity has engaged the local community in discussion at a gathering called for consultation with the local community. The primary objective of the consultation process shall be to ensure that the views and concerns of the stakeholders are considered by the project proponent at an early stage of the project. All issues and concerns raised by the stakeholders shall be addressed in a timely and appropriate manner by the project proponent. Based on the consultation process, a grievance redress mechanism has been proposed (***chapter 10***) for the community to receive and facilitate the community concerns and grievances regarding the project. The village Panchayat and village elders were briefed about the project implementation plan. They were also informed about myths and benefits of wind farm.

All the respondents were aware of the proposed project and were informed by Gamesa team about the proposed project. The stakeholders raised their wise to be employed in the project and Gamesa agreed to engage local manpower where ever possible.

Photograph 6-11: Pictures showing Stakeholders Consultation (Group Gathering)

Apart from the gathering consultation also happened at individual levels where a two-person survey team carried out the discussions and the interviews. The team followed a checklist to covers all the aspects of the project and document all possible aspects. In the primary research a list of open-ended questions are used in both the focus group discussions and the individual interviews. Random interviews in the fields were also conducted, this was done to make the villages comfortable and it is most suitable from the point of view of the interviewee. Natural group discussions were also conducted, where ever possible.

Figure

Photograph 6-12: Pictures showing Stakeholders Consultation (Individual Houses)

During the complete consultation process the team has noted the key concerns of the stakeholder which are documented in the below table. ANPWPL in its capacity shall make required efforts to prevent any activity which of concern to the stakeholders. Some of the concerns/recommendations can be incorporated in the CSR plan as well.

Table 6-3: Stakeholders' Interaction (Concerns & Actions)

	Details of Interaction	Actions by ANPWPL
Gram Panchayat	The team during social survey and consultations, ensured to visit the head of Panchayats and secretary of all the villages in the study area to record their stand on the project and concerns of the villages as a unit. At the very first impression, it was clear that the Gram Panchayat was favourable and in support of development activities like implementation of the wind power project. They key outcome from the interacts: <u>View of Project:</u> - Positive towards any prices from the land being procured. - Employment creation for local labourers was appreciated. - Increased visitors to their villages were appreciated as it helped small local businesses. <u>Key Concerns in Village & Expectations:</u> - The yield from the fields was a point of concern in all villages due to unavailability of water and unfertile nature of land. - More number of local workers to be employed in the project construction. - Infrastructure help to the common facilities such as schools and village welfare centres. - Some were concerned about help in getting the nearest canal water to the villages - Assistance to the village youth in guidance and jobs by the project leaders was desired.	The concerns from the Gram Panchyata were genuine for the development of the region. A number of issues have been discussed in the proposed CSR plan as one of the chapters of this report. The issue of employment and training were discussed at the site itself with Gamesa team and also with ANPWPL. It was identified that Gamesa is already carrying out training programme all the places of their presence. It is recommended that ANPWPL/Gamesa carry out similar exercise at the project site. The details of proposed plan for community development and CSR plan in provided under chapter 11 of this report.
Villagers	The concerns of villagers were similar to that of Panchayt. Most of the villagers knew about wind wills and have seen similar projects in surrounding villages. They were not worried about implementation of the project. Most of the villagers were expecting employment opportunity from the project. In two rare occasions, villagers asked the survey team about impact of wind farm on water availability and rains. To which it was clarified that the project whatsoever, cannot have any impact on the rainfalls and water availability.	ANPWPL where ever possible shall try to employ the local community people and is possible train to the required skill set level.

Women	Most of the women are restricted to the activities of household. There few women in the villages who could be contacted and had asserted their concerns with respect to village. It was clear from the interaction that women were not the decision makers and most of the key decision rested with men in the house. However, few of the women interviewed conveyed the following concerns: - They had no opinion about the project and were positive about any development the project may bring to the village. - Open defecation problem was to be dealt with and more initiative from private parties was desired. - Most of the women were keen on development of temples in their village. - Water condition for domestic use needed improvement as sometimes the hand pump bores were drying up.	The village has almost no sanitation facility, with houses having bathing facility but no latrines. The defecation is open is a common practice and in all the villages in study area more than 90% of the families follow defecation in open. ANPWPL can join hand with the ongoing "Swachh Bharat Abhiyan" and help manage setting up of sanitary facilities in villages. Further, ANPWPL can contribute to improving the water situation of the area by helping water shed management, repairing irrigation tanks, setting up of water pumps/ tube wells etc. The underground water needs to be replenished regularly and steps towards it should be considered as vital.
Land owners	Most of the land sellers were farmers owning large pieces of land. The land sellers were satisfied with the compensation for their land and were ready to offer more land if required by the project. They wanted to get priority in any employment opportunity from the project.	ANPWPL has paid adequate compensation for the private land procured based on negotiations with land owners, reportedly at higher rates than the prevalent market price Specific caution is taken by the land aggregator to ensure that no land is purchased from any marginal farmers. In cases where, the sale of land has any impact of the livelihood of a family it, is to be ensured that one member of the family is provided employment in the project activity.

7 DESCRIPTION OF ENVIRONEMENT

7.1 Introduction

Collection of base line data is an integral aspect of the preparation of environmental impact assessment report. Baseline data reflects the present status of environment before the initiation of any activity of the proposed project. The possible effects due to the proposed project are estimated and superimposed on the compiled baseline data subsequently to assess environmental impacts.

Baseline environment assessment was conducted in the impact zone of 5 kms surrounding the site area during the months of August – November, 2015. Studies were undertaken to generate baseline data of micrometeorology, air quality, water quality, noise levels, flora and fauna, land use, soil quality, and socio-economic status of the community were collected in a circular area of 5 kms radius surrounding the project's outermost site locations.

Kosher Climate undertook a reconnaissance survey of the proposed site and surroundings in order to understand the environmental and social setting of the proposed wind farm project. The reconnaissance survey was followed by primary baseline data generation for environment and social aspects of the study area. The photo-documentation of the study is presented in the ***Annexures.***

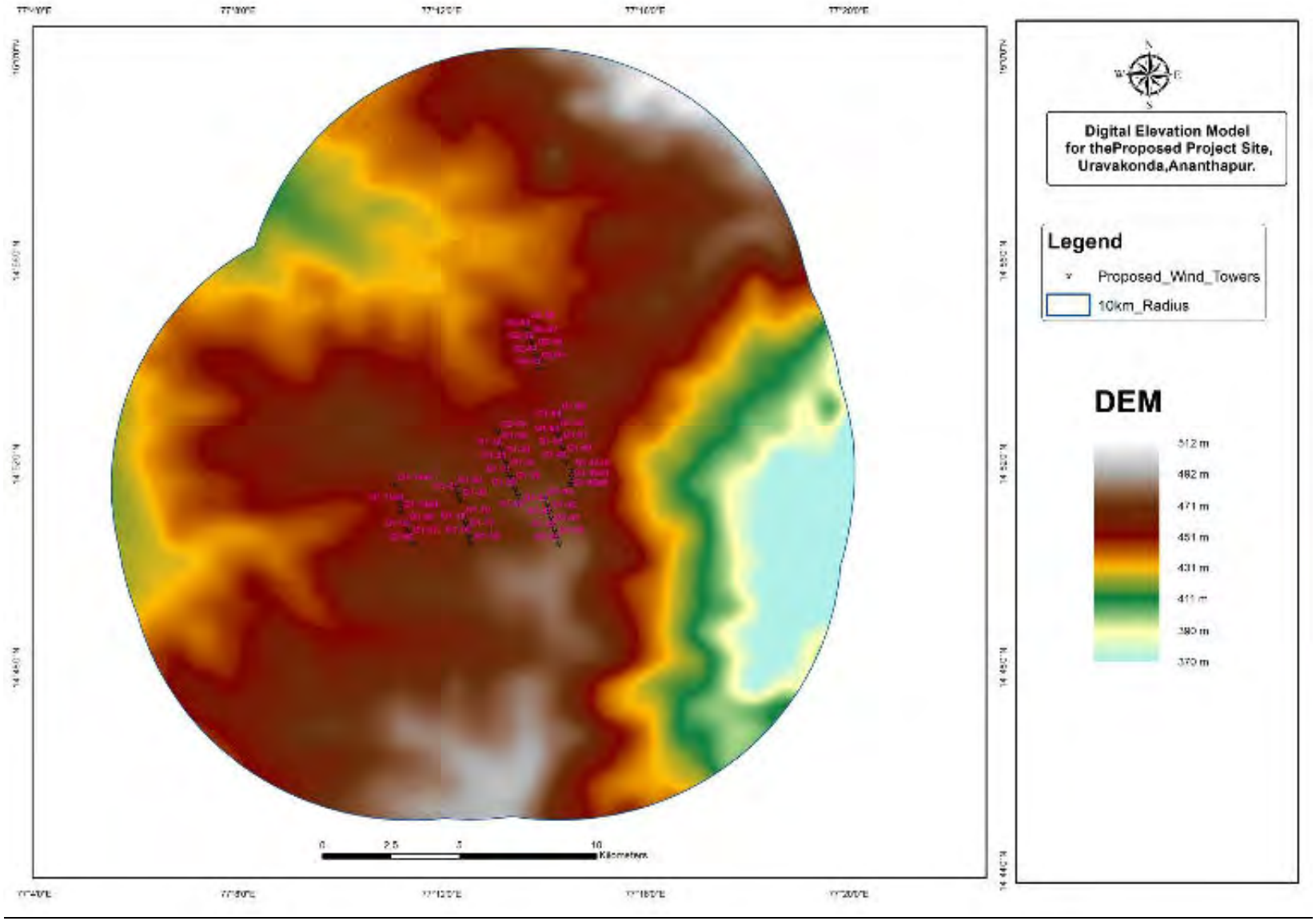
7.2 Physical Environment

7.2.1 Topography:

Topographically, major parts of the district is covered by Karnataka Plateau, with gently sloping topography and elevation ranging between 425 m and 600 m above mean sea level.

The highest elevation of the area is observed on south most corner of the area near village Amidayala with an elevation of 487 m above mean sea level, which represent undulated terrain formation. The lowest elevation is 462 m above mean sea level marked south-east of Renumakullapalli village;
The regional topography/elevation of the area is given in below Figure.

Figure 7-1: DEM topo map



7.2.2 LAND USE:

7.2.2.1 Introduction

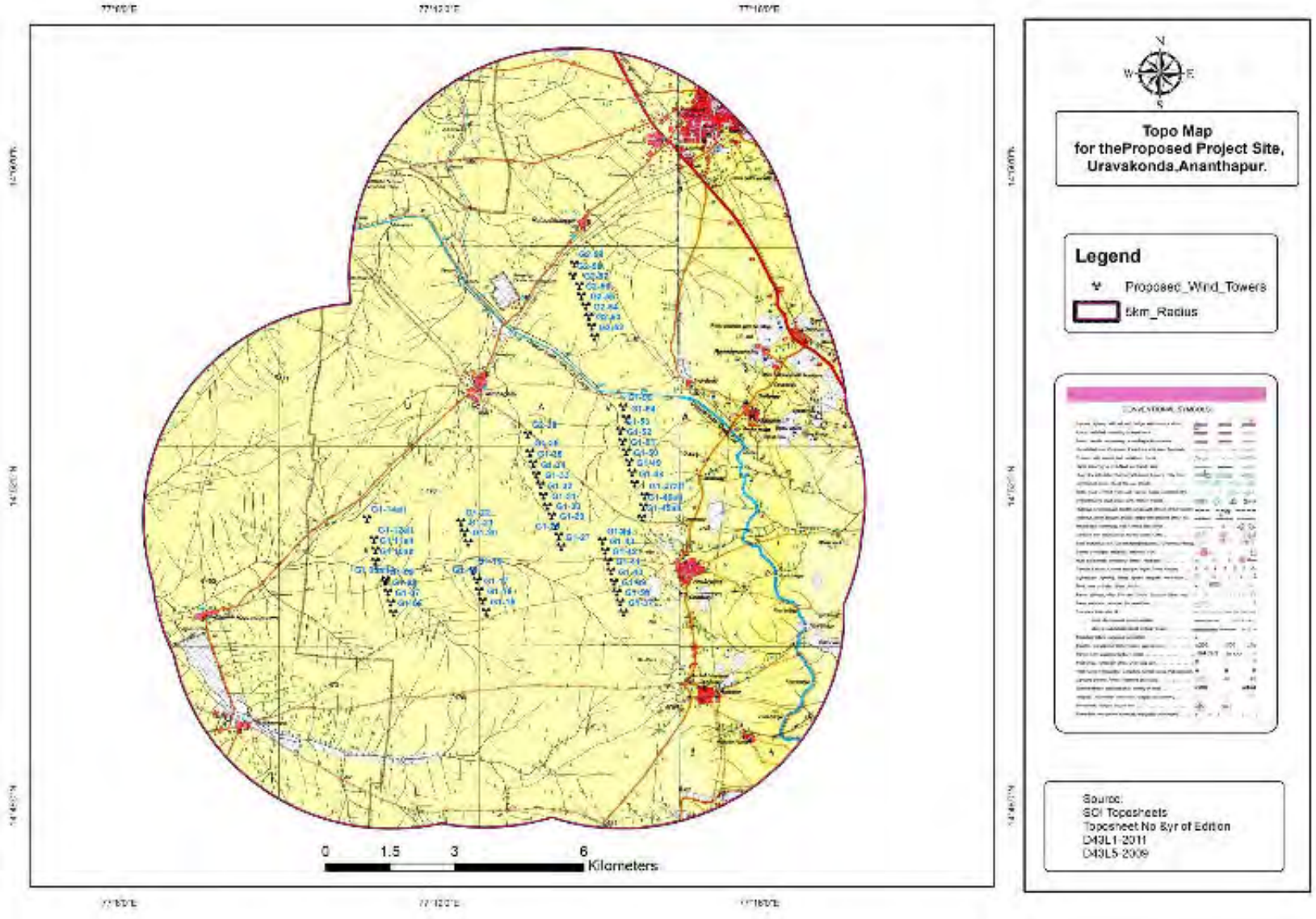
The ever-growing population and limited availability of land necessitates proper utilization of available land through scientific land use planning. Data on land use/land cover patterns, their spatial distribution and changes are the prerequisites for making development plans. Visual interpretation techniques through, stratification approach, with limited ground truth are used for mapping broad categories of land use types with aerial extent and location. Information with respect to vegetation, their types, classes, density, quality and distribution is of prime need for adopting conservation measures, eco-balance and planning-cum-management.

Land use/land cover classification is a time consuming and expensive process. Remote sensing offers a quick and efficient approach to the classification and mapping of land use/land cover changes over space and time. Information on changes in land use classes their aerial extent and pattern form a basis for future planning. Keeping this in view, Land use / Land cover assessment on 1: 50,000 scale in 10 km radius around Project site near Uravakonda village of Ananthpur district has been taken up.

7.2.2.2 Base Map of 10km & 5km radius around proposed site

The map depicts major roads, minor roads, major and minor settlements, river/stream, Canals, tanks, mining area existing wind towers etc. The data collected include information from Survey of India toposheets, collateral data and updation carried out using high resolution satellite data with limited field checks.

Figure 7-2: The map showing WTGs locations



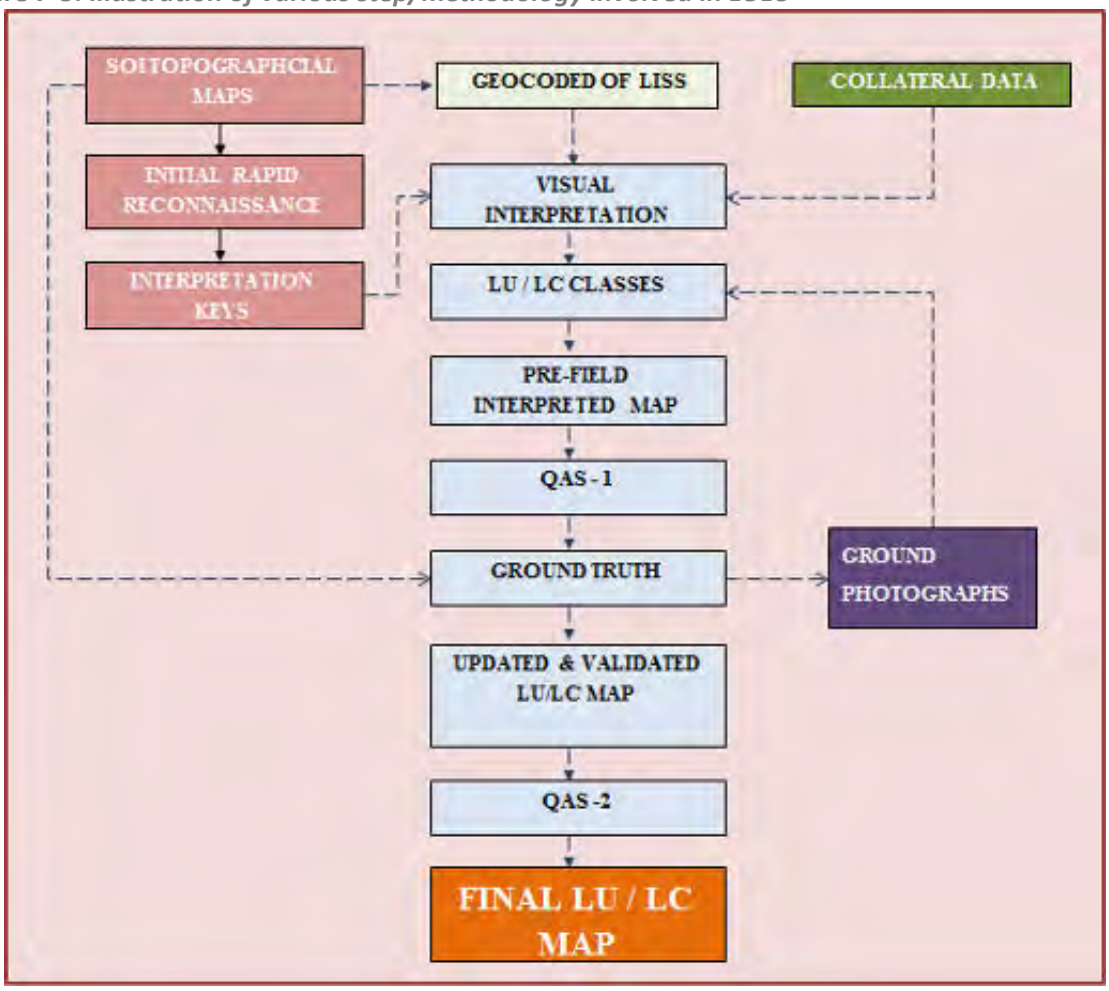
7.2.2.3 LAND USE & LAND COVER ASSESMENT

Remote Sensing in recent years has been established as most efficient and cost effective tool for surveying, mapping and monitoring of varied natural and man-made resources. It has become particularly indispensable in mapping and monitoring the dynamic aspects of earth's surface features including land use / land cover (LU/LC). Although land use at times is abstract, it can admirably be inferred from land cover, which is directly detected by remote sensing sensor and registered on the imagery. Variation in multi-spectral response of the different land cover categories enable detection, identification and categorization of the different land use classes commensurate with the scale of mapping.

Guided by these considerations, Land use and Land cover assessment in the study area was carried out by visual interpretation of latest IRS Resourcesat-1 LISS-III satellite data and ground truth verification. The major components of Land use and Land cover assessment methodology are:

- Rapid reconnaissance of the area
- Development of image interpretation key
- Image interpretation with concurrent integration of LU/LC classes
- Field validation
- Fair map drawing

Figure 7-3: Illustration of various step/methodology involved in LULC



Remote Sensing Data

Considering the user defined scale of mapping, 1:50,000, IRS Resourcesat-1 LISS-III satellite data acquired on latest basis was used for land use/land cover assessment. The satellite data were geometrically and radiometrically corrected and registered with using the control points (GCPs).

Interpretation Technique

Standard monoscopic visual interpretation procedure was followed. The various LU/LC classes perceived and recorded on SOI topographical maps during the initial rapid reconnaissance of the study area were detected, identified and classified on the corresponding FCC imageries using physiognomic expressions conceived by image elements of tone, texture, size, shape, pattern, shadow, location and association etc. Image interpretation keys were thus developed for each of the LU/LC classes in terms of image elements. Information from Survey of India topographical maps, such as scrub land, grass land, gullied land, etc. provided useful clues for image interpretation and field verification.

Procedural Steps

The various procedural steps and Land use and Land cover assessment comprise:

Systematic image interpretation involving detection, identification, classification and codification of the Land use and Land cover assessment with reference to image interpretation keys and in conjunction with corresponding topographical and other ancillary maps. The extracted Land use and Land cover classes include cropland, fallows, plantations, scrub, built-up lands, salt effected lands, various wasteland categories and probable perennial water bodies. Doubtful area, defying image interpretation keys were marked at each stage of interpretation for ground truth verification and assessment

Ground truth verification

Ground truth verification involved collection, verification and record of the different surface features that create specific spectral signatures / image expressions on FCC. In the study area, doubtful areas identified in course of interpretation of satellite imagery were systematically listed and transferred on to the corresponding SOI topographical maps for ground verification. In addition to these, traverses were made with reference to SOI topographical maps to verify interpreted LU/LC classes.

Collateral Data

Collateral data has been derived from Survey of India topographical maps. Also, local farmers and village level officers were contacted for additional information. The information thus obtained includes, among others, cropping history of the different sites, crops taken in the previous season, harvested crops in the current season (early maturing crop), crop rotations, followed, agricultural inputs applied.

Land use Categories

The Land use / Land cover information provides extent and spatial distribution of various Land use and Land cover categories. The present study is conducted using satellite data and assessed visually into six major groups.

The distributions of the different LU/LC classes together with their mapped areas are presented in below:

Figure 7-4*: Landuse Land Cover in the study Area*

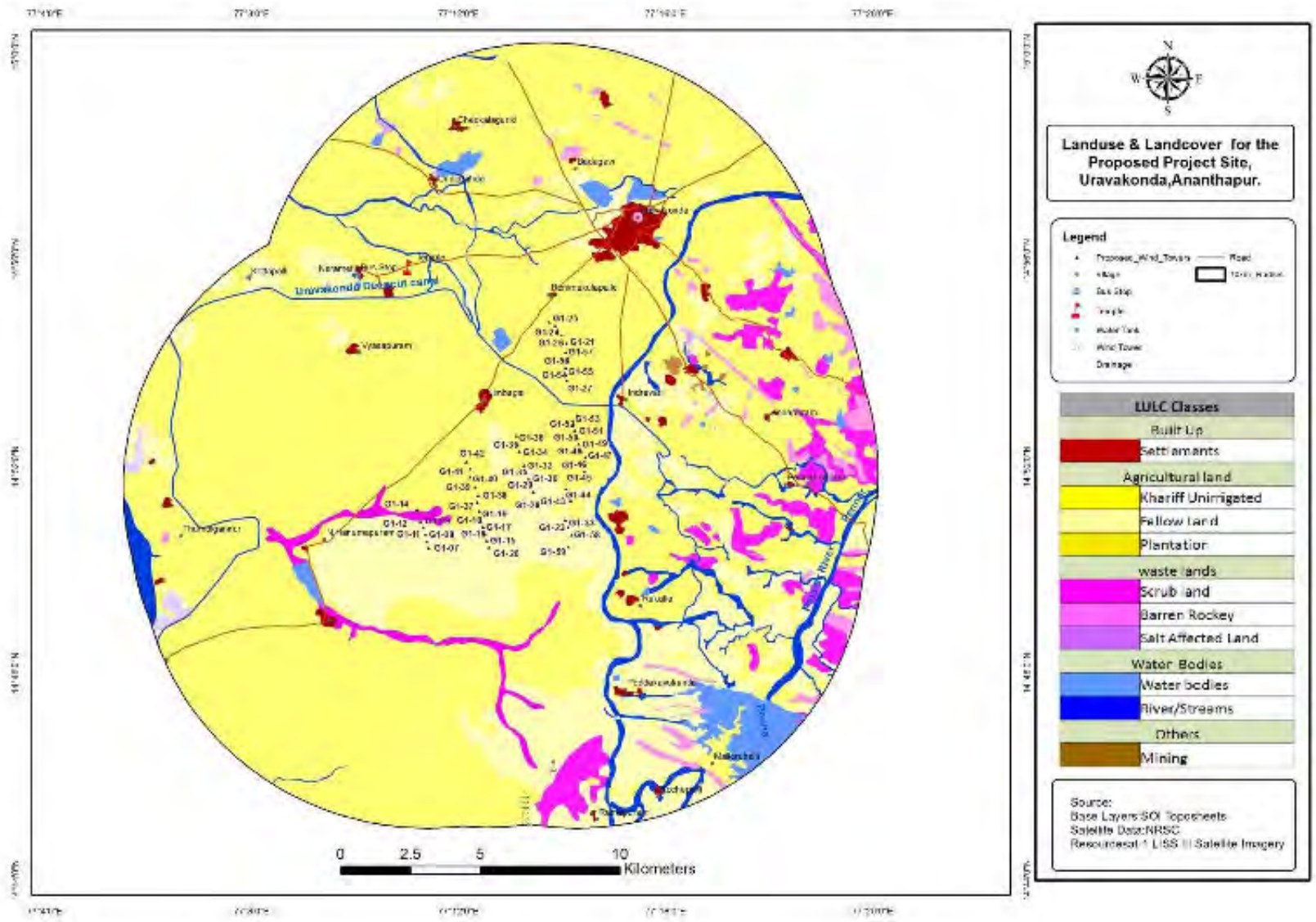


Figure 7-5: Satellite Image of the Study Area

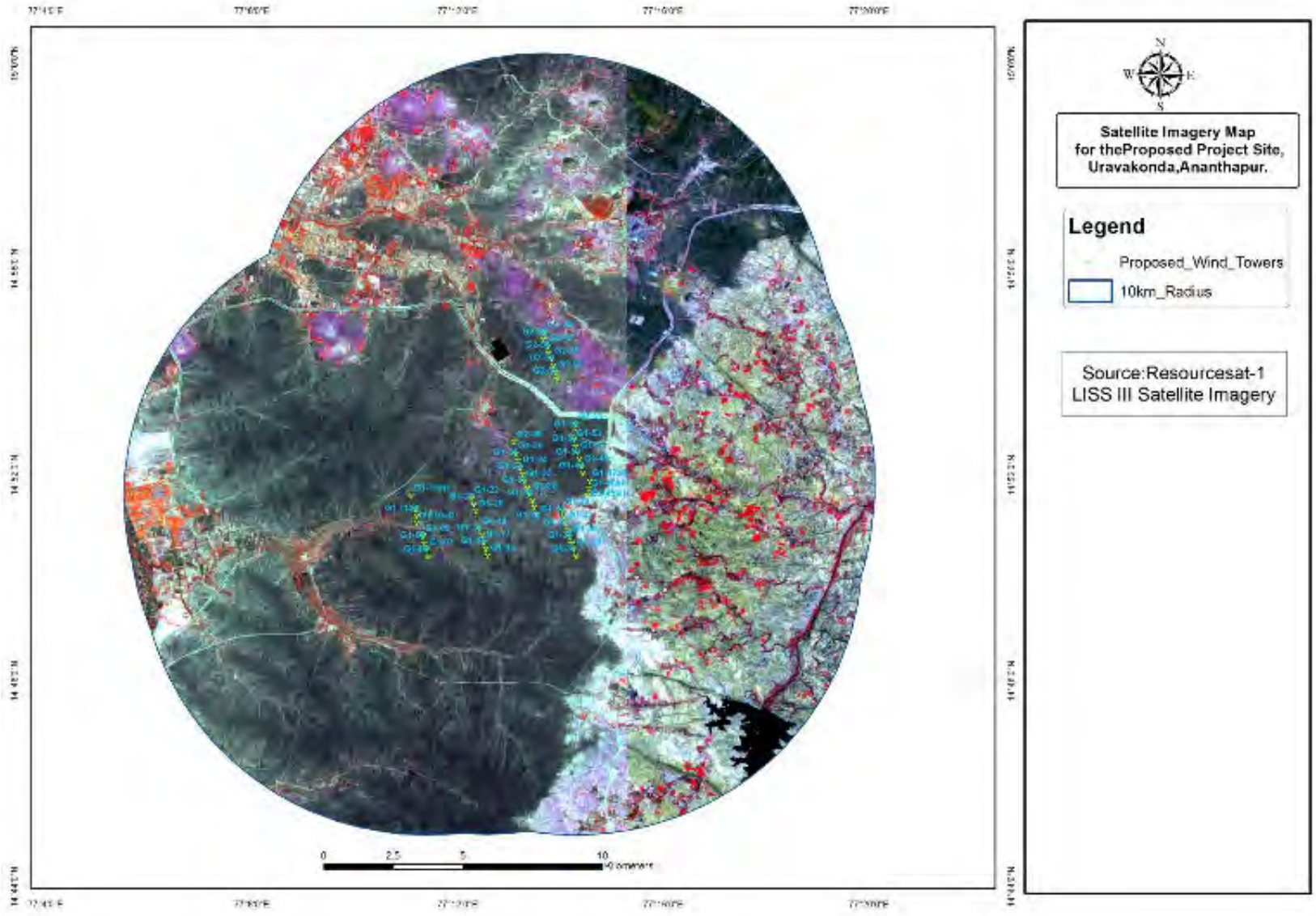


Table 7-1: Land Use/Land Cover Classes in the Study Area

Land use/Land cover categories	Area (Sq. Km.)
Settlements	
Built up	**4.74**
Agricultural Land	
Kharif un-irrigated	**481.08**
Fallow land	**66.69**
Plantation	**0.14**
Wastelands	
Scrub land	**17.58**
Barren Rocky Area	**9.84**
Salt affected land	**0.79**
Sandy Area	**0.02**
Water bodies	
Reservoirs/ Lakes/ Ponds	**10.88**
River/ Stream/ Canals	**16.16**
Others	
Mining	**0.55**
TOTAL	**608.47**

Figure 7-6*: Spatial Assessment of Land Use/Land Cover Classes*

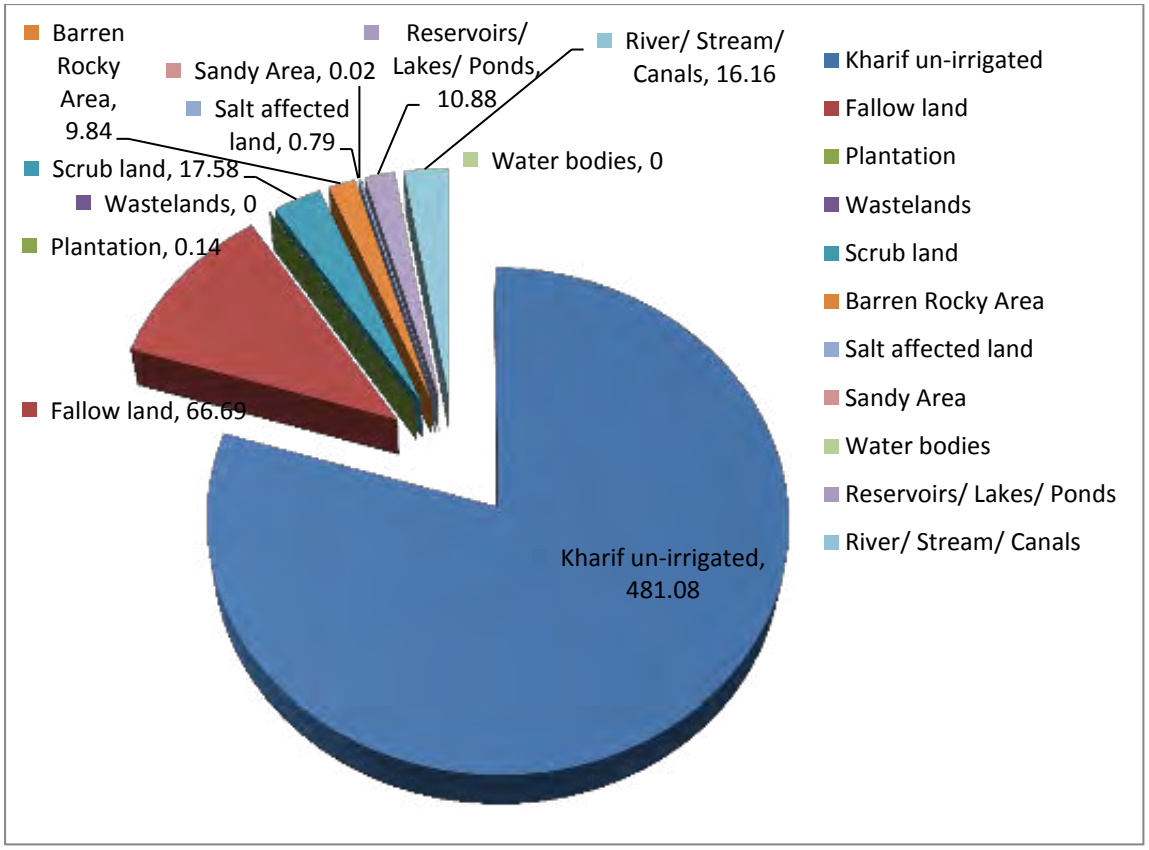
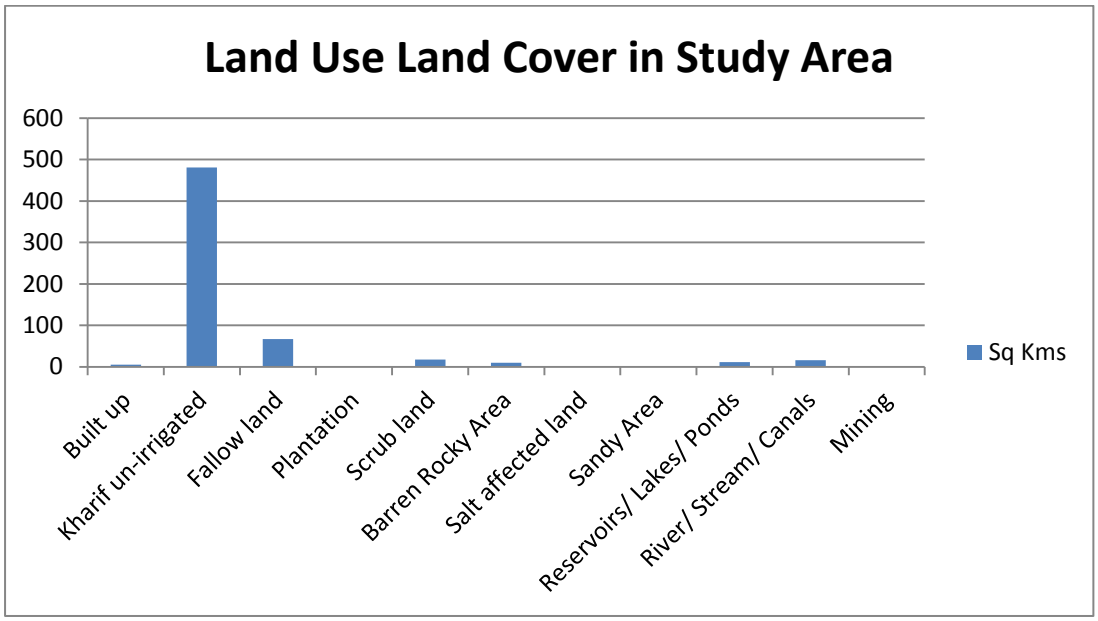


Figure 7-7: Spatial Assessment of Land Use/Land Cover Classes



7.2.2.4 Descriptions of the Land use / Land cover classes

Built-up Land

It is defined as an area of human settlements composed of houses, commercial complex, transportation, communication lines, utilities, services, places of worships, recreational areas etc.

Depending upon the nature and type of utilities, nature of services and size of habitation, residential areas are aggregated into villages, town and cities. All the manmade construction covering land belongs to this category in the study area/towns/villages covering an area of 4.74 ha.

Agricultural land

This category includes the land utilized for crops, vegetables, fodder and fruits. Existing C.L and current fallows are included in this category.

Kharif un-irrigated

Area sown for single crop / Kharif C.L. The area covered by single KharifC.L is 481.08 ha.

Current Fallow land

The land which is left vacant in either Kharif or Rabi is termed as fallow land. C.L not utilized in a particular cropping season is a fallow of corresponding crop season. The area covered by fallow land is 66.69ha.

Plantation

It is described as an area under agricultural tree crops, planted adopting certain agricultural management techniques. Plantations in the study area are found predominantly are *Bauhinia racemosa, Prosopis spicigera, Carissa spinarum, Euporbia antiuorum* etc etc. The area covered by plantation is 14ha.

Wastelands

Wastelands are the degraded or under-utilized lands most of which could be brought under productive use with proper soil and water management practices. Wasteland results from various environmental and human factors. The areas covered by wastelands in the area occupy 28.23 ha.

Water bodies

This category comprises area of surface water, either impounded in the form of ponds, reservoirs or flowing as stream, rivers and canals.

Tank

Reservoir / tank is a manmade enclosed water body usually dammed across a stream occupy an area of 2704ha.

Table 7-2: Change in Land use and Land cover due to project

Present land use in ha.	Proposed land use in ha.	Remarks
The total land under the study area is 608.5 hectare which predominantly consist of un-irrigated kharif land (481.8) and fallow land (60.69)	The project commissioning will reduce the land under Kharif un-irrigated and fallow land by around ~70 hectare.	ANPWPL will keep allowing grazing and farming in the land owned as it will not hinder the activities under project

The land use of the Project foot print consists of private land that comprises of barren land and agriculture land. Land use of the study area falling within 5 km radius is given in the table following this para. The predominant land use of the study area was observed to be agriculture, Fallow land, open land, scrubland, built-up etc. The details of breakup of land use within 5 and 2 km radius is shown below:

Table 7-3: Land use Breakup of the Study Area

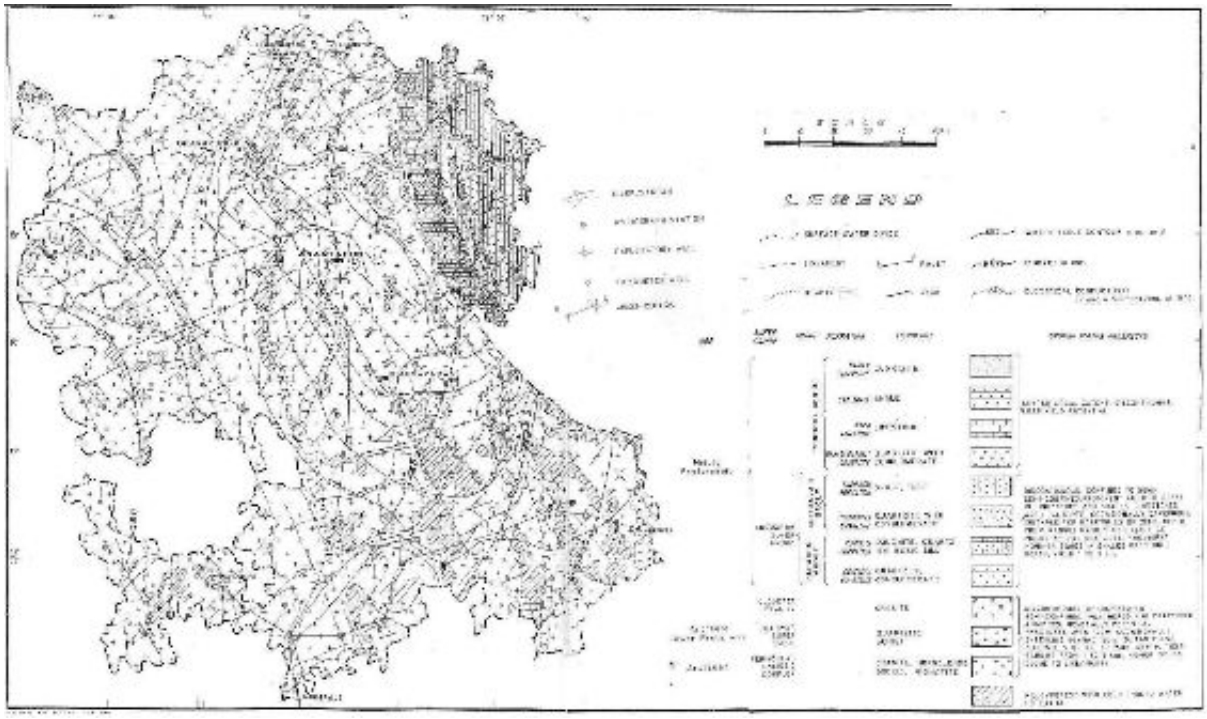
Land use Type	Area within 5km (in km^2)	Area in %	Area within 2 km (in km^2)	%
Fallow Land	54.046	14.36	27.328	15.51
Agriculture	156.937	41.69	73.418	41.66
Vegetation	54.748	14.54	25.628	14.54
Water bodies	6.379	1.69	3.017	1.71
Open Land	52.771	14.02	24.529	13.92
Open Vegetation	33.712	8.95	15.106	8.57
Scrub	9.113	2.42	3.692	2.1
Built-Up	8.776	2.33	3.502	1.99
Total	**376.482**	**100**	**176.22**	**100**

7.2.3 Geology & Hydrogeology:

The district is underlain by various geological formations ranging in Age from Archaean to Recent. Major part of the district is underlain by the granites, gneisses and schists of Archaean and Dharwar Supergroup. Northeastern part of the district is occupied by the quartzites, limestones, shales of Cuddapah and Kurnool Group of rocks. Alluvium is restricted to Pennar, Vedavati and Papagni rivers.

The district is underlain by granite gneisses and schist of Archaean age and formation of Cuddapah Super Group belonging to upper Precambrian to lower Palaeozoic Age. River alluvium occurs along the major river courses and to some extent along minor stream courses. The hydrogeological map of the district is presented in the Figure below:

Figure 7-8: Hydrogeological Map (Anantapur District)



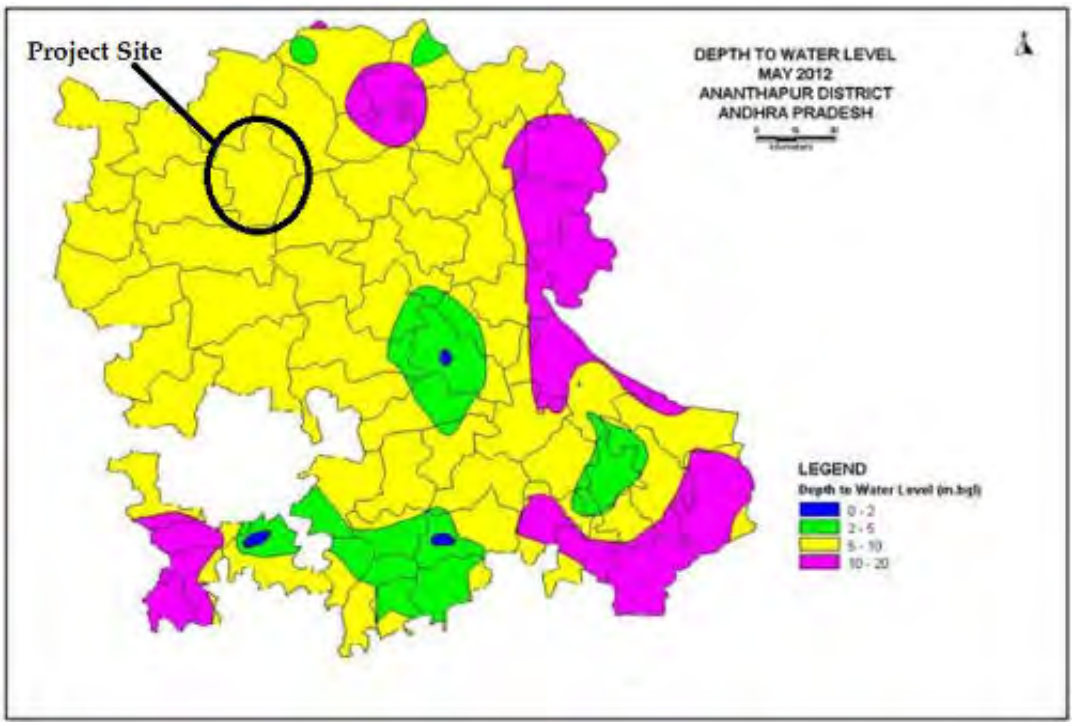
Ground Water:

The region of Anantapur is scarce in water availability, during summers, many of the bore-wells doesn't work. The "Central ground Water Board (CGWB) for the District of Anantapur" in 2012 released data about the estimation of ground water availability. Below are presented the description of water situation during pre-monsoon and post-monsoon.

Pre-Monsoon Water Levels:

The depth to water level during pre-monsoon (2012) ranges from 0.65 - 11.97m bgl. The shallow water levels of 2 m are observed in southern part of the area at three locations. The depth to water levels between 5-10 m is observed in majority of the area. Deeper water levels of >10 m bgl are observed in the North Eastern and South Eastern parts of the area.

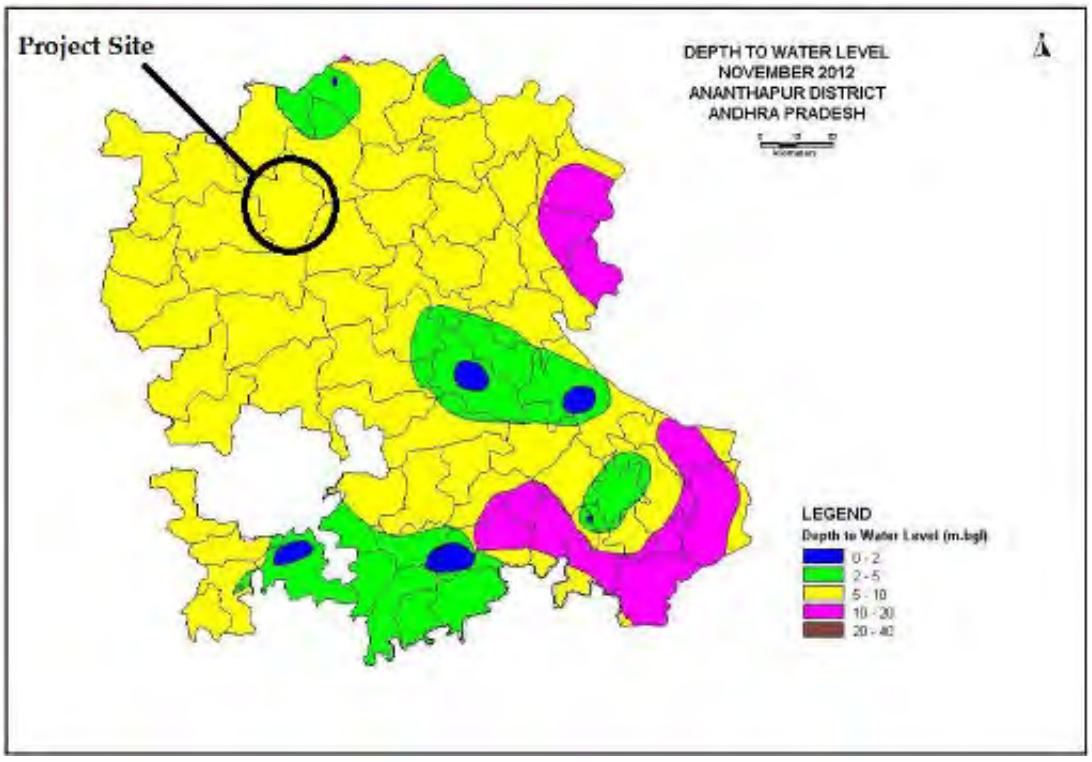
Figure 7-9: Pre-Monsoon Water Depth



Pre-Monsoon Water Levels:

The depth to Water level ranges from 0.37 to 15.26mbgl during the post monsoon period (2012). The areas having water levels of <5 m during pre-monsoon have come upto 2-5 m bgl with minimum recharge and the area having water level of more than 10 m bgl have come upto 5-10 m bgl in southwestern and northern eastern part of the district.

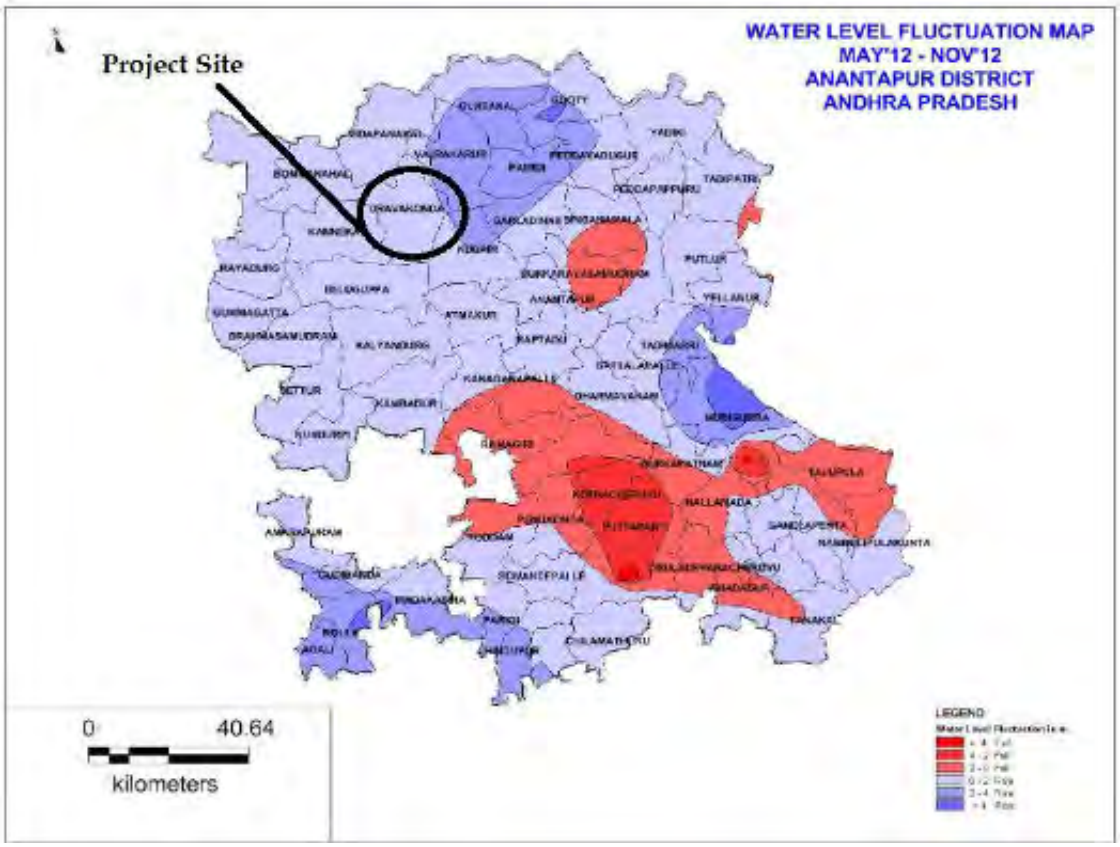
Figure 7-10: Pre-Monsoon Water Depth



Water Depth Level fluctuation:

Majority of the district shows 0-2m rise in water level between pre and post monsoon period of 2012. Rise of water level of 2-4 m is observed in North Eastern and northern part of the district as isolated pockets. Fall of Water levels have been observed in south-eastern part of the district. Less fluctuation is observed in the areas where the water levels were comparatively shallow during pre-monsoon.

Figure 7-11: Water Depth Level Fluctuation



7.2.4 Drainage pattern & Irrigation:

Nearly 80% of the district is drained by the river Pennar and its tributaries like Chitravati, Papagni, Maddeleru, Tadakaleru & Maravanka. The joints and fractures structurally control majority of the streams. Radial drainage pattern is seen near Kalyandurg, Rayadurg and Urvakonda villages. All the streams are ephemeral in nature.

The chief sources of irrigation in the district are tanks, wells and canals. The major and medium irrigation projects in the district are Tungabhadra High Level Canal project stage-I with registered Ayacut of 51771 ha, Bhairavani Tippa (BT) Project with a registered Ayacut of 4856 ha, Upper Pennar Project with an Ayacut of 4066 ha and Channarajaswamy Gudi Project with an Ayacut of 445 ha. The net area under Canal irrigation is 17234 ha (2009-10) which is 15% of net area irrigated.

7.2.5 Seismicity:

The seismic hazard map of India was updated in 2000 by the Bureau of Indian Standards (BIS). According to the new map, the state of Andhra Pradesh lies in Zones II and III. The south-eastern districts of Chitoor, Cudappah and Nellore have been placed in Zone III. Sections of Anantapur district which formerly lay in Zones II and III of the 1984 BIS map now lies in Zone II. Hence it can be said that the project activity is safe from any major quack threat.

Figure 7-12: Earthquake map of India with Project site

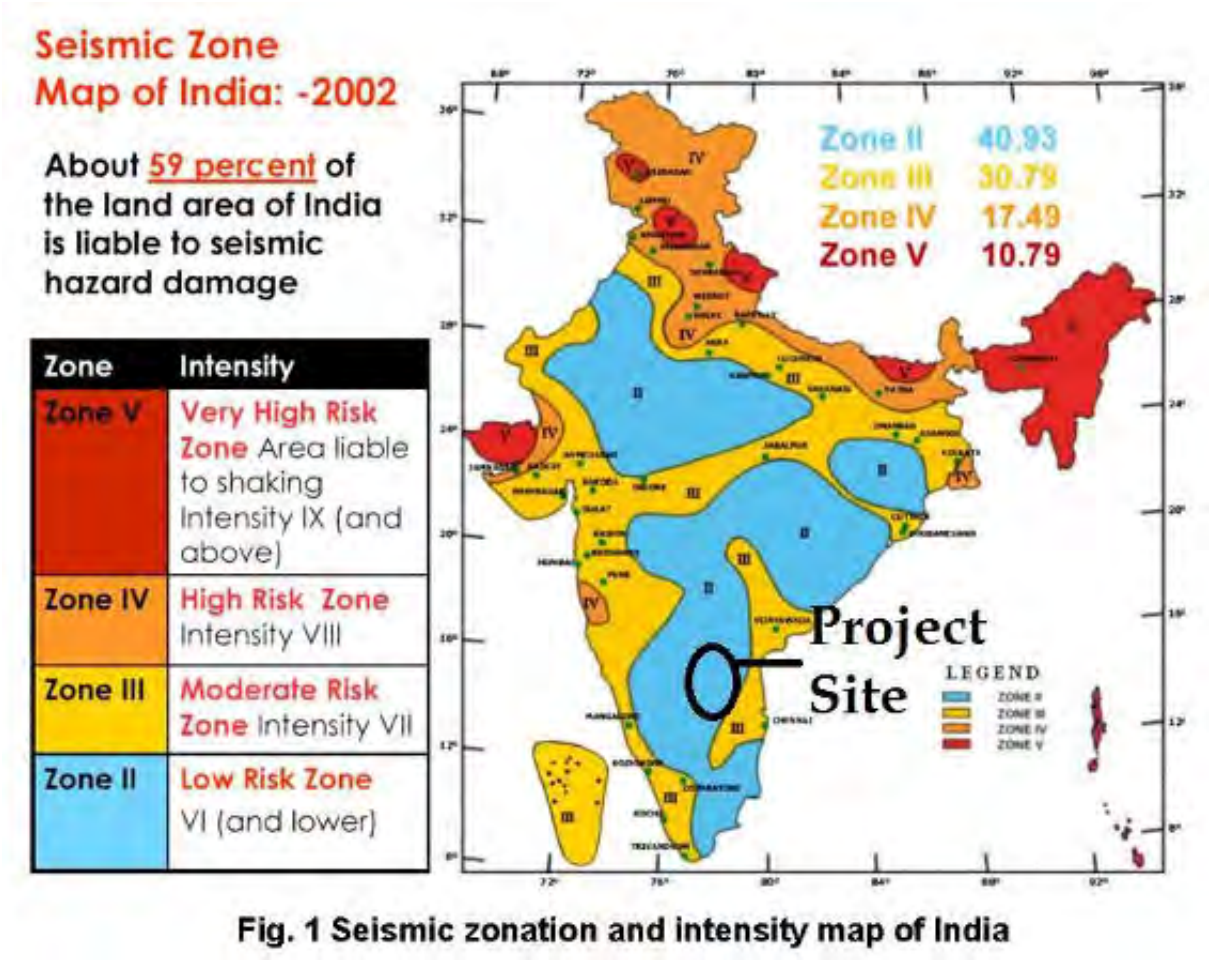


Fig. 1 Seismic zonation and intensity map of India

Source: NIDM

7.3 Meteorological Conditions

7.3.1 Meteorology of Study Area

Meteorology of the study area plays an important role in the air pollution studies. The prevailing micro meteorological conditions at the proposed project site will regulate the dispersion and dilution of air pollutants in the atmosphere. The predominant wind directions and the wind speed will decide the direction and distance of the most affected zone from the proposed activity. The meteorological data collected during the monitoring period is very useful in interpretation of baseline as input for dispersion models for predicting the Ground Level Concentrations (GLC). The present project is

ecofriendly non-hazardous and non-toxic with zero pollution emissions released into the atmosphere. Hence the micrometeorological data in this present context may be useful for better placement of the units.

The study area experiences a dry tropical type of climate. The mild and unpredictable monsoon extends from May to November, followed by a cool winter-period from November-end to mid-February. Hot summer is experienced from mid-February to May. Afternoon thunder-showers are experience in summer-heat. Rain is received chiefly from the retreating north-east monsoon, first between mid-May and mid-June, and later over October and November. The air is dry throughout the year except during the monsoon periods.

An auto weather monitoring station installed by Meteorological department at Anantapur (Nearest City) recorded during the present study period by various meteorological parameters on hourly basis to understand the wind pattern, Temperature variation, Solar insulation and relative humidity variation etc.

7.3.2 Temperature:

Anantapur has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37.3 °C (99.1 °F) range. Anantapur gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 316 mm of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 23–25 °C (73–78 °F) range. Total annual rainfall is about 549 mm.

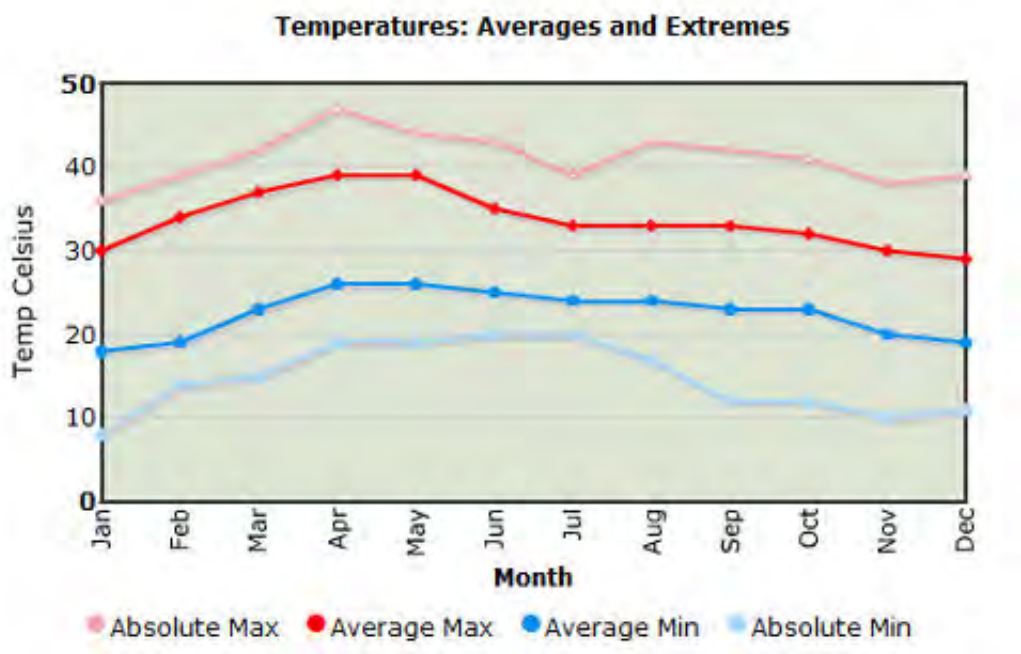
Table 7-4: Historic Climate data of Anantapur

Climate data for Ananthapur (1971–2000)													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	36.8 (98.2)	39.4 (102.9)	41.6 (107.2)	43.2 (109.8)	44.1 (111.4)	43.1 (109.6)	38.1 (100.6)	36.9 (102)	37.9 (100.2)	37.8 (100)	36.8 (98.2)	33.8 (92.8)	44.1 (111.4)
Average high °C (°F)	30.6 (87.1)	33.9 (93)	37.3 (99.1)	39.3 (102.7)	39.2 (102.6)	35.8 (96.4)	33.7 (92.7)	33.0 (91.4)	33.1 (91.6)	31.8 (89.2)	30.2 (86.4)	29.2 (84.6)	33.9 (93)
Average low °C (°F)	17.4 (63.3)	19.8 (67.6)	22.6 (72.7)	26.0 (78.8)	26.3 (79.3)	25.0 (77)	24.3 (75.7)	23.9 (75)	23.5 (74.3)	22.6 (72.7)	20.3 (68.5)	18.0 (64.4)	22.5 (72.5)
Record low °C (°F)	11.2 (52.2)	12.8 (55)	13.4 (56.1)	18.3 (64.9)	18.8 (65.8)	19.6 (67.3)	20.8 (69.4)	20.8 (69.4)	19.3 (66.7)	14.1 (57.4)	10.0 (50)	9.4 (48.9)	9.4 (48.9)
Average rainfall mm (inches)	1.2 (0.047)	0.8 (0.031)	5.1 (0.201)	16.7 (0.657)	42.7 (1.681)	53.5 (2.106)	56.7 (2.232)	77.9 (3.067)	136.7 (5.382)	106.9 (4.209)	41.4 (1.63)	9.2 (0.362)	549.0 (21.614)
Average rainy days	0.1	0.1	0.4	1.2	2.6	3.3	4.2	5.2	7.0	6.6	3.0	0.5	34.3
Source: India Meteorological Department (record high and low up to 2010)													

The cold weather starts by about the end of November and continues to about the middle of February, with December being the coldest month. In this season the mean daily maximum temperature is 23.3°C while the mean daily minimum temperature is 17.4°C. The period from the middle of February to the end of May is one of continuous increase in temperatures. In April, the hottest month in the year, the mean daily maximum temperature is 37.3°C. The heat is sometimes relieved by afternoon thunder showers. The onset of the south-west monsoon in the first or second week of June brings down the day temperatures appreciably. The day temperatures in the south-

west monsoon months are even lower than in the cold season. After the withdrawal of the south-west monsoon, day temperatures show an increase in October. Thereafter, both day and night temperatures begin to drop.

Figure 7-13: Monthly Temperature Variation



7.3.3 Relative Humidity:

The relative humidity is generally high during the morning period and moderate low in the evening. The minimum humidity of 45% is recorded in March during evening hours and the maximum relative humidity of 79% is experienced in August-September during morning hours. In the south-west monsoon months the air is highly humid but in the summer and the cold seasons the air is dry particularly in the afternoons.

Figure 7-14: Monthly Average Humidity of Anantapur

7.3.4 Wind Speed/Direction:

Winds are strong during the south-west monsoon season. In the rest of the year they are light to moderate. South-westerly or westerly winds prevail in the south-west monsoon months. In the post monsoon months, they are predominantly north-easterly or easterly, but in the afternoon northerly winds blow on some days.

During the cold season, winds are from directions between north-east and south- east in the mornings and between south-west and north-west in the afternoons. Northerly or north easterly winds are common in the mornings during the hot season, while in the afternoons winds are mainly north-westerly and sometimes westerly.

- ❖ The predominant wind directions are ENE, E, SSW and SW with 19%, 12%, 17% and 18% respectively.
- ❖ Mostly the wind speeds are observed to be in the range of 1-4 kmph and 4-12 kmph.

Figure 7-15: Wind speed and Frequency in the project study area

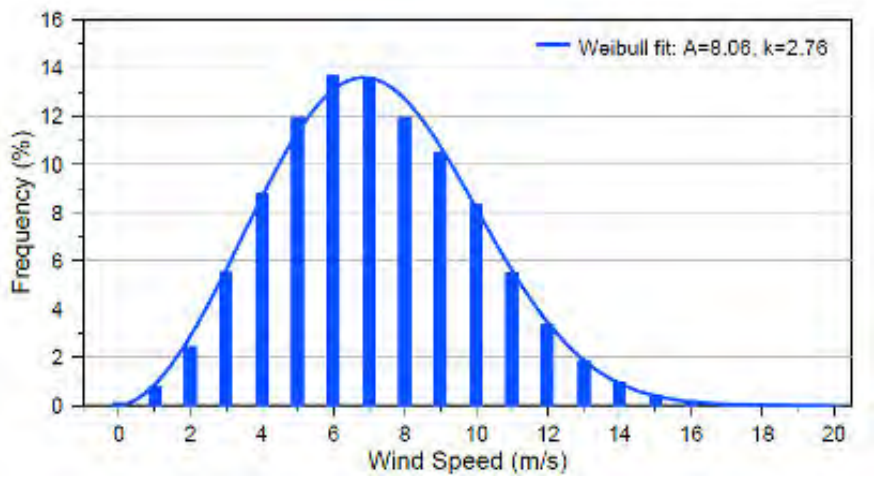
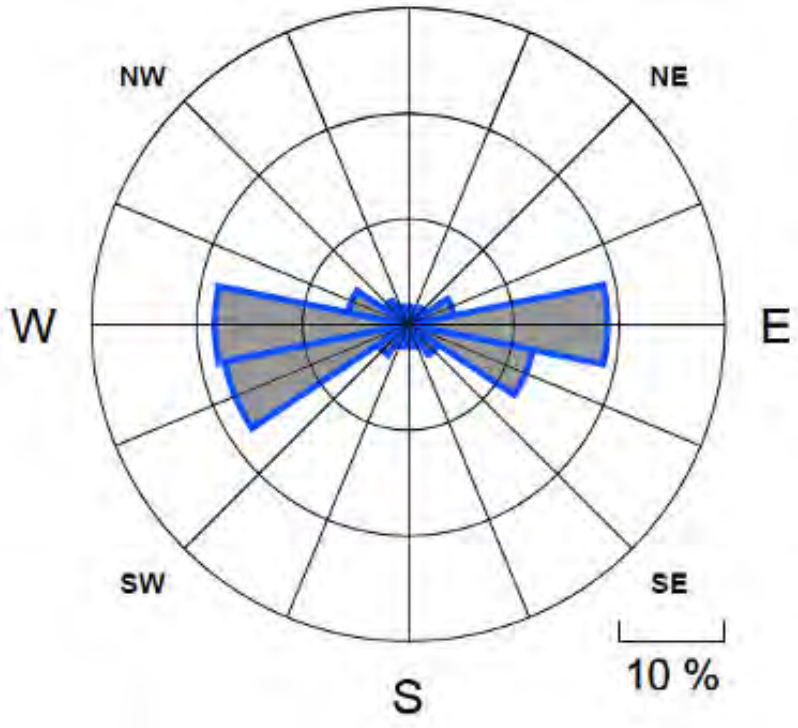


Table 7-5: Distribution of Wind Direction and Frequency (as recorded at one of the project towers)

Sector	Mean Speed(m/s)	Weibull Scale(A)	Weibull Shape(k)	Frequency(%)
N	5.21	5.88	2.16	1.57
NNE	5.14	5.80	2.04	1.62
NE	4.99	5.63	2.03	1.92
ENE	5.20	5.86	2.53	4.44
E	6.16	6.86	3.35	18.87
ESE	6.24	6.98	3.16	12.04
SE	5.56	6.26	2.51	3.42
SSE	5.67	6.39	2.43	2.16
S	6.10	6.88	2.39	1.99
SSW	6.58	7.41	2.46	2.16
SW	7.04	7.91	2.72	3.42
WSW	9.06	9.97	4.23	17.74
W	9.20	10.15	4.00	18.31
WNW	6.77	7.53	3.46	5.79
NW	5.82	6.53	2.92	2.74
NNW	5.46	6.16	2.42	1.79
ALL	**7.17**	**8.06**	**2.76**	**100.00**

Figure 7-16: Wind Rose



Annual wind rose of the hourly-mean project-average wind direction time series. Directional bins are 22.5 wide, and the radial contour interval is 10%.

Wind pattern during Peak Generation Period (May - September)

Predominant Wind directions during this peak generation period (May –September) were from the SSW and SW Wind speeds during this period were varying between 7.0 – 10.0 kmph and sometimes

more than 10.0 kmph. The wind of less than 2.0 kmph was treated as calm, and calm conditions are nil.

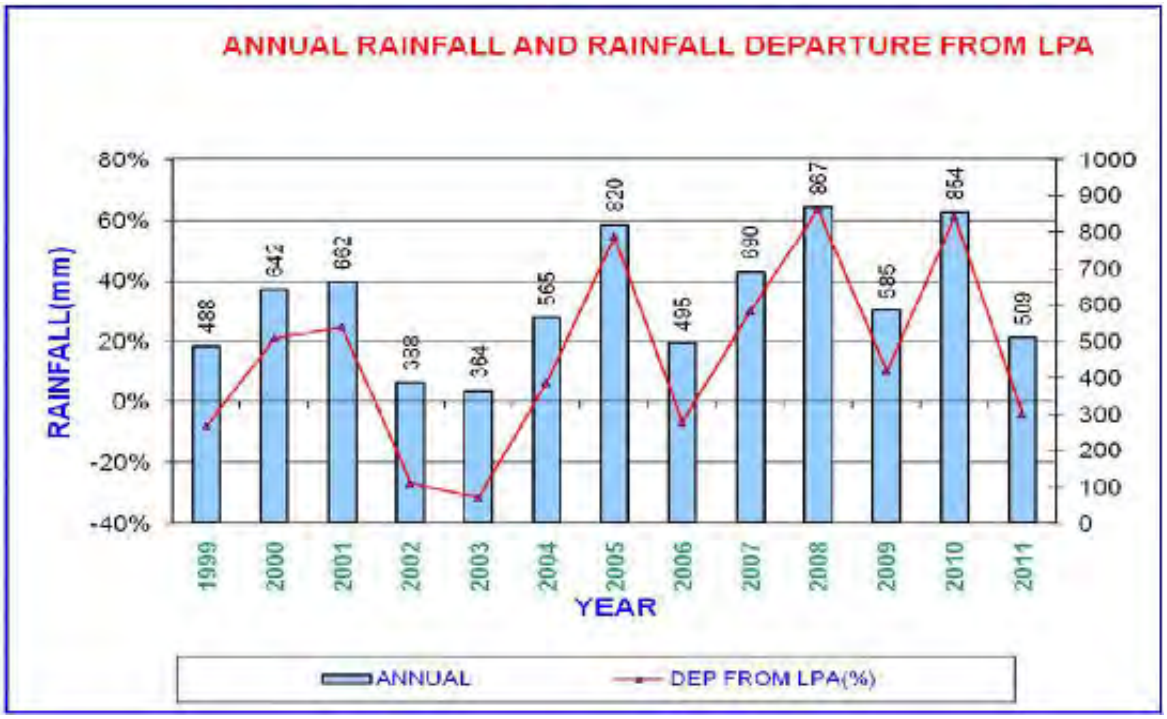
7.3.5 Rainfall:

The rainfall data for Anantapur district from 2006-2010 as provided by India Meteorological Department is presented in Table 4.4. The mean annual rainfall observed for the district in the period 2006-2010 is 696.41 mm. The heaviest rainfall is observed in the month of September and October contributing to more than 45% of the annual rainfall.

Figure 7-17: Average Rainfall presentation

The annual rainfall ranges from 364.2 mm to 867.1 mm. The annual rainfall departure ranges from -31% to 64%. The southwest monsoon rainfall contributes about 59% of annual rainfall. It ranges from 157 mm to 537 mm. The monthly rainfall distribution and the cumulative departure of annual rainfall from Lonf Period Average (LPA) are presented in figure below:

Figure 7-18: The cumulative departure of annual rainfall from LPA



Source: CGWB

Table 7-6: Rainfall (in mm) for Anantapur District

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual Total
2004	10.8	0	6	34.9	124.2	11.9	105.5	22	158.5	78.3	12.4	0	564.5
2005	1.4	9	3.9	32.3	79	52	135.8	134.5	142.9	181.9	36.1	10.9	819.7
2006	0	0	38.4	8.3	86.8	81.1	27.3	11.4	80.4	67.5	92.4	1	494.6
2007	0	0	0	1.5	13	171.4	63.1	119.9	182.6	115	8.1	15.3	689.9
2008	0	25.2	116.7	0	63	61.7	108	124.2	193.7	130.3	42.1	2.2	867.1
2009	0.4	0	2.7	6.3	77.5	50.8	10.2	100.9	203.1	64	66.6	2.8	585.3
2010	26.9	0	0	47.1	106.2	75.1	109	172.6	75	76.4	162.2	3.3	853.8

Source: IndianWaterPortal

Only the rainfall data for Anantapur has been presented for a period from 2014 – 2015.

Table 7-7: Climate data for the year 2014-15

Weather parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min Temp. °C	18.9	20.8	23.3	25.6	25.2	23.9	23.5	23.3	23.4	23.1	21.3	19.8
Max Temp. °C	31.1	33.9	36.5	38	37	33	31.9	31.2	32	31.8	30.8	30
Average Rainfall mm	1	7	16	32	104	78	106	119	244	127	52	19
Average Rainy Days	0.3	0.8	1	3.3	8.6	8.1	11.2	13.2	12.9	8.5	5.7	2.2
Average Humidity %	60	52	45	51	60	72	76	79	76	73	70	68
Avg Daily Sunshine hours	8.5	8.8	8.8	8.6	7.8	4.6	3.6	3.7	4.8	5.6	6.3	6.8
Min Temp. °C	18.9	20.8	23.3	25.6	25.2	23.9	23.5	23.3	23.4	23.1	21.3	19.8
Max Temp. °C	31.1	33.9	36.5	38	37	33	31.9	31.2	32	31.8	30.8	30
Average Rainfall mm	1	7	16	32	104	78	106	119	244	127	52	19

Source: IMD

7.3.6 Ambient Air Quality

Air pollution means the presence in the outdoor atmosphere of one or more contaminants or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include smoke, vapors, soot, fumes, gases, mist, odors, particulate matter, radioactive material or noxious chemicals. With upcoming industrial activity a range of different pollutants are released into the atmosphere that are dispersed and have a significant impact on neighborhood air environment. Thus collection of base line data of air environment occupies a predominant role in the impact assessment statement. The ambient air quality status across the study zone forms basis for prediction of the impacts due to the proposed project.

The data required to assess air quality impacts in and around neighborhood is achieved by designing such a network, which encompasses micro meteorological conditions, quantity and quality of emissions, locations, duration, resources/monitoring technology and operational criteria. The optimal scheme for air quality monitoring should consider all the above factors.

Scope of Field Study

The scope of baseline status of the ambient air quality can be obtained through a well-designed ambient air quality stations network. An intensive ambient air quality monitoring of the study area consisting of 5 kms radius

With the proposed wind site as the center point sampling was carried out during the Sampling Site Visit between 23rd of August to 30th of August 2015. The ambient air quality was monitored at six locations spread over entire study area. At each sampling station monitoring was carried out for 24 hours in a day. The major air pollutants monitored on 24 hourly basis are, PM_{10}, $PM_{2.5}$, Sulfur dioxide, Oxides of Nitrogen & VOC. Sampling and analysis of the above variables is according to the guidelines of Central Pollution Control Board.

Description of Sampling Locations

The location of ambient air quality stations is contingent on the meteorological status of the area. Hence the micro meteorological data was collected before initiating the ambient air quality monitoring. Table 3.8 presents the ambient air quality locations and their distances and directions from the plant site.

Table 7-8: Locations of Ambient Air Quality Monitoring Stations

Site Code	Location	Direction (from nearest WTG)	Distance from Industry Site Km
AAQ-A1	Nimbagallu	NW	1.5
AAQ-A2	Amidyala	SE	0.5
AAQ-A3	Mopidi	E	2.0
AAQ-A4	Indravathi	NE	<0.5
AAQ-A5	Renumakullapili	NW	0.5
AAQ-A6	Uravakonda	N	3.0

Table 7-9: Results of PM 2.5 & PM10

Parameters	Unit	Test Method	Standard	AAQ-A1	AAQ-A2	AAQ-A3	AAQ-A4	AAQ-A5	AAQ-A6
PM 10	µg/m^3	IS 5182: part23-2012	100	20	21	22	24	26	24
PM 2.5	µg/m^3	CPCB Manual (NAAQMS/36/2012-13) S.No-4	60	11	10	12	10	12	11
Sulphur Dioxide	µg/m^3	IS 5182: part02-2001	80	9	7	10	9	13	8
Oxide of Nitrogen	µg/m^3	IS 5182: part06-1998	80	10	9	11	10	14	10

Sampling: Sampling collected as per IS: 5182 standards method.

Figure 7-19: Graphical Presentation of concentration of various parameters against its "Standards"

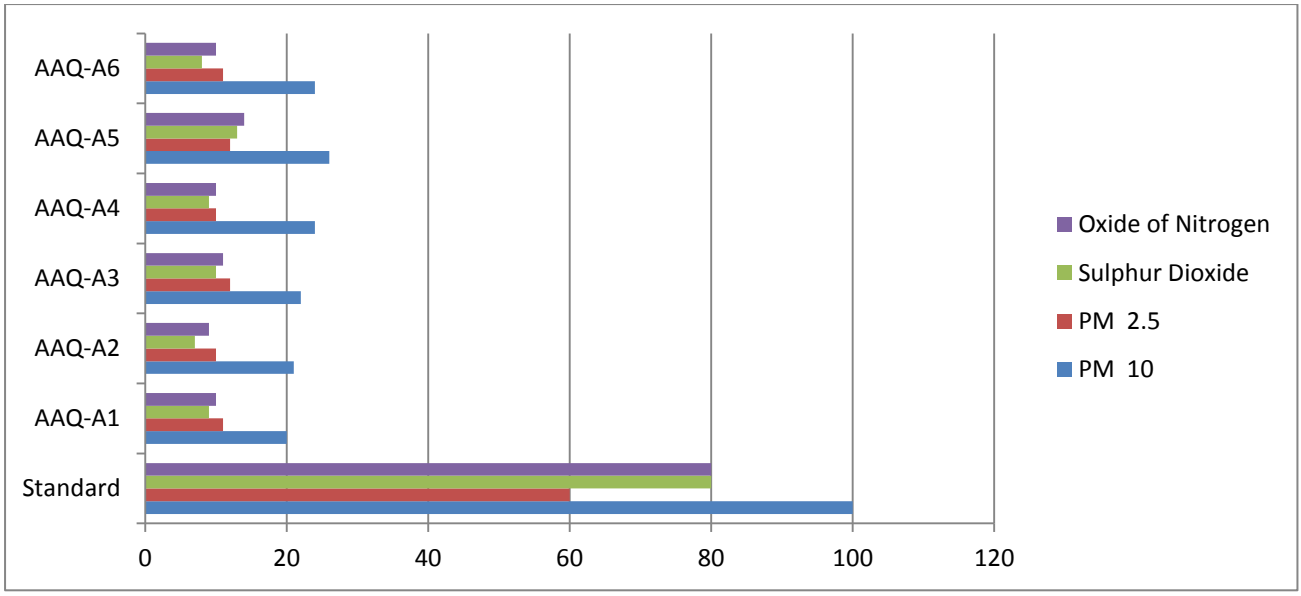


Table 7-10: Ambient Air Quality Status for VOC, CO and HC

Site Code	Location	CO in ppm		VOC in ppm		HC
		Min	Max	Min	Max	ppm
AAQ-A1	Nimbagallu	0.3	0.65	< 1	< 1	BDL
AAQ-A2	Amidyala	0.83	1.09	1.06	2.1	BDL
AAQ-A3	Mopidi	0.25	0.59	< 1	< 1	BDL
AAQ-A4	Indravathi	0.27	0.84	< 1	< 1	BDL
AAQ-A5	Renumakullapili	0.21	0.49	< 1	< 1	BDL
AAQ-A6	Uravakonda	0.25	0.59	< 1	< 1	BDL

Photograph 7-1: Sampling Team Setting Sampler

Source: Site Survey

Figure 7-20: Air sampling Location