

Environment and Social Due Diligence Report

October 2016

IND: Accelerating Infrastructure Investment Facility in India –Aarohi Solar Private Ltd.

Prepared by

India Infrastructure Finance Company Limited for the Asian Development Bank

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Due Diligence Report on Environment and Social Safeguards

By

India Infrastructure Finance Company Limited (IIFCL)
(A Govt. of India Enterprise)

**Sub Project: 50 MW Solar PV Project at Village Kalipi and Brahasamudram,
District - Anantapur, State – Andhra Pradesh, India**






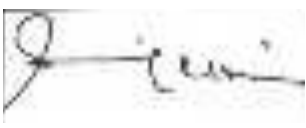
October 2016

ESDDR NO.IIFCL/ESMU/ADB-DL/2016/99

SUB PROJECT: Construction, operation and maintenance of 50 MW Solar (Photovoltaic) Power project at Village Kalipi and Brahmasamudram, District – Anantapur, State – Andhra Pradesh, India.

Aaroahi Solar Private Limited

Environmental and Social Safeguards Due Diligence Report (ESDDR)

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PROJECT BACKGROUND

1. SUB-PROJECT TITLE:

1. The sub-project includes construction, operation and maintenance of 50 MW Solar (Photovoltaic) Power project at villages Kalipi and Brahmasamudram, District Anantapur, State Andhra Pradesh, India.

2. SUB-PROJECT BACKGROUND:

2. Acme Cleantech Solutions Pvt. Ltd. (ACSPL) has set up a 50 MW Solar Photovoltaic project through its Special Purpose Vehicle M/s AaroHi Solar Private Limited (ASPL). The 50 MW Solar Photovoltaic Grid Connected Power Project is located in villages Kalipi and Brahmasamudram, District Anantapur in the State of Andhra Pradesh.
3. M/s AaroHi Solar Private Limited (ASPL) has been allocated 50 MW by Government of Andhra Pradesh. The proposed project has been implemented under Andhra Pradesh Solar Power Policy 2015.
4. ASPL has signed a Power Purchase Agreement (PPA) with Southern Power Distribution Company of Andhra Pradesh Limited (DISCOM) on 5th December 2014 for 50 MW for a period of 25 years from Commercial Operation Date. The first year tariff is Rs 5.63 per kWh.

3. SUB-PROJECT LOCATION:

5. The proposed site is located in two villages, Kalipi and Brahmasamudram, District Anantapur of Andhra Pradesh State in India.
6. The project site is approximately 16 km from Hindupur town in Anantapur District. Anantapur District is located in the Rayalaseema region of Andhra Pradesh, India. It is bounded on the north by Kurnool District, on the east by Kadapa District, on the southeast by Chittoor District, and on the southwest and west by Karnataka state.

4. SUB-PROJECT TECHNICAL DETAILS:

7. ASPL has developed a 50 MW Solar PV project in the state of Andhra Pradesh. The project has achieved Commercial Operation on 29th March 2016.
8. The power generated from the sub-project is being evacuated through 132 kV transmission lines to 132/33 kV substation at Hindupur. The total length of the transmission line is 15.256 km from project site to sub-station. The substation is owned and operated by Transmission Corporation of Andhra Pradesh Limited (AP TRANSCO).

Table 1: Project Description in Brief

Project Owner	Aaroahi Solar Private Limited (ASPL)
Location of Site	Village Kalipi and Brahasamudram, District Anantapur of Andhra Pradesh
Project Coordinates	Latitude: 13.97873N Longitude: 77.48286 E
Sensitive area	The sub-project is not located in vicinity of any protected area or ecologically sensitive area
Total cost of the project	₹ 411.86 crores
Project capacity	50 MW
Project Operational Date	29 th March 2016
Technology	Grid connected Solar Photovoltaic system
Module Type	Thin Film Solar modules
Type of land	Private land (Approx. 287 acres)
Power Purchase Agreement	Southern Power Distribution Company of Andhra Pradesh Ltd. (APSPDCL)
Annual electricity supplied to Grid - First Year	107.103 Million Units/Yr
Tarrif for purchase of power	₹ 5.637 per kWh

5. MAJOR COMPONENTS:

9. **Solar PV Modules:** The proposed project is based on Solar Photo Voltaic technology using Thin Film modules for power generation. ASPL has used Solar Frontier make thin film modules having rating 165/170 W for the 50 MW solar PV plant.
10. **Inverter:** The DC electricity generated by the modules is converted to AC in the inverters. The design uses ABB make 1000 KW each inverter. There are 50 inverters at the site. There are 12 Inverter Control Rooms at the site housing 4 inverters each and balance 2 inverters are placed in the Master Control Room.
11. **PV Array layout:** The rated capacity of proposed Solar PV Power plant is 50 MW. The 50 MW power project is located at one site in two villages, Kalipi and Brahasamudram. There are in total 313930 modules installed at ASPL site. A seasonal type module mounting system of 3° (summer months) & 15° (winter months) inclination has been chosen for the PV plant.

12. **Power Evacuation:** The project company has signed the power purchase agreement (PPA) with APSPDCL under the solar power policy of Government of Andhra Pradesh. The nearest 132/33 substation is located at Hindupur. The power from sub-project site is evacuated to Hindupur substation by 132 kV transmission line of 15.256 km length having 64 towers.

6. CONCESSIONAIRE:

13. Southern Power Distribution Company of Andhra Pradesh Ltd. (APSPDCL) has signed the Power Purchase Agreement (PPA) with M/s. ASPL on 5th December 2014 for a period of 25 years. The PPA specifies sale of power generated to Government of Andhra Pradesh at a tariff of ₹ 5.637 per KWh (first year tariff).

7. EPC CONTRACT:

14. Engineering, Procurement & Construction (EPC) Contracts have been awarded to M/s ABB, M/s Tata International Ltd., M/s Neuvsol Ltd., M/s BR Builders and M/s En En Electrical Engineers Pvt. Ltd.

8. IIFCL FUNDING:

15. The total project cost of ASPL is ₹ 411.86 crores. The project has been financed by IIFCL under Direct Finance Scheme. IIFCL has sanctioned an amount of ₹ 82.37 crores including a sublimit of ₹ 70.01 crores by way of Letter of Comfort (LOC).

9. STATUS OF THE PROJECT:

16. The construction at the sub-project commenced in July 2015. The project achieved Commercial Operation on 29th March 2016.

10. DISCLOSURE OF ESDDR:

17. The ESDDR has been prepared on the basis of site visit and review of available documents/information shared by sub-project developer. The content of the ESDDR is verified and accepted by the sub-project developer and is endorsed by IIFCL. On approval from the ADB, the ESDDR will be uploaded on IIFCL as well as ADB's website for public disclosure. Further, as per the procedural requirement, ADB will upload the Annual Environmental and Social Safeguards Audit report on its website.

DUE DILIGENCE ON ENVIRONMENTAL SAFEGUARDS

11. ABOUT THE PROJECT:

18. **Sub Project:** Acme Cleantech Solutions Private Limited (ACSL), the flagship company of Acme Group is implementing solar power project having 50 MW capacity under its Special Purpose Vehicle (SPV), namely, Aarohi Solar Private Limited (ASPL). Southern Power Distribution Company of Andhra Pradesh Limited (APSPDCL) had invited bids from solar power developers under competitive bidding route for setting up solar power projects in Andhra Pradesh. ACSL was shortlisted as successful bidder for developing and operating solar PV power projects under Andhra Pradesh Solar Policy. Power Purchase Agreement (PPA) for power output for 25 years from Commercial Operation Date (COD) was signed on December 5, 2014. The sub-project is located in villages Kalipi and Brahmasamudram, Anantapur District, Andhra Pradesh. The nearest 132/33 KV grid substation is located in Hindupur.

12. APPROACH TO THE ENVIRONMENT SAFEGUARDS DUE DILIGENCE REPORT:

19. The Environmental Due Diligence Report reviews the available documents and assesses the compliance of the sub-project with the respect to (i) environmental safeguards & regulatory requirements; (ii) health and safety; (iii) environmental management measure implementation & institutional arrangement; (iv) site visit observations & photographs ; (v) conclusions and recommendations.

20. The following documents were referred in order to prepare Environmental Safeguards Due-Diligence Report:

- Environmental & Social Impact Assessment Report
- Project Statutory Approvals
- Environment Management Plans and its implementation
- Detailed Project Report
- Power Purchase Agreement
- Project Information Memorandum (PIM)
- Environment & Social Management System of ACSPL
- Sample copies of Monthly Environment, Safety Reports & other records
- EPC Contract Documents
- Grievance Handling Mechanism of ASPL

21. The environmental safeguard due-diligence study was carried out for the sub-project on the basis of site visit observations and understanding project scope based on information and documents provided by Concessionaire. A detailed discussion on the environmental and social safeguards related issues was also carried out with the team of the sub-project at site.

13. POLICY, LEGAL AND REGULATORY REQUIREMENT:

22. Solar Power PV Projects are not covered under the ambit of Environmental Impact Assessment Notification, 2006 of Government of India and no environment clearance is required for such projects under the provisions thereof.
23. As Solar PV Projects are not covered under the EIA Notification, 2006, Environmental and Social Impact Assessment (ESIA) study was not required as a statutory requirement for ASPL. However, the developer has carried out an ESIA for ASPL (**Appendix I**) to assess the impacts of the project and Environmental Management Plans (EMPs) have been prepared and are being implemented at the project level. The purpose of the EMP is to provide a framework of procedures required to recognize, address environment management needs of the project.
24. The ESIA report assesses the significant environmental impacts of the project and suggests mitigation measures. As mentioned in the ESIA, the objective of conducting the study was to meet the project's environmental assessment requirements following ADB's Safeguard Policy Statement (2009). However, the ESIA study was not done in anticipation of ADB involvement but to meet other lender's requirements (other than IIFCL).
25. ASPL is required to comply with the applicable guidelines relating to the environment, occupational health and safety in addition to complying with local laws and regulations. The statutory clearances related to environmental aspects obtained/to be obtained from regulatory authorities as part of the ASPL development were assessed and current status of availability of such clearances are given in **Table 2** below:

Table 2: Status of Regulatory Clearances Obtained related to Environmental Safeguards

S.No.	Clearances	Statutory Authority	Current Status of Clearance
1.	Environmental Clearance	Ministry of Environment, Forests & Climate Change (MoEF&CC), New Delhi	<p>Not Applicable. As Solar PV project development is not listed in Schedule I of the MoEF&CC's EIA Notification 2006, that lists projects or activities requiring prior environmental clearance and hence this is exempted from obtaining the same.</p> <p>However, an ESIA has been conducted for the sub-project by the developer as an initiative to assess the impacts of the project and environmental management plans during construction and operation & maintenance phase have been prepared and are being implemented at the project level.</p>

2.	Forest Clearance	MoEF&CC and State Forest Department	Not applicable since the sub-project does not involve forest land.
3.	Wildlife Clearance	MoEF&CC	The Project area does not lie within an Ecologically Sensitive Area and is not located within 10 km of any National Park/Wildlife Sanctuary. The location of Project does not contravene any international biodiversity or ecosystem conservation conventions. Therefore, it does not require wildlife clearance or permission.
4.	Consent to Establish / Operate	Andhra Pradesh Pollution Control Board (APPCB), Andhra Pradesh State	Andhra Pradesh Solar Power Policy, 2015 (Section 4 (o)) exempts Solar Photovoltaic Plants from obtaining any NOC / consent under the Pollution Control Laws from Andhra Pradesh Pollution Control Board (Appendix-II).
5.	The Contract Labor (Regulation and Abolition) Rules, 1970	Licensing Officer & Assistant Commissioner of Labour, Govt. of India	The Contract Labour (Regulation and Abolition) Act, 1970 requires every principal employer of an establishment to make an application to the registering officer in the prescribed manner for registration of the establishment. The establishment is registered under the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and labour license has been obtained for the project under the said Act and is enclosed as Appendix-III .
7.	Approvals for Transmission line	Transmission Corporation of Andhra Pradesh Limited Approval of Chief Electrical Inspector to Govt. (CEIG), Andhra Pradesh	Evacuation approval for ASPL was granted by Transmission Corporation of Andhra Pradesh Limited (Appendix IV). CEIG approval has been granted for transmission line, which is enclosed as Appendix V .
8.	Tree Cutting Permission	Divisional Forest Officer, Andhra Pradesh	20 numbers of trees were coming in way of the 132 kV line bay at Hindupur substation for which tree cutting permission has been taken. The permission is attached as Appendix VI .

14. ENVIRONMENTAL SENSITIVITY AND DUE DILIGENCE:

26. The environmental sensitivity of ASPL and associated transmission line has been assessed by reviewing the ESIA and other documents shared by the Developer, safeguards compliance monitoring supplemented by field visit and consultation with the concessionaire.

27. The environmental sensitivity assessment is given below:

- The land available for the sub-project is entirely private land from two villages Kalipi and Brahmasamudram. The developer has informed and ESIA confirms that no forest area is getting affected due to the sub-project including transmission line.
- The surface topography of the site is almost flat and the entire area is shadow free as there are no shading elements on/near the site.
- The sub-project site and transmission line are not located in any protected area like wildlife sanctuary / national park or in close proximity of any eco-sensitive area.
- The potential adverse environmental impacts associated with transmission lines have been avoided or minimised through careful route selection. Forests areas, trees and settlements have been avoided.
- The length of the transmission line is 15.256 km from sub-project site to Hindupur sub-station having 64 towers. 60 towers are present on private land for which permission has been taken from the landowners and no land has been acquired for the entire ROW. Tower 61-64 are located on Government land available with Transmission Corporation of Andhra Pradesh.
- 20 number of trees were falling in the ROW of transmission line located on Government land. Tree cutting permission has been taken for these 20 number of trees. As per the preliminary survey during ESIA study, there was no tree at the sub-project site.
- Review of ESIA confirms that no endangered or protected species of flora or fauna are present at the subproject site.
- As reported in the ESIA and informed by the concessionaire, there are no archaeological / cultural / heritage sites getting affected due to the sub-project.
- Labour working at the sites stay in rented accommodation in nearby villages as such there is no labour camp at site.
- The sub-project is exempt from taking Consent to Establish / Operate from the Andhra Pradesh Pollution Control Board.
- All sewage water being generated at the sub-project premises is disposed in soak pits.
- The site staffs are well informed of Acme's Environment, Health and Safety Policy and Environmental & Social Management System.

15. PROJECT AGAINST THE PROHIBITED INVESTMENT ACTIVITIES LIST:

28. The sub - project does not involve any prohibited activity as per the Prohibited Investment Activities List (PIAL) of ADB.

16. CATEGORIZATION OF SUB-PROJECT:

29. The sub-project can be classified as category B based upon ADB's EA requirements as per Safeguard Policy Statement (2009). This classification is based on the review of the available documents and site visit with respect to the environmental sensitivity due to project activities.

17. IMPLEMENTATION OF EMP DURING CONSTRUCTION & OPERATION PHASE:

30. The ESIA reports that the impacts due to the sub-project during construction phase may be regarded as temporary or short-term. The ESIA assesses the impacts over the study area of 6 km radius of the project site.
31. The impacts identified during construction and operation phase of the project appear to be insignificant and temporary in nature. However, proper mitigation measures are to be taken to minimize such impacts. The mitigation measures being implemented at the project site as per the information provided by the developer and on the basis of observations during site visit are enumerated in this section. The mitigation measures suggested in the EMP for construction phase are being implemented at the sub-project site.
32. The EMP for the 50 MW ASPL is enclosed as **Appendix VII**. Institutional arrangement exists at sub-project to take care of the environmental management, the roles and responsibilities are also defined in the EMP.
33. The environmental impacts in brief and mitigation measures implemented during construction phase on the basis of discussions with site staff and documents provided by sub-project developer are summarized below:

Table 3: Assessment of Impacts and Mitigation Measure Implementation during Construction Phase of ASPL

Potential Impacts	Environmental parameter	Mitigation Measure Implementation / Compliance Status
Impact on land environment	<ul style="list-style-type: none"> • Site clearing and levelling (cutting, stripping, excavation, earth movement, compaction) • Loss of top soil due to construction activities • Change in land use 	<ul style="list-style-type: none"> • The land acquired for the project is barren land and less productive in nature. • As informed by the site staff, utmost care was taken to minimize land degradation. The excavated soil was again backfilled and used in levelling.

	<p>pattern</p> <ul style="list-style-type: none"> • Oil spillage 	<ul style="list-style-type: none"> • ESIA and DPR reports that the land for the sub-project is already barren land. Therefore, no major change in land use pattern. • No oil is being stored at site.
Impact on air environment	<ul style="list-style-type: none"> • Air emissions from construction equipment • Air emissions from vehicles • Fugitive dust emissions 	<ul style="list-style-type: none"> • The impacts due to emissions from vehicles and construction equipment were temporary and short term. • The vehicles were checked for valid Pollution Control Certificate at site. • Vehicle speed is restricted at site to control dust emissions. • Water sprinkling was done during construction to control fugitive dust emissions.
Impact on water environment	<ul style="list-style-type: none"> • Domestic effluents from sub-project site / labour colonies • Spillage of oil 	<ul style="list-style-type: none"> • The office at the site has toilets with soak pits. • As informed by the site staff, no labour camp was established for the sub-projects as 80% of labours were from neighbouring villages and rest were housed in rented accommodation in neighbouring villages. • No oil spills were observed at site and no oil is being stored at site. • Water is sourced from private vendors through tankers. Records of water used and drinking water usage are being maintained at site for optimum utilization.
Impact on ecology	Loss of vegetation	<ul style="list-style-type: none"> • Minimal loss of vegetation / habitat as the site was barren land with almost no vegetation. • Trees were avoided in transmission line route selection. At some locations trees could not be avoided and permission has been taken from authorities for cutting the 20 number of trees.

Impact on Noise Environment	<ul style="list-style-type: none"> During the construction phase, the major sources of noise pollution were movement of vehicles carrying the construction material and equipment to the site. 	<ul style="list-style-type: none"> Most of the access roads to the sub-project site are motor able and project traffic was very less. The work at the sub-project site was restricted during day time only causing minimum disturbance to the local people. There are no sensitive locations in the vicinity of the project site.
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34. The EMPs are well defined to be implemented during the operation phase at ASPL. The assessment of the environment performance over the month at the site is made and submitted to ACME Head Office in monthly report formats. The mitigation measures being implemented at the site are elaborated below.

Table 4: Mitigation Measures being Implemented During Operation Phase

Impact / EMP	Implementation / Compliance / Monitoring
Water Conservation and reuse	<ul style="list-style-type: none"> The water and drinking water is supplied through tankers and procured from local vendors. The team at site has informed that optimum water is being utilized at site. Monthly drinking water and water consumption records are maintained at site. Sample copy of water records for a month during construction phase (February 2016) & operation phase (June 2016) are enclosed as Appendix VIII. Water is used for module cleaning during O&M phase. Developer has informed that the modules cleaning water requirement is 2 liters / module / cycle. The frequency or cycle of module cleaning depends upon the weather condition and visual observation. During the time of site visit, the frequency of module cleaning was once a month (depending on weather conditions). The current water requirement was 30 KLD. The developer has informed that water is being sourced by authorised vendors through private tankers for the purpose.
Fugitive emission management	<ul style="list-style-type: none"> Dust generated from vehicular movements is controlled through restricting vehicular speed limits and regular sprinkling of water.

	<ul style="list-style-type: none"> • Appropriate Personal Protective Equipment (PPE) are provided to labour.
Environmental & Safety Training	<ul style="list-style-type: none"> • Environmental Awareness Training is being provided to target groups comprising of EHS Engineer, Area In-charge and Housekeeping staff through contractors to make them familiar with key onsite environmental concerns and environment management procedures and address the same. The monthly environmental training records are integral part of Monthly Environment Reports (Appendix IX). • Safety trainings are also imparted to the workforce and records are also maintained at the site (Appendix X).
Waste Management & Disposal	<ul style="list-style-type: none"> • Domestic waste generated at the site is disposed in soak pits. • The waste generated from the site including plastic waste, paper & carton boxes, wood, metal scrap, construction waste, garbage from office etc. is stored at designated stock yards and disposed through authorized recyclers / vendors. • The monthly records of waste generated are maintained at the site. Waste management records are maintained and communicated to Head Office-ACME on a monthly basis. • Site team has informed that transformer oil would be changed as per maintenance schedule and no oil is currently stored at site. The transformer oil does not involve mechanical exchange and the chances of spillage are very less, however, utmost care will be taken during the activity to prevent any kind of oil spillage or leakage.

18. ENVIRONMENT, HEALTH AND SAFETY MANAGEMENT SYSTEM:

35. Acme has its Global Environment Health & Safety Policy which is applicable on all its projects and is enclosed as **Appendix XI**. Acme has its own Environment and Social Management System (ESMS). The ESMS Manual covers environment, occupational health & safety and social aspects during the commissioning, operation, maintenance & de-commissioning phases of the Solar PV Power Plants within Acme Solar Energy Private Limited. ESMS Manual outlines the comprehensive procedures for assessing and managing social, environmental, health and safety issues at all stages of the life cycle of Acme projects based in India. The Global EHS Policy and the ESMS is applicable on ASPL too.

36. ASPL has clearly defined the roles and responsibilities of the onsite persons involved in the environmental management at site. HSE Officer was available at ASPL site. The duties of the HSE personnel at site are:

- Effective implementation of the EMP at site.
- Effective implementation of the environmental trainings
- Advise and coordinate the contractor(s) activity towards effective environmental management
- Maintain environment records, water usage records, safety records etc.

37. The following is the organizational structure in place for ESMS management:

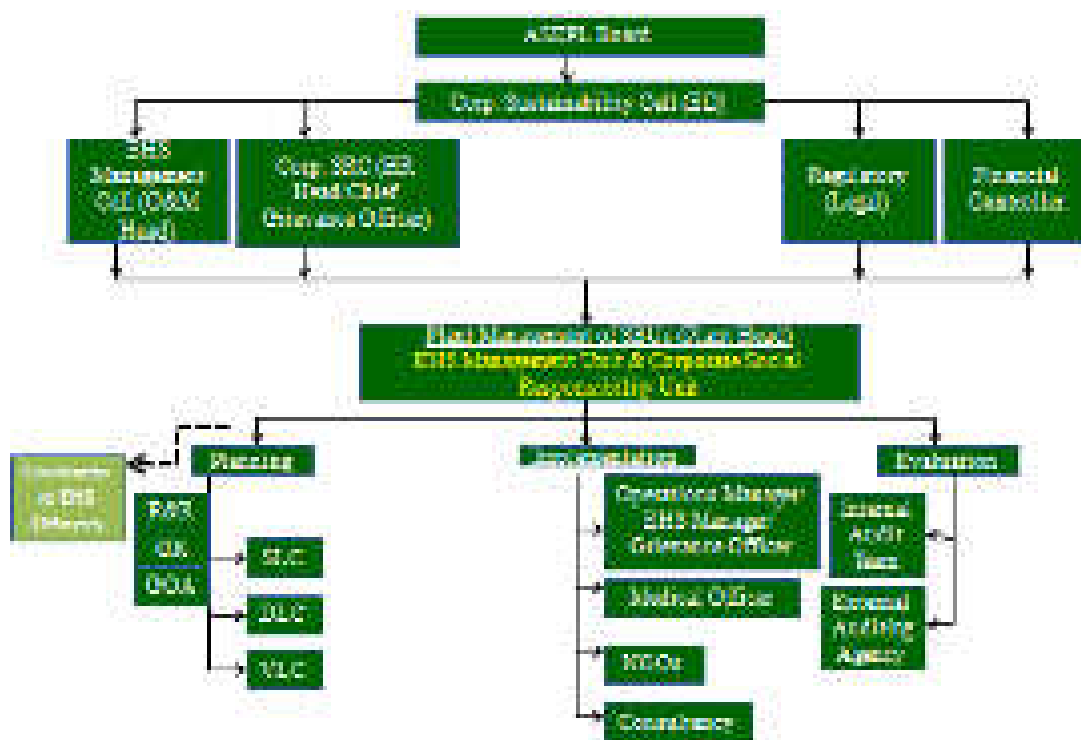


Figure 1: ESMS Management Structure

38. The EPC contracts between ASPL and various contractors, including those for transmission lines, have specific clauses related to environment and safety. Sample work order between ASPL and M/s En En Electrical Engineers Pvt. Ltd. for transmission line is attached as **Appendix XII**. The Clause 18 and 19 of the work order deals with the safety and environmental requirements.

39. The ASPL has Safety Officer/Engineer at sub-project site. Monthly safety reports are maintained at sites which also includes training details. Trainings are imparted to staff/labour on PPE, material handling, housekeeping, fire fighting, emergency response etc.

40. Fire safety alarms systems are installed in control rooms. Fire extinguishers can be seen in control rooms and switch yard.

19. GRIEVANCE REDRESSAL MECHANISM:

41. Acme has its own Grievance Redressal Policy. The grievance redress mechanism has adequate institutional arrangement. The Grievance Officer (GO) is designated for all the subsidiaries of Acme. The grievance is received by the GO through post/ grievance box. GO shall have to submit a status report to the Chief Grievance Officer (CGO) in Acme Corporate Office.
42. The responsibility and timelines for addressing complaints is also well defined in the Policy procedure.
43. Grievance register is being maintained at the site with the security guard at the gate of the sub-project. The locals have been informed of this arrangement.

20. SITE VISIT OBSERVATIONS:

44. A site visit was undertaken by IIFCL's Environmental and Social Safeguard Specialists on 4th-5th July 2016. The site visit was undertaken to review the implementation of the sub-project's environmental and social safeguards. The sub-project has achieved Commercial Operation on 29th March 2016. During the site visit, following staff was mainly consulted regarding environmental safeguards related measures being implemented at the project site:
 - (a) Mr. Kishore Koppale, Project Manager
 - (b) Mr. Nageshwar Rao, Senior Administrative Officer
 - (c) Mr. Harish Kumar, Senior Engineer (Electrical)
 - (d) Mr. Sampat, EHS Officer
45. Detailed discussions were held with Mr. Rohit Kumar Singh, EHS Co-ordinator, Acme at IIFCL Office regarding project in general and environmental safeguards.
46. During site visit, the sub-project has already achieved COD, although certain punchlist items were pending at the time of site visit. Based on the discussions with above mentioned officials and visit, the site visit observations are given below:
 - The land available for the sub-project is entirely leased private land. During discussions with the subproject developer it was informed that the land used for the sub-project was classified as agriculture land but the fertility of the land is less. The area is rain-fed and there is problem of scarcity of water in the area.
 - No tree has been cut at the project site by the developer. No dense vegetation was seen around the sub-project site.
 - The Office of ASPL at site is operating from Portable Cabins. Toilets have been constructed at site. In O&M phase Office will be shifted to the Main Control Room.

- All sewage water being generated at the sub-project premises is disposed in soak pits.
- No groundwater is being utilized at site. Water requirement for various activities is being supplied through the private tankers.
- Currently about 50 staff were present at sub-project site, who are residing in rented accommodations in nearby villages and are mostly locals. There was no labour camp at site.
- Emergency contact numbers were displayed at various locations.
- Firefighting systems were in place.
- No oil is being stored at site and no oil spillage was observed at the site.
- The area was fenced and vehicle movement in the premises was restricted.
- EHS Officer was present at the site and understood his commitments.
- On discussions with the site staff, it was observed that tool box talk and job safety analysis is done for labour as well as staff.
- Records of EMP implementation and various training records are being maintained at the site.
- Module cleaning system (pipes) and gravel roads will be constructed after all housekeeping and other works are completed.
- General housekeeping was not very good at site. Although, the waste and scrap material was stocked at designated areas and it was informed by staff at site that every 2-3 days the material is being lifted / taken by authorised dealers.
- Damaged solar panels were stacked and stored at designated place with markings all around. It was informed by site staff, that the broken or damaged solar panels are immediately shifted to a designated area in scrap yard to avoid any type of land contamination. After insurance claim settlement, the damaged solar module may be disposed to an authorised E-waste vendor.

47. The site visit photographs are given in **Photoplate - I**.

21. CONCLUSIONS AND RECOMMENDATIONS:

48. It is concluded from the above environmental safeguards examination that the proposed ASPL, 50 MW solar PV power project in Kalipi and Brahmasamudram villages has taken considerable efforts towards reducing the environmental impacts and risks. The sub-project activities have reversible and temporary environmental impacts which have been managed with structured EMPs in place.

49. Based upon the available documents and site visit, it is concluded that the concessionaire has undertaken adequate environmental safeguard measures. The conclusions for the sub-project are given below:

- The sub-project has been prepared by ASPL as per its own funding requirement and not in anticipation to ADB operation.
- The development of this solar project has no major significant environmental impacts and most of the impacts are short term and temporary. The main impacts were on land environment, water resources and waste management. However, most of the associated impacts were limited to the extent of construction phase and are temporary in nature. The EMPs are undertaken to minimize any negative impact.
- The project site is not located in or near an ecologically sensitive area or a protected area declared by MoEFCC.
- No historical or cultural monuments are affected due to this solar project.
- The land for the project development is private leased land.
- The sub-project and its transmission line do not pass through forest land.
- The concessionaire has undertaken appropriate safety measures at the project site.
- The sub-project has the required approvals/permits for project implementation.
- Environment & Social Management System at ASPL has been developed and implemented by keeping in view the requirements of the sub-project.
- The sub-project will supply clean power to the grid and will contribute to emissions reduction due to non-emission of pollutants during operation.
- The institutional arrangement available for the implementation of Environment, Health & Safety appears to be adequate.
- During site visit and discussion with the project developer, the implementation of EMP was found to be adequate.
- Housekeeping was not found to be satisfactory at the site and the developer has been asked to improve the same.
- This nature of the project site coupled with the clean nature of solar power generation ensures that the sub-project will not cause any significant adverse environmental impacts during construction and operation. The same is evident from the site visit.

50. Based on the site visit and due diligence findings, it can be deduced that the sub-project has no significant environmental safeguard issues. The sub-project, therefore, does not appear to involve any kind of reputational risk to ADB funding on environmental safeguards and is recommended for funding.

DUE DILIGENCE ON SOCIAL SAFEGUARDS

22. OBJECTIVE OF SOCIAL SAFEGUARDS DUE DILIGENCE:

51. Social Safeguards due diligence study is carried out to assess the social monitoring compliance status of the project as per the applicable National policies/procedures as observed during the site visit as well as the information received. The main objective of this Social Safeguard Due Diligence Report (SSDDR) is,
- To assess the likely social impacts and its minimization/mitigation measures adopted of the project with respect to land acquisition, compensation and involuntary resettlement, common properties, if any, in terms of displacement, loss of incomes, and community links:
 - To ascertain, in case of any adverse impact, if appropriate mitigation measures have been taken during the project planning, designing and frameworks established for carrying out safeguard measures during the implementation stage to minimize and mitigate such if any adverse impacts.

23. APPROACH AND METHODOLOGY:

52. The social due diligence report for the project has been initiated after review of Information documents made available by the Concessionaire and by conducting a site visit during 4th and 5th of July 2016. Further, applicable clearances, licenses/NoCs during construction and operation period of project as well as commissioning certificate of the project have been verified. The following documents/Reports/Licenses and notifications were referred in order to prepare the Social Safeguard Due Diligence Report:
- Environmental & Social Impact Assessment Report;
 - Project Information Memorandum (PIM);
 - Power Purchase Agreements;
 - Detailed Project Report (DPR);
 - Evacuation approval from AP Transco;
 - Lease Deed;
 - Land Conversion letter
 - Land details of the Farmers

24. PROJECT AGAINST THE PROHIBITED INVESTMENT ACTIVITIES LIST:

53. The sub - project does not involve any prohibited activity as per the Prohibited Investment Activities List (PIAL) of ADB.

25. JUSTIFICATION FOR SUB-PROJECT SITE SELECTION:

54. In order to promote Solar Power Projects, Govt. of Andhra Pradesh have formulated Andhra Pradesh Solar Power Policy, 2015, under New and Renewable Energy Development Corporation of A.P. Ltd (NREDCAP) the State Nodal Agency of Andhra Pradesh, for the purpose of promotion of Renewable Energy generation of green and clean energy. The policy provides for efficient use of conventional energy, proactively establish and promote sustained use of new and non-conventional energy sources and applications to reduce emissions and related impacts of climate change.
55. In order to assess the optimum feasibility of the solar energy project for power generation, a comprehensive site assessment has been conducted by the Company for the project, by considering the following points:
- Higher solar radiation intensity;
 - Land availability, Connectivity and accessibility;
 - Higher shade tolerance;
 - Greater efficiency in diffused sunlight conditions;
 - The project location is located away from the settlement area;
 - The land identified at this location did not involve displacement of any person;
 - No Tribal People affected;
 - No Common Property resources affected;
 - Power evacuation facilities (nearest available substations of Hindupur which comes under APTRANSCO).
56. As per the technical assessment undertaken across the Solar PV technologies, the Thin-Film solar PV technology appeared to be the feasible option for this location because of the land type, meteorological study and annual behavior of solar radiation over the location near at village Hindupur, District Anantapur, State Andhra Pradesh, India.
57. The site has been selected due to the reason that it located far away from major settlement area, it does not fall under any reserved or protected forests, and no environmental sensitive features are located within the vicinity of the immediate site surroundings.
58. The land available for acquisition for the project at this location was not very productive due to high salinity and thus was not suitable for agriculture. The land identified at this location did not involve displacement of any person.
59. Thus, considering all the above mentioned characteristics, the current location was selected for setting up Solar Power plant.

26. LAND LEASE DEED AND COMPENSATION:

60. The total land required for the construction of 50 MW solar power project at villages Kalipi and Brahmasamudram, is approx. 287 Acres of land. The land leased for the project was totally private land and has been acquired on a voluntary basis (willing seller-willing buyer) from the land owners. A third party (land arranger) was appointed by the subproject developer for helping in the process of facilitating the process of land acquisition with the land owners.
61. Land has been acquired by execution of sale deed. The 287 Acres of land has acquired from 35 land owners by execution of sale deed. The land acquired for the project is barren land comprised of hard murrum soil and less productive in nature. During the discussion with the subproject developer it was also informed that the area has received low amount of rain fall for last 10 years. As per government record, the land used for the project was classified as agriculture land but the fertility of the land had degraded over a period of time which is due to problem of scarcity of water in the area so designated as barren land which is due to less productive in nature. The details of the land and name of the owners are given in **Appendix XIII**.
62. Further during the discussion it was noted that, prior to land acquisition land was only used for agricultural activity and no other activities were exist. Since the annual yield per acre is very low therefore they have willingly opted to sell their land. The payment provided against the sale of land has helped those owners to find alternative land in a more fertile area or start an alternate livelihood/business.
63. Further, the subproject developer has confirmed that there is no issue related to land leased and compensation.
64. **Transmission Line:** The scope of the project include 15.256 Km of transmission line connecting to Hindupur substation which includes erection of 64 number of towers out of which four towers are erected at govt. land and rest sixty towers are erected on private land. As per section 164 of The Electricity Act 2003 land is not required to acquire for transmission line and the Indian Telegraph Act 1885, Part III, Section 10 (b) prohibits acquisition of any right other than that of use RoW only for transmission line. Land for towers and right of way is not acquired and agricultural activities are allowed to continue. Moreover, land would temporarily be affected for excavation, erection and stringing activity for which crop compensation is paid to the land owners.
65. **Compensation paid during Tower excavation, erection and stringing of Transmission Line:** A three stage crop compensation of Rs. 50000/- is paid to the land owners: At first during tower excavation the land owner is paid of Rs. 20000/- then during erection of tower of Rs. 20000/- and finally during stringing of the tower of Rs. 10000/- is paid to the land owners.

27. LAND LEASE DEED PROCESS:

66. During the discussion with the subproject developer, it was noted that the total land required for the project is 287 Acres of land which was purchased from land owners through one to one negotiation with the help of third party land arranger. The land for the project site is private land and was out rightly purchased by the promoter on a voluntary basis (willing seller willing buyer mode) from the land owners.
67. The promoters companies like, Yogesh Power Pvt. Ltd., Mahisagar Power Pvt. Ltd., Saibliss Power Pvt. Ltd., Banola Power Pvt. Ltd. and Acme Innovation Lab Ltd. was directly purchased through the land owners through execution of sale deed. A copy of sale deed is attached on **Appendix XIV**.
68. After the land has been purchased by the promoter companies (through sale deed) the same has been transferred to the subproject developer through execution of separate lease deed between Aaroahi Solar Pvt. Ltd. and the promoters companies. A copy of the lease is attached on **Appendix XV**.
69. Prior to the land acquisition the land was used for agricultural activity, the acquired land has been converted from Agricultural to Non-Agricultural use as issued by the Revenue Divisional Officer. A copy of land conversion from agricultural to non-agricultural use is given in **Appendix XVI**.

28. RESETTLEMENT IMPACT IN THE SUB-PROJECT:

70. During the site visit it was observed that, there is no a commercial / residential structure or inhabitants dwelling on or near to the site. The project site are so identified that the project location is far from the habitation. Even it was also observed during the site visit that there were no temporary shelters/sheds at the project site. The land leased for the project doesn't result in any involuntary resettlement impacts or any compensation issues.

29. IMPACT ON TRIBAL PEOPLE:

71. As confirmed by the subproject developer that, the project construction and operation is not affecting any tribal people.

30. IMPACT ON RELIGIOUS PROPERTIES:

72. During the site visit it was observed that no religious property on or near to the site, so no religious property is going to affect due to the project.

31. GRIEVANCE REDRESSAL:

73. During the site visit it was informed, that Grievance Redressal Committee (GRC) was formed at the project site to ensure that the affected person's grievances, on both environmental and social concerns,

are adequately addressed. The Grievance Redressal Mechanism (GRM) for the project provides an effective approach for complaints and resolution of issues raised by the affected community (if any). This mechanism was established prior to construction and will remain active throughout the life cycle of the project.

74. A Grievance Redressal Committee is already in operation at project site. The subproject developer is maintaining a complaint registered. The GRC comprises of Project Head and site in charge followed by site Engineer/EHS officer and Site Supervisor. For record keeping purposes, grievance redressal registers are maintained at site. The grievances if received are recorded in details mentioning the date, time, location, names of villager, details of grievance and the action taken to address the grievance.
75. ASEPL has to ensure that all stakeholders are treated fairly and promptly at all times. For timely completion of the project, if any complaints/ requests raised by stakeholders are dealt with promptly and professionally. Stakeholders (mainly those at or near the project site(s)) are informed of their rights to resolution of dispute(s) or complaint(s) if any. ASEPL has follow a —Bottom-upl approach in Grievance Redressal and thereby shelter the confidence of the stakeholders in the company and protect their interest under law.
76. As informed by the concessionaire during the site visit, the concerned local communities have already been informed about the project (via informal discussion with panchayat heads & local community representatives) and no such grievance/complain are received. There were no grievances related to leased land and compensation reported at the project site.

32. EMPLOYMENT GENERATION AND INCOME RESTORATION:

77. The concessionaire has generated employment opportunities for the local people during the construction stage of the sub-project. Employment opportunities have been provided to project affected people and local villagers during project construction stage. Most of the construction labours at site were employed on contractual basis through contractors.
78. It has been confirmed by the concessionaire that during construction stage, local personal are regularly been engaged on need basis on contractual basis. As informed during the site visit, approximately 250 local people have been employed on site including security guards, office boy, labours, site manager and an admin-in charge. Further during discussion it was also noted that since the project is already in operation, twenty numbers of local people are employed as technician, security guards, grass cutting personnel and module cleaning manpower.

33. COMMUNITY DEVELOPMENT ACTIVITIES:

79. During the site visit it was informed by the concessionaire that they have initiated few of community development activities on public demand, which has been briefed below:
 - Maintenance/up gradation of village approach road through village Ganapatipalli;

- Strengthening of Electric poles/cables in the village out of the public demand;
- Maintenance of village temple wall at Ganapatipalli
- Organizing Awareness/knowledge sharing camp about the solar power project;

34. SITE VISIT TO PROJECT LOCATIONS AND DISCUSSION WITH CONCESSIONAIRE:

80. A site visit was undertaken by the Environmental and Social Safeguard Specialists of IIFCL on 4th and 5th of July, 2016 for field verification of environment and social safeguards related aspects of the project. During the site visit, the project construction team was consulted regarding environmental and social safeguards measures implemented at the project site. It was observed during the site visit that:

- The project is on operation stage;
- As informed during the visit, no grievances have been received till date from the local people.
- Local people have been employed for various construction activities.
- During the site visit it was inferred that the crop yield of the area was less and uncertain since the water availability was less for irrigation, therefore they have opted to give their land on lease for a steady income source.

35. CONCLUSION AND RECOMMENDATION:

81. Based upon the available documents and information provided by the subproject developer, it is concluded that the subproject developer has undertaken adequate social safeguard measures during the construction stage of the project. The conclusion for the sub-project is given below:

- The sub-project have been prepared by the Government of Andhra Pradesh as per the national and state government requirement and not in anticipation to ADB operation;
- The project has already received its Commercial Operation Date (COD) on 29th March 2016 by Southern Power Distribution Company AP Ltd (APSPDCL). ;
- The land leased for the project site is totally private land and sale deed has been executed on a voluntary basis (willing seller-willing buyer basis) from the land owners;
- The project do not have any impact on the settlement area and no cultural/religious structures/schools/hospital and community property was affected due to the project;
- Land for towers and right of way is not acquired and agricultural activities are allowed to continue;

- Three stage compensation is paid to the land owners during excavation, erection and tower stringing;
- Crop compensation is being paid to the land owners as per section 164 of The Electricity Act 2003 and Indian Telegraph Act 1885;
- There were no grievances related to leased land and compensation reported at the project site;
- As informed by the subproject developer, during the site visit, no litigation cases are there ;
- No tribal people are affected due to the project;
- The project does not involve any diversion of forest land;
- Employment opportunities have been given to the local people for various project related activities. During O&M phase twenty numbers of local people are employed as technician, security guards, grass cutting personnel and module cleaning manpower.

82. It can be summarized that apart from the temporary impact on land for which the land owners are being paid for the tower excavation, erection and stringing site for loss of crops, the project does not involve any major social safeguard issues. It seems that the sub-project does not appear to involve reputational risk to Asian Development Bank funding on social safeguards and recommended for funding under the proposed project.

Annex S-4: Resettlement Screening Checklist

Impact	Not Known	Yes	No	Indication of scope (no. of affected persons, land area, land use, structures, etc.)
Is the prospective subproject company (PPC) undertaking or likely to undertake any land acquisition?		√		The 287 Acres of land has acquired from 35 land owners by execution of sale deed. The land acquired for the project is barren land comprised of hard murrum soil. No structures are affected because of the project.
Is the PPC acquiring land through willing buyer to willing seller transactions?		√		The land has been acquired on a voluntary basis (willing seller-willing buyer) from the land owners by a local aggregator. A third party (land arranger) was appointed by the subproject developer for helping in the process of facilitating the process of land acquisition with the land owners.
Does the PPC have any agreements or is it likely to enter into agreements with the government for provision of sites or land or rights to land?		√		Aarohi Solar Pvt. Ltd.(ASPL) has signed a Power Purchase Agreement (PPA) with Southern Power Distribution Company of Andhra Pradesh Limited (DISCOM). As per the Indian Telegraph Act 1885, prohibits acquisition of any right other than that use of RoW for erection of Transmission line.
Is any of the land used by the PPC (or likely to be used by the PPC) compulsorily acquired?			√	
Will any PPC activities involve restrictions of use on adjoining land?			√	
Are the sites for land acquisition known?		√		
What is the ownership status of the land?				Ownership status is with the subproject developer ASPL. In case of Transmission line, only RoW has been used by the subproject developer during the excavation, erection and string of Transmission line, no land acquisition is involved. However, the impact on land is temporary and the ownership status of the land remains with the landholder/farmers.

Are non-titled persons present?			√	
Will tenants, lessees, share farmers, or other third party users be affected?			√	
Will there be loss of housing?			√	
Will there be loss of crops, trees, and other fixed assets?		√		The affected land owners have been compensated for use of RoW clearance. Three stage crop compensation is paid to the land owners: At first during tower excavation, then during erection of tower and finally during stringing of the tower.
Will there be loss of incomes and livelihoods?			√	
Will access to facilities, services, or resources be lost?			√	
Will there be loss of businesses or enterprises?			√	
Will any social or economic activities be affected by land use related changes?			√	
If involuntary resettlement impacts are expected: NA				
Are local laws and regulations compatible with DFI's involuntary resettlement policy?			NA	
Will land be acquired through the government or by the PPC?			NA	
Do PPC agreements with the government (if any) specify involuntary resettlement will be conducted in accordance with international standards?			NA	
Does the government executing agency/PPC have sufficient skilled resources for resettlement planning and implementation?			NA	
Are training and capacity building required prior to resettlement planning and implementation?			NA	

Note: The process of land acquisition/RoW use has been initiated before IIFCL's involvement with the project.

ANNEX S-5: TRIBAL PEOPLES EFFECTS SCREENING CHECKLIST

Impact on Tribal Peoples	Not Known	Yes	No	Remarks or identified problems, if any
Are there tribal groups present in project locations?			√	
Do they maintain distinctive customs or economic activities that may make them vulnerable to hardship?			NA	
Will the subproject restrict their economic and social activity and make them particularly vulnerable in the context of project?			NA	
Will the subproject change their socioeconomic and cultural integrity? ¹			NA	
Will the subproject disrupt their community life?			NA	
Will the subproject positively affect their health, education, livelihood, or social security status?			NA	
Will the subproject negatively affect their health, education, livelihood, or social security status?			NA	
Will the subproject alter or undermine the recognition of their knowledge, preclude customary behaviors, or undermine customary institutions?			NA	
In case there is no disruption of tribal community life as a whole, will there be loss of housing, loss of land, crops, trees, and other fixed assets owned or controlled by individual tribal households?			NA	

¹ That is, undermine their production systems and the maintenance and transmission of their cultural patterns.

Solar PV Plant

*Environmental and Social Impact Assessment Report for
Solar PV Plant of 50 MW
at Village- Kalipi, District: Anantapur, State: Andhra Pradesh*



Prepared by

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Submitted By



Aarohi Solar Private Limited

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CHAPTER 1-INTRODUCTION

1.1 INTRODUCTION

The ACME Group is a leader in the field of energy management and innovative solutions for the wireless telecommunications and alternate energy sector. It prides itself as a pioneer in the development of green technology solutions that are environment friendly, energy efficient, & cost effective and also capable of delivering a quick return on investment. The establishment of ACME Cleantech Solutions Pvt. Ltd. (formerly ACME Tele Power Limited) in 2003 was the first step towards realization of this dream.

ACME Cleantech Solutions Pvt. Ltd. (ACSPL) is company, promoted by ACME group-India, EDF Energies Nouvelles and EREN S.A for setting up solar power plants. Recently, the company has commissioned 25 MW Solar Photo Voltaic (PV) power project in Madhya Pradesh and presently engaged in setting up of 25 MW Solar Power project in Balangir district in Odisha. 100 MW Solar Power Plant under JNNSM PHASE II BATCH-I (80 MW under open category and 20MW under domestic component requirement category).

ACME group, through its various subsidiaries, has successfully implemented solar power generation capacities aggregating to 17.5 MW, which include 15 MW Solar Photo Voltaic (PV) power project in the state of Gujarat and 2.5 MW Solar Thermal project in the state of Rajasthan.

EDF Energies Nouvelles has more than 20 years of experience in solar and wind power and is the renewable energy arm of the French company Electricity de France S.A., one of the world leading energy companies. EDF EN operates in 18 countries, mainly in Europe and North America and more recently in South Africa, India and Morocco. With 6,611 MW of gross capacity in service and 1,986 MW of gross capacity in construction worldwide as of December 2013, the Group is a leading player among renewable energy specialists.

EREN S.A.: Founded in 2012 by Paris Mouratoglou and David Corchia, EREN S.A. is the subsidiary of EREN Group S.A. founded in 1991 the FIRST group dedicated to saving natural resources. Through its various subsidiaries, EREN designs, manufactures and owns equipment allowing its customers and partners to rationalize their consumption of energy resources and

Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at Village - Kalipi, District - Anantapur in Andhra Pradesh

other natural resources. EREN is also active in the field of wind and solar renewable energies (in France, Greece, Italy, Israel and India)

Our range Of Services includes

- Planning & Consulting
- Site Inspection, Feasibility Studies & Basic Evaluation
- Yield Analysis, Cost Benefit and Revenue Forecast
- Design Planning, Approvals & Implementation, Supervision
- Project Management, Documentation & Operation

Aarohi Solar Private Limited is a subsidiary of ACME Cleantech Solutions Pvt. Ltd.(ACSPL) is planning to set up Solar PV Power Project of the capacity of 50 MW , at Village- Kalipi, District - Anantapur of the state of Andhra Pradesh, India. The Power Purchase Agreement (PPA) is executed between Aarohi Solar Private Limited & APSPDCL for a 50 MW Solar PV Power Plant herein referred to as “The Project” and the scheduled date of the commissioning of the project is estimated at 15 months from the date of signing of PPA.

1.2 PROJECT COMPANY

The profile of Aarohi Solar Private Limited is a Special Purpose Vehicle (SPV), promoted for setting up Solar PV power plant in India. The brief profile of Company is given below **Table1.1** and salient Features of projects in **Table 1.2**.

Table1.1:-Brief Profile of Company

Name of the Company	:	Aarohi Solar Private Limited (ASPL)
Date of Incorporation	:	12/06/2008
Registered Office	:	Plot No. 152, Sector – 44, Gurgaon
Constitution	:	Private Limited Company
Industry	:	Power
Parent Company	:	ACME Cleantech Solutions Ltd. (ACSL)
Group/Promoters	:	ACME Group

Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at Village - Kalipi, District - Anantapur in Andhra Pradesh

Proposed Project	:	50 MW (AC) Solar Photo Voltaic (PV) power generation facility
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Table 1.2:-Sailent Features of Projects

S. No	Particulars	Descriptions
1.	Project site	Village- Kalipi
2.	District Name	Anantapur
3.	Name of the State	Andhra Pradesh
4.	Latitude:	13.97873N
5.	Longitude:	77.48286 E
6.	Road Accessibility:	A national highway NH44 connecting commercial city of Hyderabad to Bangalore is approximately 25km from the Project
7.	Nearest airport:	Bangalore airport – 88.67 km, South
8.	Nearest Railway Station:	Chakarlapalli-10.67 km, East
9.	Nearest City:	Hindupur – 16.26 KM, in South
10.	Land available:	250 acres
11.	Water Requirement:	10,000 liters per day
12.	Daily Global Solar Irradiance	5.45 kWh/m ² /day
13.	Annual Global Solar Irradiance	1989 kWh/m ²
14.	Type of PV modules	Thin Film CIS
15.	Proposed capacity	50 MW
16.	Capacity of each module proposed	168 & 170 Wp (SF)
17.	Model of solar PV module	Solar Frontier/Any thin film Equivalent
18.	Total number of PV Modules	351200
19.	Project module area required	424919 sq. m.
20.	Solar Inverter	ABB/Sungrow/Hitachi/Any Grid tie inverter equivalent
21.	Annual electricity supplied to grid- First Year grid	107.103 MU/Yr
22.	First Year Tariff (PPA)	5.637 Rs/kWh

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S. No	Particulars	Descriptions
23.	Plant load factor (%) - First Year	24.45% annually
24.	Annual degradation (%)	As per Module Manufacturer Product
25.	Performance ratio (%)	89.57% annually (approx.)
26.	Project Cost	Rs. 412.5 Crore (approx.) including IDC, pre-operative expenses, contingencies and margin money for working capital.
27.	Name of the customer of power	Southern Power Distribution Company of AP Limited (APSPDCL)

1.3 LIST OF REQUIRED PERMITS

A Solar based PV power plant does not require any Environment clearance from Ministry of Environment, Forest & Climate Change (MoEF&CC) and **no Environmental Impact Assessment (EIA) study needs to be carried out as per the EIA notification act of 14th Sept 2006.** However, the consent to establish/NOC from Andhra Pradesh Pollution Control Board shall be required and due permission shall be obtained before making the plant operational.

Table 1.3: List of Permits Required

LIST OF PERMITS & APPROVALS		
S.No.	Authority	Permission Required
1	Southern Power Distribution Company of AP Limited	Power Purchase Agreement (PPA)
2	Land Agreement	Deeds of sale for land/ Lease Agreement
3	Andhra Pradesh Pollution control Board	Consent to Establish
4	Andhra Pradesh Pollution control Board	Consent to Operate
5	Local Governing Bodies	No objection Received from local Panchayat
6	Ministry of Environment & Forrest	Not required for Solar Projects, as per EIA notification
7	Distribution company or respective	Power Requirement

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	agencies of DISCOM	
8	APSPDCL	Power evacuation
9	Electricity Inspectorate	Start-up power and tie-in approval from Andhra Pradesh Electricity Board
10	Chief Inspector of Factory State Govt.	Registration and Establishment (Factory license)
11	Labour Office, State Govt.	License under Section 12 of CLRA obtained by EPC Contractor

1.4 BENEFITS DUE TO PROPOSED PROJECT

The proposed Project brings in multifold advantages. Not only does it produce clean, pollution free energy, it also has the capacity to provide employment to the people living in and around that area.

- **Financial savings:-** The cost savings created by reduced electricity use
- **Environmental advantages:-** Obtaining electricity from a renewable source will help preserve the earth's resources. PV systems are renewable, clean and universal power sources. Solar energy helps prevent damage to the environment by producing no pollution.
- **Reliability:-** A PV system with a battery-powered storage system can provide power to facilities in the event of an electrical outage.
- **Hedge against rate hikes:-** PV systems are less vulnerable to electrical rate increases, which have averaged about 6 percent in recent years. The PV panels produce electricity at a fixed rate over the life of the system. The cost of solar cells — primarily, the main component, silicon — also has been dropping quite dramatically recently.
- **Peak energy savings:-** PV systems can reduce the cost of peak power. A PV system produces the most power in the summer at mid-day, when the sun is highest. So it supplements the need for expensive power at peak operating times.

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- **Public relations:-** PV technology can have a legitimate, positive influence on the general public, which might think more highly of the organization for taking action to protect and improve the environment.
- **National security:-** Renewable energy sources lessen the nation's dependence on foreign oil.

1.5 INDIAN POWER SECTOR SCENARIO

Power/electricity is one of the critical infrastructural component for basic human need and multidimensional growth of any country. Power generation capacity in India has risen at the rate of around 5.88% per annum over the last 25 years. India is world's 4th largest energy consumer, accounting for 3.4% of global energy consumption. Due to India's economic rise and infrastructural development, the demand for energy has grown at an average of 3.6% per annum over the past 30 years.

The average per capital consumption of electricity in India is estimated to be 704 kWh during 2008-09. The world average stands around 2,400 kWh. So, it would require that the installed generation capacity to be at least 2, 18, 208 MW by 2016 from the present level. This translates to a required annual growth rate of around 13.5% which is significantly higher than historical growth rates for this sector. The total demand for electricity in India is expected to cross 9, 50,000 MW by 2030.

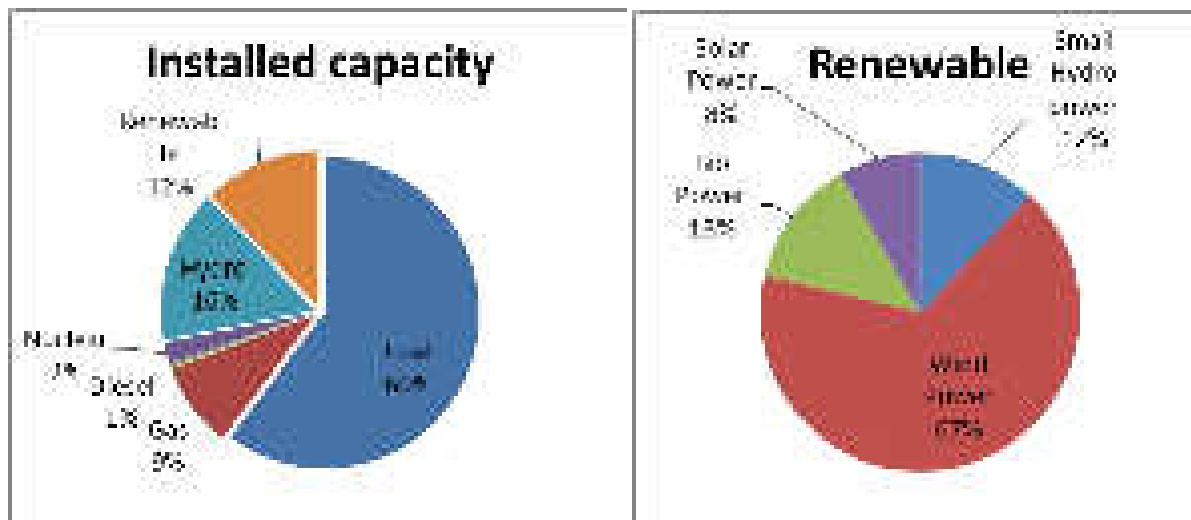


Figure 1.1 : Scenario of power generation in India: Fuel use Pattern

(Source: Central Electricity Authority, January 2015)

1.5.1 Current Status of Power Generation in India

As on 31st January 2015, the installed electricity production capacity of India stands at 258701.45 MW and it is planned to almost double this capacity by the end of the 12th five year plan (2017). With a targeted GDP growth rate of 8-9%, the energy growth rate is expected to rise at 5.5-6.5% annually. Above figure 1.1 presents the pattern of energy resources being used in the Indian Power Sector for power generation.

Table 1.4 indicates the estimated hydrocarbons and other energy reserves along with limitations either year-wise or the MW potential for all forms of conventional fossil based fuels and present form of renewable energy sources.

Table 1.4: Reserve of Fossil Fuels and Maximum Potential of RE in India

Energy Resources	Unit	Cumulative Reserve	Remarks
Coal/Lignite	MT	15,479	Will be exhausted by 2050
Extractable Lignite	MT	1,220	Will be exhausted by 2045
Oil	MT	786	Will be exhausted by 2028
Gas – including bed methane	MT	1,866	Will be exhausted by 2043
Uranium	Tons	61,000	Will be exhausted by 2057
Hydro power	MW	150,000	Maximum Potential
Wind	MW	45,000	Maximum Potential
Biomass	MW	50,000	Maximum Potential
Solar	TW	600	5000 TkWh/Year

Considering continuously rising gap in demand and supply and it is very clear that, we have to be very ambitious in our plans for adding generation capacity and renewable energy can be one of the solution for this purpose. This has created a common & clear understanding among all countries that not only serious push is required from industry but also serious action and program has to be implemented by all the countries and government to achieve the target on year on year basis.

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The government and state governments has been advised to formulate policies to look after the implementation of the same. Provision has been made to implement the penalty if the state government will not complete its RPO obligations, also some policies are in consideration by central government in which they will link the fund released to state government with meeting the targets of RPO obligation, and this will ascertain that the targets are implemented at state level.

1.5.2 Government Policies on Renewable Energy (Solar) in India

The Electricity Act 2003 stipulates minimum percentage of energy to be derived out of renewable energy sources, which shall be binding on all states. The Electricity Act 2003 and National Electricity Policy promotes electricity generation from renewable energy sources and stipulates that the SERC shall promote generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence.

The Ministry of New and Renewable Energy (MNRE), GOI has been promoting new and renewable energy sources in a big way in India. The government of India envisages 30,000 MW capacity additions during the 12th five year plan (2012-17) from renewable power generation. While about 15,000 MW is expected to be generated from wind power, 10,000MW is expected from solar and the balance is to be realized by other renewable energy systems. The Electricity Act 2003 clearly mandates state electricity boards to adopt a minimum percentage for the procurement of electricity from renewable energy sources. Accordingly, many state electricity regulatory commissions (SERC) have initiated action to meet this requirement.

The Jawaharlal Nehru National Solar Mission (JNNSM) which is part of the eight mission documents under India's National Action Plan on Climate Change (NAPCC) was launched on the 11th January, 2010 by our ex-Prime Minister, Dr. Manmohan Singh. The Mission has set the ambitious target of deploying 20,000 MW of grid connected solar power by 2022. The objective of the Jawaharlal Nehru National Solar Mission is to establish India as a

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global leader in solar energy, by creating the policy conditions for its large scale diffusion across the country as quickly as possible. For this purpose, the Mission has adopted a 3-phase approach: the 11th Plan and first year of the 12th Plan (up to 2012-13) has been considered as Phase 1, the remaining 4 years of the 12th Plan (2013-17) are included as Phase 2, and the 13th Plan period (2017-22) is envisaged as Phase 3.

Table 1.5:- JNNSM Targets

S.No.	Segment	Targets for Phase I	Cumulative Targets for Phase II	Cumulative Targets for Phase III
1.	Utility Grid Power including Roof-top	1,000-2,000 MW	4,000-10,000 MW	20,000 MW
2.	Off-grid Solar applications	200 MW	1000 MW	2000 MW
3.	Solar collectors	7 million sq. meters	15 million sq. meters	20 million sq. meters

As per the National Tariff Policy, it is envisaged that the targets for Solar RPO shall be 0.25% by 2012 -13 extending to 3% by 2022.

The following **Table 1.6** illustrates the Solar RPO requirement by 2022 on the basis of expected demand in India.

Table 1.6 : Solar Power Capacity Requirement by 2022

Year	Energy Demand (MU)*	Solar RPO (%)	Solar Energy Requirement (MU) for RPO compliance	Solar Capacity Requirement for RPO compliance (MW)
	(A)	(B)	(A)X(B)	
2011-12	953,919	0.25%	2,385	1,433
2012-13	1,022,287	0.25%	2,556	1,536
2013-14	1,095,555	0.50%	5,478	3,291
2014-15	1,174,074	0.75%	8,806	5,291

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Year	Energy Demand (MU)*	Solar RPO (%)	Solar Energy Requirement (MU) for RPO compliance	Solar Capacity Requirement for RPO compliance (MW)
2015-16	1,258,221	1.00%	12,582	7,560
2016-17	1,348,399	1.25%	16,855	10,127
2017-18	1,443,326	1.75%	25,258	15,176
2018-19	1,544,936	2.25%	34,761	20,885
2019-20	1,653,700	2.50%	41,343	24,839
2020-21	1,770,120	2.75%	48,678	29,247
2021-22	1894736	3.00%	56,842	34,152

With the objective to establish India as a global leader in solar energy many states have come up with their own Solar Policy. Various state regulators have mandated a minimum percentage of total consumption by Power Utilities from solar power, thereby, creating demand for solar power, as per the Jawaharlal Nehru Solar mission. Considering JNNSM target of increasing the solar power capacity from current capacity of 1.9 GW to 4-10 GW by 2017, there is huge scope for solar power projects in India

In addition, the **State Nodal Agencies (SNA) of MNRE** along with the State Governments has announced several policies towards promoting large scale solar power generation. Gujarat Solar Power Policy-2009 is the best example of state policy under which around 700 MW capacity solar PV power projects have been connected to the national grid. Presently a number of states have been launched their solar power policies in line with the state of Gujarat. In addition to the policies Government is implementing Renewable Power Obligation (RPO) for the generators and the distributors in the state towards promoting solar power by making specific consideration under RPO.

1.6 OBJECTIVE OF THE ESIA STUDY

The objective of conducting ESIA Study is to meet the project's environmental assessment requirements following ADB's Safeguard Policy Statement (2009). This scope of the ESIA Study to assess the significant environmental impacts and suggestion of mitigation measures. To

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comply with other lender's requirements, the document also addresses IFC Performance Standards which will be met by the project. In the context of the scope of the project, the ESIA report has addressed the following, where applicable:

- Category of the project consistent with Government of India
- Baseline Environmental and Social conditions;
- Relevant host country laws, regulations, applicable treaties and agreements;
- Protection of human health, cultural properties and biodiversity including endangered species and sensitive ecosystems;
- Major hazards; Occupational health and safety; Fire prevention and life safety;
- Socio-economic impacts; Land use: Land acquisition; Involuntary resettlement;
- Impacts on indigenous peoples and communities; if applicable
- Cumulative impacts of existing, proposed and anticipated future projects;
- Efficient production, delivery and use of energy
- Pollution prevention and waste minimization, pollution controls (liquid effluent and air emissions) and solid and chemical waste management.
- GHG reduction potential

The ESIA activities have been carried out jointly by a multi-disciplinary team of experts, including environment team, and from relevant fields in house.

All the issues such as acquisition of land, ecology, influx of people during construction and operation phase, shelter and sanitation, the equipments and machineries, environmental health and safety, occupational hazard, social and environment management and monitoring plan have been dealt in detail in the respective sections of the ESIA Report.

Therefore while categorizing this Project; the most important aspects which may impact the project in a significant manner have been described in various chapters of the ESIA document.

1.7 CONCLUSIONS ON CATEGORY OF PROJECT

The proposal is for PV based Solar power project and there are no potentially significant adverse and irreversible social and environmental impacts. As per ADB Criteria of financing a project, environmental categorization of projects are being done according to type, size and location of the proposed project.

1.8 METHODOLOGIES AND APPROACH OF ESIA

The Environmental and Social Impact Assessment has been conducted based on secondary data to include the following:

- Baseline information about the environmental, social, and economic conditions surrounding the project area; to determine the existing status and post project scenario in respect of these parameters;
- Identify potential impacts of the project and the characteristic, magnitude and distribution of the impacts;
- Compile information on potential mitigation measures to minimize the impact including mitigation costs; so as to incorporate the same in Environment and Social Management Plan;
- Formulate Environmental Management and Monitoring Action Plan

This ESIA report is undertaken to meet the environmental assessment requirements of Safeguard Policy Statement of ADB and the requirements of Equator Principles.

Various environment and social parameters were identified and examined as per standard methods. The detailed data for different parameters are given in the baseline chapter. The parameters considered for the study and their source of information are given in **Table 1.8**.

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Table 1.7: Environmental Attributes And Parameters

S. No.	Attributes	Parameters	Source of Information
1.	Meteorology	Wind speed and direction, Temperature, Relative humidity and Rainfall	Solar GIS
2.	Ecology	Existing terrestrial and aquatic flora and fauna within 10-Km radius circle.	Secondary data was collected from the Government department.
3.	Land use	Trend of land use change for different categories	Secondary data was collected from the Government department.
4.	Socio-Economic aspects	Socio-economic features, labour force characteristics, boom town effects	Based on secondary sources data like primary census abstracts of census of India 2001.

1.9 STRUCTURE OF REPORT

The report consists of seven chapters (including the present chapter) and the contents of the remaining chapters are briefly described in this section.

Chapter 2: Legal Policies and Institutional Framework:

This chapter presents applicable legal provisions, National environmental and social (including labour) laws and policies as well as the relevant national and international standards and guidelines.

Chapter 3: Project Description:

This chapter provides information related to various feature of the proposed power plant including power generation process, utilities, water and power requirement and other proposed infrastructure facilities. It also provides the glimpse of project schedule for approval and implementation.

Chapter 4: Baseline Status :

This chapter brings out findings based on secondary data on physical, biological and socio economic environments, to present the baseline environmental condition of the study area. It includes the information regarding micro-meteorology, water environment, air environment, soil environment and ecological environment and the socio- economic baseline settings of the study area.

Chapter 5: Analysis of Alternatives:

Alternatives considered for the proposed project are evaluated and discussed with particular emphasis on environmental considerations.

Chapter 6: Anticipated Environmental and Social Impacts and Mitigation Measures:

This chapter provides details of the environmental and social impact assessment of the project as well as transmission lines during construction, operational and decommissioning phases. It expresses the impacts of the proposed project on the various components of environment. Mitigation measures are suggested along with the impact prediction. This section presents a brief outline of impact and respective management plan to address socio-economic conditions. The chapter discusses social safeguard mitigation measures, and impacts of the transmission line and mitigation measures to be undertaken.

Chapter 7: Environmental & Social Management Plan :

This chapter deals with the Environmental and Social management plan incorporating recommendations to implementation of the suggested mitigation measures to minimize adverse environmental and social impacts during construction, operation and decommissioning phases.

The chapter includes management program, organization structure, training, community engagement, monitoring and reporting elements.

The chapter also includes Environment Social Action Plan and Corporate Social responsibility Plan.

Chapter 8: Grievance Redressal Mechanism:

This chapter addresses the Grievance Redressal Mechanism (GRM) drawn by ASEPL which provides an effective approach for complaints and resolution of issues made by the affected community in reliable way.

Chapter 9: Site Specific Social Survey

This chapter addresses the socio economic survey conducted at the site amongst the stakeholders.

Chapter 10: Conclusions & Recommendations: This chapter consolidates the conclusions and recommendations of the ESIA Study carried out for the Solar PV Report.

CHAPTER 2-LEGAL POLICIES AND INSTITUTIONAL FRAMEWORK

2.1 INTRODUCTION

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of the development activities and for planning suitable measures in order to ensure sustainable development of a region. The environmental considerations in any developmental process have become necessary for achieving sustainable development. To achieve such goals the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources;
- Prevention of adverse environmental and social impact to the maximum possible extent;
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

2.2 REGULATORY FRAMEWORK

Environment

The execution and enforcement of environmental regulations is the responsibility of the State governments through the State Pollution Control Boards (SPCBs) – the State Pollution Control Board (SPCB) in the case of operations in the respective States. The SPCBs are responsible for enforcing compliance under the Water Act, 1974, the Air Act, 1981, the Environmental (Protection) Act, 1986 and rules framed there under and the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. This responsibility is discharged through the introduction of secondary legislation formulated in accordance with national legislation.

The central laws are formulated by the Ministry of Environment, Forests & Climate Change (MoEF&CC) and the State Governments are required to consider these regulations as base level, though they can make the more stringent requirements for their respective states, but in no way more lenient than the national regulations.

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The Central Pollution Control Board (CPCB) was established in September 1974 along with SPCBs, for the purpose of implementing provisions of the Water (Prevention and Control of Pollution) Act, 1974. The executive responsibilities for the industrial pollution prevention and control are primarily executed by the CPCB at the Central level, which is a statutory body, attached to the MoEF&CC. The key bodies are:

- Ministry of Environment and Forests, MoEF&CC (National level)
- Central Pollution Control Board, CPCB (National level)
- State Environment Impact Assessment Authority, SEIAA (State Level)
- State Pollution Control Boards, SPCBs (State level)

Health & Safety and Social

In India, Health & Safety Management is under the Ministerial purview of Department of Labour and Employment at Central and state level which is responsible for publishing regulations, amendments and their enforcement. The Petroleum and Explosives Safety Organization (PESO) formerly Department of Explosives, with its Head Office in Nagpur, Maharashtra operates under the Ministry of Commerce and Industry, Department of Industrial Policy & Promotion, Government of India. With an overall objective of ensuring safety and security of public and property from fire and explosion, the Organisation as a statutory authority is entrusted with the administration of Explosives Act, 1884, Petroleum Act, 1934; Inflammable Substances Act, 1952 and the rules framed there under. Specific authorities dedicated for management of health and safety issues are:

- Chief Controller of Explosives, CCoE (National Level)
- Deputy Chief Controller of Explosives (State Level)
- Chief Labour Commissioner/State Labour Department
- Directorate General, Factory Advice Service and Labour Institutes (DGFASLI)
- National Safety Council (NSC) was set up by the Ministry of Labour

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Panchayati Raj is a decentralized form of Government wherein each village is responsible for managing its own affairs. Under the three tier local self-governance system in India (through 73rd amendment of constitution) village level panchayats have been given powers to manage local resources and be responsible for local administration. The constituency comprises of ex-official members (all sarpanchas of the panchayat samiti area, the MPs and MLAs of the area and the SDO of the subdivision), co-opt members (representatives of SC/ST and women), associate members (a farmer of the area, a representative of the cooperative societies and one of the marketing services), and some elected members. The samiti is elected for 5 years and is headed by the Chairman and the Deputy Chairman.

2.3 APPLICABLE ACTS AND RULES IN INDIA

The applicable laws pertaining to each aspect by which Aarohi Solar Private Limited will ensure compliance by adhering to the requirements as a time bound action are given below.

Environment Aspect

- The Wildlife Protection Act, 1972
 - The Wildlife Protection Act 1972 provides for protection to listed endangered species of flora and fauna and establishes a network of ecologically important protected areas. The objective is also to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act empowers the Central and State Governments to declare any area to be 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. The act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent.
- The Water (Prevention and Control of Pollution) Act, 1974
 - The Water Act is enacted with the objective of prevention & control of water pollution in India. The Act aims at the maintaining or restoring the wholesome nature of water for the establishment of Boards and to vest them with such powers so as to enable them to carry out the purposes of the Act. This Act introduced the State Pollution Control Boards (SPCB) to grant Consent to industries, for their wastewater discharges. The establishment or operation of any industry cannot be undertaken without the prior consent of the SPCB.

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- The Water (Prevention and Control of Pollution) Cess Act, 1977
 - This Act has provisions for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974.

- The Air (Prevention and Control of Pollution) Act, 1981
 - This Act has provisions the prevention, Control and abatement of air pollution for the establishment, with a view to carrying out the aforesaid purpose, of boards, for conferring on and assigning to such Board powers and Functions relating thereto and for matters connected Therewith. This Act introduced the State Pollution Control Boards (SPCB) to grant Consent to industries, for their Air Emissions. The establishment or operation of any industry cannot be undertaken without the prior consent of the SPCB.

- The Environment Protection Act 1986 and Rules there under (with amendments)
 - This act was introduced in 1986 as an umbrella legislation that provides a holistic framework for protection and improvement to the environment. In terms of responsibilities, the Act and the associated Rules, require for obtaining environmental clearances for specific types of new/expansion projects and for submission of environmental statement to the SPCBs annually.

- The Forest (Conservation) Act 1980 as amended in 1988
 - The Forest Conservation Act was adopted in 1980 to protect and conserve forests. It strictly restricts and regulates the de-reservation of forests top use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes. The FCA is relevant for the power sector for siting guidelines for hydroelectric power plants, and for passage of transmission through forest areas.

- The Noise Pollution (Regulation and Control) Rules, 2000
 - Under these Rules, the State Government categorizes areas into industrial, commercial,

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residential or silence areas/ zones for the purpose of implementation of noise standards for different areas. The State Government takes measures for abatement of noise including noise emanating from vehicular movements, blowing of horns, bursting of sound emitting firecrackers, use of loud speakers or public address system and sound producing instruments and ensure that the existing noise levels do not exceed the ambient air quality standards specified under these rules.

- Batteries (Management and Handling) Rules, 2001
 - The Batteries (Management and Handling) Rules 2001 were notified on 16th May 2001 and they came into effect on 9th July 2002. The most recent amendment in the Rules have been through the Batteries (Management and Handling) Amendment Rules 2010 dated 4th May 2010. As most of the facilities use lead-acid batteries in the electrical inverters, company owned vehicles and other emergency backup systems in the control rooms, etc. they would be classified as a “Consumer” and are thus required to comply with the above Rules.

- The Biodiversity Act, 2002
 - Taking cognizance of the International Convention on Biodiversity (CBD), and to address the excessive pressure on biodiversity, the Government of India has enacted Biological Diversity Act, 2002 (BDA 2002). The legislation aims at regulating access to biological resources so as to ensure equitable sharing of benefits arising from their use.

- Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2008
 - The Rules inter-alia provide for: a new criteria for defining hazardous wastes; responsibilities and duties of a facility for handling of hazardous wastes; maintenance of proper documents with respect to the quantities and characterization of hazardous wastes; grant and renewal of Authorization for handling of such wastes; storage of hazardous waste in properly labeled containers and at designated places within the facility; labeling and packaging of hazardous wastes; transportation of hazardous wastes; disposal of waste through authorized contractors [or operators of CHW-TSDF], maintenance of manifests, identification of disposal sites; designing and setting up of a disposal facility; operation and closure of a landfill site; import and export of hazardous wastes for dumping and disposal or for recycling and reuse; accident reporting and follow up; record keeping;

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submission of returns; provision for appeal; and liability if hazardous waste is not properly handled and managed.

- National Green Tribunal Act, 2010
 - On 2nd June 2010, the National Green Tribunal Act 2010 was notified. The NGT Act 2010, which has come into force on the 18th October 2010 through MOEF Notification#S.O.2569 (E) is an Act to provide for the establishment of a NGT for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal rights relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.

- E-Waste (Management and Handling) Rules, 2010
 - The E-Waste Rules 2011 define the responsibilities of all producer(s) of electrical and electronic equipment collection center(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in manufacturing, processing, sale and purchase of electrical and electronic equipment or components.

- EIA Notification 2006 – Environmental Clearance (EC) and Public Consultation as a part of EC Process.
 - Ministry of Environment, Forests and Climate Change in its Office Memorandum No. J-11013/41/2006-IA.II (I) dated 13th May, 2011 stated that the Solar Photovoltaic Power Projects are not covered under the ambit of EIA Notification, 2006 and hence, no environmental clearance is required. Hence, the Solar Power PV Projects does not require preparation of Environmental Impact Assessment Report and pursuing Environmental Clearance from Central Government or State Level Environmental Impact Assessment Authority.

Other Aspects

Health and Safety Aspect

- The Petroleum Act, 1934
- The Gas Cylinder Rules 2004
- The Explosive Act, 1884
- The Electricity Act, 2003
- The Factories Act, 1948 and state specific Factories Rules
- The Building and Other Construction Workers Act, 1996 and The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Central Rules, 1998

Social Aspect

- The Factories Act, 1948
- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013
- The Employees' Compensation Act 1923
- The Employee State Insurance Act 1948
- The Public Liability Insurance Act 1991
- The Minimum Wages Act, 1948
- The Employees' Provident Fund Act, 1948
- The Payment of Gratuity Act, 1972
- The Maternity Benefit Act, 1961
- The Bonded Labor (Abolition) Act 1976
- The Child Labour (Prohibition and Regulation) Act, 1986
- The Contract Labour (Regulation and Abolition) Act, 1970
- The Inter State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979
- The Companies Act, 2013
- The Industries Disputes (Amendment) Act, 2010
- The Trade Union Act, 1926

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- The Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 1989
- The Scheduled Castes Tribes and Other Traditional Forest Dwellers Act, 2006

Archaeology and Cultural Heritage Related Regulations

- The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010
- Indian Treasure Trove Act 1878 (as modified upto September 1949)
- The Antiquities and Art Treasures Act, 1972

State Level Legislations

- State specific Factories Rules
- State specific Land Acquisition Act & Rehabilitation and Resettlement Policies
- State specific Panchayati Raj Act
- CERC, SERC and CEA Regulations
- State specific Electricity Regulatory Commission (compliance audit) regulations

2.4 APPLICABLE INTERNATIONAL STANDARDS / REQUIREMENTS

2.4.1 IFC SUSTAINABILITY FRAMEWORK, 2012

The IFC Performance Standards (PS) applies to private sector projects and provides project participants with instruments to structure, design, construct and manage the operations of projects in an environmentally and socially acceptable manner, while providing measures to avoid or mitigate adverse environmental and social impacts resulting from the projects. These Performance Standards are intended to focus on outcomes rather than process, thereby stressing the implementation of sound environmental and social management systems that achieve desired outcomes, including the mitigation of adverse impacts.

The following Performance Standards shall be typically applicable to any Solar Photovoltaic Power Project:

- PS1: Assessment and Management of Social & Environmental Risks & Impacts

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- PS2: Labor and Working Conditions
- PS3: Resource Efficiency and Pollution Prevention
- PS4: Community Health, Safety & Security
- PS5: Land Acquisition and Involuntary Resettlement
- PS6: Biodiversity Conservation & Sustainable Management of Living natural Resources
- PS7: Indigenous Peoples
- PS8: Cultural Heritage

Performance Standard 1: Assessment and Management of Social & Environmental Risks & Impacts

Objectives:

- Identifying and assessing environmental and social impacts in the project's area of influence.
- Avoiding, minimizing, mitigating or compensating for adverse impacts.
- Ensuring that affected communities are engaged on issues that may affect them
- Promoting improved environmental and social performance through effective management systems.

Requirements:

- Conducting an Environmental and Social Impact Assessment (ESIA or EIA) of the project, appropriate to the nature of the project's environmental and social risks and potential impacts, to include issues identified in Performance Standards 2 to 5.
- Establishing Environmental and Social Management Plans commensurate with the findings of the ESIA and consultation with affected communities.
- Establishing Action Plans where specific mitigation measures and actions are required for the project to comply with applicable laws, regulations and the requirements of these Performance Standards.
- Providing organizational capacity and contractor / employee training to enable project to achieve continuous environmental and social performance.

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- Establishing and maintaining a timely process of community engagement, including a grievance mechanism, focusing on disclosure of information and consultation with local communities affected by project risks or adverse impacts that is free from external manipulation, interference or coercion to ensure relevant and understandable access to project information.
- Establishing procedures to monitor and measure the effectiveness of the environmental and social management program, including internal reporting of the program's effectiveness to the project's senior management, disclosure of Action Plans (including material changes to such Plans) to affected communities, and external reporting to affected communities on the results of Action Plans, commensurate with the concerns of the affected communities.

Performance Standard 2: Labor and Working Conditions

Objectives:

- Establishing, maintaining and improving the worker-management relationship
- Promoting fair treatment and equal opportunity for workers, in compliance with national laws
- Protect workforce by addressing child labor and forced labor
- Promote safe working conditions and protect / promote the health of workers

Requirements:

- Establishing a Human Resources Policy consistent with the requirements of this Standard that informs employees of their rights under national labor and employment laws.
- Documenting & communicating to all employees' conditions and terms of employment.
- Respecting collective bargaining agreements with worker organizations and provide reasonable conditions and terms of employment that, at a minimum, comply with national law, and enable alternative means for worker expression of grievances where national law restricts worker organizations.
- Practicing non-discrimination and equal opportunity in making employment decisions.
- Providing a mechanism for workers to raise workplace concerns.

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- Protecting the workforce from forced labor and illegal or economically exploitative child labor.
- Providing workers with a safe and healthy work environment, taking into account risks inherent to the particular project sector.

Performance Standard 3: Resource Efficiency and Pollution Prevention

Objectives:

- Avoiding or minimizing adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- Promoting more sustainable use of resources, including energy and water.
- Reducing project-related GHG emissions.

Requirements:

- Taking consideration of ambient conditions and application of technically and financially feasible, resource efficiency and pollution prevention principles and techniques those are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment.
- Implementation of technically and financially feasible and cost effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities.
- Consideration of alternatives and implementing technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project.

Performance Standard 4: Community Health, Safety & Security

Objectives:

- Avoiding or minimizing the risks to, and impacts on, the health and safety of the local community over the project life cycle, from both routine and non-routine circumstances.
- Ensuring that the safeguarding of personnel and property is carried out in a legitimate

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manner that avoids or minimizes risks to the community's safety and security.

Requirements:

- Evaluating risks and impacts of the project on health & safety of the affected community during the project lifecycle and establish preventive/mitigation measures to reduce/minimize the impacts.
- Disclosing of action plans to affected community and the government agency.
- Designing, constructing, operating and decommissioning of Structural elements or components in accordance with good industrial practice to reduce impact on community health & safety.
- Minimizing of impacts on the health and safety of the community caused by natural hazards that could arise from the land use changes due to project activities.
- Preventing or minimizing the potentials for community exposure to communicable diseases during project activities.

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Objectives:

- Avoiding or minimizing involuntary resettlement whenever feasible by exploring alternative project designs.
- Mitigating adverse social and economic impacts by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and informed participation of those affected.
- Improving or at least restore livelihoods and living standards of displaced persons.
- Improving living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.

Requirements:

- Avoiding or at least minimizing involuntary resettlement by exploring alternative project designs balancing environmental, social and economic costs and benefits; and by

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acquiring land through negotiated Settlements.

- Compensating with adequate benefits for displaced person as per Performance Standard.
- Disclosing of all relevant information and consultation with affected persons and communities in decision making process related to resettlement.
- Establishing a grievance mechanism to record and resolve communities' concerns and grievances about the relocation and compensation.
- Resettlement planning and implementation of the displaced persons/communities.

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Objectives:

- 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

Requirements:

- The risks and impacts identification process as set out in Performance Standard 1 should be considered with regards to direct and indirect project-related impacts on biodiversity and ecosystems services and identify any significant residual impacts.
- Screening and assessing the risks and potential impacts on biodiversity and ecosystem services in the project area of influence, taking into account the following:
 - The location and scale of project activities, including those of associated facilities;
 - Its supply chains
 - The project's proximity to areas of known biodiversity
 - The types of technology that will be used.
- The ESIA or any follow-up Biodiversity/ecosystem services-related assessment should take into account the differing values attached to biodiversity and ecosystem services by Affected Communities.

Performance Standard 7: Indigenous Peoples

Objectives:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on informed consultation and participation with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

Requirements:

- Checking if there are Communities of Indigenous Peoples who are resident upon the lands affected by the project as well as those who are nomadic or who seasonally migrate over relatively short distances, and whose attachment to ancestral territories may be periodic or seasonal in nature.
- Identifying communities of Indigenous Peoples who do not live on the lands affected by the project, but who retain ties to those lands through traditional ownership and/or customary usage, including seasonal or cyclical use.
- Identifying communities of Indigenous Peoples who have lost collective attachment to lands and territories in the project area of influence, occurring within the concerned group members' lifetime, as a result of forced severance, conflict, involuntary resettlement programs by governments, dispossession from their lands, natural calamities or incorporation into an urban area but who retain ties to lands affected by a project.

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- Identifying groups of Indigenous Peoples who reside in mixed settlements, such that the Affected Indigenous Peoples only form one part of the more broadly defined community.
- Identifying communities of Indigenous Peoples with collective attachment to ancestral lands located in urban areas.

Performance Standard 8: Cultural Heritage

Objectives:

- 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.

Requirements:

- The screening phase of the risks and impacts identification process should identify the extent and complexity of potential cultural heritage risks and impacts in the project's area of influence.
- The screening phase of the risks and impacts identification process should identify the extent and complexity of potential cultural heritage risks and impacts in the project's area of influence.
- The assessment should generally address potential adverse impacts to cultural heritage and, where possible, opportunities for its enhancement.
- Data collection and other assessment studies should be undertaken to avoid, minimize, and mitigate potential project impacts to cultural heritage resources.
- Measures should be undertaken for the protection of already-disturbed cultural heritage that are different from measures for the protection of untouched cultural heritage.

2.4.2 ADB SAFEGUARD POLICY STATEMENT (SPS), 2009

ADB affirms that environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific. ADB's Strategy 2020 therefore, emphasizes assisting Developing Member Countries (DMCs) to pursue environmentally sustainable and inclusive economic growth. In addition, ADB is committed to ensuring the social and

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environmental sustainability of the projects it supports. In this context, the goal of ADB's Safeguard Policy Statement (SPS) is to promote the sustainability of project outcomes by protecting the environment and people from project's potential adverse impacts.

The objectives of ADB's safeguards are to:

- Avoid adverse impacts of projects on the environment and affected people, where possible;
- Minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

2.4.2.1 ENVIRONMENTAL SAFEGUARDS

The SPS includes explicit policy principles and requirements on:

- environmental assessment process
- biodiversity protection and natural resources management
- pollution prevention and abatement
- occupational and community health and safety

Environment Categorization

A proposed subproject is assigned one of the following categories depending on the significance of the potential environmental impacts and risks:

Category A: A proposed subproject project is classified as category A, if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

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Category B: A proposed subproject is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications are reviewed and subproject specific environment management plan is framed.

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed subproject is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the EIA or IEE should commensurate with the significance of the potential impacts and risks.

2.4.2.2 SOCIAL SAFEGUARDS

ADB Social Safeguard Policies updated in June 2009 has categorized social safeguard requirements into two; namely i) Safeguard Requirements 2: Involuntary Resettlement ii). Safeguard Requirement 3: Indigenous Peoples.

Involuntary Resettlement (IR) - The three important elements of the IR Policy are:

- Compensation to replace lost assets, livelihood, and income;
- Assistance for relocation, including provision of relocation sites with appropriate facilities and services; and
- Assistance for rehabilitation to achieve at least the same level of well-being with the project as without it.

IR Categorization

A proposed subproject is assigned one of the following categories depending on the significance of the probable involuntary resettlement impacts:

Category A: A proposed project is classified as category A, if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required. The involuntary resettlement impacts of an ADB-supported project are considered significant, if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating)

Category B: A proposed project is classified as category B, if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required.

Category C: A proposed project is classified as category C, if it has no involuntary resettlement impacts. No further action is required.

2.4.2.3 INDIGENOUS PEOPLE (IP)

For the development interventions it supports or assists, ADB will ensure that affected populations and persons are at least as well-off as they would have been in the absence of the intervention, or that adequate and appropriate compensation be provided. Policy implementation should ensure equality of opportunity for Indigenous Peoples to participate in decision making and benefit sharing. Implementation must also ensure that bank-financed interventions affecting Indigenous Peoples are:

- Consistent with the needs and aspirations of affected Indigenous Peoples;
- Compatible in substance and structure with affected Indigenous Peoples' identity, culture, and social and economic institutions;
- Conceived, planned, and implemented with the informed participation of affected communities;
- Equitable in terms of development efforts and impact; and
- Not imposing the negative effects of development on Indigenous Peoples without appropriate and acceptable compensation and their approval.

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Consultation with Indigenous Peoples is the key to developing an effective, accurate, responsive Indigenous Peoples Plan.

IP Categorization

A proposed project is assigned to one of the following categories depending on the significance of the potential impacts on Indigenous Peoples:

Category A: A proposed project is classified as category A if it is likely to have significant impacts on Indigenous Peoples. An Indigenous Peoples plan (IPP), including assessment of social impacts, is required.

Category B: A proposed project is classified as category B if it is likely to have limited impacts on Indigenous Peoples. An IPP, including assessment of social impacts, is required.

Category C: A proposed project is classified as category C if it is not expected to have impacts on Indigenous Peoples. No further action is required.

Based on the categorization as discussed above for social safeguards pertaining to involuntary resettlement and indigenous people a screening will be undertaken to assess the impacts on affected communities and Indigenous Peoples. To serve this purpose, the Project proponent is required to retain qualified and experienced experts to carry out a full social impact assessment (SIA), and if impacts on Indigenous Peoples are identified, the borrower/client will prepare a Resettlement Plan (RP) or Indigenous People Plan (IPP) in conjunction with the feasibility study (SIA).

Resettlement plan or Indigenous People Plan is to be prepared that is commensurate with the extent and degree of the impacts: the scope of physical and economic displacement and the vulnerability of the affected persons.

2.4.3 ADB SOCIAL PROTECTION REQUIREMENTS

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The Social Protection Strategy, 2001 spells out the scope of social protection and commitment of ADB to develop priority interventions in five major elements:

- Labor market policies and programs designed to generate employment, improve working conditions and promote the efficient operations;
- Social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury and old age;
- Social assistance and welfare service programs for the vulnerable groups with inadequate means of support, including single mothers, the homeless, or physically or mentally challenged people;
- Micro and area-based schemes to address vulnerability at the community level, including micro-insurance, agricultural insurance, social funds and programs to manage natural disasters; and
- Child protection to ensure the healthy and productive development of children.

Aarohi Solar Pvt. Ltd. shall comply with applicable labour laws in relation to its operations, and shall take the following measures to comply with the core labour standards:

- a) carry out its activities consistent with the intent of ensuring legally permissible equal opportunity, fair treatment and non-discrimination in relation to recruitment and hiring, compensation, working conditions and terms of employment for its workers (including prohibiting any form of discrimination against women during hiring and providing equal work for equal pay for men and women engaged by the Borrower);
- b) not restrict its workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment;
- c) engage contractors and other providers of goods and services:
 - i. Who do not employ child labour or forced labour;
 - ii. Who have appropriate management systems that will allow them to operate in a manner which is consistent with the intent of (A) ensuring legally permissible equal opportunity and fair treatment and non-discrimination for their workers, and (B) not restricting their workers from developing a legally permissible means of

- expressing their grievances and protecting their rights regarding working conditions and terms of employment; and
- iii. Whose subcontracts contain provisions which are consistent with paragraphs (i) and (ii) above.

2.4.4 THE EQUATOR PRINCIPLES 2013

Equator Principles have been collectively developed by world's leading financial institutions and lending agencies keeping an eye on the enviro-social risk attached to investments in any developmental project. These principles are an industry benchmark for determining, assessing and managing social and environmental risk in project financing designed in line with the UN Guidelines, IFC Performance Standard and the World Bank's guidelines. The institutions who have formally adopted these Principles are known as the Equator Principles Financial Institutions (EPFIs). The EPFIs have consequently adopted these Principles in order to ensure that the projects they finance are developed in a manner that is socially responsible and reflect sound environmental management practices. By doing so, negative impacts on project- affected ecosystems and communities should be avoided wherever possible, and if these impacts are unavoidable, they should be reduced, mitigated and/or compensated for appropriately. These Principles are intended to serve as a common baseline and framework for the implementation by each EFPI of its own internal social and environmental policies, procedures and standards related to its project financing activities. The version of the principles used for guidance in this ESMS is of 2013 which is in line with the IFC PS 2012.

CHAPTER-3: PROJECT DESCRIPTION

3.1 INTRODUCTION

Aarohi Solar Private Limited will set up Solar PV Power Plant of 50 MW capacity to be located in Village - Kalipi, District - Anantapur in Andhra Pradesh. A Power Purchase Agreement (PPA) entered between Southern Power Distribution Company of AP Limited (APSPDCL) and Aarohi Solar Private Limited (SPD) in this regard. APSPDCL will purchase the generated power from the said power plant of Aarohi Solar Private Limited for the period of 25 years from the date of commissioning of the plant

3.2 PROJECT LOCATION AND ACCESS

The proposed site is located in Village-Kalipi, District - Anantapur of Andhra Pradesh.

Anantapur district is one of the four districts of Rayalaseema Region and the largest among the 23 districts of Andhra Pradesh. The district is economically backward and chronically drought affected. The district has three revenue districts, 63 mandals and 932 revenue villages and 7 municipalities. The district lies between North latitudes 13° 40' and 16°15' and between East longitudes 70° 50' and 78° 38'. The district occupies the southern part of the State and is bounded on the north by Bellary district of Karnataka State and Anantapur district of Andhra Pradesh, on the East by Cuddapah and Chittoor districts of Andhra Pradesh and on the South and West by Karana state (Fig.1). The geographical area of the district is 19,197 sq.km with a population of 40.83 lakhs. The population density, which was 54 persons per sq.km during 1901, has risen to 213 persons per sq.km as per 2011 census.

Figure 3.1(a) presents the location map indicating the proposed project site

Figure 3.1 (b) represents 500 meter Google map showing the proposed project site.

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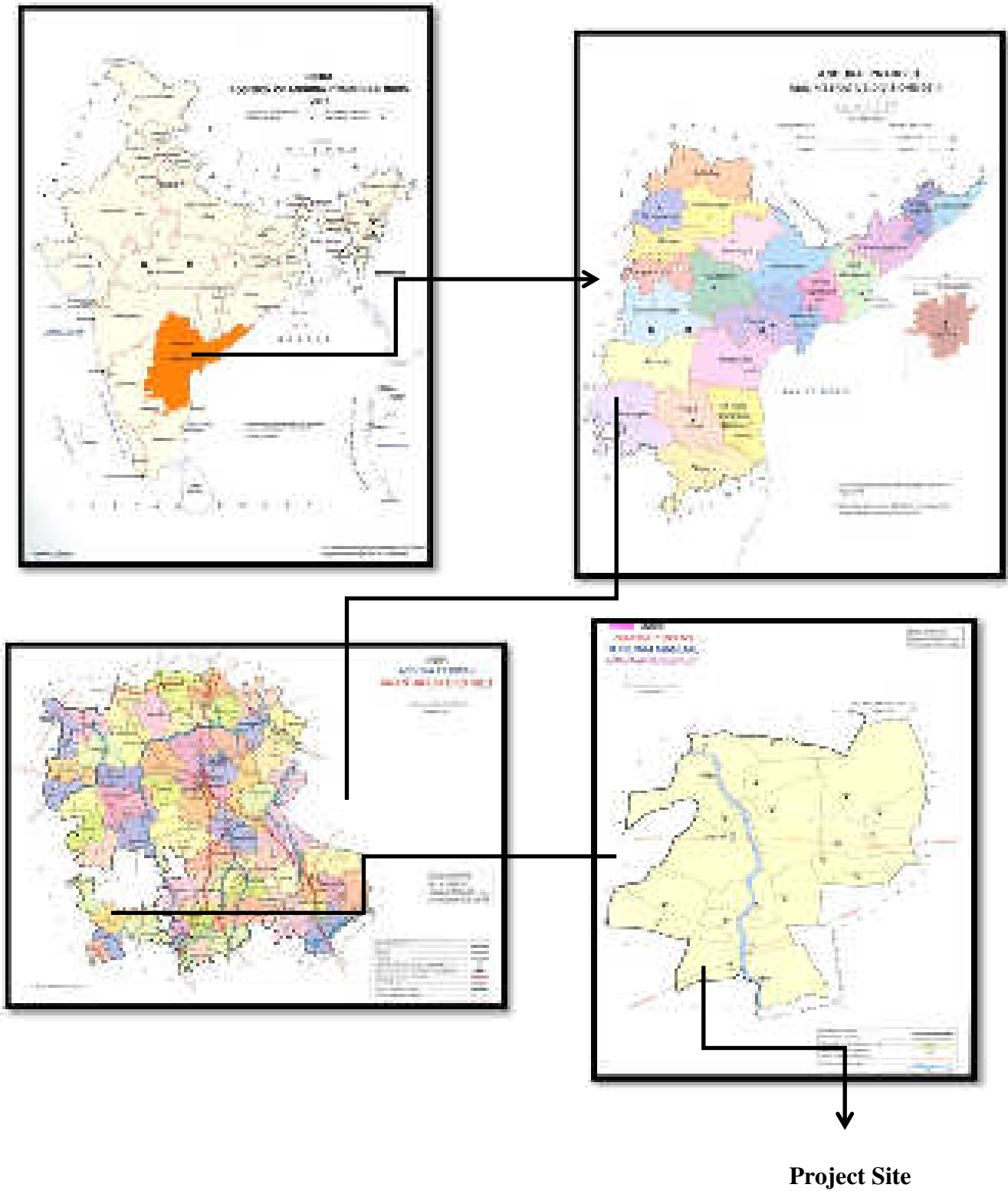
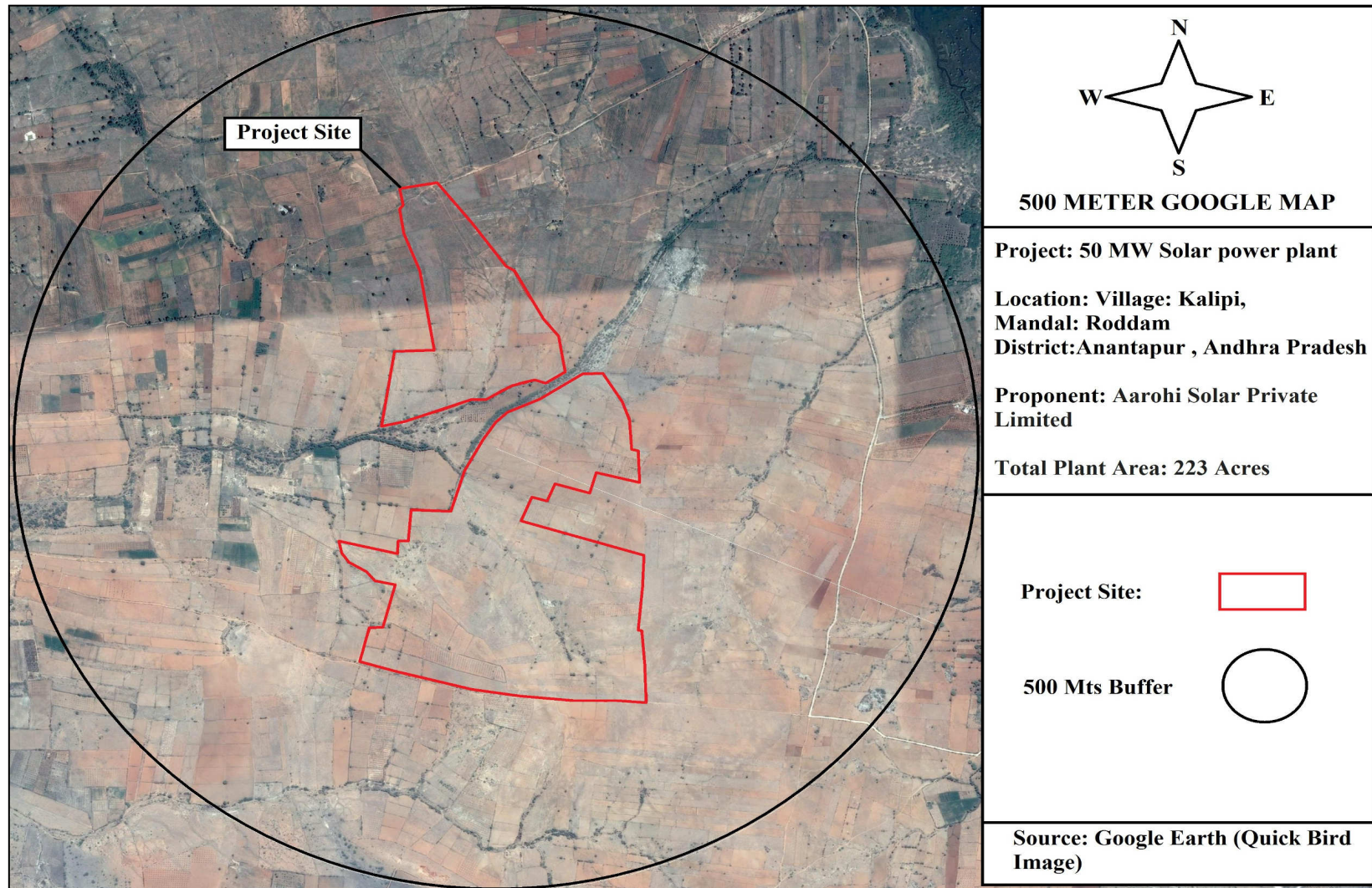


Figure-3.1(a): Location map of proposed site

Figure- 3.1(b): 500 m Google Map



3.3 BASIC REQUIREMENTS

3.3.1 Land

The land requirement for the proposed projects has been estimated at around 205 acres approximately which will be sufficient for 50 MW power plant based on Solar Photovoltaic Technology. Land will be required mainly for installation of modules, inverters, cable and control rooms for the proposed solar power plants including switchyard. The land requirement for the Project's Solar Power Plant depends basically upon the technology deployed i.e. Crystalline or Thin Film technology, conversion efficiency and solar radiation incident in the location. The technology deployed for this project is Poly Crystalline solar PV modules. The site development work has to be carried out on proposed location to make it suitable for installation of solar PV plant. The total cost of setting up of 50 MW (AC) Solar PV project and the related infrastructure has been estimated at Rs. 412 Crores (approx.) including IDC, pre-operative expenses, contingencies and margin money for working capital.

Table-3.1: Area Break up Details

Particulars	Area in Ha
PV module area	44.03
Balance of plant	0.52
Open area	45.5
Total Plant Area	90.09

3.3.2 Water

To maintain optimum efficiency, the plant will require cleaning during long dry spells. Water required for PV modules cleaning and for onsite staff consumption can be made available from River/Pond/Canal or ground source through multiple bore wells. With a cleaning schedule of twice a month, approximately 10,000 liters per day of water consumption is anticipated. The water requirement has been arrived based on the following assumptions:

Table 3.2: Break up of water requirement

Number of solar modules	351200
Area of individual module	1.23 sq.mt.
Water required to clean each module	1000 litres
Number of cycles	1 times per year
Total water requirement	3,650 m ³ /year
Total water required in KLD	10 KLD

3.3.3 Project cost

The total cost of setting up of 50 MW (AC) Solar PV project and the related infrastructure has been estimated at Rs. 412 Crores (approx.) including IDC, pre-operative expenses, contingencies and margin money for working capital.

3.4 WASTE WATER TREATMENT AND DISPOSAL SYSTEM

Waste water

Wastewater is any water that is contaminated by anthropogenic / industrial processes with solids, temperature, chemicals and other impurities. The effluent management scheme would essentially involve collection, treatment and recirculation / disposal of various effluents.

Since, water is used only for the cleaning purpose of solar PV modules to remove dust from it. The discharge water does not include any chemical or hazardous material. Water runoff / discharge from the panels is likely to get evaporate or absorbed into the arid ground below the panels, and no drainage canal is required.

3.5 POWER EVACUATION

Power from the plant shall be evacuated to 220/132/33kV Hindupur substation which is located at an aerial distance of approximately 14km from the Project site. The substation is owned and operated by Transmission Corporation of Andhra Pradesh Limited (A.P. TRANSCO).

Grid substation comprises of one transformer of 160MVA and two transformers of 100MVA for stepping down voltage from 220kV to 132kV level; and three transformers of 50MVA for

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stepping down the voltage from 132kV to 33kV level. The substation appears to have adequate space for additional bay construction to accommodate the Kalipi 50MW solar PV plant.

3.6 PROCESS OF POWER GENERATION

The proposed project is based on Solar Photo Voltaic technology using Poly Crystalline PV modules for power generation. Photovoltaic (PV) devices generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors. Electrons in these materials are freed by solar energy and can be induced to travel through an electrical circuit, powering electrical devices or sending electricity to the grid. Materials presently used for photovoltaic include monocrystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride, and copper indium selenide/sulfide.



3.7 LAYOUT

The selected location for the proposed SPV project of 50 MW capacity lie in the 'Composite' climatic zone of India. The instantaneous ambient temperature over the location reaches more than 40°C in summers; however the intensity of solar radiation is also very high enough. Hence the associated temperature losses are dominant over the crystalline technology at the location. From the assessment of current technical and

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commercial aspects of various commercially available solar PV technologies, considering the aspects of selected land type, meteorological study along with the annual behaviour of solar radiation, the Polycrystalline solar PV technology has been identified as the most feasible technology.

Table- 3.3: PV Module Technical Specifications

Type	SOLAR FRONTIER 165
Max. output, Pmax, at STC (Wp)	165
Maximum power voltage, Vmpp (Volts)	85.5
Maximum power current, Impp (A)	1.93
Open-circuit voltage, Voc (V)	110.0
Short-circuit current, Isc (A)	2.20
Length (mm)	1257
Width (mm)	977
Thickness (mm)	35
Weight (kg)	20

Table- 3.4: System Design Parameters

SYSTEM DESIGN PARAMETERS	
Module peak power (Wp)	165
Modules per string	8
Strings per inverter	865
Inverter Max Power, Pmax, at STC (kW)	1200
Inverter Maximum power voltage, Vmpp (Volts)	1100
Inverter Maximum power current, Impp (A)	1710

The DC electricity generated by the modules is converted to AC in the inverters. The design uses TBEA make 1000 KW transformer less inverters, as selected by the client. These are three phase inverters, which are clustered in groups of four for a single plot. Optimal operation of the considered inverters occurs below 50°C without any de-rating in Inverter power output. Due to the relatively high temperature conditions that may be encountered at the site, care should be taken that the inverters are shaded, well ventilated and situated sufficiently far enough apart to ensure that they do not take in the cooling air of the neighboring unit. The temperature data

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which has been accessed indicates that it is unlikely that the ambient temperature will often exceed 40°C; however provision for appropriate type of cooling system will be made.

A Seasonal type module mounting system of 3° (summer months) & 15° (winter months) inclination has been chosen for the PV plant. The mounting structures to be selected shall comply with the appropriate industrial standards and shall be capable of withstanding on-site loading and climatic conditions. Preference shall be given to locally fabricated structures of equivalent quality through competitive bidding. Material to be used shall be hot-dipped galvanised mild steel.

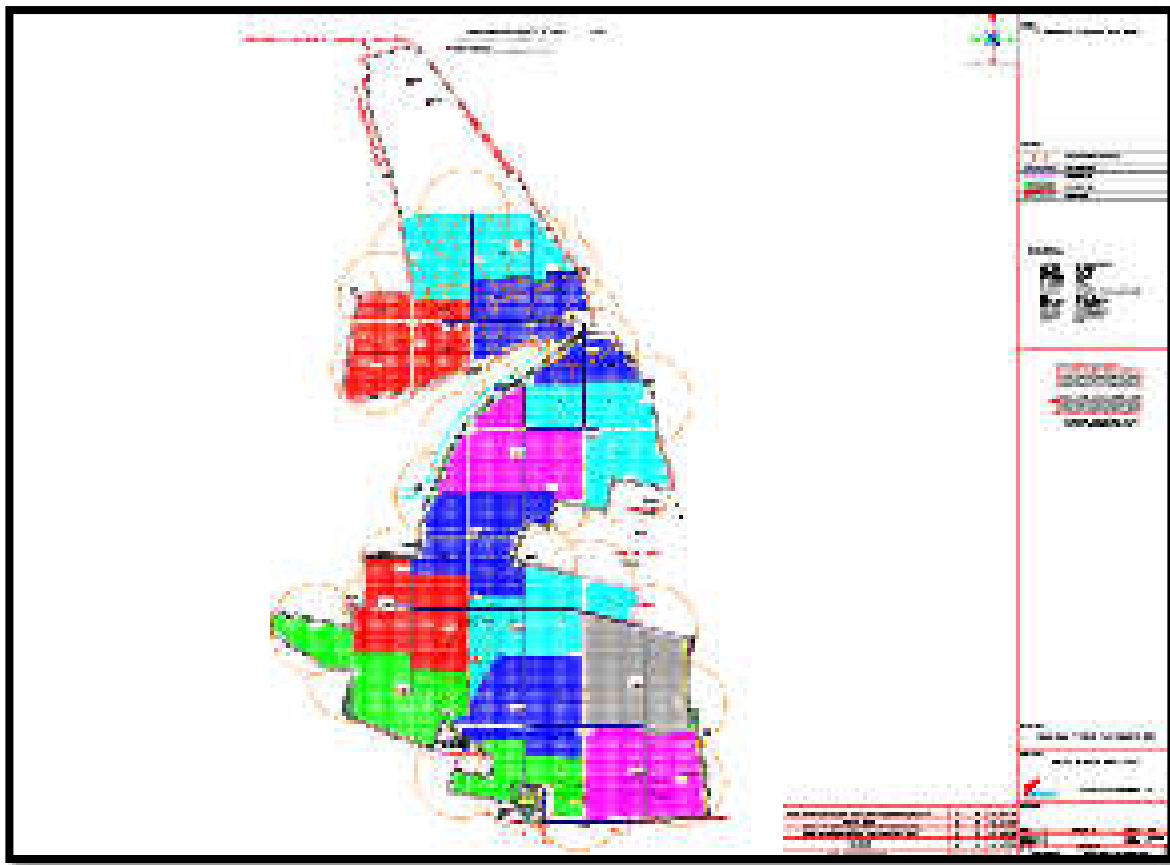


Figure-3.3: Layout plan of 50 MW solar PV plant at Hindupur

3.8 PLANT CONSTRUCTION AND IMPLEMENTATION

Project Implementation schedule

The scheduled date of the commissioning of the project is estimated at 15 months from the date of signing of PPA between Aarohi Solar Private Limited and Southern Power Distribution Company of AP Limited (APSPDCL).

Plant Operation and Maintenance

Operation and maintenance of PV plants is not very difficult but it is essential to optimise energy yield and maximise the life of the system and minimize degradation of PV modules.

Maintenance can be broken down as under:

- Scheduled or preventative maintenance – Planned in advance and aimed at preventing faults from occurring, as well as keeping the plant operating at its optimum level.
- Unscheduled maintenance – carried out in response to failures

Suitably thorough scheduled maintenance should minimize the requirement for unscheduled maintenance although, inevitably, some failure still occurs. A robust and well-planned approach to both scheduled and unscheduled maintenance is important.

Scheduled / Preventive Maintenance: The scheduled maintenance is dictated by a number of factors viz. technology selected, environmental conditions of the site, seasonal variances etc.

Although scheduled maintenance will both maximize production and prolong the life of the plant, it does represent a cost to the project. Therefore, they should be to seek the optimum balance between cost of scheduled maintenance and increased yield through the life of the system.

The Scheduled Maintenance includes the following activities:

- a) Module Cleaning – Contract labor depends upon the site location, weather patterns, availability of water & cleaning material, soiling lowering of soiling loss.

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b) Junction or String Combiner Box – periodic checking of the junction boxes and string combiner boxes for water ingress, dirt or dust accumulation and integrity of the connections to avoid corrosion & short circuit.

c) Inverter Servicing – Inverter faults are the most common cause of system downtime in PV power plants and therefore, the scheduled maintenance of inverters should be treated as a centrally important part of the O&M strategy. The preventive maintenance of inverters includes visual inspection, cleaning/replacing cooling fan filters, removal of dust from electronic components, tightening of any loose connections etc.

d) Other things included are structural integrity, balance of plant maintenance, vegetation controls etc. **Unscheduled Maintenance:** It is carried out in response of failures. The key parameter when considering unscheduled maintenance is diagnosis, speed of response and repair time. Although the shortest possible response is preferable for increasing energy yield, this should be balanced against the likely increased contractual costs of shorter response times.

3.9 POWER TRANSMISSION LINE

Power from the plant shall be evacuated to 220/132/33kV Hindupur substation which is located at an aerial distance of approximately 14km from the Project site. The substation is owned and operated by Transmission Corporation of Andhra Pradesh Limited (A.P. TRANSCO).

Grid substation comprises of one transformer of 160MVA and two transformers of 100MVA for stepping down voltage from 220kV to 132kV level; and three transformers of 50MVA for stepping down the voltage from 132kV to 33kV level. The substation appears to have adequate space for additional bay construction to accommodate the Kalipi 50MW solar PV plant.

3.9.1 Clearance from Ground, Building, Trees etc.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date.

3.9.2 Road crossing

At all important road crossings, the tower shall be fitted with double suspension and tension

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insulator strings depending on type of tower but the ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken in adjacent span, ground clearance of the conductor from the road surfaces will not be less than specified minimum ground clearance. At all national highways DD type towers with double tension insulator strings shall be used and crossing span will not be more than 250 meters. At all NH and SH crossings, crash barriers shall be employed for the safety of the towers.

3.9.3 Forest Clearance

During detailed engineering the forest/non forest areas involved if any shall be identified and authenticated by concerned authorities. Forest clearance as per the requirements of the state/MOEF&CC shall be obtained. However, preliminary survey shows that there is no forest land involved.

CHAPTER 4:- EXISTING ENVIRONMENTAL & SOCIAL CONDITION

4.1 GENERAL

Anantapur district lies between North latitude 13° 40' to 16° 15' and East Longitude 70° 50' to 78° 38'. The district is spread over an geographical area of 19,197 sq.km. The district has three revenue districts, 63 mandals and 932 revenue villages and 7 municipalities. The district occupies the southern part of the State and is bounded on the north by Bellary district of Karnataka State and Anantapur district of Andhra Pradesh, on the East by Cuddapah and Chittoor districts of Andhra Pradesh and on the South and West by Karana State. The population density, which was 54 persons per sq.km during 1901, has risen to 213 persons per sq.km as per 2011 census.

4.2 STUDY AREA

Study area is located around 10 Km as influence area and metrological data has been collected from secondary sources to analyze environmental condition of project area. Secondary data was collected from below mentioned websites as references:

1. <http://www.anantapur.ap.gov.in/login.apo>
2. <http://www.rd.ap.gov.in/>
3. <http://www.cgwb.gov.in/>
4. Detailed project report
5. Topographic map of Survey of India

4.3 TOPOGRAPHY

Anantapur district has an area of 19134 sq.kms and bounded by latitudes 13° - 40' and 15°- 13'and longitudes 76°-47'and 78°-26'. The district may be divided into three natural divisions.

They are:

1. Tadipatri, Guntakal, Gooty, Belaguppa, Rayadurga, Putlur, Yellanur, Yadiki, Uravakonda, Vajrakarur and Vidapanakal mandal are in northern side of the district and most of them are covered with black soil.
2. Anantapur, Kudair, Peddavadaguru, Pamidi, Dharmavaram, Tadimarri, Bathalapalli, Mudigubba, Chenne Kothapalli, Ramagiri, Kanaganapalli, Brahmasamudram, Kalyanadurg,

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Kambadur and Settur are in the central part of the district which is mainly made up of arid, poor red soils.

3. Hindupur, Lepakshi, Chilamathur, Parigi, Madakasira, Rolla, Agali, Amarapuram, Penugonda, Somandepalli, Roddam which belongs to south part of the district and connects with Mysore plateau at higher elevation. These lands are average sandy red soils.

4.4 GEOLOGY

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 Anantapur Group of rocks. Alluvium is restricted to Pennar, Vedavati and Papagni rivers. Older metamorphic sequences comprising biotite schist, hornblende, pyroxenite and amphibolites of Archean age and younger group of sedimentary rocks belonging to Proterozoic age, are the main geological formations of the area. The area shows an excellent example of the remnants of an ancient sea floor, in which limestones, shales, quartzites etc., had been deposited. Quaternary gravel is present as lensoidal bodies along the Penner river in the Southern and central parts. Proterozoic rocks cover part of Tadpartri Mandal and eastern part of Gooty and Anantapur Mandals, The rest of the district is covered by schists, gneisses, migmatites, younger granites, pegmatites, quartz veins and basic dykes that have been metamorphosed and recrystallised (except basic dykes). The schist belts viz, Ramagiri and Kadiri are gold bearing ones. Greenish black bouldery dolerites are seen for over several kilometers in the central part of the district in NW-SE, E-W and NE-SE directions. A number of quaternary gravel horizons located along the Penner river contain pebbles and cobbles of quartz, granite, dolerites found embedded in Clayey matrix. The general trend of foliation of Peninsular Gneissic Complex and Metamorphics is NNW-SSE with steep dips. Foliation along NNE-SSE and N-S trends are also observed to east and NE of Ramagiri (140 181: 770 501).

4.5 SOIL

76% of the soils in the district consist of red soil and 24% black soil. The soil can be classified as black clay, black loamy, black sand, red clay, red loamy and red sand. The soils of Anantapur originated from both the granite and granite-gneiss land forms, as well as the Dharwar

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landforms. Both these land forms are characterised by hills and ridges and undulating and gently-sloping lands. There are about thirty-four soil families in the district of Anantapur, and among these, the Anantapur and Penukonda soil families are the most predominant.

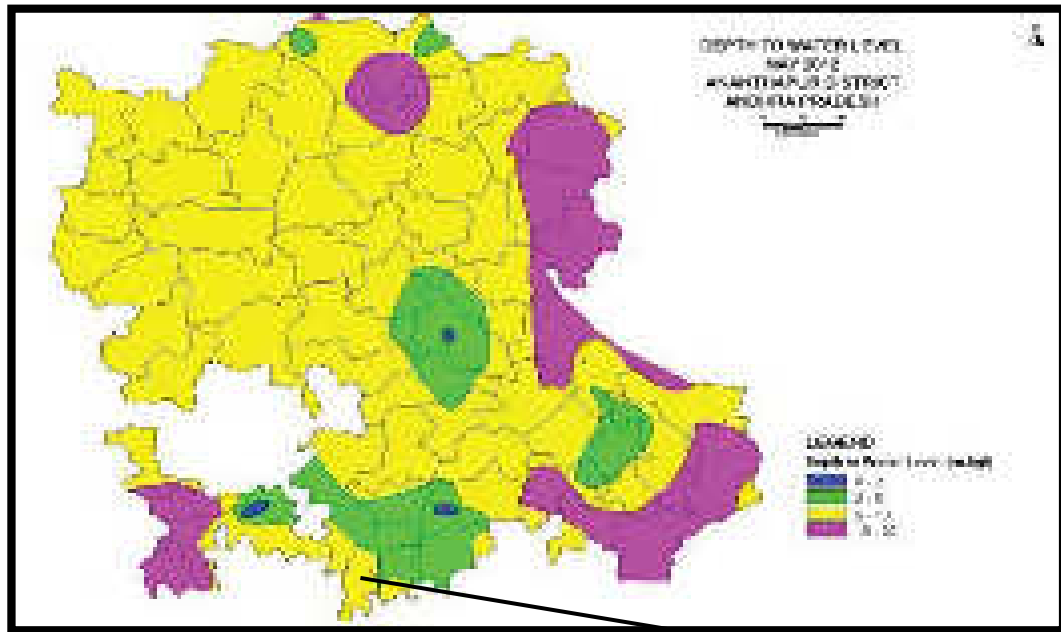
4.6 WATER QUALITY

The district is underlain by granite gneisses and schists of Archaean age and formation of Cuddapah Super Group belonging to upper Precambrian to lower Paleozoic Age. River alluvium occurs along the major river courses and to some extent along minor stream courses.

4.6.1 Depth to water level

4.6.1.1 Pre-monsoon

The depth to water level during pre-monsoon (2012) ranges from 0.65-11.97mbgl. 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.



Source:-Ground Water Brochure Anantapur District, Andhra Pradesh, CGWB

Project Site

Figure 4.1: Pre Monsoon Water Level (May 2012)

4.6.1.2 Post-monsoon

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..

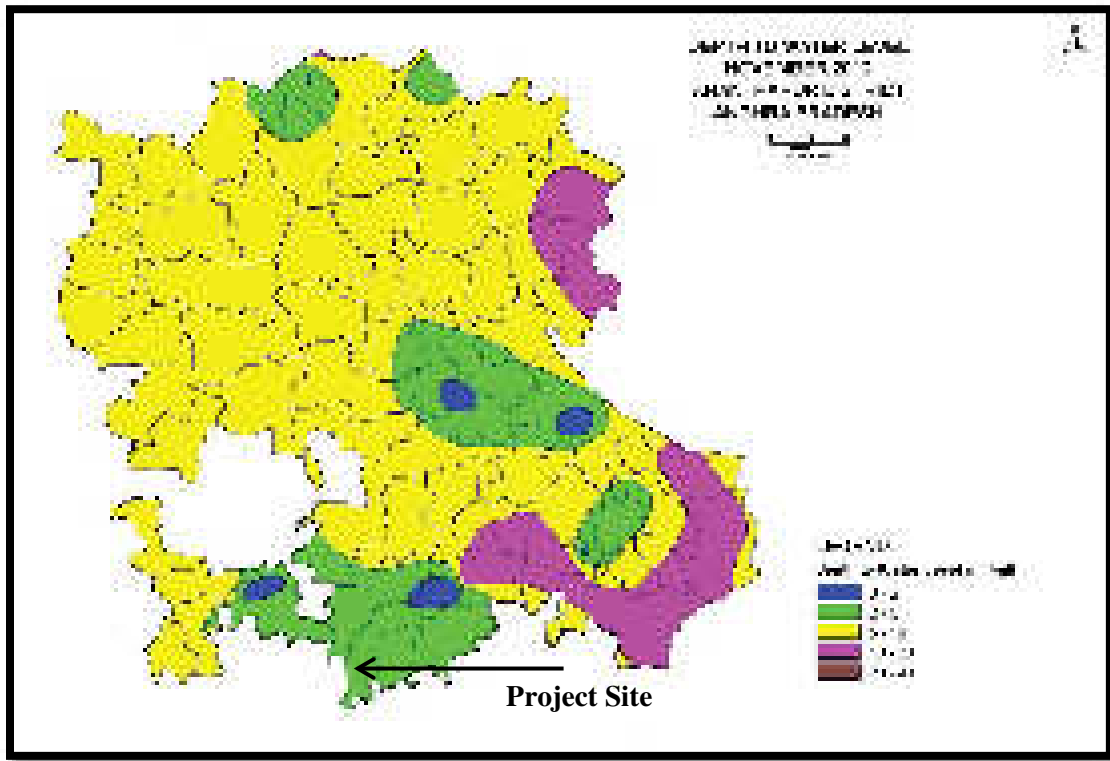
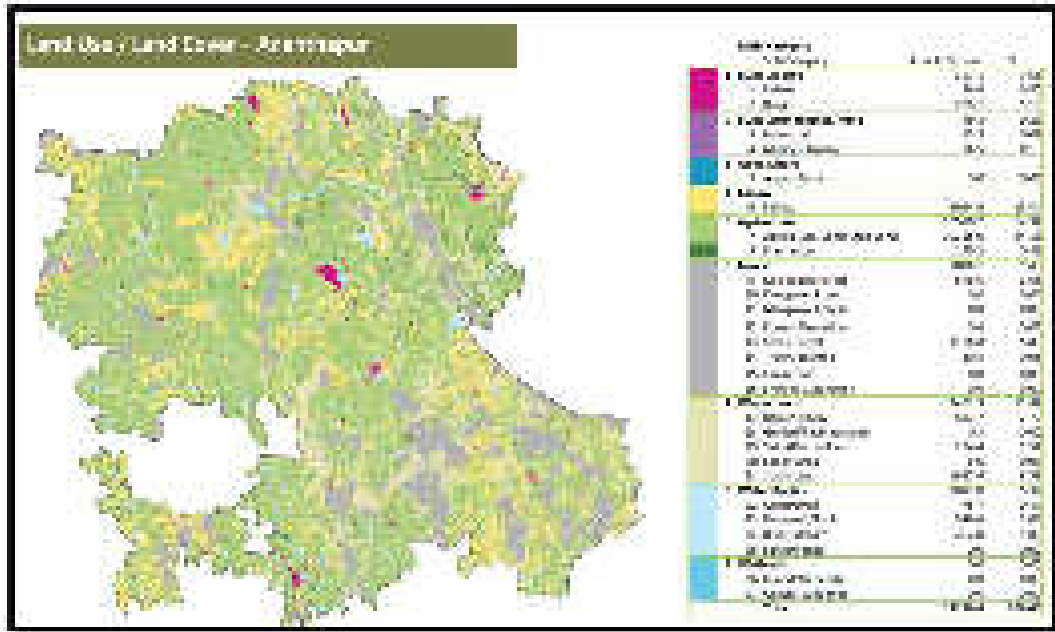


Figure 4.2:-Post Monsoon Water Level (November 2012)

Source:-Ground Water Brochure Anantapur District, Andhra Pradesh, CGWB

4.6.1.3 Water 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 southeastern part of the district. Less fluctuation is observed in the areas where the water levels were comparatively shallow during pre-monsoon.



Source: Andhra Pradesh State Remote Sensing Application Centre (2011-12)

Figure 4.4:- Land Use of Anantapur district

4.8 CLIMATE

The average annual rainfall of the district is 535 mm, which ranges from nil rainfall in February and March to 129 mm in September. September and October are the wettest months of the year. The mean seasonal rainfall distribution is 316 mm during southwest monsoon (June- September) 146 mm during northeast monsoon (Oct-Dec), 1 mm rainfall during winter (Jan-Feb) and 72 mm during summer (March-May). The percentage distribution of rainfall season wise is 58.7% in southwest monsoon, 27.6% in northeast monsoon, 0.21 percentages in winter and 13.5% in summer.

4.8.1 Microclimate

Microclimatic conditions of study area are presented in tabular form on average daily bases for one year.

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Table 4.1:- Jan 2015

2015 Jan	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	26	59	1008.37	3	0
2	26	60	1011	2	0
3	28	51	1012	2	0
4	26	63	1012.5	2	0
5	26	56	1012.63	3	0
6	26	54	1013.12	1	0
7	25	50	1012.5	1	0
8	25	54	1012.88	2	0
9	24	40	1014.88	1	0
10	22	34	1015.25	0	0
11	22	35	1015.5	1	0
12	21	44	1014.75	1	0
13	22	43	1013.75	1	0
14	23	42	1013.12	1	0
15	23	47	1013.5	1	0
16	24	50	1014.12	2	0
17	24	37	1014.25	1	0
18	23	43	1014	1	0
19	24	46	1013.75	3	0
20	24	56	1015	5	0
21	25	52	1016.88	4	0
22	24	51	1016.25	4	0
23	25	51	1013.87	4	0
24	25	50	1014.5	3	0
25	25	42	1015.5	3	0
26	24	50	1015.12	3	0
27	24	44	1013.5	4	0
28	24	51	1012.5	3	0
29	26	50	1012.63	3	0
30	26	50	1014.25	2	0
31	26	46	1014.5	1	0

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Table 4.2:- Feb 2015

2015 Feb	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	26	44	1014.37	3	0
2	25	47	1015.25	4	0
3	25	47	1017.37	4	0
4	25	41	1016.88	4	0
5	24	35	1014.87	2	0
6	26	35	1014.5	3	0
7	24	42	1013.63	3	0
8	26	42	1013.12	3	0
9	26	45	1013.38	5	0
10	25	44	1014.62	4	0
11	26	45	1013.5	3	0
12	26	44	1012.88	3	0
13	27	40	1011.63	2	0
14	28	34	1010.75	2	0
15	28	39	1010.5	2	0
16	28	40	1011.87	2	0
17	30	36	1011	1	0
18	29	34	1009.63	1	0
19	28	38	1010	4	0
20	27	41	1011.62	2	0
21	28	40	1012.12	3	0
22	27	34	1012.5	2	0
23	28	31	1012.75	2	0
24	28	27	1011.37	3	0
25	28	30	1009.75	4	0
26	28	32	1008.5	3	0
27	28	41	1008.37	3	0
28	30	53	1008.5	5	0

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Table 4.3:- March 2015

2015 Mar	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	28	65	1009.12	5	18
2	26	64	1011.62	1	0
3	28	48	1010.63	2	0
4	28	39	1010.12	2	0
5	30	53	1010.62	2	0
6	29	49	1011.87	4	0
7	29	51	1011.43	4	0
8	30	43	1011.62	4	0
9	30	41	1013.37	5	0
10	30	36	1013.5	4	0
11	28	21	1013.5	3	0
12	28	39	1013.5	2	0
13	28	41	1012.5	4	0
14	29	35	1012.37	4	0
15	30	43	1012	5	0
16	31	34	1012.25	4	0
17	30	31	1011.38	1	0
18	30	30	1009.12	1	0
19	30	27	1009.88	2	0
20	30	28	1011	2	0
21	30	30	1011.5	2	0
22	32	31	1010.5	2	0
23	32	34	1008.5	1	0
24	33	31	1007.5	2	0
25	32	32	1008.5	2	0
26	32	33	1010.75	3	0
27	30	36	1011.5	5	0
28	30	29	1009.88	2	0
29	32	34	1008	4	0
30	32	37	1008.25	3	0
31	32	42	1009.43	3	0

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Table 4.4:- April 2015

2015 Apr	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	32	36	1008.12	3	0
2	34	35	1006.63	4	0
3	34	25	1005	4	0
4	34	25	1003.37	3	0
5	34	28	1004.37	2	0
6	34	35	1004	2	0
7	34	32	1005	4	0
8	33	36	1007.12	5	0
9	32	38	1008	5	0
10	34	40	1008.37	6	0
11	32	50	1009.5	3	0
12	27	53	1012.25	4	0
13	28	47	1011.5	5	0
14	27	50	1010.25	4	1
15	28	53	1010.5	6	0.3
16	28	49	1011.88	4	0
17	30	44	1009.38	1	0
18	30	36	1006.87	3	0
19	32	33	1006.62	2	0
20	32	33	1008.25	2	0
21	32	38	1007.75	4	0
22	34	37	1006.37	3	0
23	34	36	1007.13	6	0.6
24	30	56	1008.63	7	0
25	32	41	1006.87	6	0
26	32	45	1007.88	2	0
27	32	46	1008.63	3	0
28	34	38	1007.38	1	0
29	35	30	1006	5	0
30	34	34	1007.12	6	0

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Table 4.5:- May 2015

2015 May	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	34	33	1006.25	7	0
2	35	32	1005.75	2	0
3	34	34	1006.5	6	0
4	34	35	1006.87	5	0
5	32	39	1006.62	3	0
6	34	33	1005.5	4	0
7	34	38	1006	3	0
8	34	32	1005.37	2	0
9	34	35	1003.83	1	0
10	34	29	1004.75	2	0
11	34	34	1005.5	2	0
12	32	35	1006	1	0
13	34	35	1005.37	4	0
14	34	35	1006.37	4	0
15	32	63	1007.5	3	41
16	29	63	1006	3	0
17	32	50	1003.63	1	0
18	33	43	1003.37	4	0
19	34	38	1003.5	5	0
20	35	41	1003.88	7	0
21	36	41	1003.5	8	0
22	35	39	1004.12	9	0
23	34	38	1004	13	0
24	34	33	1004.63	10	0
25	34	34	1005	14	0
26	36	33	1004.62	11	0
27	36	32	1003.63	10	0
28	34	35	1003.38	8	0
29	38	34	1002	3	0
30	34	40	1005.12	7	5
31	34	41	1003.75	6	0

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Table 4.6:- June 2015

2015	Temp.(°C)	Humidity (%)	Pressure (hPa)	Wind (km/h)	Precip. (mm)
Jun	avg	avg	avg	avg	Sum
1	29	56	1004.37	6	0.5
2	32	40	1004.5	8	0
3	33	34	1003.63	9	0
4	35	40	1003.75	6	0
5	32	46	1005.5	9	0
6	32	42	1004.5	3	0
7	32	44	1004	5	0
8	32	53	1005.62	4	49
9	29	58	1006.88	3	0.1
10	32	44	1004.63	8	0
11	32	42	1003.87	7	0.7
12	31	53	1005	7	0
13	32	52	1003.75	6	2
14	30	53	1003.62	6	0.6
15	30	53	1003.75	8	0
16	29	52	1003.37	11	0
17	30	49	1001.75	12	4
18	28	60	1002.5	12	0.5
19	28	65	1002.38	8	1
20	28	57	1001.25	10	0
21	28	59	1001.12	10	0.1
22	30	45	1002.29	14	0
23	32	45	1002.62	13	0
24	32	47	1004.25	15	0
25	31	46	1004	18	0
26	31	50	1003.38	15	0
27	32	44	1003.75	11	0
28	32	45	1005.75	12	0
29	32	47	1007	9	2
30	32	43	1006.88	8	0

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Table 4.7:- July 2015

2015 Jul	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	30	47	1007.5	10	0
2	30	49	1007.37	8	0.7
3	31	44	1007.12	7	0
4	33	35	1006.38	11	0
5	32	33	1005.14	14	0
6	32	36	1004.5	15	0
7	32	43	1003.88	12	0
8	32	48	1004.63	14	0
9	32	52	1005	13	0.7
10	31	52	1002.75	10	2
11	30	49	1003.62	12	0
12	32	43	1004.37	11	0
13	32	44	1004.12	9	0
14	32	52	1003.25	10	11
15	28	63	1002.75	3	0
16	31	47	1001.25	10	0
17	30	55	1001.75	11	0.7
18	31	49	1002.63	11	0
19	31	47	1002.75	11	0
20	30	48	1001.75	11	0.6
21	31	50	1002	9	24
22	29	55	1003.62	6	3
23	30	57	1004.5	7	0
24	30	47	1006	7	0
25	30	55	1005.62	9	1
26	30	53	1006.13	9	0
27	30	54	1007.13	6	6
28	30	50	1007.5	10	5
29	30	45	1006.75	9	0.2
30	30	50	1006.88	8	0.3
31	30	62	1007.13	9	11

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Table 4.8:- Aug 2015

2015 Aug	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	29	56	1007.75	7	0.3
2	30	48	1007.25	8	0
3	30	49	1005.88	7	0
4	30	49	1004.75	12	0
5	30	60	1005.12	8	3
6	28	63	1004.25	8	1
7	30	62	1004.5	10	1
8	29	57	1004.5	7	0
9	30	49	1002.75	8	0
10	30	51	1002.5	7	0
11	30	52	1004.38	10	0
12	28	64	1005.5	7	0
13	29	61	1005.12	8	0
14	30	47	1004.87	8	0
15	31	46	1005.88	8	10
16	28	61	1007.75	7	0
17	30	50	1006.5	5	0
18	32	59	1007	3	3
19	32	49	1007.13	3	0.3
20	28	74	1008.88	4	29
21	28	74	1008.5	2	0
22	29	64	1007	4	3
23	28	59	1006.5	3	0
24	30	50	1007.5	8	0
25	30	55	1006.75	6	6
26	29	65	1005.5	5	0.8
27	30	59	1004.75	6	0
28	30	50	1005.5	10	0
29	29	59	1005.88	8	0.3
30	29	58	1006.5	6	0
31	30	50	1007.5	7	0

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Table 4.9:- Sept 2015

2015 Sep	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	30	49	1006.63	5	0
2	30	45	1005.87	3	0
3	31	45	1006.5	5	0
4	32	55	1008.75	4	25
5	30	62	1010.12	1	0
6	30	69	1009.13	1	18
7	28	66	1009.5	3	0
8	26	74	1008.75	2	1
9	26	77	1008.62	2	6
10	26	80	1008.5	1	27
11	26	76	1007.5	2	19
12	26	69	1008	3	0
13	28	59	1007.63	4	2
14	28	65	1006.63	5	0.1
15	28	70	1005.12	5	0
16	28	70	1003.25	6	0
17	28	73	1002.75	8	3
18	29	66	1003.37	4	4
19	28	65	1004.5	4	0
20	29	58	1004.88	4	0
21	28	55	1006	4	0
22	29	56	1007	2	0
23	30	56	1008.5	2	0
24	31	53	1007	1	0
25	31	60	1005.88	2	1
26	28	74	1007.63	3	0.9
27	30	69	1007	0	0.8
28	29	55	1006.63	1	0
29	30	62	1006.75	1	8
30	28	64	1008.87	1	5

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Table 4.10:- Oct 2015

2015 Oct	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	28	70	1009.62	2	0
2	28	68	1010.5	1	0.2
3	28	67	1010.12	4	0
4	28	73	1010.12	3	28
5	28	76	1009.25	2	1
6	28	66	1007.75	1	0
7	29	57	1007.63	1	0
8	28	58	1008.12	0	0
9	30	54	1007.38	2	0
10	30	54	1008.25	2	0
11	30	58	1010.12	3	0
12	32	55	1010.25	2	0
13	30	49	1010.25	1	0
14	30	43	1010.37	1	0
15	30	42	1009.88	2	0
16	30	48	1010.5	1	0
17	30	52	1011.12	2	0
18	30	51	1012.12	1	0
19	30	48	1011.25	1	0
20	30	46	1009.75	1	0
21	30	42	1009.25	2	0
22	30	43	1010	1	0
23	29	39	1010.25	1	0
24	28	42	1009.88	2	0
25	28	44	1011.5	2	0
26	28	46	1012	2	0
27	28	39	1011.5	2	0
28	28	53	1010.88	1	0.2
29	30	53	1010.12	2	0
30	30	49	1009.38	1	0
31	29	51	1009.12	2	0

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Table 4. 11:- Nov 2015

2015 Nov	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	28	49	1010	1	0
2	28	51	1011.12	1	0
3	30	63	1011.12	1	5
4	29	52	1010.88	1	0
5	30	49	1010.62	2	0
6	29	46	1009.75	2	0
7	28	45	1010.37	4	0
8	28	46	1011.25	3	0
9	26	49	1010.5	3	0
10	26	54	1009	5	0
11	28	48	1010.13	3	0
12	28	50	1012	1	0
13	27	46	1012.75	2	0
14	26	45	1010.75	1	0
15	26	46	1009.88	1	0
16	22	70	1010	0	3
17	25	68	1009.37	3	0
18	26	61	1010.25	4	0
19	26	64	1010.88	3	0
20	27	63	1011	4	8
21	26	70	1011.37	1	0
22	27	62	1010.88	3	0
23	27	58	1011.75	3	0
24	28	56	1011.75	3	0
25	26	55	1011.75	1	0
26	26	52	1011.5	2	0
27	27	53	1010.25	1	0
28	26	50	1012.62	2	0
29	26	50	1013.5	4	8
30	26	79	1014	0	5

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Table 4.12:- Dec 2015

2015 Dec	Temp.(°C) avg	Humidity (%) avg	Pressure (hPa) avg	Wind (km/h) avg	Precip. (mm) Sum
1	26	70	1012.25	2	0
2	27	69	1012.88	3	2
3	26	55	1012.37	1	0
4	26	51	1012	1	0
5	26	47	1012.12	2	0
6	26	46	1013	2	0
7	26	51	1013.5	1	0
8	26	49	1013.88	1	0
9	26	51	1013.63	2	0
10	26	58	1012.88	2	0
11	28	56	1010.88	2	0
12	29	55	1009.37	2	0
13	28	50	1010	1	0
14	28	45	1011.12	2	0
15	26	48	1011.25	2	0
16	26	49	1011.88	1	0
17	26	54	1011.37	2	0
18	26	51	1012.5	2	0
19	26	53	1014.25	1	0
20	27	52	1013.63	2	0
21	28	51	1013.12	2	0
22	27	47	1014.12	1	0
23	27	50	1014	1	0
24	27	50	1013.38	1	0
25	26	37	1014.5	2	0
26	24	30	1015.62	3	0
27	25	40	1016.37	2	0
28	25	48	1017.75	2	0
29	25	43	1016.12	0	0
30	26	42	1014.62	0	0
31	25	47	1015.5	1	0

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4.8.2 Wind Direction

Wind rose diagram for seasonal data has been prepared on the basis of hourly wind speed and direction data. The following wind rose was prepared to study wind pattern of study area –

1. Summer season (March to May)
2. Post Monsoon (Oct to Dec)
3. Winter (Dec to Feb)
4. Monsoon (July to Sep)

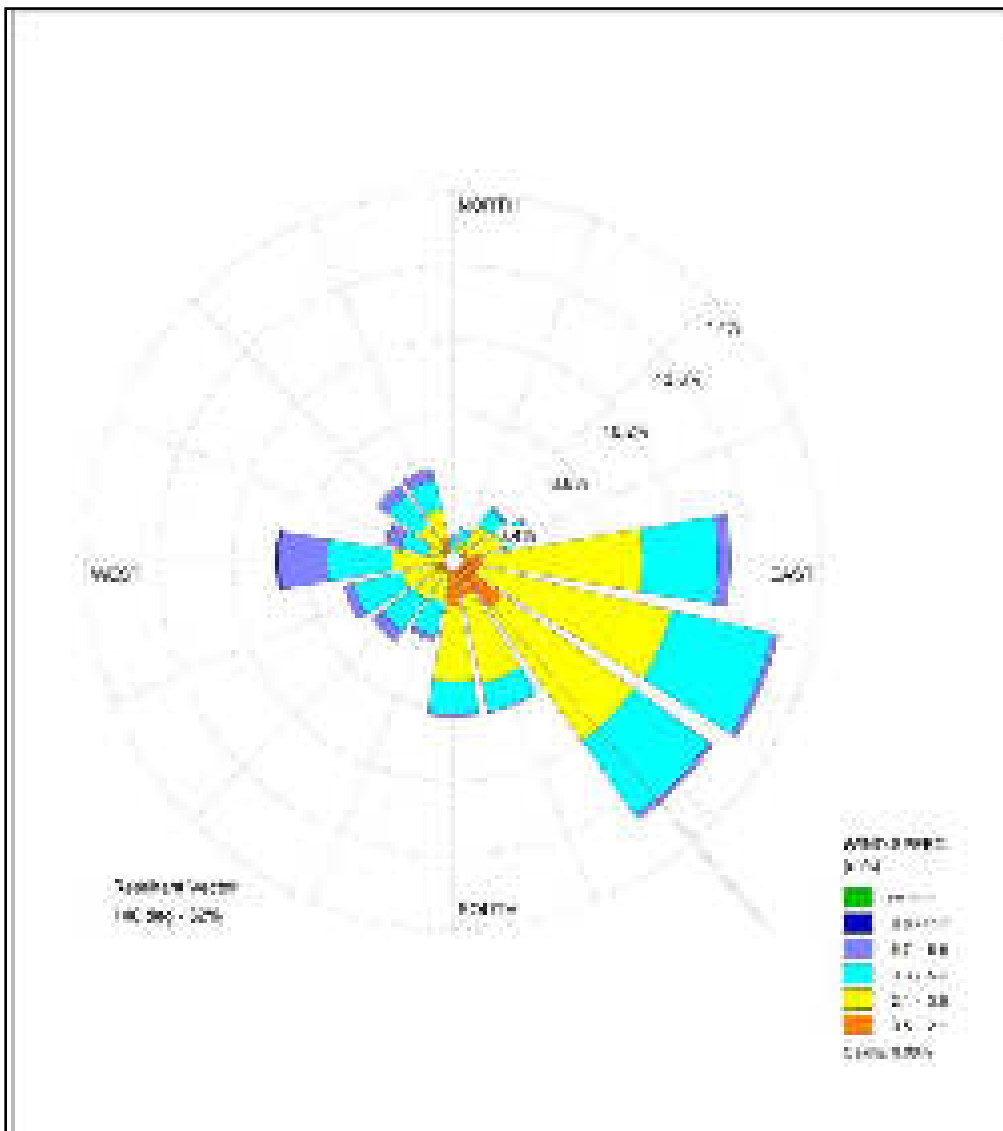


Figure 4.5:-Wind Rose Diagram Summer Season(March to May)

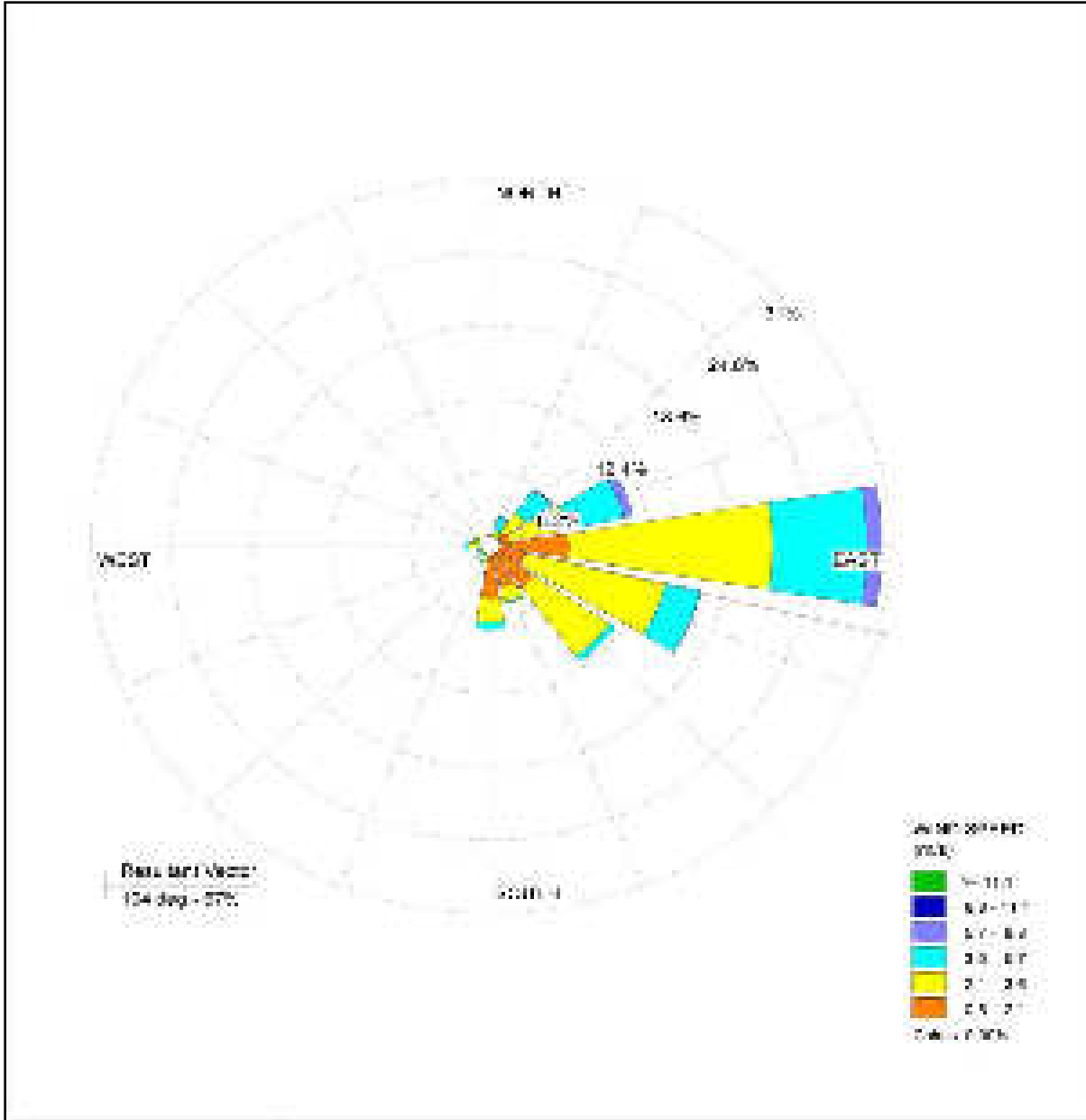


Figure 4.6:-Wind Rose Diagram Post Monsoon(October to December)

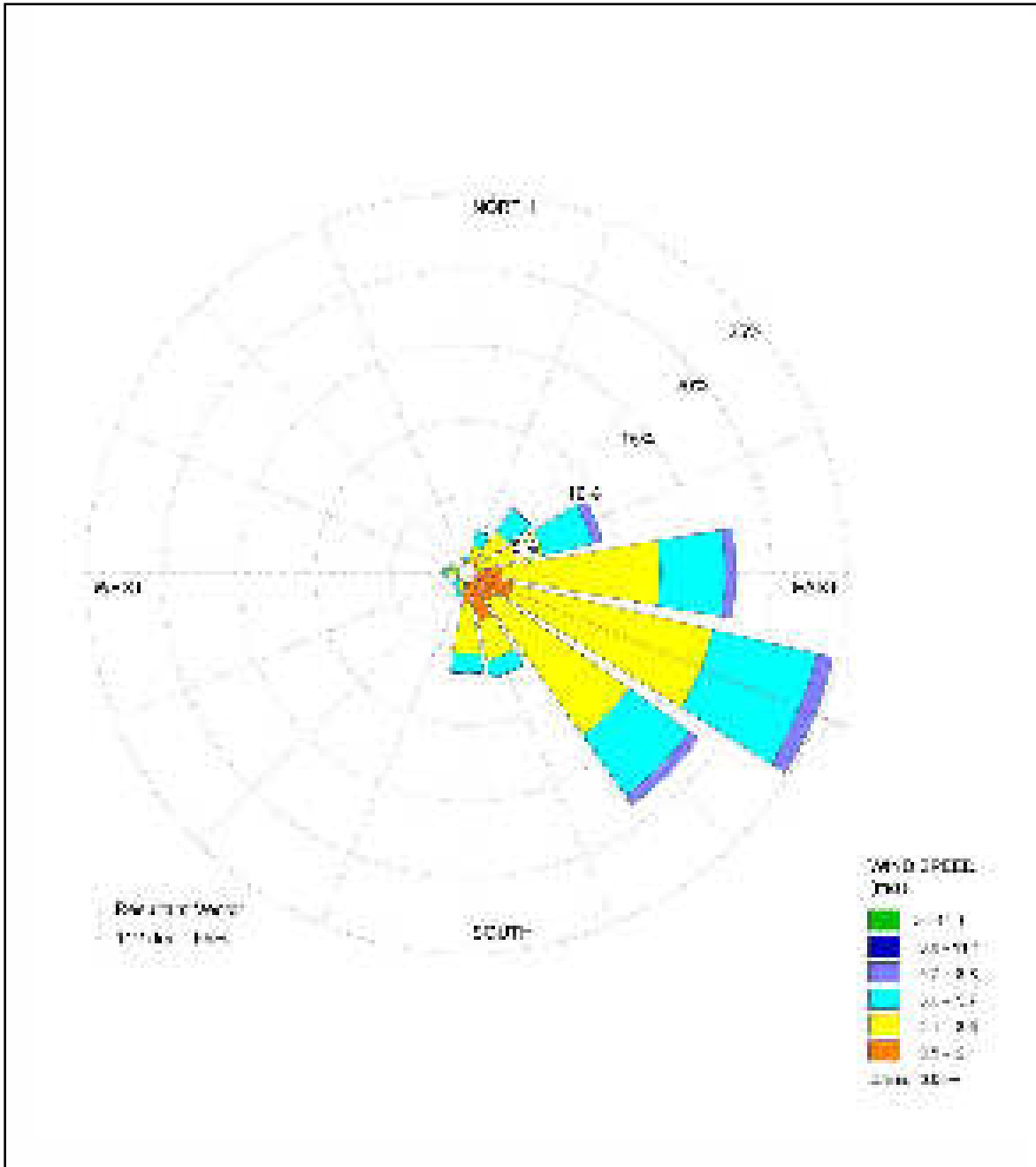


Figure 4.7:-Wind Rose Diagram Winter Season (December to February)

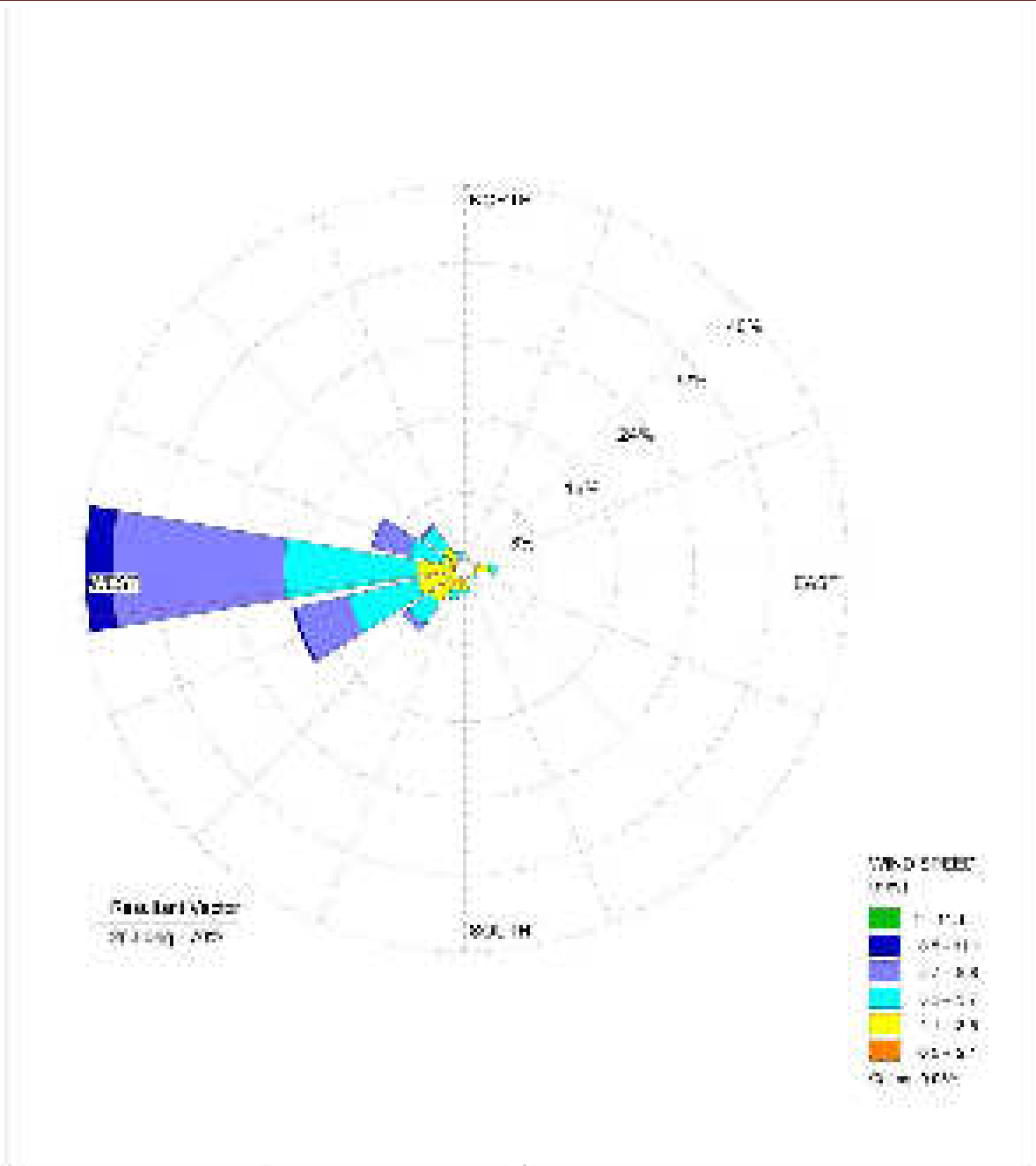


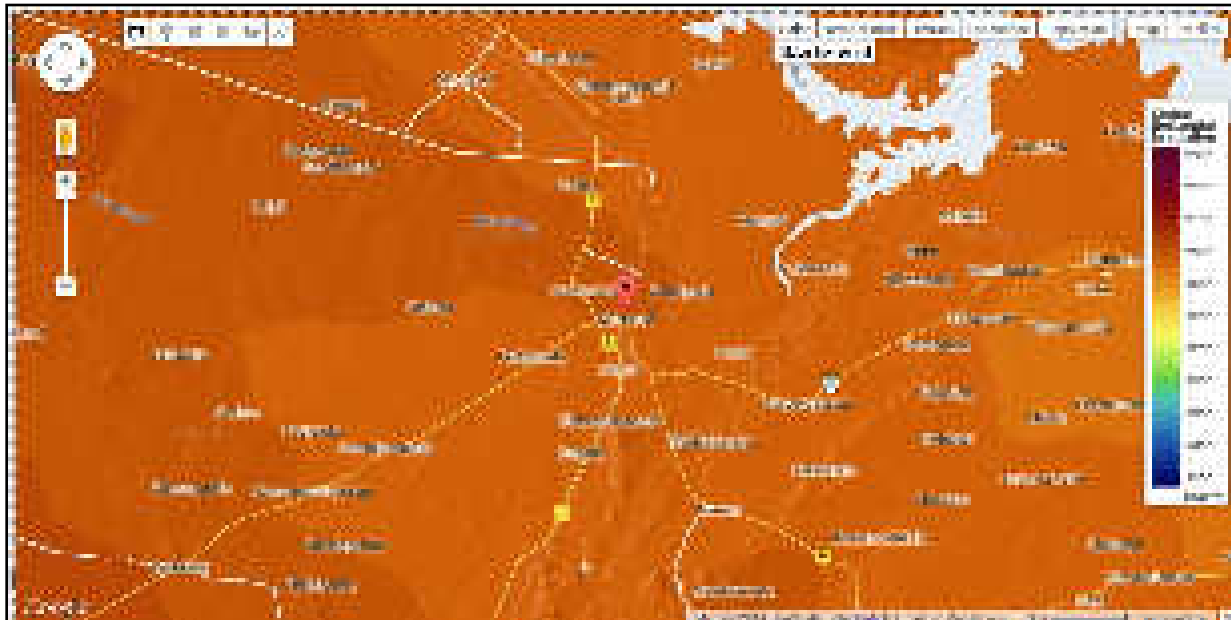
Figure 4.8:-Wind Rose Diagram during Monsoon (June to September)

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4.8.3 Solar Resource in Andhra Pradesh

Solar resource in the Andhra Pradesh is in the range of 5.0 - 6.0 kWh/m²/Day and the state is blessed with approx 300 sunny days. Most part of the state falls under 'composite' climatic zones⁴ of India hence received good annual solar radiation along with the extreme climatic conditions across the year.

Availability of the ground (measured) solar radiation is only for few locations of the state. The proposed Village - Kalipi , District - Anantapur in Andhra Pradesh is having an average Global Horizontal Irradiation of 5.45 kWh/m²/day as per Solar GIS. Comparison of various resources is done and Solar GIS dataset is used for energy yield estimation as the uncertainty level is low in this dataset and it matches with the 1 year ground data. estimation as the uncertainty level is low in this dataset and it matches with the 1 year ground data.



Source:- GHI – Global Horizontal Irradiation, DHI – Diffused Horizontal Irradiation, Source: <http://www.solargis.info/>

Figure 4.9: Global Horizontal Irradiation over Andhra Pradesh

Solar GIS Data

Solar GIS is a geographical information system which integrates solar resource and meteorological data and provides monthly average values for the location on 10 years basis; it also provides TMY files of Solar & Climatic parameters, the data is calculated using in-house developed algorithms that process satellite imagery and atmospheric and geographical inputs.

4.9:- TERRESTRIAL ECOLOGY

The study area mostly falls under waste land. Main agricultural crops and fauna within Anantapur district are summarized below –

Major Field crop cultivated –

1. Bengalgram
2. Chillies
3. Brinjal
4. Groundnut
5. Sunflower
6. Rice
7. Sorghum
8. Redgram
9. Cotton
10. Castor

Major horticultural fruits in the district are Mango, Banana, and Orange. Major horticultural flower crop jasmine and crossandra, including spice crop Coriander and turmeric.

Livestock found in Anantapur district (Fauna) –

Mainly graded buffaloes, goat, sheep and pig found in study area.

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4.10:-BASELINE SOCIOECONOMIC STATUS

In this study demography, occupational pattern, land holding, literacy rate and other important socio-economic indicators of study area are summarized here as per surveyed and government data.

The study village Kalipi is within Roddam subdistrict of Anantapur district of Andhra Pradesh. The number of households and total population of village Kalipi are 984 & 4271 individuals. The percentage gender difference nil in Kalipi village. Village Kalipi was having 2133 individuals' number of children. The schedule tribe was absent in Kalipi village. The percentage of literates was 53 % in kalipi. The total workers and main workers were 2309 and 1326 individuals. Main occupations practiced are cultivation and agricultural labour. The marginal workers are very high in compare to district, subdistrict and state. (Refer Table 1.1 for further census details).

As Religious worship in January month a festival known as the “Neelakanteshwara Swamy Rathothsava” is celebrated. This is one of the biggest cart festivals in Andhra Pradesh. Some temples are the Venkata sai temple, Hanuman Temple, Thayammavva Temple, etc.

Table -4.13: Census details of state, district and Villages

Name	State :ANDHRA PRADESH	District: Anantapur	Subdistrict: Roddam	Village: Kalipi
Number of Household	21022588	968160	11536	984
Total Population	84580777	4081148	51168	4271
Male	42442146 (50)	2064495 (51)	25889(51)	2138 (50)
Female	42138631(50)	2016653 (49)	25279 (49)	2133 (50)
Children's	9142802 (11)	445956 (11)	5161(10)	412 (10)
Schedule Caste	13878078 (16)	583135 (14)	9923 (19)	856 (20)
Schedule Tribe	5918073 (7)	154127 (4)	542 (1)	0 (0)
Literate	50556760 (60)	2310960 (57)	27255 (53)	2273 (53)
Illiterate	34024017 (40)	1770188 (43)	23913 (47)	1998 (47)
Total Worker	39422906 (47)	2036166 (50)	28952 (57)	2309 (54)

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Name	State :ANDHRA PRADESH	District: Anantapur	Subdistrict: Roddam	Village: Kalipi
#Main Worker	33037378 (84)	1679655 (82)	22111(76)	1326 (57)
*Main Cultivator	6087607 (18)	377298 (22)	7242 (33)	589 (44)
*Main Ag labour	13201989 (40)	653162 (39)	10444 (47)	510 (38)
*Main Household worker	1164314 (4)	87104 (5)	889 (4)	65 (5)
*Main Other worker	12583468 (38)	562091(33)	3536 (16)	162 (12)
#Marginal Worker	6385528 (16)	356511 (18)	6841 (24)	983 (43)
Total Non-Worker	45157871 (53)	2044982 (50)	22216 (43)	1962 (46)

Source: Census of India 2011

*Figures in parenthesis represent percent value * percentage of main worker & # percentage of total worker*

CHAPTER- 5: ANALYSIS OF ALTERNATIVES

Setting up of a solar power project involves selection of environmentally and techno-economically suitable site, land characteristics, meteorology, infrastructure, grid availability, water availability, rail and road connectivity, accessibility and shading aspects etc. Before selecting the database the comprehensive review of the measured data of Indian meteorological Department (IMD) for similar and nearby locations of Puchakayla Nada village have been studied and compared.

With or Without Project

As on 31st January 2015, the installed electricity production capacity of India stands at 258701.45 MW and it is planned to almost double this capacity by the end of the 12th five year plan (2017). With a targeted GDP growth rate of 8-9%, the energy growth rate is expected to rise at 5.5-6.5% annually.

Electricity consumption in India steadily increased from 1995 to 2010, driven by high economic growth. Although India's generation and distribution capacity has grown significantly over the last decade, many parts of the country continue to suffer power shortages both in terms of unmet demand during peak periods and an overall energy shortage. Also, under the Electricity Act, 2003, the State Electricity Regulatory Commissions (SERCs) set targets for distribution companies to purchase certain percentage of their total power requirement from renewable energy sources.. This project will help on achieving both the demand-supply gap in energy requirement and RPO requirement.

Alternative Fuel

The only viable generating options for energy production to meet the supply-demand gap in western region are fossil fuel energy. There are a number of issues associated with generation of electricity through fossil fuels like climate change, GHG emissions etc. Which are not environment supporting. Renewable and non-conventional energy resources appear to be alternatives to conventional resources as there are no harmful emissions to the environment. Solar energy is the most readily available source of non-polluting renewable energy and more or less uniformly distributed over all tropical and sub-tropical regions of the earth.

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India is already facing huge short fall in fulfilling the coal requirement for already existing thermal power plant. So, it is imperative to look for alternatives to fossil fuel based power generation to achieve long term power solution of the country.

Site Assessment

Site assessment involves the viability of the project location based on the geographical location of the site, road and rail connectivity, water availability, local resources, power availability, area availability, distance from the Grid substation etc. which are crucial while selection of the project site apart from the solar resource availability at the site as it impacts the overall cost involved and the financial viability of the project.

CHAPTER 6. ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

6.1 INTRODUCTION

The proposed project may have impact on the environment during construction & operation phases. During the construction phase, the impacts may be regarded as temporary or short-term; while long term impacts may be observed during the operation stage. Spatially the impacts have been assessed over the study area of 6 km radius of the project site.

The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of Solar PV power. It will certainly meet the ever increasing Demand of Power and to bridge the Gap between Demand and Supply of Power and renewable energy can be one of the solution for this purpose. Renewable and non-conventional energy resources appear to be alternatives to conventional resources as there are no harmful emissions to the environment. Solar energy is the most readily available source of non-polluting renewable energy and more or less uniformly distributed over all tropical and sub-tropical regions of the earth.

6.2 POTENTIAL IMPACT GENERATION ACTIVITIES

The construction and operation phase of the proposed project comprises various activities each of which may have an impact on environmental parameters. The impacts of the project are envisaged during the design and planning, during pre-construction phase, construction phase.

During the construction phase, the following activities may have impacts on environment:

- Site preparation
- Minor excavation and leveling
- Hauling of earth materials and wastes
- Cutting and drilling
- Erection of concrete and steel structures
- Road construction
- Painting and finishing
- Clean up operations
- Landscaping and afforestation

The activities can be divided into two categories, viz. sub-structural and super-structural work. Moreover, construction work will involve cutting of trenches, excavation, concreting etc. All these activities attribute to dust pollution. The super-structural work will involve steel work, concrete work, masonry work etc. and will involve operation of large construction equipment like cranes, concrete mixers, hoists, welding sets etc. There may be emission of dust and gases as well as noise pollution from these activities.

Mechanical erection work involves extensive use of mechanical equipment for storage, transportation, erection and on-site fabrication work. These activities may generate some air contaminants and noise pollution. The electrical activities are less polluting in general.

6.3 IMPACTS DURING PLANNING AND DESIGN PHASE

The potential adverse environment impacts associated with transmission lines have been avoided or minimised through careful route selection. The alignment is sited away from major settlements, whenever possible, to account for future urban expansion. Forests areas and vegetation areas are avoided. Alignment in this project has avoided geologically unstable areas, which can also pose foundation related problems. The land requirement for the proposed projects has been estimated at around 205 acres approximately. Land will be required mainly for installation of modules, inverters, cable & control rooms for the proposed solar power plants including switchyard. No land acquisition is required for placing transmission towers on private land.

6.4 IMPACTS DURING CONSTRUCTION PHASE

The environmental impact during construction phase is localized and of short term magnitude. However, as this project land is barren land, the change in land use will be nil. Impact is primarily related to the civil works and some intensive impact due to erection of the equipment. The details of the activities and probable impact are brought out in table below:

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Table 6.1: Identification of activities & probable impacts (construction phase)

Construction Activities	Environment Attribute	Probable Impacts
Land Acquisition	Land	❖ No significant impact on land-use is expected.
	Socio-economics	❖ No Impact due to Rehabilitation & Resettlement issues is expected as govt. wasteland will be used for the power plant construction. The ROW for the transmission line is sited away from major settlements and agricultural use of the ROW will be allowed. Small parcels of privately owned land will be required for the transmission line towers.
Site clearing and Leveling (cutting, stripping, excavation, earth movement, compaction)	Air	❖ Fugitive Dust Emissions ❖ Air Emissions from construction equipment
	Water	❖ Run-off from construction area
	Land	❖ Loss of top soil
	Ecology	❖ Minimal loss of vegetation / habitat as the site is has barren land with almost no vegetation.
Transportation and Storage of Construction Material/ Equipment	Air	❖ Air Emissions from vehicles ❖ Fugitive Dust Emissions due to traffic
	Water	❖ Run-off from Storage Areas of construction Material
	Public Utilities	❖ Increased flow of traffic
Civil Construction Activities	Air	❖ Air Emissions from construction machinery ❖ Fugitive Dust Emissions
	Water	❖ Run-off from Construction Areas
Mech. and Elec.	Air	❖ Air Emissions from Machines / activities

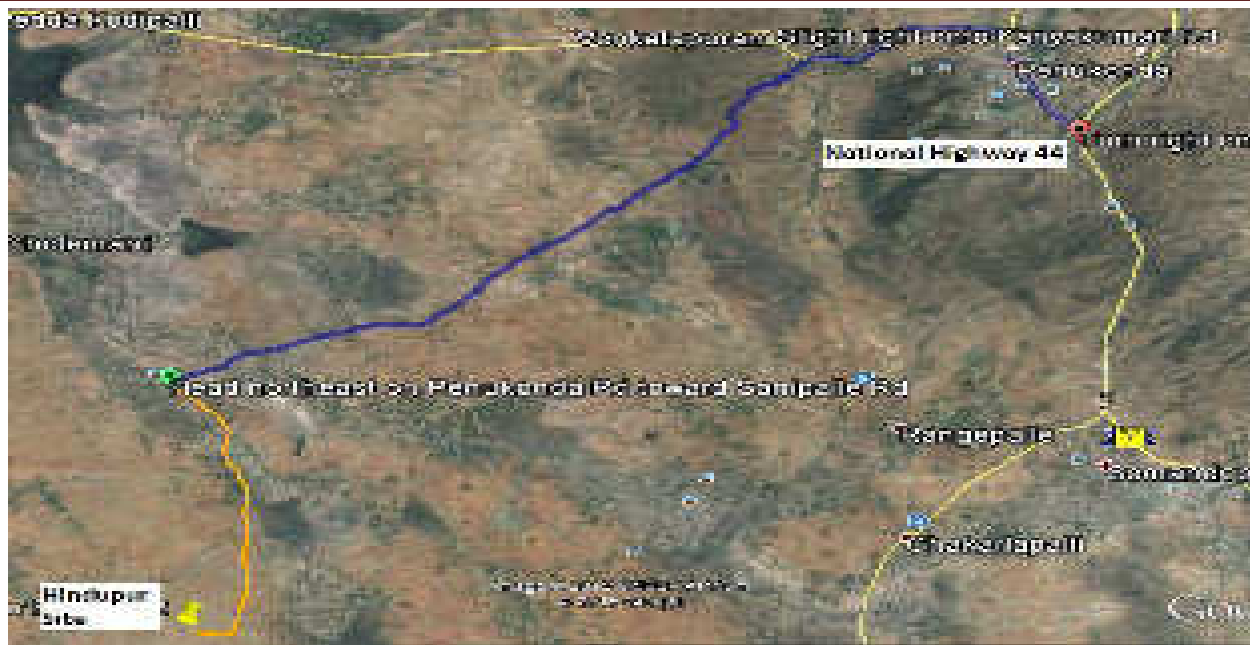
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Influx of Labour and construction of temporary houses	Socio-economics	❖ Employment opportunities shall increase ❖ Stress on infrastructure
	Land	❖ Change in land use pattern of the area
	Water	❖ Sanitary effluents from labour colonies
Transportation and Disposal of Construction Debris	Air	❖ Air Emissions from Transport Vehicles ❖ Fugitive Dust Emissions due to Movement of Traffic
	Water	❖ Run-off from Disposal Areas
	Soil	❖ No Conversion of land into waste land as it is already barren land.

6.4.1 Impact on Land use

The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labor camps for human resource to avoid environmental impact and public inconvenience. These locations shall comply with the local laws and regulations and need approval from authorities to utilize these facilities (access roads, telecommunication, and pipe borne water supply). The selection of temporary lands shall be made in such a way that it is atleast 500 m away from highly populated areas, water bodies, natural flow paths, agricultural lands, important ecological habitats and residential areas. The removal of trees and green cover vegetation will be minimized during preparation of access road and other facilities. A national highway NH44 connecting commercial city of Hyderabad to Bangalore is approximately 25km from the Project site.

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The construction activities attract a sizeable population and the influx of population is likely to be associated with construction of temporary hutments for construction work force, having an effect on land use pattern of the areas surrounding the project.

However, this impact is envisaged to be insignificant due to following reasons.

- Temporary labour colonies shall be situated in the areas already acquired for the project.
- It will be only a temporary change (restricted to construction period). After construction phase, the areas acquired by labour colonies shall be reverted back similar to preconstruction stage.
- Any use of private land will follow the principles in the Resettlement Framework.

Further, ASEPL shall also be in the process to improve the infrastructure of the area such as roads, schools, hospitals, etc. The project would add to the economic development of the area through allied business, which will be set-up along with the plant.

6.4.2 Impact on Soil Cover

The selected Project site comprises of barren land. The terrain in the east was noted to be sloping towards west whereas that of west was noted to be sloping towards east. The land profile thus leads to low lying central area that can be effectively used for central storm water drains. An overall slope towards the north direction was also observed on the site. Maximum land area

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comprised of hard murrum soil which is considered suitable for the construction of the solar PV plant.



No adverse impact on soil in the surrounding area is anticipated. However, in order to minimize such impacts, appropriate soil erosion control measures such as plantation activities would be undertaken by ASPL to appease the chances of soil erosion. Completion of excavation and foundation work in limited time schedule would also reduce / minimize the chances of soil erosion.

6.4.3 Impact of Solid Waste

Solid waste during the construction phase consists primarily of scrapped building materials, excess concrete and cement, rejected components and materials, packing and shipping materials (pallets, crates, Styrofoam, plastics etc.) and human waste. During the construction there will be generation of garbage, for which designated practices of solid waste disposal shall be followed.

Solid waste disposal will be done as follows:

- A waste inventory of various waste generated will be prepared and periodically updated.
- The excavated material generated will be reused for site filling and leveling operation to the maximum extent possible.

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- The scrap metal waste generated from erection of structures and related construction activities will be collected and stored separately in a stack yard and sold to local recyclers.
- Food waste and recyclables viz. paper, plastic, glass etc will be properly segregated and stored in designated waste bins/containers. The recyclables will be periodically sold to local recyclers while food waste will be disposed through waste handling agency.
- Hazardous waste viz. waste oil etc will be collected and stored in paved and bunded area and subsequently sold to authorized recyclers. Necessary manifest for the same will be maintained.

6.4.4 Air Impact

As the proposed project is Solar PV Project, the impact during construction of is expected to be minimal as a Greenfield Project plant. Particulate matter in the form of dust would be the predominant pollutant affecting the air quality during the construction phase. Dust will be generated mainly during excavation, back filling and hauling operations along with transportation activities. However, a high boundary wall will prevent the dust generated due to construction activities going outside the project area.

The main source of gaseous emission during the construction phase is movement of equipment and vehicles at site. Equipment deployed during the construction phase is also likely to result in marginal increase in the levels of SO₂, NO_x, and particulate matter. The impact is reversible, marginal and temporary in nature.

6.4.5 Noise Impact

The major noise generating sources during the construction phase are vehicular traffic, construction equipment like dozer, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, vibrators etc. The operation of this equipment will generate noise ranging between 75 – 90 dB (A).

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To minimize the impact on nearby communities, construction schedules have been optimized and vehicular traffic will be routed away from the nearest settlement, located in Village - Kalipi, District - Anantapur in Andhra Pradesh. The nearest town to the village remains Hindupur which is 18 km from the site. Also the noise level is substantially lower near the plant boundary due to attenuation caused over the distance. Overall, the impact of generated noise on the environment during construction period is insignificant, reversible and localized in nature.

6.4.6 Impact on Water Environment

The construction personnel would be housed in temporary settlements. These settlements would discharge considerable amount of domestic wastewater. Stagnant pools of water would increase breeding of mosquitoes and generally create insanitary conditions. Contractor will provide Soak pit with a depth of 2 meter to dispose liquid water so that such water do not form stagnant pools nor aggravate soil erosion. The main pollutants are organic components and microorganisms with the potential to cause contamination of water quality. To address potential impacts on water quality, disinfected latrines (e.g., through regular liming) will be used as main component of the sanitation system.

Construction processes include fabrication of concrete and related water usage. Wastewater from construction activities would mostly contain suspended impurities. The waste water will be arrested before discharge, to prevent solids buildup in the existing drains. Thus, the construction site wastewater would be led to sedimentation basins, allowing a hydraulic retention time of 1 ½ to 2 hours, where excess suspended solids would be settled out and relatively clear supernatant would be discharged to the plant drain. To maintain optimum efficiency, the plant will require cleaning during long dry spells. Water required for PV modules cleaning and for onsite staff consumption can be made available from River/Pond/Canal or ground source through multiple bore wells. With a cleaning schedule of twice a month, approximately 10,000 liters per day of water consumption is anticipated.

6.4.7 Ecological Impact

The project site is barren land and there are no major habitats near the site. The impact of the construction activities would be primarily confined to the project site. Since, the entire land is barren land with some xerophytic plants, shrubs. Thus, the site development works would not lead to any significant loss of important species or ecosystems.

6.4.8 Impacts due to transmission lines during construction phase

The project activities during construction phase will involve clearing of trees along the route alignment wherever required, excavation for installation of towers, erection of towers, civil works related to transmission line and line stringing. During the operation phase, most of the construction phase impacts will get stabilized and the impacts will be restricted only to the operation and maintenance of the project.

The impacts of the project activities on various environmental attributes are discussed in subsequent sections.

Impact on Topography

The proposed site Kalipi is located in the Anantapur district of Andhra Pradesh. Geographically it is situated at 13.97873 N latitude and 77.48286 E longitudes at an altitude of approximately 630m, above mean sea level. The site location covers two villages; *Kalipi* and *Brahmasamudram* in the *Anantapur* district of Andhra Pradesh state in India. During the construction of the transmission line, the topography will change due to excavation and erection of tower, fill and cut for leveling the tower erection place. The most prominent impact on the surface topography will be at the tower erection site if required, along the Right-of-Way (RoW). This will lead to change in the surface features only. The impact will be irreversible as the present features along the RoW will be changed due to presence of the transmission line.

No topographical changes are envisaged during the operation phase of the transmission line and the substation. The existing access routes will be utilized during the operation and maintenance of the transmission lines.

Impact on Climate

The Transmission lines area consists of barren lands. Also, there will be no removals of trees therefore there will be no impact on the climate conditions from the transmission lines during the construction and operation phases.

Impact on Air Quality

During the construction phase, the activity would involve excavation for the tower erection, movement of vehicles carrying the construction materials along the haul road (through un-built roads, which are not maintained).

All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site. The impact will be temporary in nature and therefore is assessed as of low significance. Covering of stockpiles and sprinkling of water during excavation will reduce the dust emission to a great extent. The construction of transmission line and the substation will not have any negative impact on the air quality of the region during the operation phase.

Impact on Noise Levels

During the construction phase, the major sources of noise pollution are movement of vehicles carrying the construction material and equipment to the site. Most of the access roads along the alignment are motor able and project traffic would be negligible. The major work of the construction is expected to be carried out during the day time. Apart from vehicles bringing in materials to the nearest road, construction works for the transmission line will require minimal powered equipment. As such, noise emissions will be minor. As the predominant land use along most part of the alignment is barren and inhabited, there will be few residential areas exposed to noise generated during the construction phase and the noise produced during the construction period will have negligible impact on residents.

During the operation phase of the project, there may be corona noise from the conductors which will be felt only up to 15 to 30 m area, hence the ambient noise level will meet the CPCB standard for residential areas : 55 dB(A) during daytime and 45 dB(A) during night time.

Impact on Surface Water Quality

The water bodies in the area for onsite staff consumption can be made available from River/Pond/Canal or ground source through multiple bore wells. The construction and operation of the transmission lines will not have any major impact on the surface and ground water quality in the area.

Impact on Water Resources

Water needs during construction of the Project would be limited to sanitary water and minimal amounts of water for construction (such as spraying for dust prevention). This would be a negligible impact on water resources. Operation of the lines would not require any water.

Impact on Ground Water Quality

In Transmission line construction activity, no chemical substance or oil is used hence there is no impact on ground water quality.

Impact on Ecological Resources

Since transmission line will be routed away from the inhabited areas, there will be no displacement of people or animals. It will also not cause any disturbance to the life of people, local animals and birds' movement. In transmission there is no dynamic equipment and moving machinery causing noise pollution, water and air pollution. There is no national wildlife park, bird sanctuary, wetland in the route alignment of the proposed transmission line. Although, the route of transmission line route is finalized, some minor change in route alignment shall not be ruled out till ASPL obtains the RoW permission for the transmission line.

None of the declared environmentally sensitive areas is located within the route alignment. It is not expected that any flora and fauna that are rare, endangered, endemic or threatened will be affected. However noise, vibration and emission from construction vehicles, equipment will occur during construction and pre-construction stages in temporary manner.

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The impacts related to above activities are temporary and can be mitigated through following measures:

- Strict attention on worker force regarding disturbance to surrounding habitats, flora and fauna including hunting of animals,
- Selection of approved locations for material storage yards and labour camps away from the environmental sensitive areas, and
- Avoid entering of construction waste (cement particles, rock, rubbles and waste water) and sanitary waste to the surrounding water bodies.

Impact on Terrestrial Ecology

There is no sensitive ecological area / protected forest area such as national wildlife park, bird sanctuary crossing the proposed route alignment. The removal of herbaceous vegetation from the soil and loosening of the top soil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimized through adoption of mitigation measures like paving and surface treatment and water sprinkling.

Removal of Trees

As per the preliminary survey there is no tree at the site. The initial construction works along the alignment involving land clearance, cutting, filling, and leveling that may cause loss of vegetation.

Effect on Local Road Network

Transformers, tower material, substation equipment, iron bars, concrete materials, piling equipment, will be transported through the provincial and local road network to the project site. This may impact local traffic temporarily. Appropriate maintenance all road sections, which will be utilized for the construction related activities shall be carried.

Disposal of Debris

As a result of construction related activities, spoil and debris will be generated during the construction stage. Proper disposal of the debris shall be ensured to minimize the impact on the surrounding ecology, public health and scenic beauty.

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Impact on Human Environment

Project activities could impact the health and safety of the work force and of the general public, in particular, in terms of risk of accidents and exposure to electromagnetic fields along the alignment. The accidents may be caused due to electro-cutting, lightening, fires and explosions. Necessary training regarding safety aspects to the personnel working at the line will be provided by the contractor. Personal protective equipment like safety gloves, helmet, harness, Goggles, mufflers will be provided during construction period and during the maintenance work. First aid facilities will be made available with the labor gangs and doctors called in from nearby towns when necessary. Workers are also covered by the statutory Workmen Compensation as per GoI laws by the contractor.

Socio-Economics

Construction of transmission line will generate local employment, as number of unskilled labors will be required at the time of construction activities. Local employment during this period will increase socio-economic standards.

Resettlement and Rehabilitation

For the construction of transmission line, involuntary resettlement impacts is yet to be determined as some minor changes in transmission line route shall not be ruled out till ASPL obtains RoW permission for the transmission line. The land acquisition will not be done as far as possible. But, if ASPL has to do it under inevitable circumstances then ASPL will prepare a resettlement plan following the Resettlement Framework consistent with the ADB Safeguard Policy Statement.

Cultural sites

There are no archaeological, historical or cultural important sites along the route alignment, hence no impact on these sites is envisaged. In the case of discovery of archaeological features during excavation/construction works, a chance find procedure to notify relevant authorities will be put in place by ASPL.

Solid Waste Disposal

The solid waste generation will be at the location of the tower erection site which will include metal scraps, wooden packing material. Waste will be minimized and recycled wherever

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possible. Final waste will be collected and disposed of in compliance with applicable regulations and rules.

Liquid Waste Disposal

There will be no oil or chemical waste generated during the construction of transmission line, hence no mitigation is required.

Sanitary Waste Disposal at Construction Sites and Labour Camps

The labour camps at the site of tower erection will be temporary in nature and the human excreta will not be significant to cause contamination of ground water. Those places where most labor will be staying will be near hamlets which shall use the community services for solid waste, water and sanitation. Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of the construction workers should be provided to avoid the surface water pollution.

Provision of adequate washing and toilet facilities should be made obligatory. This should form an integral component in the planning stage before commencement of construction activity. There shall be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps. Septic tank will be used for sanitation purpose. Thus possibilities of infecting water borne diseases or vector borne diseases (Parasitic infections) will be eliminated by adopting proper solid waste disposal procedure. Unacceptable solid waste disposal practices such as open dumping of solid waste and poor sanitation facilities will lead to pollution of surrounding environment, contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives and general public inhabited in the area. Surrounding of labour camps, garbage disposal sites and material storage yards provide favourable habitats for vectors of diseases such as mosquitoes, rats and flies.

Thus following measures are needed to protect and enhance the quality of environment during the construction stage:

- A better way to overcome garbage disposal as mentioned above by reducing or avoiding the need to construct labour camps, thus the selection of the majority of skilled and

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unskilled workers from the project area of influence will be a proper measure in this regard.

- Contractor shall provide adequate facilities, soak pits to manage liquid waste.
- Provision of the solid waste disposal, sanitation and sewage facilities at all site of the construction/labour camps to avoid or minimize health hazards and environmental pollution.
- Contractor should handle and manage waste generated from the construction/labour camps without contamination to natural environment and it will reduce risk to general public who stay close to sites. Also contractor should be responsible to enhance the quality of environment.
- Adequate supply of water should be provided to the urinals, toilets and wash rooms of the workers' accommodation.

Contractor shall provide garbage bins to all workers' accommodation and construction sites, for dumping wastes regularly in a hygienic manner in the area

6.5 IMPACT DURING OPERATION PHASE

Various activities of operation and maintenance phase and their probable impacts on various sectors of environment are presented in table below.

Table 6.2: Identification of activities and probable impacts (o&m)

O&M Activities	Sector	Probable Impacts
Transportation	Air	❖ Air Emissions from Vehicles ❖ Fugitive Dust Emissions due to Traffic
	Public Utilities	❖ Increased flow of traffic
	Water	❖ Effluents from Oil Storage Areas
Burning of Fuel	Air	❖ No Stack emissions from solar Project
Water Treatment for various uses	Water	❖ Generation of Wastewater due to PV Cleaning

6.5.1 Impact on Land use

The proposed project will be set up on barren land which has been taken on lease. The site, after completion of its development, would consist of built structures, landscaped to give a pleasing outlook.

Following the construction phase, the temporarily modified land use pattern, such as construction of temporary tents to accommodate some construction personnel will be totally removed during the operation stage. Land released from the construction activities would be put to economic and aesthetic use to hasten recovery from adverse impacts.

6.5.2 Impact on Soil Cover

Most impacts of Solar PV project on soil are restricted to the construction phase, which will get stabilized during operation phase. The soil conditions of the project site would be allowed to stabilize during this period after the impacts of the construction phase. The topsoil in non-built up areas would be restored and such portions of the site would be replanted with appropriate plant species to stabilize soil. The species shall be suitable for local climate and available. The concerned District Forest Officer can be consulted for selection of species and technical guidance, if required. During operation of a project, no appreciable adverse changes in the soils are anticipated. Losses due to dust and bird droppings soiling the module depend on the environmental conditions, rainfall frequency and on the cleaning strategy as defined in the O&M contract. As the performance loss due to soiling can be relatively large compared to other balance of system loss factors, it is important this effect be studied and taken into account when formulating the O&M contract. With our experience, we consider the soiling losses at 1.0 %.

6.5.3 Air Impact

Plant operation would not significantly affect the air quality, as Solar project is green field project & there are no any gaseous emissions during operation phase from the proposed project.

6.5.4 Noise Impact

Work Zone Noise Levels

Protective instruments will be provided to the operators and workers working near the high noise generating machinery. As per Occupational Safety and Health Administration (OSHA)

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Standards, the maximum allowable noise level for the workers is 90 dB (A) for 8 hours exposure a day.

Therefore, adequate protective measures in the form of ear muffers/ear plugs to the workers working in high noise areas will be provided. In addition, reduction in noise levels in the high noise machinery areas will be achieved by adoption of suitable preventive measures such as adding sound barriers, use of enclosures with suitable absorption material, etc.

6.5.5 Impact on Water Environment

6.5.5.1 Impact on Ground Water

The water bodies in the area for onsite staff consumption can be made available from River/Pond/Canal or ground source through multiple bore wells which will not have any major impact on the ground water quality in the area. So lowering of groundwater table will not be an issue. In addition, Rainwater Harvesting will be implemented at proposed plant to conserve storm water and help in recharge of ground water.

6.5.5.2 Impact on Surface Water

Impact due to Discharge

To maintain optimum efficiency, the plant will require cleaning during long dry spells. Water required for PV modules cleaning and for onsite staff consumption can be made available from River/Pond/Canal or ground source through multiple bore wells. With a cleaning schedule of twice a month, approximately 10,000 liters per day of water consumption is anticipated.

Special Module cleaning infrastructure is created in the plant by way of laying pipelines throughout the plant to carry pressurized water to cover the entire plant locations for Module cleaning. With this infrastructure we are able to effectively clean the Modules at an increased frequency and extremely low O&M costs.

There shall be minimal discharge of wastewater from cleaning of Solar PV modules. The wastewater emanating from cleaning operations shall be recycled for plantation and greenbelt development around the plant. The rest of the wastewater will be deposited in rain water harvesting pond.

6.5.5.3 Terrestrial Ecology

There is no sensitive ecological area / protected forest area such as national wildlife park, bird sanctuary crossing the proposed route alignment. The removal of herbaceous vegetation from the soil and loosening of the top soil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimized through adoption of mitigation measures like paving and surface treatment and water sprinkling.

6.5.5.4 Impacts of Transmission Lines during Operation Phase

Electric Shock

This may lead to death or injury to the workers and public in the area. This shall be minimised or avoided by:

- Security fences around substation
- Establishment of warning signs
- Careful design using appropriate technologies to minimise hazards.

Noise Generation

Nuisance to the community around the substation site can occur during the project operation stage. Provision of appropriate noise barriers at substations shall be made in this regard.

Maintenance of Transmission Line and Substation

Possible exposure to electromagnetic interference could occur during these activities. Design of transmission line shall comply with the limits of electromagnetic interference from overhead power lines.

Oil Spillage

Contamination of water on land/nearby water bodies by the transformer oil can occur during operation due to leakage or accident. Substation transformers are normally located within secure and impervious areas with a storage capacity of 100% spare oil. Also proper drainage facilities will be constructed during the construction stage to avoid overflow or contamination with natural flow paths especially during the rainy season. ASPL shall maintain account of the usage of oil,

inbuilt technical methods and procedures for oil monitoring mechanism, and will prepare mitigation plan for any oil spillage.

Sulphur Hexa fluoride (SF6) Leakage

SF6 is a non-toxic greenhouse gas used as a dielectric in circuit breakers, switch gear, and other electrical equipment. Very high grade sealing system and erection methodology to keep the loss of SF6 within 0.01% every year. SF6 handling is part of each contracts technical specifications, and required design and routine test are done after manufacturing of the circuit breaker. SF6 gas handling system for evacuation and storage is always used for the maintenance of the circuit breaker. SF6 gas leakage is one of the checks in every shift of the operation. Stock SF6 records shall be maintained in each substation. This shall allow tracking of any release of SF6 gas to the atmosphere.

6.6 IMPACTS DURING DECOMMISSIONING PHASE

Dismantling operation however will have impact on environment due to noise and dust arising out of it. During de-installation, a specific strategy shall be adopted in order to handle the each type of item to keep the impact during the actual activity low. The decommissioning will also have social impact. The decommissioning of the power house which was a part of the local social fabric for many years will certainly create vacuum in the lives of the people directly and indirectly connected with it. The impact due to decommissioning on power, social and environmental scenario will be guided by applicable laws and guidelines. These will be addressed appropriately.

6.7 SOCIAL IMPACTS

6.7.1 Traffic Congestion

No overburden on the local transportation system is envisaged due to the proposed Project.

6.7.2 Labour Influence

6.7.2.1 Construction Phase

During construction activities, there will be a sizeable influx of population and labour colony is being constructed with basic amenities for the labourers working on the project. This will have

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an effect on social fabrics of the areas surrounding the project. However, this impact is envisaged to be insignificant due to the following reasons:

- Temporary labour colonies shall be situated in the areas already acquired for the project.
- It will be only a temporary change (restricted to construction period). After construction phase, the areas acquired by labour colonies shall be reverted back similar to preconstruction stage.

ASPL has a Human Resources Policy, which specifies the terms of employment and working conditions. These include procedures for hiring and recruiting, probation, training, performance review, promotion, insurance, salary and compensation, resignation, lay-off and retrenchment, leave and vacation, and superannuation, which follow Indian labour law. All the employees will have access to the human resources policy and procedures. Labour inspections are done annually by the relevant government agency, which reviews wages, working hours, benefits, etc. Most of the construction labor will be on contractual basis. Separate labour camps shall be made within the plant premises for the construction labors. Therefore, conflict of the migrating labor with locals, will not take place during the construction phase. Regarding monitoring of diseases corresponding to labor influx, regular health status monitoring of labors and its surrounding population will be carried out with the mobile health care facilities shall be developed and operated by ASPL in this area. The health areas and issues that requires attention by ASPL is as follows:

Table 6.3- Labour health management

Environmental Health Areas	Influx camp followers, job seekers, family, service workers	Resettlement; relocation	Water management Including creation of new water bodies; altering existing water bodies and changes in drainage pattern	Linear features Roadways; transportati on routes;	Hazardous materials control and disposal	Changes in income & expenditure consumption including food/ housing inflation
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Vector Related	Increasing human parasite	Movement to different prevalence area	Creation and movement of breeding grounds	Improper drainage, temporary water pool	Creation of breeding sites with drums at household	
Respiratory & Housing	Crowded housing, both work camps and community	Number of occupants per room; mix of occupants children/elderly / adults (different vulnerability)		Facilitating mixing/interaction of different groups		Housing inflation triggered crowding
Veterinary Medicine	Movement and migration of livestock	Movement and migration of livestock due to influx of new groups	Creation and/or movement of livestock watering locations		Inadvertent water source contamination, of streams/ rivers	
Sexually Transmitted Infections; HIV / AIDS				Facilitating movement of high risk groups into		Men with money mixing with

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Soil, Water & sanitation	Overburdening existing services/systems; explosive food-borne epidemics	Failure to anticipate extended family influx in initial design	Changes in surface waterflows/quality, potential groundwater drawdown		Releases into surface water; long-term impacts to ground water	
Food & Nutrition	Influx of extended family more mouths to	Shift from subsistence agriculture to peri-urban	Changes in crop/garden selection and planting cycle	Changes in access to gardens or local markets		Food inflation further marginalizi
Accidents & Injuries	Overcrowding, falls, burns, road traffic			Road traffic, increased pedestrian activity	Unplanned releases/emissions	
Hazardous Materials Exposure	Squatter developments adjacent to industrial facilities with unplanned releases			Movement via trucks of hazardous materials across communities to project areas	Use of Project drums and containers for water and food storage; Inadequate incinerators	
Psychosocial; Gender Issues	Cultural shock due to rapid societal change	Transformation of rural to peri urban/urban lifestyle		Greater ease of mixing social/ethnic groups		Sudden money influx in a barter economic

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Cultural Health Practices	Introduction of new practices and /or elimination of existing practices	Introduction of new practices and/or elimination of existing practices				Shift to western medicine
Health Services Infrastructure & Capacity	Increased visits for out and inpatient services	Increased visits for out and inpatient services if access improves		Changes in access		Attraction of additional private providers/ increase in
Non-communicable; hypertension, diabetes	Changes in diet	urban living versus high intensity subsistence				Shift from physical activity to

6.7.2.2 Operation Phase

Accommodation for the workforce required for construction may be found in Tehsils located near the site. Therefore no impact on the local life pattern is envisaged due to operational worker of the project.

6.7.3 R&R Issue

The proposed Solar PV Project will be set-up on barren land which has been taken on lease. Therefore there is no R& R issue for the project site. The preliminary survey observed that there are no houses along the initial alignment. As per the Electricity Act of 2003, land will not be acquired for the ROW and for the tower footings. However, transmission lines may pass through private lands and towers may be erected on private lands. This may have economic impacts including partial loss of privately owned lands. It may also affect or limit future land use and potentially decrease the market value of privately owned. The ROW and tower locations will be

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screened for involuntary resettlement impacts and any use or acquisition of private land will follow the principles in the Resettlement Framework.

Change in Socio-economic Condition

Employment: The project will generate employment opportunities for the local population. Even indirect job opportunities will be created outside the project boundary. Many people will find employment in service sector and marketing of day-to-day needs viz. poultry and other agricultural products. The project will improve the basic infrastructure and the people of nearby villages can also use these amenities.

ASPL is working for the employment and skills training for the locals through following steps.

- Provision in project contracts to provide priority in employment.
- Training for skills up-gradation
- Encouraging labour co-operative of displaced families and giving priority to labour cooperatives of displaced families for award of miscellaneous contracts
- Reservation of shops for displaced families in employee township
- Efforts to employ educated unemployed youth

Overall there will be marginal impact on the socio-economic condition of the locality and the impact will be mostly positive.

Development of Infrastructure:

The job opportunities in non-agricultural sector are likely to increase. The installation of the power plant is expected to further increase the prospects by bringing in direct and indirect employment opportunities. As the project and consequent activities are expected to generate additional employment and income opportunities for the local population, market expansion supported by infrastructural development will foster economic growth in the area. Flow of reliable and adequate power from the proposed plant will not only enhance growth in the region, but will also bring about a change in energy consumption pattern by switching over from other sources of energy. This will ease off burden on the existing biomass.

CHAPTER-7

ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

7.1 INTRODUCTION

Environmental & Social Management Plan is an implementation plan to mitigate and offset the potential adverse environmental & social impacts of the project and enhance the positive impacts. Based on the environmental baseline conditions, planned project activities and impacts assessed earlier, this section enumerates the set of measures to be adopted to minimize the adverse impacts. Process of implementing mitigation and compensatory measures, execution, agencies responsible for their implementation and indicative costs is discussed in this chapter.

The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of Solar PV power. It will certainly meet the ever increasing Demand of Power and to bridge the Gap between Demand and Supply of Power.

7.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Aarohi Solar Private Limited is a subsidiary company of ASEPL and shall follow the ESMS of ASEPL.

ASEPL's Environment and Social Management System (ESMS) is an updation of existing Environment and Social Management System (ESMS) to be in line with Asian Development Bank (ADB) Safeguard Policy Statement (2009), Social Protection Strategy (2001), ADB Gender and Development Policy (1998), Public Communication Policy (PCP) (2011), IFC Sustainability Framework 2012, World Bank EHS Guidelines and other applicable laws and regulations pertaining to environment, health, safety, social and labour in India.

The updated ESMS would provide ASEPL comprehensive procedures at the corporate level for assessing and managing social, environmental, health and safety issues at all stages of the life cycle of their projects based in India.

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This ESMS Manual is prepared as an outline of the Management System at the Corporate Level, which provides generic guidelines that are required to be skillfully adopted and validated for each project under ASEPL. The desired flexibility has been given to the ESMS Manual to make it applicable to all future and present solar PV projects of ASEPL and its subsidiaries, irrespective of specific site or project conditions. This manual covers the Commissioning, Operation, Maintenance & De-commissioning phases of the project.

It addresses elements of the management system drawing upon the fundamentals from ISO 14001:2004, International Finance Corporation (IFC) Sustainability Framework 2012 and describes how the requirements of IFC Sustainability Framework 2012 are implemented via the management system. In addition, updation of the manual has been incorporated in line with Asian Development Bank (ADB) Safeguard Policy Statement (2009), Social Protection Strategy (2001), ADB Gender and Development Policy (1998), Public Communication Policy (PCP) (2011), and other applicable laws and regulations pertaining to environment, health, safety, social and labour in India.

The documentation that supports the general descriptions given in this manual is identified and cross-references are provided. This supporting documentation provides the mechanism by which the management system elements are implemented. For example, a general description on the Legal Procedures to be followed while going for a solar project is provided in this manual. The ESMS Continual Improvement Loop as per ISO 14001:2004 has been provided in **Figure-7.1**.

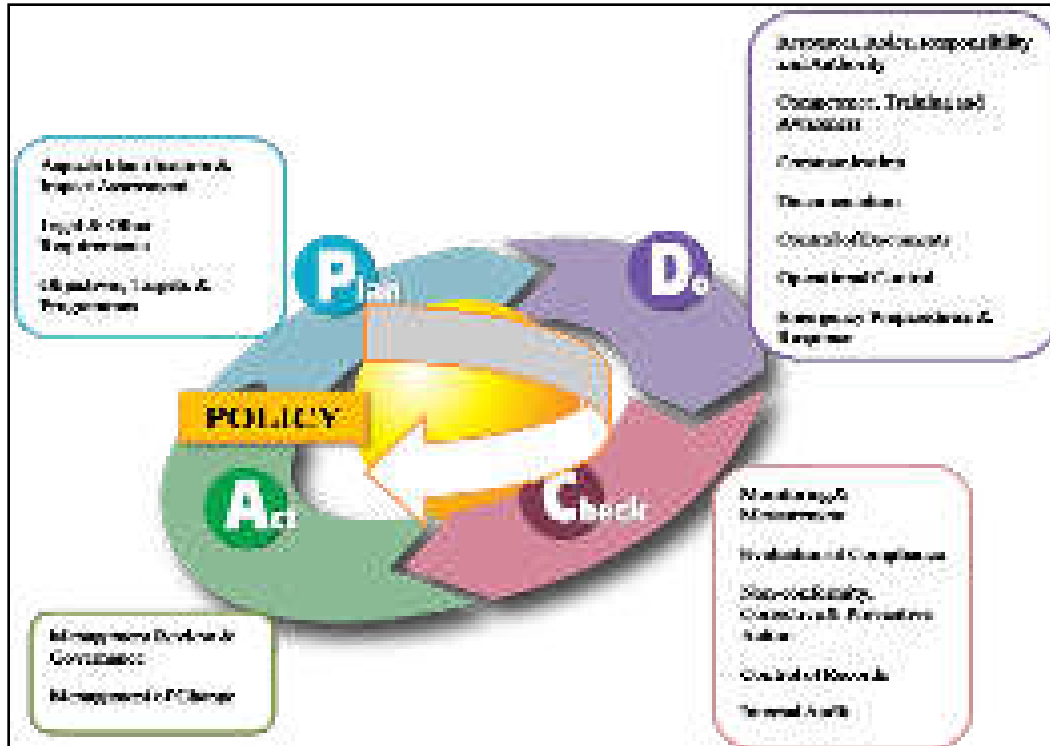


Figure-7.1: ESMS Continual Improvement Loop

The above figure outlines how the ESMS for ASEPL shall approach the Management of Environment, Health, Safety and Social (EHSS) Issues. The ESMS Manual shall provide a list of various actions (e.g.: mitigation and monitoring) to be undertaken. During the execution of monitoring of these activities, some form of monitoring audit shall occur to assess the success of these actions. Based on the assessment, changes have to be planned and built into mitigation and monitoring activities that might have been identified initially.

ASEPL aims to utilize analysis of its process and implementation related data for bringing in continual improvements within the system for the increased effectiveness of the management system.

7.3 POLICIES

ASEPL has prepared Environment, Health & Safety (EHS) Policy and Social Policy as principles and guidelines to ensure that the issues related to environment, health, safety and social are addressed appropriately and decisions that are taken give rational outcomes. These policies are

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applicable to all the workers employed directly or indirectly by ASEPL for all its projects.

7.3.1 Environment, health & safety (EHS) policy

ASEPL values the surroundings as they are important resources and is committed to minimize adverse EHS impacts of their business during the entire life cycle of the project, and dedicate them further to –

- Comply with all applicable EHS legislations and all other requirements of interested parties.
- Adopt measures to prevent pollution, injuries & ill health.
- Ongoing improvement in processes and continual improvement in EHS performance.
- Adopting measures to minimize accidents and optimal utilization of resources, in particular groundwater and adopting waste management practices.
- Educating, motivating and involving all our suppliers and business associates to adopt similar approaches towards environment protection and safety realization in their products, activities and services.
- This EHS policy should be widely communicated to all persons working for or on behalf of ASEPL.
- The policy statement shall have to be communicated to all employees and sub contractors of the plant with the intent that they are made aware of their individual obligations. It should be ensured that this is understood and implemented by all concerned.
- This policy shall be available to interested parties and public and shall be reviewed periodically to ensure that they remain relevant and appropriate to company.

7.3.1.1 EHS policy objective

The main objectives of the EHS policy of ASEPL are as follows -

- To comply with all legal requirements during all the C, O, M and D phases of the project.
- To ensure safe work practices and clean environment during the O&M phase.
- To have continual improvement in areas having significant impacts on Environment, Health and Safety.

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- To increase awareness of all stakeholders through regular consultation during all the project phases.

7.3.2 Social policy

ASEPL believes that a healthy society is the key to sustainable business environment. Values like respecting human rights, working in a transparent manner and abiding by all the applicable rules and regulations form a part of the work culture at ASEPL. And hence, ASEPL is committed to conduct its business in a socially responsible manner by minimizing the social impacts of the project activities during the entire life cycle of the project, on the people directly or indirectly related with the project and help them in improving their socio-economic profile that can be sustained over a period of time. For the same, we shall dedicate ourselves for ensuring the following:

- At the time of site selection and feasibility analysis, ASEPL shall make decent efforts to ensure that there is no significant displacement of people and their moveable properties, so as to have minimal impacts on the socio-economy and the livelihoods of the people.
- ASEPL shall devise avenues for greater community engagement and participation, taking special cognizance of the needs of the indigenous people.
- ASEPL shall take all appropriate efforts to comply with the requirements of the applicable labor laws mainly related to child labor, forced labor/bonded labor, migrant workers etc. It shall also ensure that appropriate remedial actions are taken in case of any non-compliance in the above respect. ASEPL shall not employ trafficked persons.
- ASEPL shall take due cognizance regarding provision of equal opportunities; and equal wages for equal work irrespective of any bias.
- ASEPL shall treat all stakeholders fairly and promptly at all times. ASEPL shall deal any complaints/ requests raised by stakeholders promptly and professionally (as per the Grievance Redressal Policy of ASEPL).
- ASEPL shall provide workers with documented information that is clear and understandable, regarding their rights under national labor and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation and benefits during the various phases (C, O, M and D) of the project.

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- ASEPL shall ensure that stakeholders (mainly those directly or indirectly affected and influenced by the project) are adequately informed of their rights to resolution, through frequent stakeholder consultation and are encouraged to seek judicial or third party opinion, wherever there is any interpretational uncertainty through appropriate stakeholder forum or otherwise.

7.3.2.1 Social policy objective

The main objectives of the Social Policy of ASEPL are as follows –

- To ensure a sound worker-management relationship for the sustainability of the company.
- To work for the wholesome betterment of the socio-economy of the project and people affected by it through appropriate Community Engagement Plans, Social Development Plans and Corporate Social Responsibility (CSR) activities. To promote compliance with national employment and labor laws.
- To provide fair, adequate and appropriate compensation to the project affected people and wherever possible, impart basic set of skills to such people for enabling them to be productive for the operation of the project activities. To provide a forum for the people around the project area to discuss and solve grievances in minimum possible time. To provide a safe and healthy work atmosphere that is free from any kind of favoritism on the basis of personal characteristics.

7.3.3 CSR (corporate social responsibility) policy

Taking responsibility for society was the driver for founding ASEPL. At ASEPL, we believe that Corporate Social Responsibility (CSR) is the way to conduct business that achieves a balance and integration of economic, environmental and social aspects while at the same time addressing stakeholder expectations.

Under this CSR policy, the company shall affirm its commitment of seamless integration of marketplace, workplace, and environment and community concerns with business operations. ASEPL shall make CSR as an integral business process in order to support sustainable development at all its subsidiaries. As per this policy, the company shall constantly endeavor to be a good corporate citizen and enhance its performance.

7.3.3.1 ASEPL mission under CSR policy

Whilst being committed to excellence in outputs and deliverables through constant team work and ceaseless innovation, we recognize our responsibilities towards social and environmental dimensions of our business and thus aim to visibly play a leading role within our spheres of influence.

ASEPL shall strive to be a leader while continuing its business in a socially and environmentally responsible manner. The company shall affirm to its commitment to contribute to nation building measures through improving quality of life of our workforce, their families and the communities of the area where the company and its subsidiaries exist. It shall be a priority under this policy to take care of issues related to global warming, preservation of cultural heritage and special vocational programs for youth.

7.3.3.2 Structure under CSR Policy

There is a Corporate Sustainability Cell (CSC) that works directly under ASEPL Board of Directors. This CSC is headed by Human Resource Head of the company. Functional scorecard and Key Result Areas (KRAs) shall be aligned with the company's strategic objectives. Regular reporting to CSC after stakeholder dialogue, action plans and targets programs shall be evolved on continual basis. An independent budget shall be allotted from the Corporate for the Corporate Social Responsibility (CSR) initiatives and Community Development Programs (CDPs) at subsidiary levels.

7.3.4 Rehabilitation and Resettlement Policy

ASEPL should take decent efforts at the time of site selection and feasibility analysis, to make sure that there is minimum or no displacement of people and their moveable properties so as to cause least effect on the sources of livelihoods of the people. While identifying land for its projects, ASEPL is required to concentrate on private lands wherein land purchase can take place on a 'willing buyer-willing seller' basis with the private land owners. This policy is designed in line with the objectives of ADB Safeguard Requirement on Involuntary Resettlement, Paragraph 25 of Section 4 on Negotiated Land Acquisition wherein negotiated settlement has been

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considered to avoid expropriation and eliminate the need to use governmental authority to remove people forcibly. Here ASEPL is encouraged to acquire land and other assets through a negotiated settlement wherever possible, based on meaningful consultation with affected persons, including those without legal title to assets. This will ensure that any negotiations with displaced persons openly address the risks of asymmetry of information and bargaining power of the parties involved in such transactions. For this purpose, ASEPL will engage an independent third party to document the negotiation and settlement processes. ASEPL will agree with ADB on consultation, processes, policies and laws that are applicable to such transactions; third-party validation; mechanisms for calculating the replacement costs of land and other assets affected; and record-keeping requirements. In case the project(s) is/ are being established on a government land, ASEPL or its subsidiary shall communicate through appropriate medium to the Revenue Department of the concerned state stating that policy provisions with respect to Rehabilitation & Resettlement (R&R) as suggested by the concerned Revenue Department have been followed while designing/ adapting the R&R policy of ASEPL for that particular project. ASEPL is also required to abide by Paragraph 17 of IFC PS 5 on Land Acquisition and Involuntary Resettlement wherein informal rights of the people are also taken into consideration. ASEPL is required to follow the regulation on the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 if any private land shortlisted for its projects has been notified by appropriate Government.

7.3.4.1 Rehabilitation and Resettlement Policy Preamble

The purpose of this statement is to set out the basic principles for the R&R of people affected by projects established by ASEPL. As such, this statement attempts to streamline the different R&R practices that are being followed by subsidiaries and to modify them in a way that allows subsidiaries to deal more effectively with resettlement and rehabilitation issues.

While ASEPL's basic philosophy for compensating land losers and other project affected people remains substantially unchanged, the statement emphasizes the need to cultivate and maintain good relationships with the people affected by ASEPL.

It also underscores that the subsidiaries have a responsibility towards the local people whose

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livelihood, temporary as well as permanent, is taken away because of the activities of the project. On the other hand, subsidiaries need to protect themselves more effectively against unjustified claims. To this end, the statement proposes that subsidiaries prepare detailed Resettlement and Rehabilitation Action Plans (RAPs) that clearly identify, at an early stage, the entitlements of the people affected by Solar Photovoltaic (PV) Projects.

7.3.4.2 Rehabilitation and Resettlement Policy Objective

In line with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013:-

At district level, the following people/ organizations should be responsible for the R&R related issues and activities

- District Collector
- Land Acquisition Officer
- ADM Land
- ASEPL Representative
- Legal Advisor
- NGO

While at village level, the composition will consist of -

- Panchayat Member
- NGO Representative
- Opinion Leaders (neutral and non-political)
- Tribal and /or Minority Community Representative

Besides settling R&R issues, the above people/ organizations shall also look after the Grievance Redressal issues, Community Development Plans, supervision of other project related activities; for example alternate grazing arrangement for the cattle displaced because of the project activities.

- In the light of growing difficulties many subsidiaries face in land acquisition highest

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priority will be given to avoiding or minimizing disturbance of local population. In their decisions to establish new plants or expand existing ones, subsidiaries will explore alternative sites and project designs in order to minimize need for resettlements. Wherever people are likely to be affected by the project, the subsidiaries will prepare resettlements and rehabilitation action plans for the project.

- Through the preparation of resettlement and rehabilitation action plans, subsidiaries will safeguard that project-affected people improve or at least regain, their former standard of living and earning capacity after a reasonable transition period. The transition period is to be kept to a minimum. However, the involvement of subsidiaries in resettlement and rehabilitation activities will continue until all the actions specified in the RAP have been completed.
- Involuntary resettlement is conceived and executed as a development program with project affected people being provided sufficient resources and opportunities to share in a project's benefits. To the extent that is necessary, the concurrence, approvals and support from the concerned Government authorities will be sought. In parallel, subsidiaries will also work closely with Non-Government Organizations (NGOs), which are legally recognized and constituted and also have the confidence of the project affected people, in the preparation and implementation of RAPs.
- Corporate Social Responsibility (CSR) – Apart from the above steps to be taken under the project specific RAPs, CSR activities shall be intensified in and around the villages where the land has been acquired. A separate provision shall be made and a separate institution shall be created to closely monitor such activities.
- While taking up CSR Projects that will be designed with a “Bottom-up” approach; the programme will be designed with due consultation with the Project Affected People (PAP); overriding priority will be given to villagers being displaced as a result of acquisition of land by the projects. It is absolutely essential that involvement of project affected people, particularly land losers, be insured in the process of making decisions for utilization of the allocated funds.
- Actual implementation of R&R plan must follow a detailed survey of the project affected villages to formulate the list of persons/ families affected by the project, the nature of the effect, the likely loss of income, etc.

7.3.4.3 Eligibility Criteria for Economic Rehabilitation Benefits

This benefit shall accrue only to Entitled Project Affected Person (PAP). Entitled Project Affected Person shall be one from the following categories –

- People from whom land is acquired including tribals (if any) cultivating land under traditional rights.
- People whose homestead is acquired
- Sharecroppers, land lessees, tenants and day laborers
- Tribal/Non-tribal dependent on forest produce
- Non-title Holders- To be determined through own socioeconomic survey: Scope of defining of a cutoff date for giving compensation.

7.3.4.4 Eligibility Criteria for Resettlement Benefits

- Only a “Displaced” family or person shall be eligible for resettlement benefits.
- A family or person shall be termed “displaced” and hence eligible for resettlement benefits if such family or person has been a permanent resident and ordinarily residing on the project area on the date of publication or notification under Section 16 of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 and on account of acquisition of his/her homestead land/ structure is displaced from such areas or he/ she is a homestead less or landless who has been/ is required to be displaced.
- In addition, any person who are displaced may have formal legal rights to the land; they may have recognized but not formal legal rights to land (e.g., through traditional customary claim to the land or communal possession of community land); or they may have no recognizable legal right to the land (including government land) they occupy (e.g., informal or opportunistic settlers). In addition, displaced persons may be seasonal or permanent tenants, paying and non-paying or seasonal migrants.

7.3.4.5 Eligibility and Compensation

Drawing upon the elements of IFC PS and ADB SPS against The Right to Fair Compensation

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and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, circle rates and market rates, the Table 7-1 below shows the compensation and rehabilitation efforts subsidiaries will offer for each person or family affected by one of their project. Evidence to the effect that a person is a legitimate Project Affected Person (PAP) will need to be provided in the form of a written legal document, or reference to a record, such a Revenue Officer Certificate (Certificate from Revenue Department/ Tehsildar/ RI/ Title or Patta of Revenue Department), Electoral Roll, Ration Card, etc.

Table 7-1: Guidelines for Eligibility and Compensation for Rehabilitation Benefits

S. No.	Category of Persons affected by the Project	Compensation and Rehabilitation Plans
		Provisions
1	People (including tribals (if any) cultivating land under traditional rights) from whom land is acquired	<p>All titleholders shall receive monetary compensation at replacement values of the lands acquired based on current market rates. The value of the land shall be determined on the basis of prevailing legal norms of the Central Government; project specific State Government(s), and the policy requirements of the lending organizations. In case of tribals (if any) cultivating land under traditional rights, authentication of land held under traditional rights by state authorities will be necessary. In addition to above, the following shall apply –</p> <ul style="list-style-type: none"> • Subject to the suitability and availability of vacancies and further subject to approval of the Board of Directors of the Subsidiary company concerned, they shall offer employment. The employment shall be released to actual land losers or their dependent as prescribed in the R&R Policy notified by Ministry of Rural Development. The list of the people to be given employment shall be vetted and concurred by all land losers in presence of District Officials and officials/

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		<p>representatives from the subsidiary company of ASEPL.</p> <ul style="list-style-type: none"> • Land for land option shall be preferred. <p>NOTE –</p> <ul style="list-style-type: none"> • The subsidiary companies shall offer monetary compensation/ onetime cash grant/ financial package as announced by the concerned State Government. • All lands/assets lost will require to be compensated at replacement value. • In addition, all land losers will be given priority in employment opportunities by ASEPL and its subsidiaries besides attaining compensation for the land parcels sold. • A person receiving a job foregoes all claims to above compensation and a person receiving above compensation forgoes all claims to employment. <ul style="list-style-type: none"> ○ A list of the land losers shall be prepared in the descending order of land lost and employment released in that order upto the cut off determined on the basis of vacancy and suitability of candidate. Any deviation in the priority for release of employment can be made only with full justification to be recorded in writing and accepted by Company Officials, District Officials, as well as the concerned local leaders and specially the persons whose claim is superseded.
2	People whose homestead is acquired (if any)	<p>An alternate house site of same area and assistance in constructing the new house (if required by the displaced family) shall be provided.</p> <p>Compensation for shifting shall be as follows –</p>

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		<ul style="list-style-type: none"> • Each affected family that is displaced and has cattle, shall get financial assistance for construction of cattle shed. • Each affected family that is displaced shall get a onetime financial assistance for shifting the family, building materials, belongings and cattle. • Each affected person who is a rural artisan, small trader or self employed person and who has been displaced shall get a onetime financial assistance for constructing working shed or shop. <p>OR</p> <ul style="list-style-type: none"> • A onetime lump sum payment.
3	Sharecroppers, Land Lessees, Tenants and Day Laborers	<p>Any subsidiary of ASEPL shall assist Project Affected Persons (PAP) to establish non-farm self-employment through the provision of infrastructure, petty contracts or formation of co-operatives.</p> <p>OR</p> <p>Contractors shall be persuaded to give jobs to eligible PAPs on preferential basis, where feasible, in compliance with Contract Labor Act 2007 and relevant policies of State or Centre on wages.</p> <ul style="list-style-type: none"> • In addition, the subsidiary/ies shall make decent efforts so that there is no or minimum displacement of tribal community/ies. However, if there is a group of tribal people whose non-displacement otherwise leads to financial non-viability of the project, the subsidiary/ies shall shift the tribal community as a unit and provide facilities to meet the specific needs of the tribal community that will allow them to maintain their unique cultural identity.

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		<ul style="list-style-type: none"> • Tribal affected family shall be given one time financial assistance for loss of customary rights or usages of forest produce. Loss of customary rights needs to be authenticated by the District Authority. • Tribal affected families resettled out of the district shall be given higher rehabilitation and resettlement benefit.
4	Non-titleholders/Informal Rights	<ul style="list-style-type: none"> • ASEPL and its subsidiaries shall compensate any displaced persons having informal entitlements in cases where livelihood like seasonal agriculture, grazing activities etc. is affected. A one-time full lump sum payment shall be provided to non-titleholders. This payment will be based on the value of crops sown or value of fodder at present market rate. • In addition, employment opportunities shall also be provided by ASEPL and its subsidiaries to these non-titleholders whose livelihood has been affected.

7.3.4.6 Rehabilitation Efforts

ASEPL shall make the following rehabilitation efforts to prevent any sort of imbalances because of any of their present and future project(s) and in making the life of the people easier.

Non-farm self-employment

This provision shall be open only to those who are sharecroppers, land lessees, tenants, day laborers, or landless tribals (if any), or tribals dependent on forest produce.

Resettlement Benefit

Compensation to the homestead whether in the category of land owner or land less category is same and provides for one time lump sum payment in lieu of –

- Alternate house site of same area.
- Assistance in designing the new house if so desired by the displaced family
- Shifting allowance

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- Assistance for construction of cattle shed, working shed or shop
- Substance allowance

Women

Special attempts shall be made to ensure that women will be given adequate access to income generating opportunities offered under this policy. Training and skill development programmes to be carried out on priority basis through CSR Action Plans, to be developed for individual projects.

Community Facilities

The subsidiary will examine the feasibility of providing facilities for setting up or running of existing primary or upper primary school(s), good road with street light in the project area, pucca drain, pond, dug well or tube well for drinking water supply, community centre, place of worship, dispensary, grazing land for cattle and playground. Similar infrastructural facility, if necessary, will be extended to the host locality. The community facilities and services would be available to all residents of the area, including PAPs and host population.

The operation for the operation of community facilities would be flexible and all efforts will be made to involve the State and Local Self Government/ Panchayat for operating the facilities. To achieve this, subsidiaries will pursue with these agencies to ensure the same. The planning of the community facilities and their construction should be undertaken in consultation with the affected communities.

7.3.4.7 Implementation, Monitoring and Evaluation, Dispute Mechanism

The rehabilitation action plan will address the following –

- The project design including an analysis of alternative designs aimed at avoiding or minimizing resettlement;
- Socio-Economic Survey and activities to ensure restoration of incomes of PAPs in line with ASEPL's R&R Policy;
- Description of the institutional and other mechanisms for provision of entitlements;
- Time table for the acquisition and preparation of the resettlement site(s);

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- The cost and budgets for the resettlement and rehabilitation of PAFs;
- Project-specific arrangements to deal with grievances of PAFs;
- Time tables, benchmarks and arrangements for the monitoring the R&R effort.

Implementation of a Resettlement Action Plan shall be considered completed when the adverse impacts of resettlement have been addressed in a manner that is consistent with the relevant plan as well as the objectives of FC PS 5 and ADB IR Safeguard Requirement. It may be necessary for the client to commission an external completion audit of the Resettlement Action Plan to assess whether the provisions have been met, depending on the scale and/or complexity of physical and economic displacement associated with a project.

7.3.4.7 Socio Economic Survey

- A baseline socio-economic survey will be carried out to identify the PAPs to ensure restoration of incomes of PAPs in line with the ASEPL's R&R policy for any Solar PV Project of subsidiaries for the fulfillment of the broad requirements of IFC PS 5, ADB IR safeguard requirement and the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.
- The basic objective of the Socio-economic study will be to generate baseline data on the social and economic status of the population who are likely to lose their source of livelihood or homestead because of the project. The database will be to formulate a viable and practical Rehabilitation Action Plan (RAP) for the affected people in line with their entitlements.
- The RAP shall be monitored & evaluated periodically and will be flexible for any amendment (if deemed necessary).

7.3.5 Grievance Redressal Policy

7.3.5.1 Policy Preamble

It is the policy of ASEPL to ensure that –

- All stakeholders are treated fairly and promptly at all times.
- Any complaints/ requests raised by stakeholders are dealt with promptly and

professionally.

- Stakeholders (mainly those at or near the project site(s)) are informed of their rights to resolution of dispute(s) or complaint(s) and are encouraged to seek judicial or third party opinion wherever there is any interpretational uncertainty through appropriate stakeholder forum or otherwise.

ASEPL shall follow a “Bottom-up” approach in Grievance Redressal and thereby shelter the confidence of the stakeholders in the company and protect their interest under law. All complaints and queries received by the company shall be treated efficiently and fairly. ASEPL shall ensure that all the employees concerned are informed of the rights of all the other stakeholders and the Grievance Redressal Mechanism (GRM) prevalent in ASEPL for handling the various complaints and queries.

7.4 IMPLEMENTATION

ASEPL understands that for effective and efficient realization of the Corporate EHS & Social Policy, intelligent planning should be corroborated with diligent implementation mechanism. Because no matter how much pre-planning is done, weak implementation procedures will result in non-realization of business goal and often taken as a sign of critical management failure.

The implementation process shall take inputs from planning and review of the same (if required). And hence, this process shall be conducted as follows –

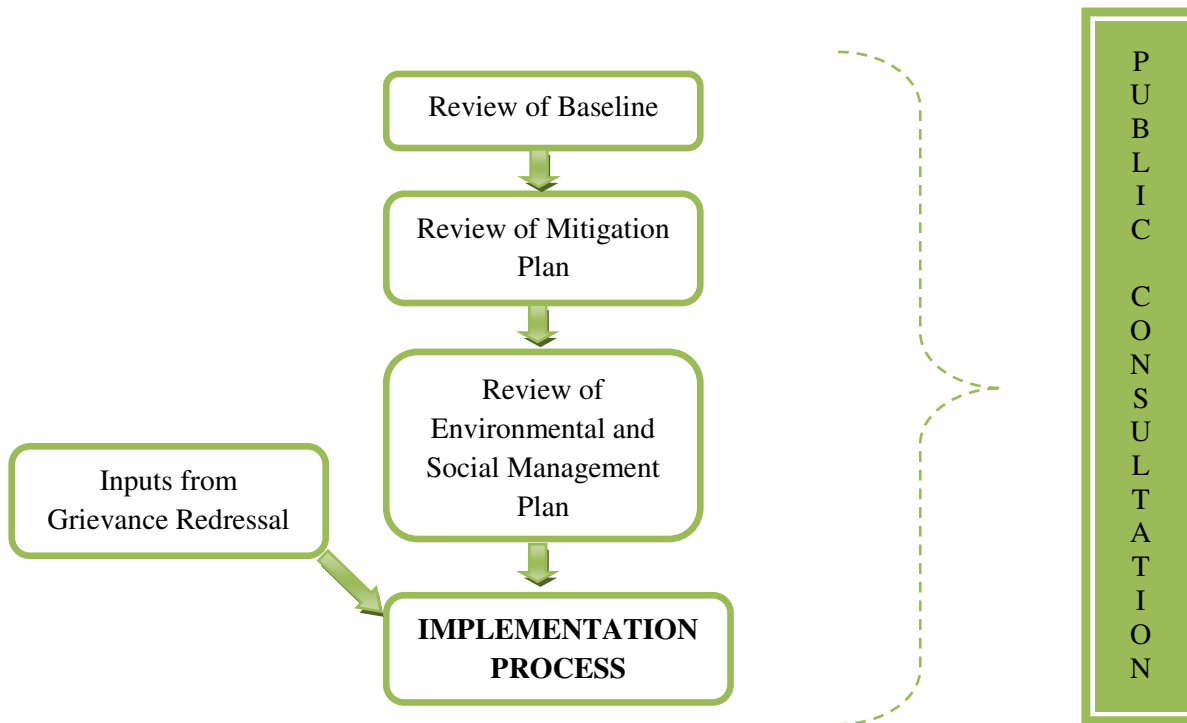


Figure 7.2: Implementation Process

Implementation shall be ensured through the following:

- Institutional Framework
- Competence training and awareness
- Communication
- Documentation
- Control of Documents
- Operational Control
- Emergency Preparedness

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7.4.1 Institutional Framework

Every project finds itself in the middle of different stakeholders, individuals and organizations who are actively involved in the project, or whose interest may be affected in a positive or negative manner as a result of project execution or successful project completion. The institutional framework of a project usually consists of –

- Project beneficiaries
- Project owner
- Contracting authority
- Implementing agency
- Funding agency

7.4.2 ESMS Organization Structure

The following will be the broad structure for management of ESMS:

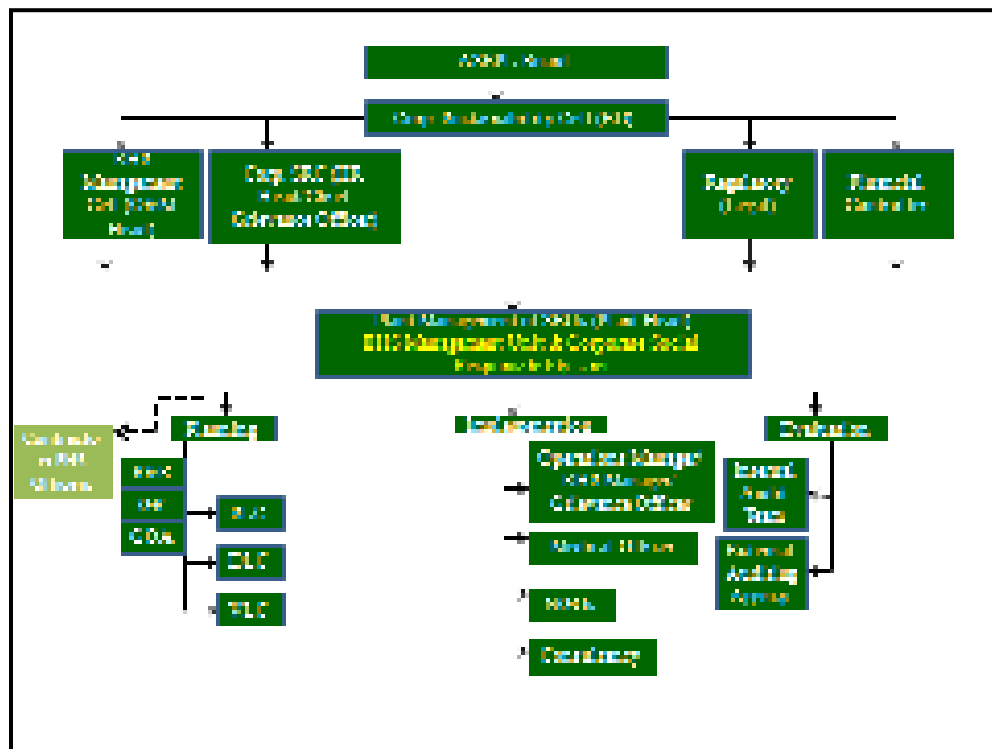


Figure 7.3: ASEPL ESMS Management Structure

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7.4.3 Roles and Responsibilities

ASEPL shall define, document and communicate the environmental and social management roles and responsibilities of all the people involved in the project, including contractors and others working on behalf of the company. Personnel with specific roles and responsibilities will have the authority, and be held accountable for, carrying out these responsibilities.

The basic roles required to implement the requirements of ESMS, and establish and maintain the ESMS, are shown in Table 7.2 below. These roles shall be reviewed and incorporated into the organizational structures for the C, O&M phases of the project.

Table 7.2: Roles and Responsibilities for Environmental and Social Management

ASEPL Board	<ul style="list-style-type: none"> • Endorse the environmental and social management system and communicate it to the public • Allocate adequate human and financial resources to enable effective functioning and continual improvement of the ESMS • Establish and maintain a management review and governance system
EHS Management Cell	<ul style="list-style-type: none"> • Establish the ESMS, with assistance from the senior management (ASEPL Board), Financial Controller, Regulatory Head and HR Head. • Liaise with specific Plant Heads regarding EHS and Social management roles, responsibilities and authorities throughout the life cycle of the project(s). • Coordinate monitoring and evaluation activities and confirm that corrective actions (an action taken to address a non-conformance) are taken to address incidents and non-conformances (a failure to comply with the Project(s)' ESMS) Report progress in implementation and functioning of the ESMS to senior management, development financiers, regulatory authorities and stakeholders

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<p>Corporate Social Responsibility Cell</p>	<ul style="list-style-type: none"> • Assist the EHS Management team with ongoing reporting to stakeholders on EHS and Social Management Plans and supporting management plans, and progress with implementation of management measures • Assist Operations’ and Maintenance Head and specific Plant Heads, with stakeholder communication where awareness and/ or co-operation of stakeholders are required to implement management measures • Manage the Grievance Redressal Mechanism by discharging the duty of a Chief Grievance Officer.
<p>Plant Heads/Operations Manager/Project Manager</p>	<p>The project head or Project manager is appointed for project construction, contractor management and other project related requirements. The Project Manager or project head is given the position of Plant Head or Operations Manager. Project Manager/Plant Head/Operations Manager term has been interchangeably used in the ESMS. The following are the responsibilities of Plant Head/Operations Manager/Project Manager:</p> <ul style="list-style-type: none"> • Communication and reporting • Confirm there is adequate ongoing stakeholder engagement • Confirm obligations for reporting to regulatory authorities, development financiers and affected communities are met • Management review • Provide leadership in the pursuit of environmental and social management • Examine and review the ESMS periodically to determine its suitability, adequacy and effectiveness, Support action to enhance the ESMS and make improvements in EHS and Social management performance • Prepare on-site workers and other local people for Emergency Preparedness Plans
<p>All personnel and</p>	<ul style="list-style-type: none"> • Comply with ASEPL policies, site standards, contract conditions

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contractors	and applicable legal requirements <ul style="list-style-type: none">• Work in accordance with the Environmental and Social Management Plan and supporting documents• Report problems or deviations from the ESMS to specific Plant Heads or Operations Managers, as instructed.
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Existing Organization Structure

ASEPL has established an organization structure both at the Corporate and Site levels for its operations. The structure at the corporate level comprises of a Corporate Sustainability Cell comprising of four sub divisional departments, namely, EHS Management Cell, Corporate Social Responsibility Cell, Regulatory (Legal) and Financial Controller. All these departments report directly to the ASEPL Board.

Below these divisions is the Plant Head at the Site level. The EHS Manager/ Grievance Officer and others Officers comprise the team at the site and they report directly to the Plant Head. As the size of the operations at a solar plant is minimal and owing to the manpower deployed at various stages of the project life cycle for management of Environment and Social issues at the site, the Plant Head will be responsible for management of EHS and Social issues at site in close association with Corporate Sustainability Cell. Additional personnel can be deployed with multiple responsibilities to assist the Plant Head for managing EHS and social issues. The EHS Manager will look after both the EHS and Social related issues with assistance from the HR Head. It shall be noted that, corporate level the Corporate Sustainability Cell shall ensure that adequate training is provided to the concerned employees for management of E&S issues associated with the site. Deployment of specific EHS Officer and Social Officer is not envisaged in the present system; however, responsibilities sharing are suggested at the Plant level.

Environmental and Social Management Unit (ESMU)

In order to ensure an effective implementation of the ESMS, ASEPL shall establish an Environmental and Social Management Unit (ESMU) which will implement the Environment

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and Social Management System Manual as documented at each operating or upcoming facility of ASEPL. To align the proposed members of ESMU with existing organization structure of ASEPL, additional responsibilities will be allocated to current designated officers in the existing organization structure. The ESMU will comprise of EHS Management Cell and Corporate Social Responsibility Cell at corporate level who will report to ASEPL Board. The respective Heads will be assisted by the Managers like EHS Manager/Officer and Plant Head from the project level.

The Managers shall meet on weekly basis and undertake the role of providing resources, manpower and provisions as required for effective implementation and operation of ESMS Manual through appropriate decision making. The existing organization structure of ASEPL has not assigned dedicated position for matters pertaining to social aspects. Henceforth, the Human Resource (HR) Head who is responsible for the Corporate Social Responsibility Cell shall be allotted additional responsibility of overseeing activities pertaining to the social aspects. The EHS Head looking after the EHS Management Cell along with other members of the implementation unit shall be responsible for:

- Identification of time bound milestones, engage objective driven mechanism and assess them at periodic intervals;
- Compliance with laws, regulations, permits and other standards as committed;
- Incorporating environment and social elements into new and existing projects after considering the technical and financial aspects;
- Monitor the ESMS Manual through review of audits and other assessments programs;
- Review the feedbacks on various project through different channels; and
- Communicate the shortcomings and improvement mechanism to all project (existing and proposed ones)

The ESMU will be responsible for implementing and overseeing project facility specific environmental regulatory compliance, safeguards implementation management, performance and review at all ASEPL's project, periodical monitoring, review and preparation of annual environmental performance report for submission of National and State regulatory bodies as well

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as to IFC and ADB.

ASEPL Board: The additional responsibilities handled by ASEPL's senior management are as follows:

- The Board will work closely with the members of ESMU to ensure that adequate resources have been committed for effective implementation of the ESMS and procedures;
- They will be responsible for maintaining a pool of qualified environmental and social consultants, who can be engaged on requirement basis to assist in conducting environmental and social reviews as appropriate;
- They will implement EHSS management system at all operating and upcoming operations through the respective project EHS officer after prior customization as required; and
- Act as a corporate guidance cell for all issues related to Environment, Health and Safety and Social.

EHS Management Cell: The EHS Management Cell comprises of the EHS Head at the corporate level. Besides the above mentioned roles and responsibilities, he is required to undertake the following responsibilities as well,

- Dissemination of information about the aspects of environment, health and safety as per IFC Sustainability Framework and ADB Safeguard Policy Statement applicable to the projects to EHS officers stationed at respective site;
- Organize capacity building workshops and training programs for the main contractors and employees of ASEPL pertaining to subjects like construction labour such as mock drills and emergency response procedures;
- Work in association with EHS Officers stationed at different project sites of ASEPL for addressing issues related to working environment and safety of the labours and site;
- Periodically review the EHS performance of the project during construction phase and operation phase;
- Assess the ESMS performance of all operating company and develop an annual report.

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Corporate Social Responsibility Cell: The Corporate Social Responsibility Cell is headed by the Human Resource (HR) Head of ASEPL based at the Corporate Office. Besides the responsibilities mentioned above, he is required to perform additional responsibilities as HR Head, Social Head and Chief Grievance Officer.

- Responsible for formulating Grievance Redressal Committee (GRC) at corporate level and will conduct meetings for grievance closure at project site on a quarterly basis;
- Playing a crucial role in formulation of Corporate Social Responsibility (CSR) team and preparation and allocation of budget on the basis of requirements;
- Process and prepare a budget on quarterly basis from feedback, complaints and comments received from other team members for financial inputs required;
- Evaluate the performance feedback of corporate and operational site staff and subcontractors on issues and include it in decision making at all stages as required;
- Assess the staff for awareness and competencies at regular frequency;
- Develop and organize training programs for staff and contractors regarding ESMS Manual;
- Effectively monitor all shortcomings and improvements required for the ESMS Manual and update the ESMS Manual periodically.

Executive Director: The Executive Director shall approve and sign all documents, include the EHS Policy, Social Policy, CSR Policy, ESMS Manual, ESMS Procedures, Instructions, Objectives, Targets and Programmes, Register of EHSS Aspects and Impacts and Registers of Legal and Other Requirements.

Solar Financial Controller (SFC): The SFC shall work together with the EHS Management Cell, HR Department and Regulatory Department to prepare and revise all ESMS documents.

Administration Department (AD): The AD is responsible for the ESMS document control system. The AD shall ensure that only controlled and current copies of documents are used, and distribute the controlled ESMS documents to relevant personnel whenever updated versions are available. The AD shall also maintain and update the Master List of Documents.

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Project / Function / Departmental Manager: The Project / Function / Departmental Manager shall review relevant ESMS documents and procedures; ensure that their subordinates are familiar with the updated ESMS documents related to them; and report any proposed changes to the ESMS documents and forms to the SFC.

Project Level EHS Structure

ASEPL project level operations comprises of an EHS Manager and other Officers who will be overall responsible for establishing and maintaining ASEPL's ESMS Manual at project level. These designated personnel will act as the primary interface between the ESMU and all the contractors working at site.

These designated individuals will be constantly in touch with the EHS Head and HR Head for acquainting them about EHSS issues, milestones achieved, financial requirements and receive from them regular guidance on improving the performance of Environment, Health Safety and Social Aspects at different project sites of ASEPL. These persons shall be responsible for ensuring that the policies and procedures of ASEPL are integrated into the overall operations, plans and programmes in relation with management of the facility. The EHS Manager at site will handle EHS issues while the other Officers will be instrumental in interacting with labours and addressing their day to day concerns. The contractors will be controlled by the EHS Manager at the respective project site. In relation to community engagement and aspects related to grievance redressal at the community level the EHS and other Officers, shall report directly to the HR Head based at the corporate level.

Sub-contractors at Site and EHS compliance

Every contractor engaged by ASEPL management for construction of new project site or to manage operation phase of a facility shall appoint a representative (preferably EHS Officer) who will be responsible for supervising the implementation of ESMS Manual at site.

To manage EHS and social issue related to activities of the sub-contractors, ASEPL's project level EHS Manager in conjunction with EHS Head and HR Head of ESMU will be responsible to check the capability of the contractors to manage EHS and Social risks, their legal

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compliances, licenses, their implementing procedures etc. ASEPL's EHS team will ensure that the SOPs which the contractor implements are consistent with the documented ASEPL's ESMS Manual, IFC Sustainability Framework and ADB Safeguard Policy Statement.

CHAPTER-8: GRIEVANCE REDRESSAL MECHANISM

Environmental and social grievances will be handled in accordance to the project grievance redress mechanism. Acme Solar Energy Private Limited (hereafter referred as 'ASEPL') is a flagship company of ACME group that is engaged in development and promotion solar energy generation through Photovoltaic technologies. As on date, ASEPL has developed capabilities for developing, constructing, and operating Mega Watt (MW) scale power projects. ASEPL also provides Engineering, Procurement and Construction (EPC) services to other solar power developers as well.

8.1.GRIEVANCE REDRESSAL POLICY

8.1.1 Policy Preamble

It is the policy of ASEPL to ensure that –

- All stakeholders are treated fairly and promptly at all times.
- Any complaints/ requests raised by stakeholders are dealt with promptly and professionally.
- Stakeholders (mainly those at or near the project site(s)) are informed of their rights to resolution of dispute(s) or complaint(s) and are encouraged to seek judicial or third party opinion wherever there is any interpretational uncertainty through appropriate stakeholder forum or otherwise.

ASEPL shall follow a “Bottom-up” approach in Grievance Redressal and thereby shelter the confidence of the stakeholders in the company and protect their interest under law. All complaints and queries received by the company shall be treated efficiently and fairly. ASEPL shall ensure that all the employees concerned are informed of the rights of all the other stakeholders and the Grievance Redressal Mechanism (GRM) prevalent in ASEPL for handling the various complaints and queries.

8.2.GRIEVANCE REDRESSAL MECHANISM

Approach and Objective

Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at Village - Kalipi, District - Anantapur in Andhra Pradesh

The ASEPL will have a dedicated team with adequate manpower and infrastructure to receive, resolve and close the complaints and queries successfully

The Head of the Regulatory Department is designated as Grievance Officer (GO) for all the subsidiaries of ASEPL. The grievance is received by the GO through post/ grievance box. GO shall have to submit a status report to the Chief Grievance Officer (CGO) in ASEPL Corporate Office by 7th of every month. The contact details of the GO shall be maintained and updated in the following format displayed at prominent places available to public at all subsidiaries.

Response to be expected by a person lodging the Grievance

All grievance received by post/grievance box shall be acknowledged and a record shall be maintained.

All complainants shall be provided acknowledgement on receipt of grievance within seven (7) days from the day of receipt by the GO.

Communication to Complainant

All complainants shall be given grievance number and expected time of redressal by the GO as per the time norm. Complainant can approach higher authorities if grievance is not resolved within the prescribed timeline. If grievance is not resolved within the expected time, the Complainant shall be provided the following information by the GO –

- Information on reasons for delay.
- Updated expected time of redressal.
- If not addressed within the expected time, action to be taken by the complainant.

At the time of final redress the complainant shall be provided with the following information by the office responsible for redress of the grievances –

- Action taken for redress.
- If not satisfied with the redress action, other avenues for pursuing the matter.

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This information shall be given in the same letter / order through which the final decision on redress is conveyed to the complainant.

The following will be the flow in which any complaint will be acknowledged and redressed –

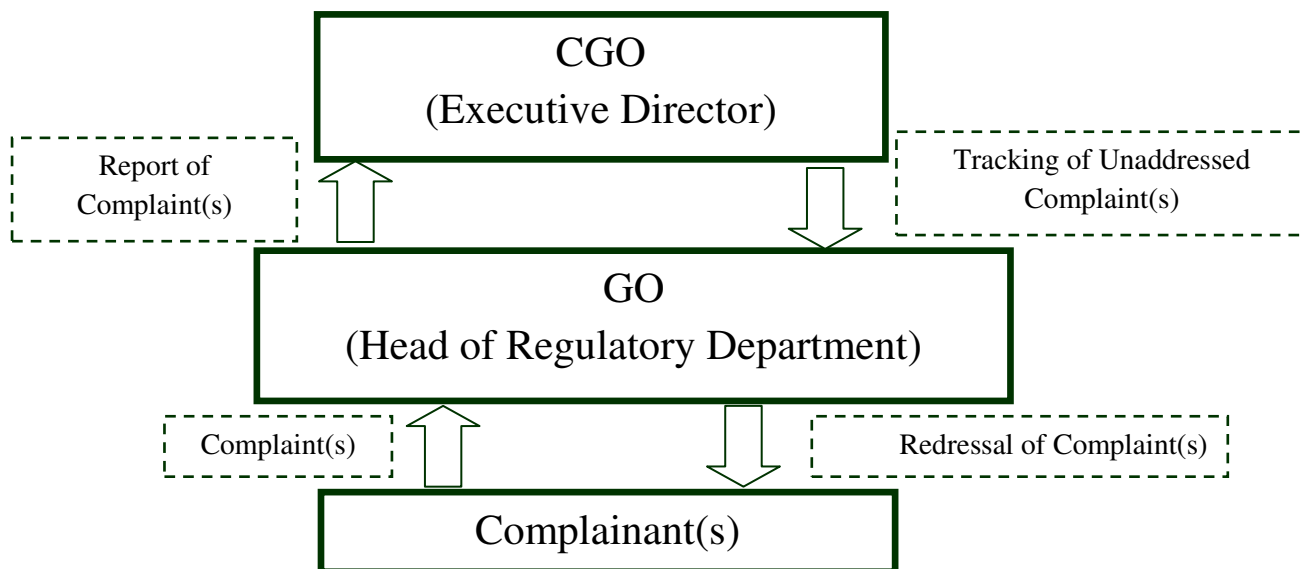


Table 8.1– Time Norms for Redress

S. No	Grievance	Time norms for redress
1.	EHS Related	1 week
2.	Social Related	1 week

Table 8.2-Level of Responsibility for Redress

S. No.	Grievance Category	Timelines for Redressal by Grievance	Timelines for Redressal by Chief
1.	EHS Related	1 week	2 weeks
2.	Social Related	1 week	2 weeks

Analysis and Prevention

All grievances shall be analyzed to find out the root cause of the frequent grievances in any particular area and matters shall be taken up with the competent authority for necessary modification in the policy / rules and regulations to prevent the same.

Periodic Review

All the GOs of ASEPL shall have to submit a monthly progress report to the CGO at ASEPL Corporate Office by 7th of every month. Thereafter, the CGO shall take up the matter for resolving unaddressed grievances. He/ She will track the unaddressed grievances with the GO on a fortnightly basis.

8.3 GRIEVANCE REDRESSAL MECHANISM DESIGN AND IMPLEMENTATION PROCESS

This section describes the step by step process for implementing the GRM:

Step 1 - Design of GRM

All the Grievances are first received by designated GO of the respective subsidiaries of ASEPL by Post / Grievance Box or even orally. For the complaints that are received orally, there should be a provision that the same are documented in a record register. All the grievances are categorized as per criteria defined, level of responsibility for redress and timeline for redress for each level. The details of complainant, complaint description and any other information provided by the complainant are noted. Thereafter, the grievance is forwarded to the concerned department for redressal and the status is informed to the head of the subsidiary. All the GOs of ASEPL have to submit a status report of grievances to the CGO in ASEPL Corporate Office by 7th of every month. All Grievances which remain unaddressed are taken up by the CGO with the respective subsidiaries and is appraised of the status.

Step 2 - Implementation of GRM

The CGO shall ensure that the GOs are nominated as each subsidiary of ASEPL. These GOs are responsible for implementing the process as documented above and ensure that they are aware

Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at Village - Kalipi, District - Anantapur in Andhra Pradesh

and trained in respect of their role in implementation of the process flow. They shall also conduct an awareness campaign to spread awareness among all stakeholders about GRM.

Step 3 - Grievance Prevention

All the grievances shall be analyzed for finding the root cause using the information on grievance description and subsequent redressal provided to the complainant. The most frequent types of grievance and the most frequent cause behind the grievance shall be identified and remedial action shall be taken. It should be ensured that the GRM is modified in order to prevent the root causes from recurring. Every quarter, results of the previous quarter's analysis shall be reviewed to ensure that there is no backlog in the redressal of grievances.

Step 1 Design of GRM

- Task 1 - Prepare a list of Data Items to be captured in GRM
- Task 2 - Prepare the internal process flow chart for GRM

Step 2 Implementation Process of GRM

- Task 1 - Implement the process flow through existing systems
- Task 2 - Training / Workshops on GRM
- Task 3 - Launch the GRM
- Task 4 - Publicize the GRM

Step 3 Grievance Prevention

- Task 1 - Conduct systemic analysis
- Task 2 - Identify grievance prone areas and remedial actions
- Task 3 - Take follow up action to address grievance prone areas

CHAPTER 9-SITE SPECIFIC SOCIAL SURVEY

9.1 INTRODUCTION

This chapter describes the socio-economic conditions of the villagers, who have given their land on lease and are the major stakeholders in the project.

9.2 NEED OF SOCIAL SURVEY

A social survey is the collection of data concerning the living and working conditions, broadly speaking, of the people, in a given community.

The social survey method has the ultimate goal of seeking social facts. It normally involves the following steps: Enunciating the object or purpose of the survey; definition of the problem under study; the delimitation of the area or scope of study; examination of the available evidences or sources relating to the problem; preparation of questionnaire schedule; field work to collect data; arrangement, tabulation and statistical analysis of the data; interpretation of results; deduction and graphic expression.

The social survey is concerned with the collection of data relating to some problems of great social importance with a view to find out an effective solution for it. The survey is normally limited to a fixed geographic area or confined to a defined population.

The total group of people whose attitudes, opinions or behaviour, the sociologist is interested in is called the “population”. The people are carefully selected so that they become representative of the population being studied.

They are asked to answer exactly the same questions, so that the replies of different categories of respondents may be examined for differences. In some cases, it is possible to survey the entire population, but time and expense make their procedure impracticable unless the population is a small one and confined to limited area.

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In most cases it is necessary to survey a “sample”, a small number of individuals drawn from the larger population. This type of survey is often called “sample survey”. The sample must exactly represent the population in question.

If it does not, then any conclusions are valid only for the actual people who were surveyed (that is, the respondents) and cannot be applied to the entire population from which the sample was drawn.

One of the major virtues of the survey is that a large number of respondents can be included in it. For the very same reason both the method of getting the questionnaires completed, and the formulation of the questions to be asked, must be very carefully worked out.

9.3 DESCRIPTION OF THE PROJECT SITE

Project site comprises of barren land. The terrain in the east was noted to be sloping towards west whereas that of west was noted to be sloping towards east. The land profile thus leads to low lying central area that can be effectively used for central storm water drains. The site photographs are given in Annexure-I.

9.4 SITE SOCIAL SURVEY

A site social survey was conducted on 13.02.2016 amongst the villagers, who had given their land to the project and were engaged in the labour work at the site. Total of 6 villagers were interrogated regarding their socio-economic conditions. The social data collected in specified formats are attached in Annexure-II and is summarized in Table-9.1 below.

**Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at
Village - Kalipi, District - Anantapur in Andhra Pradesh**

Table-9.1 Summarized Socio-Economic Data

S. No	Name of Villager	Village	Block	District	Annual Income	Status of Indebtness	Consumption Pattern	Government Scheme availed
1	G. Ramesh	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme
2	A. Balaji	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme
3	A. Anjan Reddy	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme
4	B. Maruti	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme
5	A. Krishna Reddy	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme
6	B. Ramanji	Seshapuram	Roddam	Anantapur	Rs. 84,000 (approx.)	Nil	As per Government Ration Scheme	Ration Scheme

CHAPTER 10: CONCLUSION AND RECOMMENDATION

Impacts are manageable and can be managed cost effectively - Environmental impacts are likely to result from the proposed transmission system development. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for subprojects have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes.

The proposed project will have number of positive impacts and negative impacts to the existing environment as follows:

Significantly improvement in the economic activities in the surrounding areas due to generation of direct and indirect employment opportunities.

Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, nuisance from dust, noise, vehicle fumes, black smoke, vibration are the short term negative impacts due to proposed project.

Proper GRM will have to be implemented by ASEPL to overcome public inconvenience during the proposed project activities. It is highly recommended to establish a tree replanting programme which would be undertaken as per the directives/requirements of the Forest Department, and financed by ASEPL where ever trees will be planted for corresponding number of trees that are cut.

Based on the environmental and social assessment and surveys conducted for the Project, the potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified in the EMP. Adequate provisions are being made in the Project to cover the environmental mitigation and monitoring requirements, and their associated costs. Adequate provisions are being made by ASEPL to cover the environmental mitigation and monitoring requirements, and their associated costs.

CONCLUSION

An environment and social analysis has been carried out looking at various criteria such as topology air, noise, water resources and water quality, ecology and demography of the area, climate and natural habitat, community and employee health and safety etc. The impact analysis, found that due to careful consideration of environmental and social aspects during route and site selection by ASEPL, no major adverse impacts are expected. There is no adverse impact on the migration of habitat, any natural existing land resources and effect in the regular life of people. The environment and social impact associated with transmission line project is limited to the extent of construction phase and can be mitigated through a set of recommended measures and adequate provision for environment and social impacts which cover monitoring, measuring and mitigation.

ESMP has been prepared. Most impacts are expected to occur during the construction phase and are considered to be of a temporary nature. The transmission corridor was carefully selected after undergoing an options assessment. This enabled the right of way alignment to bypass villages and important water supplies and resources. The main project impacts are associated with clearing of shrub vegetation, waste management and excavation and movement of soils.

From this perspective, the project is expected to have a small "environmental footprint". No endangered or protected species of flora or fauna are reported at any of the subproject sites. Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts, along with their associated costs. Adverse impacts if noticed during implementation will be mitigated using appropriate design and management measures.

Mitigation measures related to construction, as specified in the ESMP, will be incorporated into civil works contracts, and their implementation will be primarily the responsibility of the contractors. Hence, the proposed project has limited adverse environmental and social impact which can be mitigated following the ESMP & shall be pollution free Renewable source of Power.

**Environmental and Social Impact Assessment Report for Solar PV Project (50 MW) at
Village - Kalipi, District - Anantapur in Andhra Pradesh**

SITE PHOTOGRAPHS



SOODI ECONOMIC SURVEY QUESTIONNAIRE

Date: 05/07/16
 Time: 12:35 pm

Dist/Amalga (A)
 Block (B)
 Name of village Potansojit Dam
 Tal. Supervisor

1. GENERAL IDENTIFICATION

1	Location	1	Lat.	27°41'	
2	Longitude	2	Long.		
3	State				
4	Dist.				
5	1. Block 2. Sub-block 3. Village	<u>Amalga</u> <u>Potansojit</u> <u>Sardaputran village</u>			
6	7. Gender	1. Male	2. Female	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female	

2. HOUSEHOLD IDENTIFICATION

2.1 Name of the head of household A. Palasi
 2.2 Address of the household (village) Sardaputran village

3. LAND Type of land

Salable	Non-salable	Total Land Area (ha)

4. CROPPING PATTERN: Wet

Sl. No.	Type of Crops	Total Cultivable Land (ha)	Total Area (ha)

3 ANNUAL INCOME

Sl. No	Source	Amount (Rs)
1	Salaries	-
2	Dividend	-
3	Business	-
4	Labour	-
5	Interest	-
6	Any other	-
Grand Total		-

Inc. 3000 pending for 3 months per annum
20000 per year salary
100000 per year dividend
100000 per year business

4 INTERESTNESS *nil*

S.N.	Source	Amount (Rs)	Annual Interest (Rs)	Balance (Rs)

5 CONSUMPTION PATTERNS

Sl. No	Particulars/Source	Expenditure (Rs)	
		Monthly	Annual
A	Food		
	1. Groceries <i>10000</i>	<i>2000</i>	
	2. Fuel <i>5000</i>	<i>1000</i>	
	3. Milk <i>1000</i>	<i>1200</i>	
	4. Clothing		
	5. Repairs		
	6. Misc.		
	7. Utilities		
	8. Total Food	<i>3200</i>	
	9. Rent		
	10. Transport <i>1000</i>	<i>1200</i>	
B	11. Groceries <i>1000</i>	<i>1000</i>	
	12. Fuel		
	13. Milk		
	14. Clothing		
	15. Repairs		
	16. Misc.		
	17. Utilities		
	18. Total (A+B)		
Grand Total (A+B)			

1. POSSESSION OF DURABLE CONSUMER ITEM

Do you possess following items?

Sl. No.	Items	Response	
		Yes	No
1	Kaba	<input checked="" type="checkbox"/>	
2	Car	<input checked="" type="checkbox"/>	
3	Washing Machine		<input checked="" type="checkbox"/>
4	Car		<input checked="" type="checkbox"/>
5	LPG Connection	<input checked="" type="checkbox"/>	
6	Television	<input checked="" type="checkbox"/>	
7	Refrigerator	<input checked="" type="checkbox"/>	
8	Washing Machine		<input checked="" type="checkbox"/>
9	Color TV set		<input checked="" type="checkbox"/>
10	Car		<input checked="" type="checkbox"/>
11	Air conditioner		<input checked="" type="checkbox"/>
12	Any other product		<input checked="" type="checkbox"/>

2. COVERAGE UNDER GOVERNMENT DEVELOPMENT SCHEMES

9.1 How you get subsidy under any Govt. scheme?

Patron card

9.2 How you find out the details of such schemes?

Name of the Schemes	Kind of help (loan, & Training, & Employment)
IRROCI	
DEWASA	
ICCI	
SCSP/MSU	
Kilic Skills Programme	
Other (Specify)	<i>Patron scheme</i>

1. If only include the amount.

2. If only include the type of subsidy.

9.3 How you find the details of your business (if any)?

1. Yes 2. No

9.4 How you find it?

Under Patron scheme few suitable schemes are available at subsidized rate. However, this rate was not available to those business concerns.

16 HEALTH STATUS *n/a*

101 Was any member of your family affected by any notifiable disease?
 Yes *2/0*

102 List present illness/diseases

S. No.	Type of disease/illness	Treatment taken			
		1. Allopathic	2. Homeopathic	3. Ayurvedic	4. Traditional
1					
2					
3					
4					
5					
6					

170 VIGILANCE *n/a*

101 Is your shop/office open?
 Yes *2/0*

102 If not, how long closed and for how long? *n/a*

103 Where do you get goods? *n/a*

1. In the State 2. Out of the State 3. Overseas

104 What kind of shops/business do you run?

1. Agricultural (crop) *2* 2. Agricultural (Livestock) *1*
 3. Trade & Business 4. Other (Specify)

105 How much do you earn?

2 65,000/- (monthly)

106 How often you visit

1. Once in a year 2. Twice in a year 3. Every six months
 4. Once in every three years 5. Regularly (Specify interval and when (DD, MM, YR))

107 At what time of day do you visit?

1. Morning 2. Afternoon
 3. Evening

12.0 WOMEN STATUS

12.1 Are you doing any of the following

S.No.	Economic / Non-economic Activities	Engagement in Activities Yes / No
1	Outcasting	Yes
2	Art and Crafts	No
3	Run of House Hold	No
4	Trade & Business	No
5	Agricultural work	No
6	Non-Agricultural Labour	No
7	Self-employment	No
8	Service	No
9	Domestic Work	No
10	Education & Child Training	No
11	Other (Specify)	No

- a. Daily Wages / Earnings (Specify work, Qty, etc) No
- b. Earnings from own or self-employment (Specify work, Qty, etc) No

12.2 Do you want to monitor the progress of development work in your village? Yes

12.3 Do you wish to be involved in?

S.No.	Issues	Yes	No
1	Financial matters		<input checked="" type="checkbox"/>
2	Educational matters		<input checked="" type="checkbox"/>
3	Health care of child	<input checked="" type="checkbox"/>	
4	Purchase of assets	<input checked="" type="checkbox"/>	
5	Day to day activities	<input checked="" type="checkbox"/>	
6	On social functions and meetings		<input checked="" type="checkbox"/>
7	Others		<input checked="" type="checkbox"/>

Signature

(Signature)
Signed by the beneficiary

Name & Address: A. Dalaji

A. Dalaji

Inspector's remarks

Local villagers are getting their facilities on basis of labour provided in project site

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SCIENCE-BASED SURVEY QUESTIONNAIRE

Date: 12/12/2023
 Time: 10:30 AM

Age (in years): 21
 Sex: Male
 Name of Institution: Government College of Engineering, Salem
 Full Name: _____

1. GENERAL INFORMATION

1. How often do you use the internet? 1 to 2 times

2. How often do you use social media? 3 to 4 times
 a. Facebook _____
 b. WhatsApp _____

3. How often do you use mobile applications? 1 to 2 times
 a. WhatsApp _____
 b. Instagram _____
 c. Facebook _____
 d. Messenger _____

4. How often do you use mobile banking services? 1 to 2 times

2. USER-ROLE IDENTIFICATION

5. Name of the user role: Student

6. Address of the user role: Salem, Tamil Nadu

3. USER PROFILE

7. Age: _____
 Gender: _____
 Education Group: _____

4. EXPERIENCE

1. How often do you use mobile banking services?	2. How often do you use mobile applications?	3. How often do you use social media?	4. How often do you use the internet?
<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

5. ANNUAL INCOME

S.No	Source	Amount (Rs)
1	Salary	
2	Dividend	
3	Interest	
4	Profit	
5	Gifts	
6	Other	
Grand Total		80000

Handwritten note: Total = 12,000 - 2000 = 10,000

6. INVESTMENT IN EQUITY SHARES

S.No	Name of the Company	Amount (Rs)	Percentage (%)
1			
2			
3			
4			
5			
6			
7			
8			
9			
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12			
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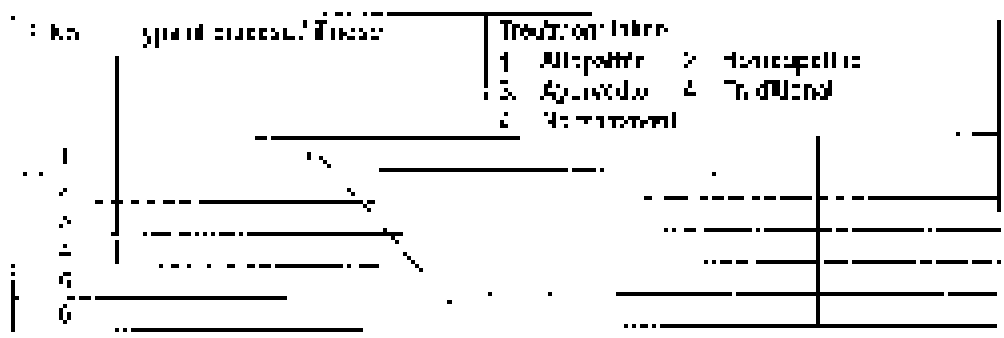
7. ANNUAL EXPENDITURE

Sl. No	Particulars/Service	Expenditure (Rs)	
		Monthly	Annual
A	1. Rent		
	2. Electricity		
	3. Water		
	4. Telephone		
	5. Gas		
	6. Fuel		
	7. Repairs		
	8. Entertainment		
	9. Education		
	10. Medical		
	11. Insurance		
	12. Tax		
	13. Interest		
	14. Dividend		
	15. Profit		
	16. Gift		
	17. Other		
	18. Miscellaneous		
	19. Salary		
	20. Dividend		
	21. Interest		
	22. Fuel		
	23. Repairs		
	24. Entertainment		
	25. Education		
	26. Medical		
	27. Insurance		
	28. Tax		
	29. Interest		
	30. Dividend		
	31. Profit		
	32. Gift		
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	35. Salary		
	36. Dividend		
	37. Interest		
	38. Fuel		
	39. Repairs		
	40. Entertainment		
	41. Education		
	42. Medical		
	43. Insurance		
	44. Tax		
	45. Interest		
	46. Dividend		
	47. Profit		
	48. Gift		
	49. Other		
	50. Miscellaneous		
	51. Salary		
	52. Dividend		
	53. Interest		
	54. Fuel		
	55. Repairs		
	56. Entertainment		
	57. Education		
	58. Medical		
	59. Insurance		
	60. Tax		
	61. Interest		
	62. Dividend		
	63. Profit		
	64. Gift		
	65. Other		
	66. Miscellaneous		
	67. Salary		
	68. Dividend		
	69. Interest		
	70. Fuel		
	71. Repairs		
	72. Entertainment		
	73. Education		
	74. Medical		
	75. Insurance		
	76. Tax		
	77. Interest		
	78. Dividend		
	79. Profit		
	80. Gift		
	81. Other		
	82. Miscellaneous		
	83. Salary		
	84. Dividend		
	85. Interest		
	86. Fuel		
	87. Repairs		
	88. Entertainment		
	89. Education		
	90. Medical		
	91. Insurance		
	92. Tax		
	93. Interest		
	94. Dividend		
	95. Profit		
	96. Gift		
	97. Other		
	98. Miscellaneous		
	99. Salary		
	100. Dividend		
	101. Interest		
	102. Fuel		
	103. Repairs		
	104. Entertainment		
	105. Education		
	106. Medical		
	107. Insurance		
	108. Tax		
	109. Interest		
	110. Dividend		
	111. Profit		
	112. Gift		
	113. Other		
	114. Miscellaneous		
	115. Salary		
	116. Dividend		
	117. Interest		
	118. Fuel		
	119. Repairs		
	120. Entertainment		
	121. Education		
	122. Medical		
	123. Insurance		
	124. Tax		
	125. Interest		
	126. Dividend		
	127. Profit		
	128. Gift		
	129. Other		
	130. Miscellaneous		
	131. Salary		
	132. Dividend		
	133. Interest		
	134. Fuel		
	135. Repairs		
	136. Entertainment		
	137. Education		
	138. Medical		
	139. Insurance		
	140. Tax		
	141. Interest		
	142. Dividend		
	143. Profit		
	144. Gift		
	145. Other		
	146. Miscellaneous		
	147. Salary		
	148. Dividend		
	149. Interest		
	150. Fuel		
	151. Repairs		
	152. Entertainment		
	153. Education		
	154. Medical		
	155. Insurance		
	156. Tax		
	157. Interest		
	158. Dividend		
	159. Profit		
	160. Gift		
	161. Other		
	162. Miscellaneous		
	163. Salary		
	164. Dividend		
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	166. Fuel		
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	196. Dividend		
	197. Interest		
	198. Fuel		
	199. Repairs		
	200. Entertainment		
	201. Education		
	202. Medical		
	203. Insurance		
	204. Tax		
	205. Interest		
	206. Dividend		
	207. Profit		
	208. Gift		
	209. Other		
	210. Miscellaneous		
	211. Salary		
	212. Dividend		
	213. Interest		
	214. Fuel		
	215. Repairs		
	216. Entertainment		
	217. Education		
	218. Medical		
	219. Insurance		
	220. Tax		
	221. Interest		
	222. Dividend		
	223. Profit		
	224. Gift		
	225. Other		
	226. Miscellaneous		
	227. Salary		
	228. Dividend		
	229. Interest		
	230. Fuel		
	231. Repairs		
	232. Entertainment		
	233. Education		
	234. Medical		
	235. Insurance		
	236. Tax		
	237. Interest		
	238. Dividend		
	239. Profit		
	240. Gift		
	241. Other		
	242. Miscellaneous		
	243. Salary		
	244. Dividend		
	245. Interest		
	246. Fuel		
	247. Repairs		
	248. Entertainment		
	249. Education		
	250. Medical		
	251. Insurance		
	252. Tax		
	253. Interest		
	254. Dividend		
	255. Profit		
	256. Gift		
	257. Other		
	258. Miscellaneous		
	259. Salary		
	260. Dividend		
	261. Interest		
	262. Fuel		
	263. Repairs		
	264. Entertainment		
	265. Education		
	266. Medical		

11. QUESTION → ANS

11.1. How are the control systems of the body regulated? (10 marks)

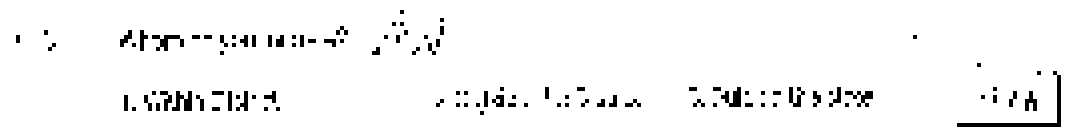
11.2. How are the control systems of the body regulated?



11.1. QUESTION → ANS

11.1. How are the control systems of the body regulated? (10 marks)

11.2. How are the control systems of the body regulated?



11.2. How are the control systems of the body regulated? (10 marks)

11.3. How are the control systems of the body regulated? (10 marks)

11.4. How are the control systems of the body regulated? (10 marks)

11.5. How are the control systems of the body regulated? (10 marks)

12.1 HOME STATUS

2.1 Early life in the home

S No	Economic/Manufacturing Activities	Engagement in Activities	
		1. Yes	2. No
1	Industrial		✓
2	Agro/Agribusiness		✓
3	Small/medium scale		✓
4	Trade/Commerce		✓
5	Construction		✓
6	Transportation		✓
7	Health care		✓
8	Education		✓
9	Household Work		✓
10	Finance/Banking		✓
11	Other		✓

2.2 Family Income (approximate) per annum (Rs. _____)
 2.3 Do you own any immovable property (land/building) in the name of _____
 1. No 2. Yes

2.4 What are the types of crops? (1/2/3)

S No	Crop	1. Yes	2. No
1	Wheat		✓
2	Soybean		✓
3	Maize	✓	
4	Other		✓
5	Other		✓
6	Other		✓
7	Other		✓

Dated: _____
 (Signature of the Head of the Household)

Signature of the Head of the Household: _____
 (Seal)

Declaration: _____
 I hereby declare that the information furnished above is true and correct to the best of my knowledge and belief.



SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

Date: 12/01/12
 Title: 12-2012

Question No:
 Serial No:
 Name of land use: Brachylyt Trees
 Field Supervisor:

1. GENERAL IDENTIFICATION

1. Forest 1 1.1 2011

2. District

3. State

4. PWD

5. District: Amravati
 Block: Roham
 Village: Seshapuram village

6. Location 1 2 Semi Urban Rural

2. HOUSE-HOLD IDENTIFICATION

7.1 Name of the head of household: Mr. Ramesh

7.2 Address of the household: Seshapuram village

8. WAREHOUSE: Type of land

GH/WH	Non-eligible	Total land area (sq)
	<u> </u>	

4. CROPPING PATTERN NA

Year	Area (ha)	Total yield (kg)	Yield (kg/ha)

6. ANNUAL INCOME

S.No	Source	Amount (Rs)
1	Accumulation	
2	Savings	
3	Realization	
4	Labour	2,500 - 3,000 per year
5	Professional	
6	Any Other	
Grand Total		84,000/-

7. GRAND TOTAL

S.No	Source	Amount taken (Rs)	Amount retained (Rs)	Balance (Rs)

8. CONSUMPTION EXPENDITURE

S.No	Particulars / Source	Expenditure (Rs)	
		Yearly	Annual
1	Food		
2	Books	7,500/-	
3	Travel	1,000/-	
4	Medical	2,000/-	
5	Vegetables	2,000/-	
6	Fuel	2,500/-	
7	Household		
8	Medical	2,000/-	
9	Exp	10,000/-	
10	Payment	1,500/-	
Sub Total (A)			
B	Interest on Mortgage	5,000/-	
C	Salary	6,000/-	
D	Rent	2,000/-	
E	Education	2,000/-	
F	Domestic	2,500/-	
G	Social		
H	Agri. Inv. (incl. of profit)		
I	Interest on Capital & Debt		
J	Insurance		
Grand Total (B)			

8. POSSESSION OF DURABLE CONSUMER ITEMS

Do you possess following items?

Sl. No.	Items	Response	
		Yes	No
1	Auto	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Refr.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Washing Machine	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Cupb.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	P.G. Controller	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Washing Machine	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Refrigerator	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Washing Machine	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Washing Machine	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10	AC	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Air conditioner	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	Any other durable	<input checked="" type="checkbox"/>	<input type="checkbox"/>

9. COVERAGE UNDER GOVERNMENT EMPLOYMENT SCHEMES

9.1 How many of the following are you covered in?

Ration Scheme
 Subsidized
 Other

9.2 If covered, give details of the following details:

Name of the Scheme	Kind of Help (Loan, 2. Training, 3. Employment)
1. PDS	-
2. PDS	-
3. PDS	-
4. PDS	-
5. PDS	-
6. PDS	-
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95. PDS	-
96. PDS	-
97. PDS	-
98. PDS	-
99. PDS	-
100. PDS	-

9.3 How many individuals are covered?

010

9.4 How many individuals are covered?

010

9.5 How many individuals are covered under the following schemes?

Yes No

010

9.6 How many individuals are covered?

010

9.7 How many individuals are covered?

Under PDS Scheme, the eligible items are available at subsidized rates.

11 HEALTH STATUS: *N/A*

11.1 How are you (or your family) affected by any illness or condition?
 1) No *NA*

11.2 If you please indicate the table:

Sex	Age at diagnosis / illness	Treatment taken			
		1. Allopathic	2. Homeopathic	3. Ayurvedic	4. Traditional
1					
2					
3					
4					
5					
6					

11.3 VIGILANCE: *N/A*

11.1 Do you take any medicine?
 1) Yes *NA*

11.2 If you have any pain, how do you treat it?

11.3 Do you take any medicine? *NA*

- 1) No medicine 2) Some of the medicine 3) Some of the medicine

11.4 What kind of pain do you experience?

1. Generalized pain: *2. Pain in joints of lower limbs*
 2. Local pain: *3. Pain in the neck*

11.5 How much do you take? *NA*

— pain —

11.6 Type of medicine

1. Homeopathic 2. Allopathic 3. Ayurvedic or his own
 4. Traditional medicine 5. Some of the above

NA

11.7 What kind of pain do you experience?

- 1) None 2) Pain

11.8 Any other:

21. ACHIEVEMENT

Q1. Study and fill the following details.

S.No	Economic & Non-economic Activities	Engagement in Activities 1. Yes / 2. No
1	Cultivation	Yes
2	Animal husbandry	No
3	Sale of hired labour	No
4	Trade & Services	No
5	Application of labour	No
6	Non-Agricultural work	No
7	Unemployed	No
8	Service	No
9	Unemployed wife	No
10	Employment in agriculture	No
11	Other (specify)	No

1. Date, Family, Payers, Source of Income, State etc. No

Is expenditure in excess of available resources of the year? No

Q2. In your own words, define the following, in case of making it successful. Define?

1. Success 2. Failure 1

Q3. Fill and give the following details?

S.No	Feature	Yes	No
1	Employment		✓
2	Education		✓
3	Health	✓	
4	Production		✓
5	Employment	✓	
6	Production		✓
7	Other		✓

Signature:

[Signature]
Teacher / Principal

Name & Address of village

Dr. Ramesh

[Signature]

Remarks:

Local villagers are getting their health on basis of health centre in govt site

