Initial Environmental Examination

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IND: Tamil Nadu Urban Flagship Investment Program (TNUFIP) – Coimbatore Underground Sewerage System- Providing 2 MW Solar Photovoltaic Power Plant at Kavundampalayam old compost yard campus, Coimbatore,Tamil Nadu.

Prepared by Coimbatore City Municipal Corporation, Government of Tamil Nadu, for the Asian Development Bank

ABBREVIATIONS

AC	Alternating Current
ADB	Asian Development Bank
BOM	Bill of Materials
COD	Commercial Operation Date
CUF	Capacity Utilization Factor
CCMC	Coimbatore City Municipal Corporation
CERC	Central Electricity Regulatory Commission
DC	Direct Current
EPC	Engineering, Procurement & Construction
ESSA	Environmental & Social Systems Assessment
GW	Giga Watts
GSS	Grid Sub Station
GHI	Global Horizontal Irradiance
HT	High Tension
IAM	Incidence Angle Modifier
MMS	Module Mounting Structure
SCADA	Supervisory Control and Data Acquisition
MNRE	The Ministry of New and Renewable Energy
NREL	The National Renewable Energy Laboratory
PV	Photovoltaic
PSS	Pooling Sub Station
kWh	Kilo-Watt-Hour (Unit)
MW	Mega-Watt
kW	Kilo-Watt
PDGF	Project Development Grant Fund
SOW	Scope of Work
TNPCB	Tamil Nadu Pollution Control Board
TNUFIP	Tamil Nadu Urban Flagship Investment Program
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Limited
Wp	Watt Peak
WHO	World Health Organization
WMS	Weather Monitoring System

WEIGHTS and MEASURES

cm	centimeter
dB(A)	decibel
°C	degree Celsius
ha	hectare
km	kilometer
kW	kilowatt

lpcd	liter per capita per day
m	meter
mbgl	meter below ground level
$\mu g/m^3$	micrograms per cubic meter
mm	millimeter
MLD	million liters per day

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Executive Summary

1. The Tamil Nadu Urban Flagship Investment Program (TNUFIP) will advance India's national urban flagship programs to develop priority urban and environmental infrastructure in ten cities located within strategic industrial corridors of Tamil Nadu (the State), including those within the East Coast Economic Corridor (ECEC), to enhance environmental sustainability, climate resilience, and livability. It will also strengthen the capacity of state and local institutions and improve urban governance. TNUFIP is aligned with the following impacts: (i) universal access to basic water and sanitation services achieved, (ii) world- class cities and industrial corridors across the State developed, and (iii) water security and reducingvulnerability to climate change in urban areas and enhancing share of renewable energy achieved. TNUFIP will have the following outcomes: livability and climate resilience in at least 10 cities in priority industrial corridors enhanced.

2. The TNUFIP is structured under three outputs: (i) climate-resilient sewage collection and treatment,and drainage systems developed in at least 8 cities; (ii) water supply systems in at least 5 cities improved with smart features; and (iii) institutional capacity, public awareness, and urban governance strengthened. TNUFIP will be implemented over an 8-year period beginning in 2018, and will be funded by Asian Development Bank (ADB) via its multi-tranche financing facility (MFF).

3. The Coimbatore City Municipal Corporation (CCMC) has conducted a feasibility study to setup a 2 MW(AC) solar photo-voltaic (PV) power project at Vellalore site. Due to non-responsiveness of bidders it was decided to change the location to Kavudampalayam old compost yard , Coimbatore of Coimbatore district in the state of Tamil Nadu (India). The project is being implemented under the Tamil Nadu State Solar Power Policy 2019. As per the solar policy, for Captive consumption power shall be evacuated tothe local substation/client LT side with or without net metering system. If the Solar plant capacity is more than sanctioned load, then the generated power shall be exported to grid through dedicated HT line.

4. **The Subproject.** The proposed **site is located approx. 1.0 km from Mettupalayam - Ooty Highway road & 7 Kms from the Coimbatore railway junction.** Proposed land, is **owned by CCMC** and is identified proposed land for implementation solar project. The Geographical coordinates of proposed solar plant site are mentioned below:

- Latitude 11.0366 and Longitude 76.948
- Elevation of about 421 meters from the mean sea level.

Project site suitability for 2MW (AC) solar PV plant, land type and access & connectivity to project site has been demonstrated in this section. There is 7.67 acres of land allocated by CCMC for 2MW solar PV plant. Site condition has been explained in this section. To assess the generation profile of the proposed project site NASA Data has been considered. The solar irradiation received by NASA at GHI is 2005.0 kWh/m2/year, which is good as compare to most of the other region in India. For the assessment of the energy yield, Mono crystalline PV modules of capacity 450Wp are considered. The AC: DC ratio considered for 450 Wp is1:1.15 respectively. The estimated Energy Yield of the plant is 3823, 3657 and 3507 at P50, P75 & P90 respectively. The estimated AC & DC CUF of the plant is 21.82% & 18.93% respectively at P50 and same is 20.0% and 17.37% at P90. The preliminary layout has been

prepared at tilt angle of 12° and Pitch distance of 5.5 mtr and 450Wp modules.

The configuration of the 2 MW(AC) solar PV plant is summarized in this section considering technology options and conceptual design. Total 5340 modules (450 Wp), 30 modules in series and 178 parallel strings shall be planned for this plant. There shall be 1 nos. of inverters (2000 kW) located in inverter control room (ICR) and 1 nos. outdoor type two winding inverter transformers (2 MVA) located adjacent to ICR. LT switchboard inside the main control room (MCR) for clubbing of output of inverters and auxiliary requirements.

The power of 1 inverter transformers i.e. 2 MW(AC) shall be merged together in 11 kV switch board locatedin MCR. MCR building consist of 25 kVA, 11/0.43 kV Auxiliary transformer shall fed to auxiliary load of MCC building. Further, the power will be evacuated through 11 KV underground transmission lines to nearby 110kV/11 kV Substation at Kavudampalayam through separate HT feeder. The total length of the transmission line shall be approximately 400 Mts. Laying of transmission line shall be along the road side within the site premises, hence ROW issues can be avoided.

5. **Project Implementation Arrangements**. The Municipal Administration and Water Supply Department (MAWS)of Government of Tamil Nadu acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) is the state-level executing agency. A project management unit (PMU) has beenestablished in TNUIFSL and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. Coimbatore City Municipal Corporation shall be the implementing agency for this subproject. Coimbatore City Municipal Corporation shall be the implementing agency for this subproject. Existing Project Implementation Unit (PIU) will support in implementation of the 2 MW(AC) solar PV project and in coordinate, monitoring and implementation of safeguards at subproject level. The contractor will have EHS person to implements EHS related activities in the Site and report to PIU. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL will coordinate all the safeguard related activities of the subproject and will ensure the compliance with environmental management plan (EMP) and environmental assessment and review framework (EARF). Environmental Expert will ensure implementation of subproject in compliance with EMP and EARF, and will carry out all necessary tasks at PIU level.

6. **Screening and Assessment of Potential Impacts**. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the Government of India Environmental Impact Assessment (EIA) Notification, 2006, as amended thereon, this subproject does not require EIA study or environmental clearance. For the solar PV plant sub-component, the consent to establish would be obtained prior to commencement of works from the Tamil Nadu Pollution Control Board. The potential negative impacts were identified in relation to pre-construction, construction and operation.

7. **Categorization.** Based on results of the assessment and ADB SPS 2009, the subproject (2MW solar Project) is classified as environment Category B, i.e., subproject's potential to cause adverse environmentalimpacts is less adverse than that of category A, and is site-specific, and in most cases

mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.

8. **Description of the Environment.** The subproject components are located in Kavudampalayam old compost yard, Coimbatore, in the western part of Tamil Nadu. The solar plant site is situated on government owned vacant land parcels, and transmission line will be laid on the along with public roads. Therefore, the subproject does not involve any private land acquisition. All the subproject components are located within urban environment. The proposed site is located within the Kavudampalayam old compost yard belongiin to Corporation land having already functioning 1 MW solar plant and Micro Compost Centres (MCC's) and surrounded by developed urbanized area. . There are no ecologically sensitive or protected wildlife or archeological areas in or close to subproject area. Proposed site is located on the southern side of the town, There is no streams/rivers flowing through or close to project site area. There is one canal closer to the site in which restoration work is under progress

9. **Potential Environmental Impacts and Mitigation Measures.** The subproject is unlikely to cause adverse impacts that are irreversible, diverse or unprecedented because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) there are no sensitive environmental features in the project sites although careful attention needs to be paid to minimizing disruption to population of urban area and (iii) predicted impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements in some stretches along the alignment.

10. In this IEE, negative impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. Mitigation measures have been developed to reduce all adverse impacts and incorporated in the infrastructure design. Standard operating procedures for operation and maintenance, imparting necessary training, safety and personal protection equipment shall be established for workers, measures to maintain the solar PV generation efficiency etc.

11. Potential impacts during construction are minimal and temporary. These common impacts of construction in project areas, and there shall be well developed methods to mitigate the same. Inthese works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material from the existing government licensed mining areas having environmental permissions as applicable, occupational health and safety aspects. Safety risk to workers due to trench excavations in the field, there will be general impacts of construction in this area, and there will be well developed methods of mitigation that are suggested in the EMP.

12. **Environmental Management Plan.** An environmental management plan (EMP) has been developedto provide mitigation measures to reduce all negative impacts, along with the delegation of

responsibility toappropriate agency. As stated above, various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) proper planning of works to minimize the public inconvenience (ii) barricading, dust suppression and control measures (iii) provision of walkways and planks over trenches to ensure access will not be impeded; and (iv) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. Mitigation measures to ensure safety during the implementation have been included in the EMP. EMP will guide the environmentally-sound construction of the subproject. During construction phase, EMP will include amonitoring program to measure the effectiveness of EMP implementation and include observations on- and- off-site, document checks, and interviews with workers and beneficiaries and accordingly environmental management and monitoring plan will be derived.

13. The EMP has already been included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. The contractor will be required to submit to PIU, for review and approval, an updated site environmental management plan (SEMP) also reflecting the associated mitigation and monitoring measures for the construction activities proposed now. No works are allowed to commence prior to approval of SEMP. A copyof the updated EMP/approved SEMP will always be kept on site during the construction period.

14. **Consultation, Disclosure and Grievance Redress Mechanism.** The stakeholders were involved in developing the updated IEE through on-site discussions within the limitations imposed by the district authorities during on-going corona virus disease (COVID-19) pandemic. The details have been incorporated into the updated IEE and the EMP. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB, CCMC and TNUIFSL websites. The consultation process will be further strengthened after relaxation of present restrictions due to COVID-19 pandemic and also continued thereafter during project implementation. A grievance redress mechanism as described in the IEE has already been made fully functional to ensure quick redressal of public grievances.

15. **Monitoring and Reporting.** The Contractor shall submit a monthly EMP implementation report to PIU. PIU will monitor the compliance of Contractor, and submit a Quarterly Environmental Monitoring Report to PMU. The PMU has to oversee the implementation and compliance, and submitting semi-annual monitoring reports to ADB. All environmental monitoring reports will be posted on websites of CCMCand TNUIFSL.

16. **Conclusions and Recommendations.** Therefore, as per ADB SPS, the project continues to be classified as environmental category B and does not require further environmental impact assessment. This IEE is prepared based on the preliminary design, and shall be updated by PIU during detailed design phase toreflect final project design. The updated IEE will be submitted toADB for concurrence and disclosure.

I. Introduction

A. Background

As part of the TNUFIP, Coimbatore City Municipal Corporation (CCMC) has taken up Under Ground Sewerage Scheme for Kurichi and Kuniamuthur areas in CCMC and a new Sewage Treatment Plant (STP) is under construction at Vellalore compost yard, Coimbatore within the existing municipal Solid WasteManagement (SWM) facility site. The proposed STP is of a capacity of 30.53 MLD is going to set up at Vellaore, Coimbatore Compost yard Coimbatore district in Tamilnadu state. Initially CCMC

had proposed to establish the 2 MW solar plant within the Vellalore Compost Yard site near the STP project site. Howeever, there is no responses to the bid. Hence CCMC has proposed the new site in kavudampalayam, for establishing the proposed solar plant. Therein, the IEE has been updated for the new site.-The kavudampalayam site has huge potential for tapping solar energy, and has proposed to install a 2 MW(AC) ground mounted grid connected solar PV power plant (the sub project). CCMC has allocated 7.67 acres of extent of land for constructing 2MW Solar PV plant at Kavudampalayam old compost yard, Coimbatore.

The solar project is funded by grant from Asian Clean Energy Fund (ACEF) to support innovative pilot project to offset greenhouse gas emission and enhance operational efficiency and saving energy cost. The Target of this proposal is to undertake necessary feasibility study and tender document preparation. The final Design will be prepared by the contractor.

For this solar PV plant, Crystalline Silicon PV (Photo Voltaic) solar cells shall be used in the project to generate electricity. As per the solar policy, for Captive consumption power shall be evacuated to the local substation/client LT side with or without net metering system. If the Solar plant capacity is more than sanctioned load, then the generated power shall be exported to grid through dedicated HT line. 2 MW(AC) Solar plant can be installed under captive mode by Coimbatore Corporation, where generation will be exported to the grid and compensated with all other HT consumption by Coimbatore Corporation. The power generated from the proposed solar power plant would be evacuated through a 11 kV transmission line for a length of 400 mtr to Kavudampalayam Sub-Station of TANGEDCO.

Table 1:Project details

SI.No	Particulars	Descriptions
1	Project site	Kavudampalayam old compost yard , Coimbatore
2	Village Name (s)	Kavudampalayam, Coimbatore
3	District Name	Coimbatore
4	Name of the state	Tamilnadu
5	Latitude	11.0366
6	Longitude	76.948
7	Road Accessibility	Road connectivity from highways road to the proposed site is 1 Km
8	Nearest Airport	Coimbatore airport
9	Nearest site	Coimbatore
10	Land available (Acres)	7.67 acres
11	Water requirement (LPD)	1,500 liters per day
12	Annual Global Irradiance at GHI (KWh/m2)	2005
13	Type of PV Module	Mono-crystalline (Perc)
14	Proposed Capacity (MWdc/MWac)	2.4 MWp/2.0 MWac
15	Capacity of modules proposed (Wp)	450 Wp (or minimum 400 Wp)
16	Total no of PV modules (Number)	5340 nos
17	Inverter model	ABB make & Model: PVS800-57B-1732 kW-C

18	Transmission line	11 Kv line for the length of 400 meter Underground line
19	Annual electricity supplied to grid (MWh)	3994.56
20	Annual Capacity Utilisation factor (%)	19.0%
21	Total Project Cost (INR)	12.00 Crore

B. Scope of the project component

Proposed components of this sub-project as follows

- Solar PV Modules
- Central inverters
- Module mounting system
- Grid connect equipment's
- Battery Storage System
- Monitoring system
- SCADA
- Cables & connectors
- Buildings for housing the electronics (Power-house)
- Transmission line for about400 M. (Underground Cable)

C. Purpose of Initial Environmental Examination (IEE)

ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009.The potential environmental impacts of the subproject have been assessed using ADB Rapid EnvironmentalAssessment Checklist for solar PV plant. This IEE is based on the feasibility of solar PV project report prepared by Coimbatore City Municipal Corporation.

The IEE was based mainly on field reconnaissance surveys and secondary sources of information. Field monitoring (environmental) survey was conducted and the environmental monitoring program developed as part of the environmental management plan (EMP) will require the EPC contractors to establish thebaseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE. Details are attached in the Annexure 3

The purpose of conducting IEE is to provide information about the general environmental settings of the project area, identify impacts of the project activities on bio-physical, socioeconomic and cultural environment of the project, recommend site specific environmental mitigation measures, prepare and implement environmental monitoring plan for project area and to make sure that IEE addresses the

requirement of the ADB's Safeguard Policy Statement, 2009

The assessment of the project has been carried out for both positive and negative impacts. It is expected that the adoption of green power generation technology will not have any significant adverse impact on the environment. The project, apart from generating clean power will also carry associated socio-economic benefits for the local community.

D. Report Structure

This Report contains the following ten (10) sections including the executive summary at the beginning ofthe report:

(i) Executive summary
(ii) Introduction
(iii) Policy, legal and administrative framework
(iv) Description of the project
(v) Description of the environment
(vi) Anticipated environmental impacts and mitigation measures
(vii) Public consultation and information disclosure
(viii) Grievance redress mechanism
(ix) Environmental management and monitoring plan, and
(x) Conclusion and recommendation.

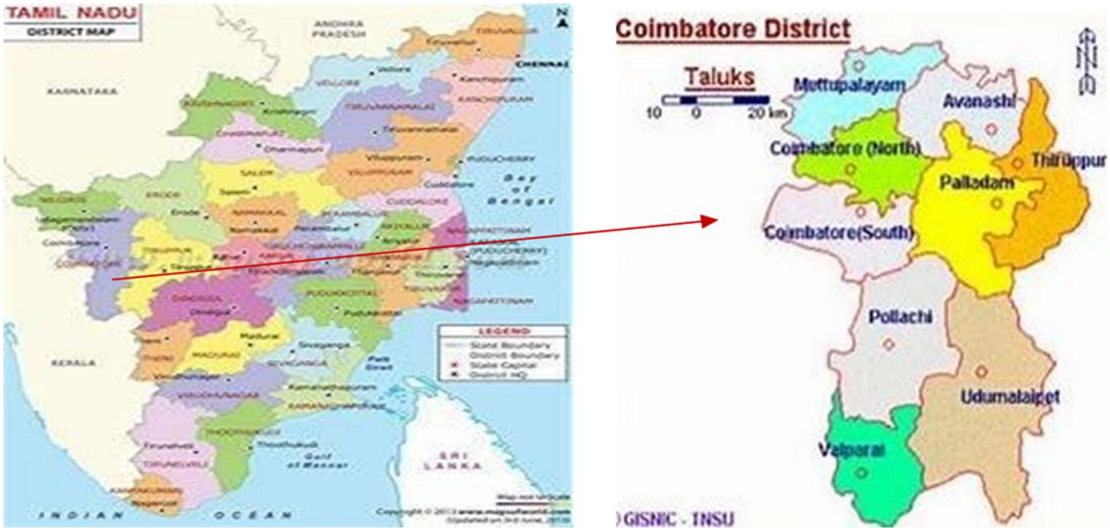


Figure 1:Map of Tamilnadu & Coimbatore district

II. Description of Project

The project involves setting up of a 2.4 MWp(DC) Solar PV Power Project, at village Kavudampalayam old compost yard , Coimbatore, District Coimbatore, in the state of Tamilnadu, India. 2 MW(AC)ac

Solar plant can be installed under captive mode by Coimbatore Corporation, where generation will be exported to thegrid and compensated with all other HT consumption by Coimbatore Corporation. The power generated from the proposed solar power plant would be evacuated through a 11 kV transmission line to Kavudampalayam Sub-Station of TANGEDCO.

A. Project location

The proposed site is located approx. 1 km from Mettupalayam-Ooty High way, Kavudamaplayam village Coimbatore north Taluk, District-Coimbatore in Tamil Nadu state, India. Proposed land is owned by CCMC and is identified for implementation of solar PV project. The Geographical coordinates of proposed solar plant site are mentioned below:

- Latitude 11.0366 and Longitude 76.948.
- Elevation of about 421 meters from the mean sea level.

The location of the project is at an elevation of about 421 meters from the mean sea level. The soil texture is loamy and surface topography is almost flat. Hence, limited site preparation/leveling activity is needed tomake the land flat as per the requirements of solar PV power plant. The entire area is shadow free as there are no shading elements like mountains, large sand dunes, however some (bushes (Prosopis juliflora) are present at the site and these need to cut/remove prior to implementation of project. Map of the region indicating theproject location is depicted below;

B. Access Road

The project will utilize the existing highway-roads & artillery roads; **no new roads will be built** as part of thisproject. The length of the access road to the site from the main road is around 1 kilometers. The project company plans to construct a 4 m wide road inside the plant for heavy vehicle movement and around 3 m wide road along the boundary wall inside the plant boundary for the movement of light vehicle in the proposed campus and also with in the site.

Figure 2: Photographs showing the existing access roads leading to the site

A. Land availability and requirement for Project

The land requirement for the Project's Solar Power Plant depends upon the technology deployed, conversion efficiency and solar radiation incident in the Project location. The 7.67 acres of land is available for the 2.4 MWp Solar PV Project. The area break-up is provided below:

Table 2: Project area break up detail

Particulars	Area in square meters
Total plant area	31039.39 (7.67 acres)
PV module area	14410 m2
Balance of plant	16872.2 m2

Table 3:Land ownership status

Use of land	Private Land	Govt. Land	Forest Land	Total
Total Project Area	Nil	7.67 acres	Nil	7.67 acres
Acquisition Status	Nil	Nil	Nil	Nil. 7.67 acres Land belongs to CCMC. Hence no land acquisition required.

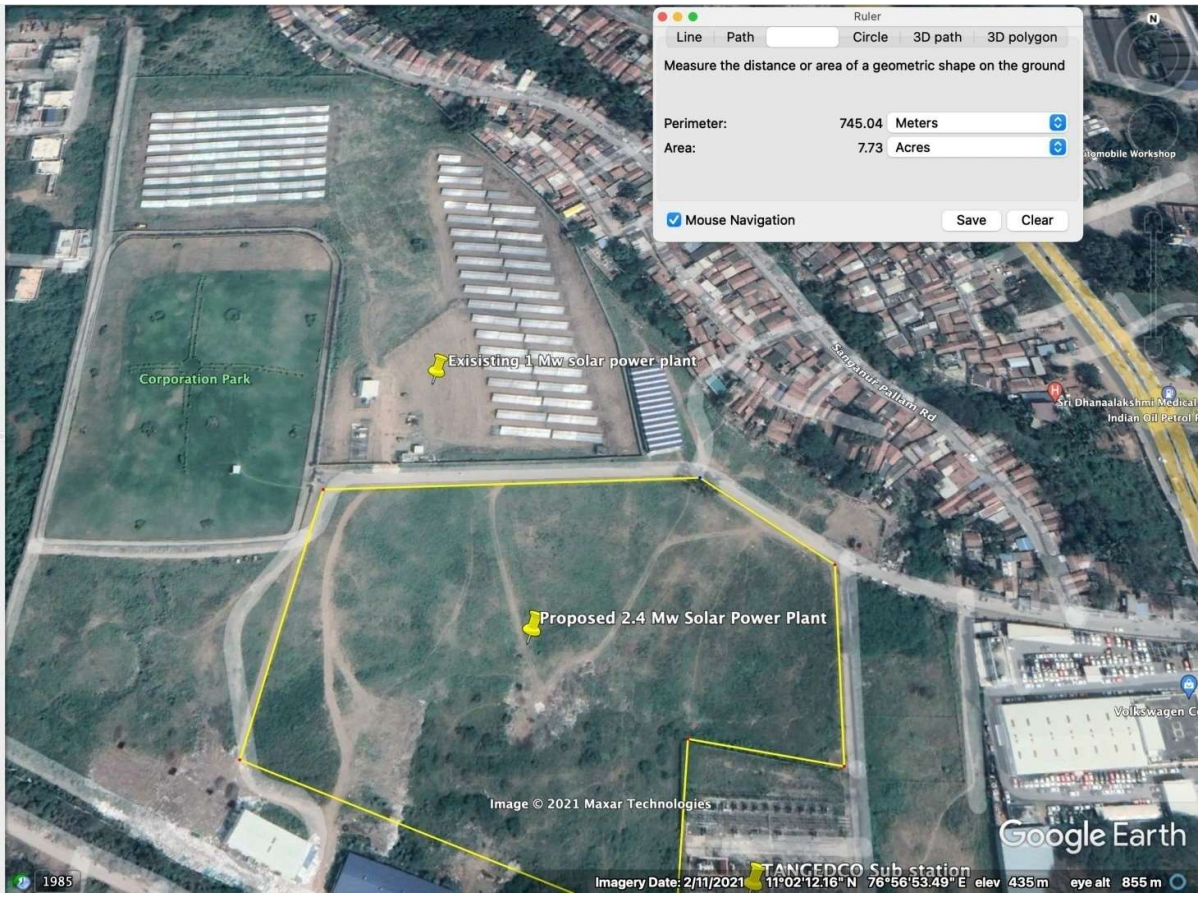
The land acquired for the project site is totally govt. land

Proposed land is owned by CCMC and is identified proposed land for implementation solar project. It is located at southern part of Micro compost yard of CMC and 1 MW solar power plant atKavudampalayam old compost yard , Coimbatore in Coimbatore district of Tamil Nadu State. Following figures depict the maps of the region indicating the project location.

Figure 3:CCMC Plant layout

The 1 MW solar power plant adjacent to the proposed site was commissioned during November, 2019. It has 3168 Nos. of solar panel modules and associated facilities in 3.83 acres of land. The power generated in this plant is evacuated to the nearby EB grid through 11 KvA underground transmission lines. The water requirement of about 650 liters per day for the plant is met by authorized water tanker suppliers. There is no issues reported for this existing facility. The proposed project site is non-agricultural land. shrub thickets were also observed on the project site. These shrubs and trees (Prosopis juliflora) needs to be cleared implementation for solar project.

The land of approximate 7.67 acres is readily available for proposed 2 MW(AC) Solar PV Power Project. Installation of Mono crystalline SPV technology of > 400 Wp, requires around 2.5 acres of land per MWp installation owing to which, 7.67 acre of land would be sufficient for the proposed project activity.



D. Water requirement

Figure 4:Proposed solar plant

The water requirement for the project is minimal. The main consumption of water in the project is for cleaning of the solar modules with minimal requirement for domestic usage. The total water requirement at the project site is about 1,500 liters per day.

Table 4:Water requirement for solar plant

Particular	Data values
Water Consumption Per MW (Crystalline Silicon) required for	1,000 Liters /day
Water Consumption for domestic usage construction phase	500 Liters / day
Total water usage for solar PV project (2MWac)	1,500 Liters /day

Water would be sourced by the contractors/ from the local vendors or from borewell approved by CCMC.. Majority of people in the region are sourcing water from the bore wells at several locations and also from corporation water supply. Depth of water level is 600 ft approx. There is also a canal around 500m km from the site.

F. Technical description

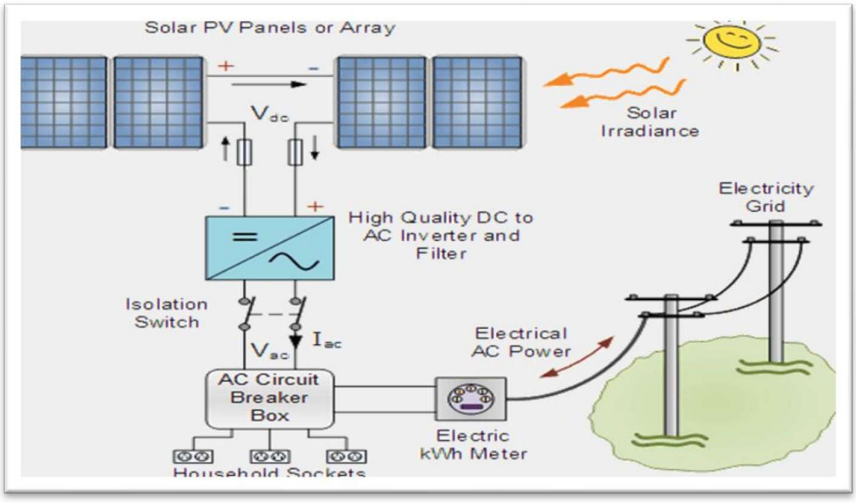
Mono Crystalline Silicon Photovoltaic (PV) is used in the proposed project for generating electrical power by converting solar radiation into direct current. This phenomenon takes place due to the photovoltaic effect exhibited by the semiconductors.

The selected location for the proposed project lies in “warm and humid climate zone of India. The instantaneous ambient temperature over the location reaches more than 42º C in summer; however, the intensity of solar radiation is also very high. From the land type, meteorological study and annual behavior of solar radiation over the location near village Kavudampalayam old compost yard , Coimbatore, Coimbatore district, Tamilnadu, the crystalline solar PV technology has been identified as the most feasible technology.

In order to achieve a higher system voltage, modules are connected in series, called a string. The strings areconnected with the photovoltaic branch or the PV-distributor (Smart connect box). This distributor is connected with the Main Combiner Box (MCB) which acts as the main DC collecting unit which passes the power to be converted to the central inverters. Central inverters combine the various advantages of the other installation technologies. The AC power from the inverter is passed to low voltage panel and then to the main transformer. From the transformer, the power is routed

through the high voltage panel and eventually to other required measuring & protection devices before connecting to the grid. The typical sketch of the solar PV plant is shown in below figures

Figure 5:Typical sketch up of solar plant



Grid-connected solar power plant comprises of the main equipment and components listed below.

- Solar PV Modules
- Central inverters
- Module mounting system
- Grid connect equipment's
- Battery Storage System
- Monitoring system
- SCADA
- Cables & connectors
- Buildings for housing the electronics (Power-house)
- Transmission line

Modules: Solar PV Modules will be considered as Longi Solar make of 450 Wp. Technical specification ofmodules is depicted below;

Table 5: Module details

Parameters	450WP
PV Module type	Low LID Mono PERC
Make & Model	LR4-72HPH-450M
Rated Power (Pmax)	450

Maximum Power Voltage-VMPP (V)	41.5
Opt. Operating Current (Imp)	10.85
Open Circuit Voltage (Voc)	49.3
Short Circuit Current (Isc)	11.6
Module Efficiency (%)	20.7
Temp Coefficient of Pmax	-0.37%/deg C

Inverters: Inverters are used for DC voltage to AC voltage conversion. An Inverter is the heart of a Solar Power project. It is also known as Conditioning Unit (PCU). A PCU consists of an electronic Inverter along with associated control, protection and data logging devices. The inverter is having inbuilt microprocessor- based controls. The Inverter is designed in such a way that it will synchronize with the utility (grid) power with respect to the Voltage and frequency of grid and it gets corrected itself according to the grid parameters within its settable limits. Here ABB inverter of 2.5 MW(DC) capacity (1 nos.) has been considered for this plant.

Module mounting structure (MMS): The module mounting structure is designed for holding the suitable number of modules in series. The frames and leg assembly of the array structures are made of mild steel hot-dip galvanized of suitable sections of Angle, Channel, Tubes or any other sections conforming to IS:2062for steel structure to meet the design criteria. All nuts & bolts considered for fastening modules with the proposed structure should be of high-quality stainless steel.

Here Fixed-Tilt MMS is recommended for 2 MW(AC) capacity of plant, as case of tracker system lack of skilled manpower for the operation and frequent breakdown of the tracker based MMS, which leads to lossof generation.

The MMS Pile Foundation shall be design confirming to IS 2921. The MMS Pile shall be RCC type, dia. and length of pile shall be as per the calculation during detailed engineering and recommendations of Geotechnical investigation report corresponding to prevalent soil characteristics at site

Solar PV Array: As per the requirement of the inverter input, the number of modules in series is fixed as 30.Therefore, the total number of parallel string, which is a combination of 30 series connected module, shall be about 178 for the inverter.

Monitoring system (SCADA): The proposed system will maintain and provide all technical information on daily solar radiation availability, hours of sunshine, duration of plant operation and the quantum of power fed to the grid. This will help in the estimation of generation in kWh per MWp PV array capacity installed at the site.

The SCADA system shall have the following features:

- Monitoring: Ability to control, using specially designed devices, the state & evolution of one or various physiologic (or others) parameters to detect possible malfunctions

- Remote control: Group of devices which allow modifying the state of the equipment and devices ofthe plant, from a remote location

Cables & Connectors: The size of the cables between array interconnections, array to junction boxes, junction boxes to PCU etc. shall be so selected to keep the voltage drop and losses to the minimum.

DC Cables and Connectors: Working with solar PV arrays can be hazardous since Solar panels connected together in an array are often configured to produce high DC voltage. Furthermore, DC voltage is constant in nature so, the effect of electric shock due to DC voltage will surely be severe. Hence, DC Cables should be
double insulated and polarized and DC connectors should always be used. (Standard: IEC 60227 / IS 694 IEC60502 / IS 1554 (Pt. I & II)).

AC Cables: In order to make the system more reliable and facilitate maintenance and management, output three-phase AC cables from the inverter are connected to AC dis-connector unit. The voltage output of the inverter is connected to the transformer using the required rating LT cables to step up the voltage. From thetransformer, the lines are connected to the grid.

Control room: The powerhouse will be utilized for housing the inverters, Low Voltage panels, High Tension panels, Plant Monitoring system, Safety equipment, Office room etc. In order to avoid shading effect, the power house is proposed to be constructed on the North side of the layout. The equipment will be erected as per the Indian Electrical Standards. The cables will be routed through cables trenches or cable trays as required. An Alarm system will be provided to alert the operator in case of emergency or plant break-down.

Transformers: Photovoltaic modules generate low voltage DC power. This power is transformed to 400 V, three phase and 50 Hz AC power in the inverter to facilitate interface with utility grid supply. To minimize the distribution loss in low voltage, high current DC circuit, there will be 1 sets of 2500 kW inverters installed. A 1 no. of inverter transformer (outdoor) 11/0.400 kV, 3 winding transformer shall be set up to facilitate power evacuation nearby inverter units. This transformer shall be utilized to step up power to 11 kV level as per IS: 2026.

Auxiliary transformer: One number Auxiliary transformer shall be provided near main control room building. This transformer shall feed load to ICR and MCR buildings. This transformer will be around 11/0.415 kV, Dyn-11, 50 Hz, provided with off circuit tap changer (OCTC). Capacity of this transformer shall be finalized during detailed engineering stage and will be rated to meet total auxiliary load connected to auxiliary transformer.

Switchyard components:

Circuit breaker: a 11 kV SF6 circuit breakers with leakage detectors and monitoring system each comprises set of 3 single pole live/dead tank unit with spring, pneumatic or hydraulic spring operated mechanism. Two trip coils per pole and meeting therequirement as specific as per IEC, IS standard. This shall be finalized during detailed engineering stage.

Disconnecting switches: electric motor operated central rotating post horizontal double break triple

pole disconnecting switch with/without earth switch. Operation of disconnecting switch will be interlocked with associated breaker and earth switch. This shall be finalized during detailed engineering stage.

Current transformer and induced voltage transformer: Live/dead tank type single phase multi core, multi ratio current transformer to be provided. Induced voltage transformer with multiple secondary winding willbe provided on line bus bar.

Power Evacuation

The Direct Current (DC) from modules will be converted into Alternating Current (AC) by Inverters. The inverter output will be fed to a transformer in the control room. The HT Panel has all necessary metering and protection as per Power Evacuation schematic.

For initial conceptual design, 450 Wp modules, with string size of 30 modules and 178 parallel strings is considered for this plant. 1 nos. of inverters (2500 kW) located in inverter control room (ICR) and 1 nos. outdoor type two winding inverter transformers (2 MVA) located adjacent to ICR is also considered along with LT switch board inside the main control room (MCR) for clubbing of output of inverters and auxiliary requirements. The power of 1 inverter transformers i.e. 2 MW fed into 11 KV switch board located in MCR. Further, the power will be evacuated through 11 KV underground transmission lines to nearby 110/11 KV Substation at Kavudampalayam through separate HT feeder. The total length of the transmission line shall be approximately 400 Mts. Laying of transmission line shall be along the road side, hence ROW issues will be avoided/minimized. Total estimated generation will be 3994.56 MWh/year from solar PV plant.

G.Implementation arrangement Schedule

Project Implementation Arrangements: The Municipal Administration and Water Supply Department (MAWS) Government of Tamil Nadu acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) is the state- level executing agency. For implementation of 2MW(AC) solar PV project, a project management unit (PMU) has been established in TNUIFSL comprising dedicated staff for overall project and financial management. Coimbatore City Municipal Corporation shall be the implementing agency for this subproject. Existing Project Implementation Unit (PIU) will support in implementation of the 2 MW(AC) solar PV project and in coordinating, monitoring and implementation of safeguards at subproject level. The contractor will have EHS person to implements EHS related activities in the Site and report to PIU. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL will coordinate all the safeguard related activities of the subproject and will ensure the compliance with environmental management plan (EMP) and environmental assessment and review framework (EARF). Environmental Expert will ensure implementation of subproject in compliance with EMP and EARF, and will carry out all necessary tasks at PIU level.

Table 6:Description of Proposed Power Transmission Line

S.No	Aspect	Description
1	**Route Particulars**	
i)	Length (km)	400 Mts along with road side
ii)	Land acquired for transmission line s and corridor (ROW)	NA. Since the power evacuation land belongs to the Coimbatore corporation
iii)	Land acquired for access roads along transmission corridor	Nil
iv)	Width fortransmission line	4 meters to 5 meters
v)	Transmission line (TL) alignment	Alignment of TL line will be on road side
vi)	Ownership	DISCOM
vii)	Length of TL	400 M
viii)	Terrain	Flat
ix)	Hilly/Plain	Plain
x)	Agriculture/Waste Land	Government land
xi)	Wet/Marshy	Nil
xii)	Estuarine	Nil
xiii)	Other type of land	Yes (Dry land)
2	**Environmental/Social Details**	
i)	Name of District / District details (through which transmission line pass)	Coimbatore district, Tamilnadu
ii)	RoW	The entire land including power evacuation area belongs to the coimbatore city municipal corporation.
iii)	Total length of transmission line	400 Mts approx
iv)	Power line laying	Power line will be laying underground
v)	Maintenance of road within the site	By Contractor
vi)	Charges of laying of transmission line	By Contractor - Charges of transmission laying has been considered in financial model

vii)	Town/Village falling in corridor route alignment (Nearby)	Nil
viii)	House/residences within transmission line RoW	None
ix)	Type of forest (if applicable): Reserve / Protected / Mangrove / Wildlife area / any other environment sensitive area	None. The transmission line is within the CCMC boundary.
x)	Type of Fauna and Flora noticed along corridor route; presence of any Endangered species	Only bushes is to be cleared
xi)	Historical or cultural monuments affected	None
xii)	Ground clearance of the transmission line	it is underground lines.
3	**Interference with other utilities**	
i)	Other Transmission Line Corridors Intercepting the project line route	Nil
ii)	River Crossing	Nil
iii)	Road Crossing	All the roads to the subs station belongs to the CCMC, hence no permission need to be obtained for ROW

Implementation Schedule

BID for 2 MW Solar PV plant will be invited in April 2022, and the contract will be awarded by June 2022. Construction will take about 6 months to complete. Tentative implementation schedule for 2 MW solar PV plant at Kavudampalayam old compost yard , Coimbatore is depicted below;

Activities / Months	M1	M2	M3	M4	M5	M6
Boundary wall/ fence and gate						
Approach road construction						
Water & Power arrangement for Construction						
Registration and approaval, licensing process						
Substation 11kv/11 KV switchyard						
11 KV transmission lines						
Licensing and other permission						
EPC Contractor Scope						
Design & Engineering						
Award of EPC Contract						
Construction, Installation & Commissioning						
Mobilisation						
Grading & Compacting						
Vertical post installation						
Racking installation						
Installation monitoring & Control system						
Grid interface connection						
Testing & Commissioning						
Supply Schedule						
Module mounting structure						
SPV Modules						
Cable & electrical accessories						
Inverter						
11kv transformer and related accessories						

III.Policy Legal and Administrative Framework

A.ADB Policy

This report has been prepared with reference to ADB`s Safeguards Policy Statement (SPS), 2009 that specifies environmental and social safeguards requirements to the proposed project.

ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

Screening and Categorization: The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

1. **Category A:** A proposed 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 is required.
2. **Category B:** A proposed project 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 is required.
3. **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
4. **Category FI:** A proposed project is classified as category FI if it involves investment of ADB funds toor through a Financial Intermediary (FI).
5. **The project is therefore expected to be classified as category B as per ADB's safeguard policy andan initial environmental examination is required.**

Environmental Management Plan: An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

Public Disclosure: ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

(i) Final or updated IEE upon receipt; and
(i) Environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

National Environmental Laws

Environmental Assessment: The Government of India EIA Notification of 2006 as amended thereon, (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A

or B depending on the scale of the project and the nature of its impacts.

1. **Category A** projects requires Environmental Clearance from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details ofthe project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the Environmental Clearance if appropriate.
2. **Category B** projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIAstudy) or B2 (no EIA study), and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

None of the components of this solar PV project subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or Environmental Clearance is not required for the subproject.

Ministry of Environment and Forest (MoEF) 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 ambitof EIA Notification, 2006, no environmental assessment required and hence, no environmental clearance is required.

Hence, the Solar Power PV Projects do not require preparation of Environmental Impact Assessment Reports and pursuing Environmental Clearance from Central Government or State Level Environmental Impact Assessment Authority.

ADB SPS Requirements: During the design, construction, and operation phase of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized WBG standards such as the Environmental, Health and Safety Guidelines (both General Guidelines and sector specific guidelines of water and sanitation projects to be referred. For construction of solar PV plant, there is less impact on air & noise pollution. All these parameters will be within the limits. Further during construction phase, EPC contractor will doenvironmental assessment in view of specific project circumstances.

III. Description of Environment

Methodology used for baseline study

Data Collection and Stakeholder Consultations: Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits conducted to the proposed subproject site during Aug-Sept'21.

The literature survey broadly covered the following:
(i) Project details, reports, maps, and other documents prepared by CCMC
(ii) Discussions with Technical experts, public and other relevant government agencies
(iii) Secondary data from previous/similar project reports and published articles, and
(iv) Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planningdocuments collected from Government agencies and websites.

Ocular Inspection: Several visits to the project site were made during IEE preparation period during Aug- Sept'21 to assess the existing environment (physical, biological, and socioeconomic) and gather informationwith regard to the proposed sites and scale of the proposed project. A separate study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

A. Physical resources

a) Location, area and connectivity

The proposed site is located in Kavudampalayam village ,Coimbatore North Taluk , Coimbatore, District-Coimbatore in Tamilnadu state, India. The proposed solar plant area is located at Latitude of 11.0366 North and Longitude of 76.948 East. The location of the project is at an elevation of about 421 meters from the mean sea level. The 7.67 acres of land is available for the 2.4 MWp Solar PV Project. The entire area is shadow free as there are no shading elements like mountains, large sand dunes, however some trees are present at the site and these need to cut/remove prior to implementation of project. Below figures depict the map of the region indicating the project location.

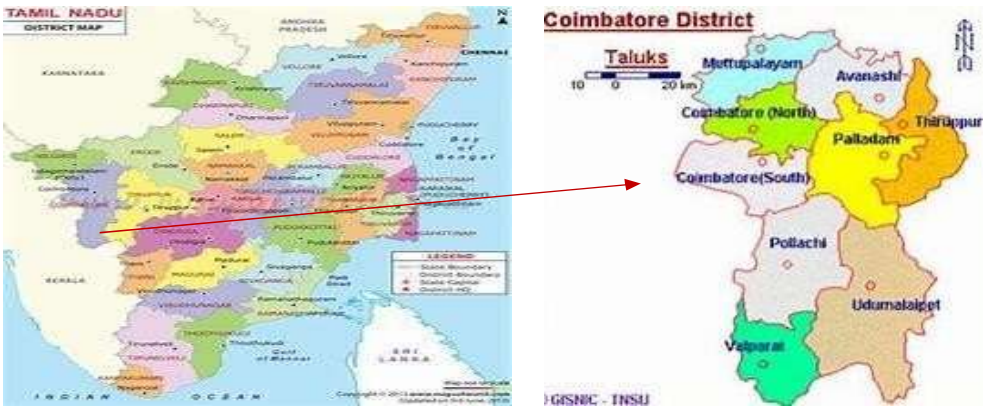


Figure 6:Map of Tamilnadu & Coimbatore district

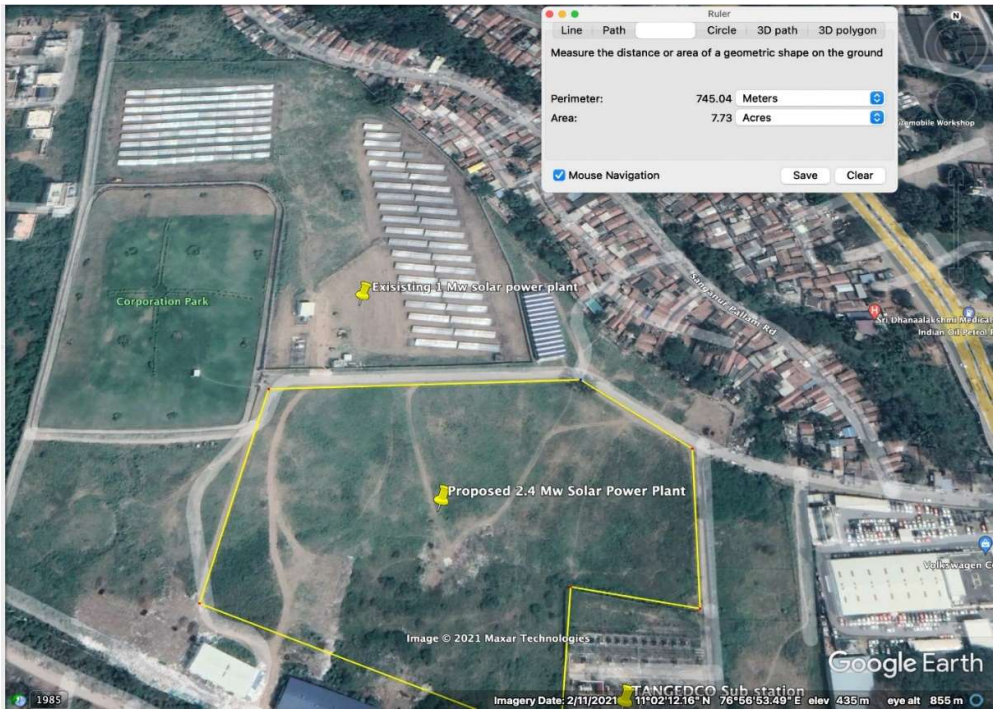


Figure 7: CCMC Plant layout

Figure 8:Project land

The land identified and proposed by CCMC is in the premises of old compost yard. At present, MCC centres were operated and this site is adjacent to the porposed site and completely separetd by compond wall. The road access to this site is also separate. Hence there is no influence or odur issue in the proposed location. Since it is only vermi compost yard for segregated waste, there is no issue of stray animals or birds at site. The overall CCMC premises layout is shown in below image;

The selected project location is well connected and accessible through road, rail, air and port.

Air : Coimbatore city has an airport which is 15 km away from the site

Rail : Project site is connected with Coimbatore railway station and well connected by South Western railways Coimbatore railway station is around 7 km from project site

Road : National highway passes through the district, connecting Coimbatore with other main districts

The baseline conditions of the region are as follows:

b) Topography

The Coimbatore city is divided into two distinctive geographic regions: the dry eastern side which includes majority of the urban area of the city and the western region which borders the Nilgiris, Anaimalai and Munnar ranges. Terrain is almost flat in the project area with gentle slope, and is located atan elevation of about 421 meters from the mean sea level..

C) Geology

Coimbatore district is covered by a wide range of high grade metamorphic rocks of the peninsular gneissic complex. These rocks are extensively weathered and overlain by recent valley fills and alluvium at places. The major rock types occurring in the district are charnockites, granites, complex gneisses mainly hornblende biotite gneiss and sillimanite gneiss with basic and ultra basicintrusives, crystalline limestone, syenite, pegmatite and quartz veins. (Ground water Resources Report for Coimbatore District, by NWM). The district has diversity in hydrogeological environments which is attributed to its geomorphic characteristics such as ponding of streams and formation of lakes, fluvio-lacustrine deposits, waterfalls, stabilized and active landslide fans, offering numerous landforms characters viz. Nilgiris, Anaimalai and Munnar ranges. Palghat

Gap, a mountain pass which connects the neighboring state of Kerala to Tamil Nadu, lies to the west of the city etc.

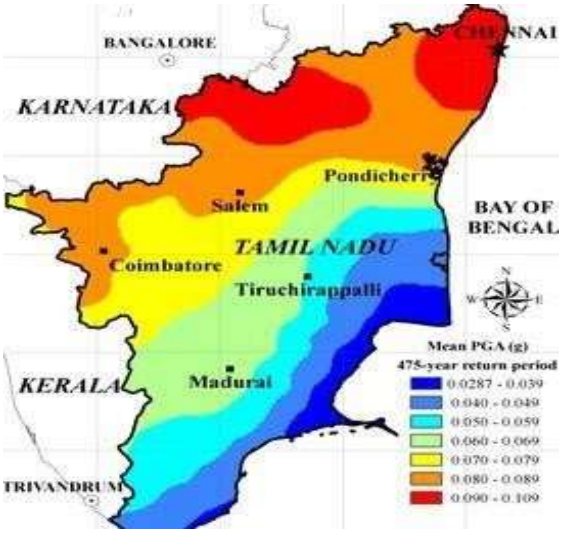
D) Soil

Soil type in district is black soil and red loamy soil, which can yield crops only under optimum rainfall conditions. The soil is predominantly black, which is suitable for cotton cultivation, but some red loamy soil is also found.

E) Earthquake zone (Seismology)

The proposed solar power project site falls in Seismic Zone – 3 that is classified as Moderate Damage Risk Zone. Therefore, applicable seismic coefficients will be applied during the detailed design and engineering phase of the project to withstand the impacts of earthquakes in the area, if any. The following figure depicts the earthquake hazard risk zone of the project site.

Figure 9:Seismeic Zonic Map of Tamilnadu depicting project area in Zone III



F).WindZone

The proposed project alignment falls under range where wind power density is between 150-250 W/sq.m at 10 m. In the existing plant, the only issue which needs periodic attention is the dust. It requires periodic cleaning for optimized results. Except dust no others issues reported in the existing 1 MW plant.

G) Climate

Coimbatore has forest at northern side and river has in southern side and city has semi- arid climate with wet season lasting from September to November due to northeast monsoon. Due to the typical semi- arid climate, the annual variation in ambient temperature is very limited. The mean maximum temperature ranges from 35.9 °C (97 °F) to 29.2 °C (85 °F) and the mean minimum temperature ranges from 24.5 °C (76°F) to 19.8 °C (68 °F). The highest temperature ever recorded is 42.6 °C (109 °F) on 22 April 1976 while the lowest is 12.2 °C (54 °F) on 12 January 1957.The summer season in the region continues from March to June with the daytime temperature crossing over 42° C. Monsoon season is from July to September and winter from October to February. (Source: Indian Metrological department)

H) Rainfall

The district receives average rainfall of around 600 mm with the northeast and the southwest monsoons contributing to 47% and 28% respectively to the total rainfall. This periodic rainfall does not satisfy the city's water requirements throughout the year and water supply schemes like Siruvani and Pillur maintain its availability during low rainfall months. (Source: Indian Metrological department).

I) Water resources

Coimbatore is surrounded by the Western Ghats mountain range to the west and the north, with reserve forests of the Nilgiri Biosphere Reserve on the northern side. The Noyyal River forms the southern boundary of the city, which has an extensive tank system fed by the river and rainwater. The eight major tanks and wetland areas of Coimbatore are namely, Singanallur, Valankulam, Ukkadam Periyakulam, Selvampathy, Narasampathi, Krishnampathi, Selvachinthamani, and Kumaraswami. City's water requirements is met through water supply schemes likes Siruvani and Pillur dam and through authorized borewells throughout the year.

Majority of people/farmers in the region are sourcing water from the open well or bore wells dug at some locations. Apart from this, farmers have also developed various check dams and farm ponds in their area. This periodic rainfall does not satisfy the city's water requirements throughout the year and water supply schemes like Siruvani and Pillur maintain its availability during low rainfall months. (Source: Indian Metrological department).

J) Air Quality and Noise

The Ambient Air Quality measurements along the project area, is well within the limits of the National Ambient Air Quality Standards (Source: TNPCB Coimbatore Air pollution database). During construction period, dust will be generated during digging, vehicle movements, is expected to be insignificant and shall be controlled by sprinkling of water. Overall, the other impact which is the noise generated during construction period is insignificant, reversible and localized in nature. During Operational phase, due to wind dust fumes may be generated which shall be suppressed by sprayingwater has insignificant impact.

B. Ecological resources

The project site is located within the CCMC boundary and has no ecological sensitive area. Site is located in a completely urbanized area. It is not located in or near any sensitive ecosystem. Site area earmarked does not have any trees and requires only clearance of bushes. There will be no any impact on any of the ecological resources due to installation of solar plant and the 11kV underground transmission line . .

Impacts on ecological resources during pre-construction, construction and operation phases are depicted below;

Pre-construction Phase: Site clearance needs to be done before construction as there are shrubs thickets in the existing site. Clearing these will not have any adverse ecological and environmental impacts.

Construction Phase: During construction, soil disturbance during activities such as excavation and drilling, poses a minor risk to the natural vegetation and increases the risk of erosion.. In addition, noise from the presence of workers and the operation of heavy machinery will likely pose a disturbance to the local community. . The impact significance is considered to be insignificant.

Operational Phase: Vegetation will change from the current condition to man-made landscape vegetation. The removal of vegetation from the soil and loosening of the top soil could lead to soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the constructionphase. The likelihood of impact of operation phase on vegetation is negligible and the severity/risk level is negligible.

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Decommissioning Phase: The restoration of the site during decommissioning will include restoration of the vegetation cover and replenishment of the top soil once the solar plant components have been uninstalled.The significance of this impact is considered is low.

Environmental and Social Management Plan: Issue/Impact:

Mitigation Measure:

Good site management practices will be observed to ensure that disturbance of site is minimized. Restricting personnel and vehicles to site boundaries, lay down areas, and access roads during site preparation.

C. Major agricultural crops

In Coimbatore, the major crop is cotton and also includes oil seed crops like groundnut and other food crops like rice, coconut, cereals, etc.

Coimbatore is called the "Manchester of South India" due to its extensive textile industry, fed by the surrounding cotton fields. TIDEL Park Coimbatore in ELCOT SEZ was the first special economic zone (SEZ) setup in 2006. In 2010, Coimbatore ranked 15th in the list of most competitive (by business environment) Indian cities. (Source: Coimbatore Wikipedia).

D. Socio – economic status

The total project land acquired by Project Company falls within the villages of Kavudampalayam oldcompost yard , Coimbatore situated in Kurichi Taluk, Coimbatore district, Tamilnadu State.

Village-Kavudampalayam old compost yard , Coimbatore

Kavudampalayam is a small-sized village located in the district of Coimbatore, Tamilnadu (India). and around 8 km from district Coimbatore head quarters. As per the records of Census 2011, the village has a population of about 83,908 persons living in around 22,185households. Population wise Kavudampalayam old compost yard, Coimbatore village has around equal male-female ratio. Around 65% of the village population consists of the Hindu community. Literacy rate is 89.88%. Majority of the households rely on agriculture as well as some are working in industries located in Coimbatore.

The Project construction and operation will not in any way affect the dignity, human rights, livelihood systems and culture of the residents of the village. Moreover, the lands where the Project's solar power generation facility are being constructed are not owned, used, occupied, or claimed as ancestral domain or asset of any tribal groups. Entire Project land belongs to CCMC Demographic details of Coimbatore are depicted below;

Total Population as per census -2011	83,908
Male Population	42,351
Female Population	41,557
Male-Female sex ratio	981
Literacy rate	89.88%
Total Households	22,185

Table 7: Demographic details of Kavudampalayam village, Coimbatore

E.Sub project Site Environmental Features

Infrastructure	Location & Environmental Feature	Site Photos
Solar PV Plant	Proposed land is in Kavudampalayam old compost yard , Coimbatore, near CCMC compost yard. Here 2 MW(AC) solar PV plant has been proposed. This site identified by CCMC. Nearest houses located at around 100 m. Potential impact onvegetationduring preconstruction phase, minor soil disturbance during construction phase	
Transmission line alignment	Transmission line of 400 Mts will be laid along with road side. Potential impact on vegetationduring preconstruction phase, minor soil disturbance during construction phase	

Table 8: Project specific Environmental features

I. Anticipated Environmental Impact and Mitigation Measures

Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, and ancillary services.
(iii) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(iv) **O&M impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

Screening of environmental impacts has been based on the impact magnitude (negligible/ moderate/ severe – in the order of increasing degree) and impact duration (temporary/permanent).

This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

The ADB Rapid Environmental Assessment Checklist been used to screen the project for environmental impacts and to determine the scope of the IEE. REA checklist is attached as Annexure-2 in this report.

In the case of this project (i) most of the individual elements involve simple construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associatedwith the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being mostly located in an urban area,. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impact – Design and Location

Design of proposed components: Technical design of 2MW solar PV plant, modules, array yard, inverters, transformers, cables earthings and lightning arresters including control room buildings. It follows the relevant national planning and design guidelines focusing on providing a robust system which is easy tooperate, sustainable, efficient and economically viable.

No significant environmental impacts are envisaged during the Pre-construction phase of the project. The activities and their anticipated impacts during the pre-construction phase include the following:

a) land for the subprojects

The land identified for the project site is belongs to CCMC. In this project site, there is 1 MW solar power plant and two MCC compost yards is already present. The proposed site is earmarked between existing MCC centre and 1 MW plant. All these facilities have individual road access and well connected. The site has exclusive road and compound facilities within the premises. The land for the project is non-agricultural land since it was earlier used as compost yard which is now reclaimed. At present, there is only MCC compost yard adjacent to the earmarked site. A separate compound wall is proposed between the compost yard and proposed site. The segregated organic waste is received and processed in the MCC yard and compost is taken back by the vehicles. This site has separate access and will not any influence on the proposed project. The earmarked extent is vacant and readily available for construction of Solar plant.

b) Tree Cutting at Project Sites

As presented in the baseline profile of subproject sites, there are some shrubs thickets (Prosopis juliflora) at present in the project site, therefore clearing the shrubs and Prosopis juliflora trees cutting envisaged and mandatory

c) Temporary usage of project land for storage of project equipment, materials

The mobilization of construction equipment's and construction materials from authorized source shall require space for storage and parking of construction vehicles and equipment. Space shall also be required for construction material storage yards, disposal sites and labor camps to avoid environmental impact and public inconvenience.

Table 9: Environmental impact and mitigation plan-preconstruction phase

Potential	Mitigation action plans	Monitoring	Responsibili
Impact on soil and water	• The equipment's and construction Material shall be placedaway from water bodies (if any), natural flow paths and residential areas Equipment's and • materials shall be stored at designated areas with concreteflooring to avoid any spillages which may lead to soil or ground water	Continuous during	Contractor

d) Site Clearing and Leveling

Before initiating the construction work, clearing of the vegetation cover (trees, shrubs, bushes etc.) and leveling work shall be carried out at site. The site clearing work may lead to loss of vegetation cover and topsoil to some extent in the plant area. It is proposed to construct line drains for storm water collection to minimize the soil erosion. Apart from localized construction impacts at the plant site, no adverse impacts on soil in the surrounding area are anticipated. Also, as the proposed project land is flat, it is less susceptible to

erosion.

Table 10: Environmental impact and mitigation plan-preconstruction phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Soil erosion	• Planning and designing the development within the natural constraints of the site; • Minimizing the area of bare soil exposed at one time (phased grading); • Avoiding the unnecessary clearing of the site, •	Continuous	Contractor
Air pollution	• Water sprinkling shall be practiced • Construction machinery shall be properly maintained to minimize exhaust emissions of CO, SPM and Hydrocarbons	Continuous	Contractor

a) Establishment of labor camp

Provision of civic amenities with proper ventilation, well illuminated and with emergency medical facilities for construction labour and movement of truck drivers for transporting construction material shall be provided at the site. Contractor will take utmost COVID appropriate practices and ensures workers behavior awareness. The labour camps at the project site will be temporary innature and the human excreta will not be significant to cause contamination of ground water. 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.

Table 11: Environmental impact and mitigation plan-preconstruction phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Health Risks	• Provision of separate mobile toilet facilities for men and women shall be made. • The domestic effluent shall be properly disposed off in soak pits. • Contractor shall provide garbage bins to all workers' accommodation for dumping wastes regularly in a hygienic manner in the area	Continuous	Contractor
Chances of spread ofsexually transmittable diseases like AIDS	• Awareness programmes to be conducted regularly for worker son AIDS, and other health related issues. • Health checkup facilities for employees and contract workers	During Construction	Contractor
Water pollution	• Separate Mobile Toilet facilities shall be made available for	Continuous	Contractor

	male and female workers. • The domestic effluent shall be properly disposed off in soak pits.		
Land contamination	• Basic sanitary facilities shall be provided for the workers stayingat the labour camp and at the project site. • Dustbins shall be provided at the camp by the contractor	Continuous	Contractor

B. Construction Impact

Main civil works in the subproject include laying of cables, boundary wall/fence and construction offoundation of inverter, transformers, control rooms at the identified sites. The activities and their anticipated impacts during the construction phase included the following:

a) Construction of internal roads, and development of other areas

Internal roads and boundary wall shall be constructed at the site. Foundations of the solar panels, inverter house, LT houses, admin & main control room and switchyard shall also be constructed at the site. Internal road shall be constructed prior to above facilities for free movements of vehicles and equipment's. The impact due to construction and its mitigation measures are depicted in below;

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Impact on Air quality and Noise Levels- The impact on air quality will be for short duration and confined with in the project boundary and is expected to be negligible to outside plant boundaries. The impact will, however, be reversible, marginal and temporary in nature.	• Activities like digging and filling are to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site • Construction equipments are to be properly maintained to minimize exhaust emissions • Water sprinkling shall be practiced	• Continuous • Monthly • Continuous	Contractor Contractor Contractor
Impact on Water quality	• The construction will be more related to mechanical fabrication, assembly and erection; hence the water requirements would be meager. Soak pits will be made for disposal of sanitary sewage generated by the workforce. The overall impact on water during construction p h a s e d u e t o proposed project is likely to be short term and insignificant • Also, consumption of water should be monitored	During planning layout and construction work	Contractor

	and attempt should be made to avoid spills / wastages and ensure optimal consumption		

a) Movement of vehicles

Vehicle movement shall prevail at the site to transfer the material and workers at site. Apart from this, third party vehicles delivering the material and equipments shall also be there.

Table 13: Environmental impact and mitigation plan- Construction phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Air pollution	• All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. • Vehicle speed is to be restricted to 15km/hour at site • Trucks/dumpers are to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil • Maintenance of vehicles shall be carried out regularly • Sprinkling of water shall be practiced at the site	Continuous	Contractor
Water contamination	Proper maintenance of vehicle shall be carried outto avoid any leakage of oil or grease	Annually	Contractor
Vehicle movement safety	• Vehicle speed is to be restricted to 15km/hour at site • Necessary safety trainings shall be provided to the drivers of construction vehicles for speed restrictions and do's and don'ts to be followed during movement of construction vehicles	Continuous	Contractor

a) Excavation and drilling

Excavation and drilling shall be carried out at site for the construction of foundation and base of solarpanels, inverter houses, LT houses, security rooms, admin building, switchyard, etc.

Table 14: Environmental impact and mitigation plan- During excavation

Potential impact	Mitigation action	Monitoring frequency	Responsibility

Occupational health hazards	Provision of adequate personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. for the safety of workers. Training shall be imparted to workers on occupational safety and technical aspects of job undertaken by them	Continuous	Contractor 45
Air pollution	Water sprinkling at regular intervals during excavation and drilling activities shall be practiced to avoid generation of dust.	Continuous	Contractor
Noise pollution	• Regular maintenance of plant equipment shall be carried out • Noise prone activities are to be restricted to the extent possible during night time. • Personal protective equipments shall be provided for workers performing drilling at site	• Monthly • Continuo us • Continuo us	Contractor

a) Use of D.G sets

D.G sets shall be used at site to provide electricity to labour camps in the night time. Also, in case of non-availability of power from grid, D.G sets shall be used to provide electricity at the site for construction activity.

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Air pollution	• D.G set to be optimally used with properorientation and adequate stack height • Stack monitoring carried out on regular basis. • Proper maintenance of the DG Set carried outon regular basis	At time of installation Annually Annually	Contractor
Noise pollution	Acoustic enclosures are to be provided with the D.G sets to minimize the noise levels	Installation period	Contract or

E) Storage of diesel

Diesel shall be stored on-site so as to ensure availability for D.G sets.

Table 15: Environmental impact and mitigation plan- Construction phase storage

Potential impact	Mitigation action	Monitoring frequency	Responsibility

Soil contamination	A covered area shall be defined for storage of HSD with concrete flooring	Planning stage	Contractor
Fire Safety related Measures	• The diesel storage area shall not be proximity of the labour camps • Inflammable substance shall not be allowed at the project site.	Continuous	Contractor

F) Handling of broken solar panels

During transportation, handling, installation and operation, there is a chance of damage to the solar PV panels. These damaged panels are required to be handled with care owing to presence of traces of metals like cadmium, selenium, etc. and presence of recoverable materials like glass, aluminum and semi- conductor materials. Damaged solar panels needs to be disposed based on stipulations in Hazardous waste and E-waste Management handling rules.

Table 16: Environmental impact and mitigation plan- Handling waste modules

Potential	Mitigation action	Monitoring frequency	Responsibilit
Land contamination	• Broken or damaged solar panels shall be immediately shifted to a designatedarea in scrap yard to avoid any type ofland contamination. A photograph is tobetaken of the broken panel at the siteto cater to Insurance settlement claims. The storage area shall have a concretebase	Continuous	Site in-charge and
Health risks	• PPE shall be provided to the workers handling the broken solar panels • The workers at site shall be apprised about the potential health risks	Continuous	Site in-charge, EHS and

G) Handling of waste

Both hazardous and non-hazardous waste shall be generated during the construction activity. All the wasteshall be properly managed as per the hazardous materials and waste handling guidelines in order to minimize the following potential impacts:

Potential impact	Mitigation action	Monitoring frequency	Responsibility
• Air Pollution • Soil Contaminati on • Water Contaminati on	• The excavated material generated will be reused for site filling and leveling operation to the maximum extent possible. • The scrap metal waste generated from erection of structures and	Continuo us Continuous	Contractor

	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 collected and composted at site • Hazardous waste viz. waste oil etc will be collected and stored in paved and		
	bounded area and subsequently sold to authorized recyclers. Necessary manifest for the same will be maintained.	Within 90days	
Safety risks	Adequate PPE's shall be identified and provided to the workers at site.	Continuous	Safety risks

Handling of all wastes and disposals will be done compliance to hazardous waste (batteries, spilled oil, waste oil, SPF, transformer oil, etc) management and E-waste management guidelines.

h) Installation and operation of Concrete mixing machines

Concrete mixing machines may be installed on temporary basis at the project site. If installed, it should be done with necessary regulatory permissions.

Table 19: Environmental impact and mitigation plan- Construction

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Noise pollution	• Noise shielding to be used where practicable and fixed noise sources to be acoustically treated for example with silencers, acoustic louvers and enclosures. • Provision of make shift noise barriers near high noise generating equipment to minimize horizontal propagation of noise	At the time of installation	Contractor

i) Construction labour management

There will be) around 50 labourers engaged during construction and contractor shall make temporary facility within the site like water supply, resting shed, temporary toilets etc., At the Labor camp, contractor shall ensure necessary basic facilities (proper lighting, ventilation, water supply, sewerage, and emergency medical facility as per labour regulatory requirements

Table 20: Impact and mitigation plan- Construction labour management

Potential impact	Mitigation action	Monitoring	Responsibility

		frequency	
Child labour and forced labour	• Provision of clause in contractor's agreement that bans child labour and forced labour at project site. • Adequate procedures to avoid or prevent hiring/entry of child labour at the project site	Continuous	Contractor
Health and safety risks	Temporary crèche facility may be provided in case of migrant laborers children residing in the camps to ensure safety	Continuous	Contractor
Water wastage	Emphasis shall be given on optimization of water usage and supply of potable drinking water for labour camps	Weekly	Contractor
Pressure on forest produce	Fuel shall be made available to construction workers so as to reduce pressure on forest produceor local fuel wood resources	Weekly	Contractor

For all construction works

(i) Damp down the soil and any stockpiled material on site by water sprinkling - (3-4 times a day - before the start of work, 1-2 times in between, and at the end of the day); when working in the roads there should permanently be one person responsible for directing when water sprinkling needs to take place to stop the dust moving

(ii) Reduce the need to sprinkle water by stabilizing surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition

(iii) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process

(iv) Cover the soil stocked at the sites with tarpaulins and surround by dust screens

(v) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation

(vi) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported byopen trucks;

(vii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area, minimize thedrop height when moving the excavated soil

(viii) Clean wheels and undercarriage of haul trucks prior to leaving construction site

(ix) Ensure that all the construction equipment, machinery are fitted with pollution control devises, which are operating correctly, and have a valid pollution under control (PUC) certificate

(x) No vehicles or plant to be left idling at site generators to be at placed maximum distance from properties.

Socio-Economic – Employment Manpower will be required during the 6-months construction stage. This can result in generation of temporary employment with COVID appropriate behavior and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to employ local labour force as far as possible.

Occupational Health and Safety: Workers need to be mindful of the occupational hazards which can arise from working in confined areas such as trenches, working at heights, near the heavy equipment operating areas etc. Potential impacts are negative and long-term but reversible by mitigation measures. The construction

contractor will be required to:

(i) Follow all national, state and local labor laws
(ii) Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training for all site personnel, (d) excluding public from the work sites; and (e) documentation of work related accidents.11 Follow International Standards such as the World BankGroup's Environment, Health and Safety Guidelines
(iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites;
(iv) Secure all installations from unauthorized intrusion and accident risks
(v) (v) Provide OHS orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(vi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(vii) Ensure the visibility of workers through their use of high visibility vests and other PPEs when working in or walking through heavy equipment operating areas;
(viii) Ensure moving equipment is outfitted with audible back-up alarms;
(ix) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
(x) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection as per Noise rules and OSHA safety guidelines. The use of hearing protection shall be enforced actively.
(xi) Provide supplies of potable drinking water;
(xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances

Construction Camps:

Contractor may require to set up construction camps – for temporary storage of construction material (modules, inverter parts, cables, connectors, tools & tackles, MMS structures, accessories etc.,), and stocking of surplus soil, and may also include separate living areas for migrant workers. The contractor will however be encouraged to engage local workers as much as possible. Operation of work camps can cause

temporary air, noise and water pollution, and may become a source of conflicts, and unhealthy environment if not operated properly. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

I. Consult PIU before locating project offices, sheds, and construction plants;
II. Select a camp site away from residential areas (at least 100 m buffer shall be maintained) or locate the camp site within the existing facilities of City Corporation
III.
IV. Provide a proper fencing/compound wall for camp sites
V. Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas
VI. Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit.
VII. Ensure conditions of livability at work camps are maintained at the highest standards possible at alltimes; living quarters and construction camps shall be provided with standard

materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like Asbestos materials, GI sheets, tarpaulins, etc., shall not be used as accommodation for workers

VIII. Camp shall be provided with proper drainage, there shall not be any water accumulation

IX. Provide drinking water, water for other uses, and sanitation facilities for employees; drinking watershould be regularly tested to confirm that drinking water standards are met

X. Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas and/or kerosene); fire wood not allowed

XI. Train employees in the storage and handling of materials which can potentially cause soil contamination

XII. Wastewater from the camps shall be disposed properly either into sewer system; if sewer system isnot available, provide on-site sanitation with septic tank and soak pit arrangements; (100 m away from surface water body or groundwater well)

XIII. Recover used oil and lubricants and reuse or remove from the site and disposed in designated disposal site;

XIV. Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal atdesignated authorized areas in consultation with CCMC; provide a compost pit for bio degradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market

XV. Remove all wreckage, rubbish, or temporary structures which are no longer required; and

XVI. At the completion of work, camp area shall be cleaned and restored to pre-project conditions, andsubmit report to PIU; PIU to review and approve camp clearance and closure of work site

C. Operation and Maintenance (O&M) Impact

Solar power projects are environment friendly and easy to operate as most of the procedures are automated and requirement of manpower is minimal. Therefore, no significant negative impacts are envisaged during the operation phase of the project. Operation & maintenance (O&M) of 2MW solar PV plant will be carried out by contractor up to 5 years. There after it would be carried out by owner of the plant.

a) Operational activities

A dedicated team shall be deployed at the site for the carrying out operation and maintenance like repair & replacement of damaged components, safety of workers etc., which shall be responsible to pass on the electricity to the sub-station. Since it is a high voltage area, safety precautions are required to be undertaken.

Table 21: Environmental impact and mitigation plan- O&M period

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Safety risks	• Regular safety training shall be imparted to employee on electrical safety • Rubber mats to be provided near all high voltage areas • Cardiopulmonary resuscitation (CPR) charts to be displayed in the switchyard area	Continuous At the time of installation	Contractor
Soil contamination	Regular maintenance and monitoring of the transformers shall be carried out to avoid leakage of transformer oil	Annually	Contractor

Repair of minor components	Minor damaged components to be repaired/replaced	Continuous	Contractor
Water arrangement	Water will be arranged from outsourced authorized vendor through water tankers for module cleaning and domestic use	Module cleaning2/3 cycles per month	Contractor

a) Use of ground water resources

Minimal quantity of water would be required for the purpose of cleaning solar panels and for domestic use by the employees including contract works employed during the operational phase. The water requirement would be sourced from water tankers or from bore wells at site.

Table 22: Environmental impact and mitigation plan- O&M phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Depletion of Ground water	• A water meter shall be installed at water intake works to monitor total water consumption • Water reduction measures through periodic checking of pipeline leakages • Spills / wastages to be avoided and ensure optimal consumption	Monthly Weekly	Contractor Contractor

D. Decommissioning Impact

The project has an expected lifetime of 25 years after which the project shall be decommissioned. The site may further be used for similar power project which will not require much of remediation. However, if the site is used for some other purpose land restoration shall be an important exercise.

A decommissioning plan shall be prepared for the project activity and the key impacts envisaged due to the decommissioning activities. Some key activities need to take care are highlighted below:

a) Removal and disposal of Solar panels

Solar panels shall be removed after the end of the lifetime and shall be disposed in accordance of a pre- defined procedure.

Table 23: Decomposition impact and mitigation plan- O&M phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Safety risks	Safety shoes, helmet and gloves shall be provided to the workers involved in removal of solar panels	Before initiation	contractor
Soil contamination	• The removed solar panels shall be immediately shifted to designated	Continuous	Contractor

	storage area to avoid contact with soil • In case of breakage or damage to solar panels, the panels shall be immediately shifted to a designated area in scrap yard to avoid any type of land contamination.		

a) Restoration of area

If the project site is not intended to be used for similar type of project, the same shall be restored to its natural state

Table 24: Impact and mitigation plan- O&M phase

Potential impact	Mitigation action	Monitoring frequency	Responsibility
Land degradation	• All the excavated construction material/debris from the foundations shall be reused at site or disposed in a predetermined landfill belonging to CCMC and shall not be disposed at the project site • Re-vegetation shall be done as appropriate of the exposed area. • All the waste generated till date shall be disposed in accordance of the applicable legislation	Continuous	Contractor

There will be no environmental risk from the operation of solar PV plant. Handling of all wastes and disposals will be done in compliance to E-waste management.

E. Budgetary estimates for implementing ESMMP:

An estimated budget of INR 2 to 3.5 Lakhs per annum is planned for conducting assessments on an annual basis for Soil, Air, Noise & Water quality from third party agency (i.e. an approved NABL Laboratory) during the operational phase of the project.

VI. Public Consultation and Information Discloser

The active participation of stakeholders including CCMC, TANGEDCO, TEDA, TWAD etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people.

Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: CCMC, TENGEDCO, TEDA, TWAD and people who residenear the project site where facilities will be built, government and utility agencies responsible for provision of various services in project area.

A. Public Consultation and Participation

The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

Stakeholder consultation meeting held for 2MW solar PV plant at Kavudampalayam old compostyard , Coimbatore held on Friday, 6 December 2021 at CCMC Conference hall. In the chair: Mr.Rajagopal Sunkara, IAS, Commissioner, Coimbatore City Municipal Corporation (CCMC). A detailed presentation has been given by the municipal engineers of Coimbatore City Municipal Corporation, to the stakeholders. The CCMC engineer's presented on the Background of the Project, Funding from Asian Development Bank, technical, financial, environmental and social feasibility of setting up of Solar plant in the site., Following points were discussed during consultation meeting;

1. Total capacity of the solar PV plant will be 2 MW(AC).

2. 2 MW(AC) Solar plant can be installed under **Captive mode** by Coimbatore Corporation, wheregeneration will be exported to the grid and compensated with all other HT consumption by Coimbatore Corporation.

3. 11 KV dedicated HT feeder is required to evacuate solar power to nearby Kavudampalayam substation (approximately 400 Mts from site).

4. Only Wheeling charges will be applicable, as banking is not allowed as per TN solar policy. Same will be shared by TNERC. TANGEDCO officials will support to receive this information.

5. Information related to power evacuation charges, billing charges, and grid connectivity approval process can be obtained from TANGEDCO Chennai office. CCMC officials has coordinated with TANGEDCO official and got the information.

6. Modules has been considered of more than 390 Wp capacity for bid documentation. The module of 450 Wp has been considered for energy yield assessment (EYA) is ok in conceptual stage.

7. DC/AC ratio shall be decided to keep CUF <= 20%, as maximum limit for bill able energy generation is equivalent to capacity utilization factor of 19% per annum as per TNERC

8. All the approvals and permission for this 2MW solar plant will be obtained by EPC.

9. .

10. Minimum requirement and Specification of all the components has been provided in tender as per industrial practice and as per requirement.

Table 25:Description of Public Consultation

Sl. No.	Sub Project Components	Scope of land acquisition and Resettlement & Rehabilitation	Summary
1	Land of 7.67 acres re q u i re d f o r 2 MW(AC) solar PV p l a n t a t Kavudampalayam old compost yard , Coimbatore	Proposed land boundary of 7.67 acres is Coimbatore municipal c o r p o r a ti o n l a n d a t Kavudampalayam old compost yard , Coimbatore. This land is owned by CCMC	No land acquisition necessary. No encroachers/ squatters are identified on that land. No involuntary resettlement issues involved.
2	2 MW(AC) Solar PV Plant implementation	Project site is located on CCMC land. Land is non-agricultural and belongs to CCMC	No land acquisition necessary. No encroachers/ squatters are identified on that land. No involuntary resettlement issues involved.
3	Solar components (modules, inverter, transformers, MCR and DC & AC cabling	Land provided by CCMC (owned)	No land acquisition necessary. No encroachers/ squatters are identified on that land. No involuntary resettlement issues involved.
4	Transmission line from solar plant to Kavudampalayam su bstation (400 Mts from site approx)	A total length of around 400 Mts will be laid from plant to Kavudampalayam substation below ground along the internal road within the plant boundary.	No involuntary resettlement impact envisaged. No temporary impact also identified as the sewer lines will be laid in the middle of the r5o8ads/ streets.

Consultation during Construction

Prior to start of construction, Project Information and construction schedule shall be disclosed in the site. Focus group meetings, as required, may be conducted. Contractor will provide prior public information (in Tamil and English) about the construction work in the area, once 7 days prior to the start of work. At the work sit, public information boards will also be provided to disseminate project related information.

B. Information Disclosure

Executive summary of the IEE will be translated in Tamil and made available at the offices of PMU and PIU and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Tamil will be placed in the official website of the TNUIFSL and CCMC after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction sites for the information of general public.

Local communities may be consulted if required regarding location of construction camps, access and hauling routes and other likely disturbances during construction.

VII. Grievance Redress Mechanism (GRM)

A common GRM will be in place to redress social, environmental or any other project related grievances. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and Project Management Unit (PMU) and concerned CCMC will ensure that their grievances are addressed.

The major objectives of the Grievance Redressal Mechanism System are to:

a. Create a platform / process for prevailing proactive GMR;

b. Make people accountable for timely Redressal of grievances;
c. Establish a robust process for addressing contract worker grievances;
d. Create a healthy working atmosphere and drive active engagement at contract worker level;
e. Have a strategy, supporting long-term business requirements at site;
f. Prevent minor disagreements developing into more serious disputes later on;
g. Defend against legal intervention

Environmental and social grievances are handled in accordance with the project grievance Redress mechanism defined under the HR policy for contractors. The Grievance Redressal Mechanism (GRM) for the project provides an effective approach for complaints and resolution of issues made by the affected community in a reliable way. This mechanism was established prior to construction and will remain active throughout the life cycle of the project. Open and transparent dialogue will be maintained with project affected persons as and when needed, in compliance with ADB safeguard policy requirements.

Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaints register in CCMC/ULB or PIU offices. PIU Safeguards officer will have the responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party.

GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievanceredress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a grievance redress committee (GRC) will be established in PIUs; Project/Construction Manager, along with support Engineer – Construction supervision (and Environmental safeguard Assistant (and Supervision Consultant (CMSC) will be responsible for creating awareness among affected communities and help them through the process of grievance redress, recording and registering grievances of non-literate affected persons.

GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. Documentation of the name of the complainant, date of receipt of the complaint, address/contact details ofthe person, location of the problem area, and how the problem was resolved will be undertaken. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants, on the status of their grievance and recording their feedback (satisfaction/dissatisfaction/ suggestions).

In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the CCMC and PIU will resolve the issue on site, and any issue that is not resolved at this level will be dealt at PIU head level for immediate resolution. Should the CCMC fail to resolve any grievance within the stipulated time period of 15 days, the unresolved grievances will be taken up at PMU level. In the event that certain grievances cannot be resolved even at PMU level, particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc., they will be referred to the grievance redress committee (GRC) headed by the Managing Director, CCMC. Any issue which requires higher than district level inter-departmental coordination or grievance redress, will be referred to the State level Steering Committee.

GRC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-failing which the grievance will be

addressed by the state-level Steering Committee. The Steering Committee will resolve escalated/unresolved grievances received.

Communication has to be made to all contractor staff regarding the 'Dos' and 'Don'ts' and they will be apprised about the discipline amenable with the local customs and traditions during their association with the project.

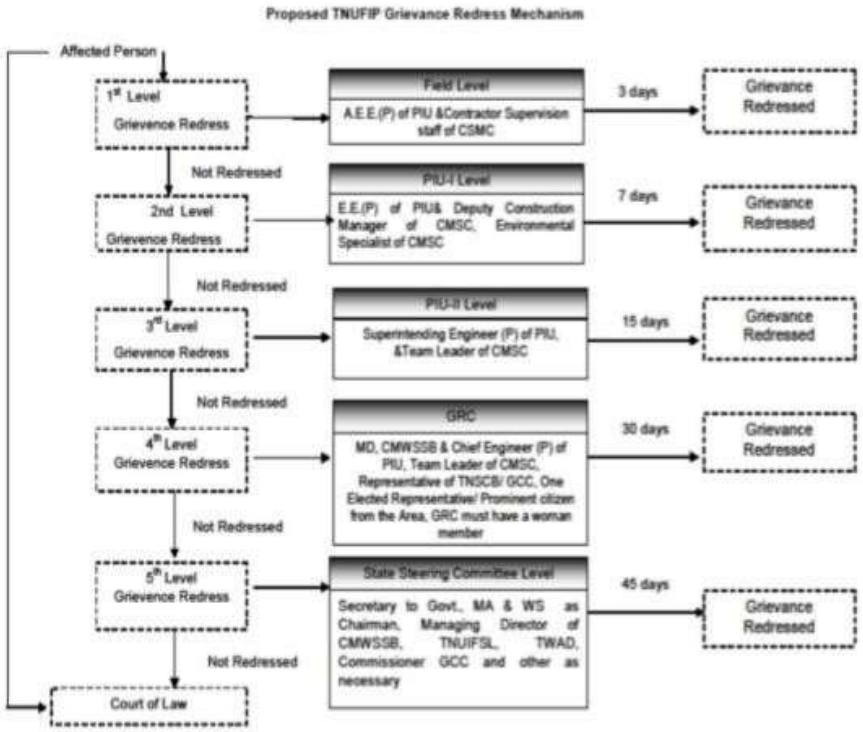
Composition of Grievance Redress Committee: GRC will be headed by the Managing Director, CCMC, and members include: Chief Engineer (P), Team leader of PIU, representative of TNPCB, one elected representative/prominent citizen from the area, and a representative of affected community. GRC must have a women member.

State Level Steering Committee will include Secretary to Government, members from TNUIFIP, CCMC, and others as necessary.

Areas of Jurisdiction: The areas of jurisdiction of the GRC/SSC, will be all locations of sites within the Coimbatore city where subproject facilities are proposed.

The multi-tier GRM for the project is outlined below figure, each tier having time bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ CCMC shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

Proposed TNUFIP Grievance Redress Mechanism flow chart is as below:



CMSC = Construction Management and Supervision Consultant, CMWSSB = Chennai Metropolitan Water Supply and Sewerage Board, GRC = grievance redress committee, PIU = project management unit, TNUIFSL = Tamil Nadu Urban Infrastructure Financial Services Limited, TWADB = Tamil Nadu Water and Drainage Board.

Recordkeeping. Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU and submitted to PMU.

Information Dissemination Methods of the Grievance Redress Mechanism: The PIU, from CCMC will be responsible for information dissemination to affected persons and general public in the project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreedentitlement matrix including, whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU, offices, CCMC notice boards and on the web, as well as reported in the semi-annual environmentaland social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in Appendix 3.

Periodic Review and Documentation of Lessons Learned: The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

Costs: All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement cost estimates.

Country legal procedure: An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

ADB's Accountability Mechanism: In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. Thecomplaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

VI. Environmental Management Plan

Environmental Management Plan

An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between, TNUIFSL, PMU, CMWSSB, PIU, consultants and contractors.

The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on-and off-site, document checks, and interviews with workers and beneficiaries.

The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas,hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEP. No works are allowed to commence prior to approval of SEMP.

A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents to ensure compliance to the conditions set out in this document.

For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measuresset forth in the approved EMP; and (ii) implement any corrective or preventative actions set out insafeguards monitoring reports that the employer will prepare from time to time to monitor implementationof this IEE, EMP and SEMP. The contractor shall allocate budget for compliance with these IEE, EMP and SEMP measures, requirements and actions.

Main mitigation will include design stage environmental impact and mitigation measures, Pre-construction stage environmental impact and mitigation measures, Construction stage environmental impact and mitigation measures and O&M stage environmental impact and mitigation measures. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 26: Environmental management plan

Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost & Source of Fund

Soil erosion, Air Pollution due to clearing of vegetation (shrubs, bushes)	• Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metalled grating/ grill work shall be provided over the sections (or full cross section if required) where workers will stand / work for inspection and repair/ operation and maintenance (O&M) purposes. • Provide training to the staff in standard operating procedures (SOPs) and emergency procedures	CCMC & Contractor	Project Cost
Air and Noise Pollution due to Transportation of equipment to site	• Minimize vehicular trips to the extent possible • Proper maintenance of vehicles to minimize air and noise emissions	CCMC & Contractor	Project Cost
Soil Movement, Air Emissions due to Excavation, digging of pits	Minimal quantity of waste would be generated during the construction period due to the excavation of the TL laying. The excavated soil would be backfilled after the construction work.	CCMC & Contractor	Project Cost
Air Emissions, Noise Pollution due to Structural work/Mechanical Work	Water sprinkling shall be practiced Construction machinery shall be properly maintained to minimize exhaust emissions of CO, SPM and Hydrocarbons PPEs to be used by the workers	CCMC & Contractor	Project Cost
Wastage of water resources due to use of water for construction activities	• Optimized utilization of water for construction purpose • Emphasis shall be given on optimization of water usage and supply of potable drinking water for labour working at construction site	CCMC & Contractor	Project Cost
Physical hazards related to working at height due to Erection of towers, line stringing	• Safety practices to prevent physical hazards to employees should be employed • Training imparted to employees on regular basis • PPEs to be provided to workers	CCMC & Contractor	Project Cost
Issues related to construction labour management (Limited number of contractual workforce are employed during construction phase)	• Provision of clause in contractor's agreement that bans child labour and forced labour at project site. • Adequate procedures to avoid or prevent hiring/entry of child labour at the project site	CCMC & Contractor	Project Cost

Designing stage environmental impact and mitigation measures

Table 27: Environmental management plan in Designing period

Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost & Source of Fund
Gradient & Drainage	• Provision of leveling of land and drainage in slope direction and layout preparation accordingly • Provide training to the staff in standard operating procedures (SOPs) and emergency procedures	Contractor	Project Cost
Water treatment	• Provision of water quality checkup and treatment • Provision of waste water shall be collected from plant and worker's camp properly • Provide training to the staff in standard operating procedures (SOPs) and emergency procedures	Contractor	Project Cost
Air quality	• Air quality shall be checked on continuous basis • PM10, PM2.5, NO2, SO2, CO to be monitored	Contractor	Project Cost
Water Quality	• Physical and Chemical parameters mandatory. If required Biological parameters to be included.	Contractor	Project Cost
Noise levels	• Day and Night time noise monitoring to be done	Contractor	Project Cost
Soil quality	• Soil analysis needs to be done to store the top soil or to use in some other site of CCMC.	Contractor	Project Cost

Construction stage environmental impact and mitigation measures

Table 28: Environmental management plan in construction plan

Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost & Source of Fund
Submission of updated EMP/SEMP; EMP implementation and reporting	• Appoint EHS Supervisor to ensure EMP implementation; • Submission of updated EMP/ SEMP; and • Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs. • Ensure H&S requirements for COVID-19 are followed as per established protocols and ADB guidelines	Contractor	Contractor Cost
Sources of Materials Obtain construction materials only from government approved	• Obtain construction materials only from authorized vendors with applicable valid permits.	Contractor	Contractor Cost

quarries with prior approval of PIU	• PIU shall verify the validity of such permits periodically.		
Impact on Air quality-- The impact on air quality will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. The impact will, however, be reversible, marginal and temporary in nature.	• Activities like digging and filling are to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site • Construction equipments are to be properly maintained to minimize exhaust emissions • Water sprinkling shall be practiced	Contractor	Contractor Cost
Irreversible impact to the environment, workers, and community due to EMP	Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHS), core labor laws, applicable environmental laws, etc.	Contractor	Contractor Cost
Impact on Soil and Water quality	• The construction will be more related to mechanical fabrication, assembly and erection; hence the water requirements would be meager. Soak pits will be made for disposal of sanitary sewage generated by the workforce. The overall impact on water during construction phase due to proposed project is likely to be short term and insignificant • Also, consumption of water should be monitored and attempt should be made to avoid spills / wastages and ensure optimal consumption. • The equipments and construction material shall be placed at least 100m away from water bodies (if any), natural flow paths and residential areas • Equipments and materials shall be stored at designated areas with concrete flooring to avoid any spillages which may lead to soil or ground water contamination. • Proper maintenance of vehicle shall be carried out to avoid any leakage of oil or grease	CCMC & Contractor	Contractor Cost
Occupational hazards which can arise during work	• Follow all national, state and local labour laws; • Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. for the safety of workers.; (c) OHS Training for all site personnel,- Training shall be imparted to workers on occupational safety and	Contractor	Contractor Cost

	technical aspects of job undertaken by them (d) excluding public from the work sites; and (e) documentation of work related accidents and follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines. • Ensure that qualified first-aid is provided at all times. Equipped first aid stations shall be easily accessible throughout the sites; • Secure all installations from unauthorized intrusion and accident risks • Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; • Ensure the visibility of workers through their use of high visibility vests and other PPE when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and • Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances		
Labour facilities at work site Labour Accommodation	• Provision of separate mobile toilet facilities for men and women shall be made. • The domestic effluent shall be properly disposed off in soak pits.	Contractor	Contractor Cost

Chances of spread of sexually transmittable diseases like AIDS	• Contractor shall provide garbage bins to all workers' accommodation for dumping wastes regularly in a hygienic manner in the area • Consult PIU before locating project offices, sheds, and construction plants; • Select a camp site away from residential areas (at least 100 m buffer shall be maintained) or locate the camp site within the existing facilities of City Corporation • Avoid tree cutting for setting up camp facilities • Provide a proper fencing/compound wall for camp sites • Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas • Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit • Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like asbestos, GI sheets, tarpaulins, etc., shall not be used as accommodation for workers • Camp shall be provided with proper drainage, there shall not be any water accumulation • Provide drinking water, water for other uses, and sanitation facilities for employees; drinking water should be regularly tested to confirm that drinking water standards are met • Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed • Train employees in the storage and handling of materials which can potentially cause soil contamination • Wastewater from the camps shall be disposed properly either into sewer system; if sewer system is not available, provide on-site sanitation with septic tank and soak pit arrangements (100 m away from surface water body or groundwater well). • Recover used oil and lubricants and reuse or remove from the site;		

	• Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for bio degradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market. • Dustbins shall be provided at the camp by the contractor • Remove all wreckage, rubbish, or temporary structures which are no longer required; and • At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU; PIU to review and approve camp clearance and closure of work site • Awareness programmes to be conducted regularly for workers on AIDS, and other health related issues. • Health checkup facilities for employees and contract workers		
Movement of Vehicles-Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Safety risks	• All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. • Vehicle speed is to be restricted to 15km/hour at site • Trucks/dumpers are to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil • Maintenance of vehicles shall be carried out regularly • Sprinkling of water shall be practiced at the site • Proper maintenance of vehicle shall be carried out to avoid any leakage of oil or grease • Necessary safety trainings shall be provided to the drivers of construction vehicles for speed restrictions and do's and don'ts to be followed during movement of construction vehicles	Contractor	Contractor Cost
Use of D.G.Sets – Air and Noise Pollution	• D.G set to be optimally used with proper orientation and adequate stack height. • Stack monitoring carried out on regular basis. • Proper maintenance of the DG Set carried out on regular basis • Acoustic enclosures are to be provided with the D.G sets to minimize the noise levels	Contractor	Contractor Cost
Handling of wastes	• Both hazardous and non-hazardous waste shall be generated during the construction activity. All the		

Handling of construction wastes	waste s shall be properly managed as per the hazardous materials and waste handling rules. • The excavated material generated will be reused for site filling and leveling operation to the maximum extent possible. • 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 collected and composted at site • Hazardous waste viz. waste oil etc will be collected and stored in paved and bounded area and subsequently sold to authorized recyclers. Necessary manifest for the same will be maintained. • Adequate PPE's shall be identified and provided to the workers at site. • All the excavated construction material/ debris from the foundations shall be disposed in a predetermined landfill and shall not be disposed at the project site		
Handling of Solar Panel Wastes	• Broken or damaged solar panels needs to be disposed based on stipulations in E-waste Management rules and shall be immediately shifted to a designated area in scrap yard to avoid any type of land contamination. • A photograph is to be taken of the broken panel at the site to cater to Insurance settlement claims • The storage area shall have a concrete base. • PPE shall be provided to the workers handling the broken solar panels • The workers at site shall be apprised about the potential health risks associated with handling of solar panels		
SF6 (Sulfur hexafluoride) indoor circuit breaker	• Installation of SF6 circuit breakers shall be as per manufacturer instruction and manual. Proper trained person shall be handling SF6 • Warning signage should be provided • Use of adequate & properly calibrated SF6 gas detector by responsible person • Installation of SF6 gas monitoring alarm to monitor leakage of gas .	Contractor	Contractor Cost

	• An eyewash bottle shall be provided in the battery room.		

O&M stage environmental impact and mitigation measures

Table 29: Environmental management plan in O&M period

Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost & Source of Fund
Safety risks	• Regular safety training shall be imparted to employee on electrical safety • Rubber mats to be provided near all high voltage areas • Cardiopulmonary resuscitation (CPR) charts to be displayed in the switchyard area	CCMC & Contractor	Project Cost
Soil contamination	• Regular maintenance and monitoring of the transformers shall be carried out to avoid leakage of transformer oil. • A covered area shall be defined for storage of HSD with concrete flooring. • The diesel storage area shall not be proximity of the labour camps. • Inflammable substance shall not be allowed at the project site.	CCMC & Contractor	Project Cost
Repair of minor components	Minor damaged components to be repaired/ replaced	CCMC & Contractor	Project Cost
Water arrangement	Water will be arranged from outsourced vender through water tankers for module cleaning and domestic use	CCMC & Contractor	Project Cost
Depletion of Ground water	A water meter shall be installed at water intake works to monitor total water consumption Water reduction measures through periodic checking of pipeline leakages	CCMC & Contractor	Project Cost

	Spills / wastages to be avoided and ensure optimal consumption		
Safety risks in removal of damaged solar panels	Safety shoes, helmet and gloves shall be provided to the workers involved in removal of solar panels	CCMC & Contractor	Project Cost
Soil contamination of damaged solar panels	• The removed solar panels shall be immediately shifted to designated storage area to avoid contact with soil • In case of breakage or damage to solar panels, the panels shall be immediately shifted to a designated area in scrap yard to avoid any type of land contamination.	CCMC & Contractor	Project Cost
SF6 (Sulfur hexafluoride) circuit breaker	• Proper training to be provided to O&M staff who are dealing with SF6 • SOP shall be provided for operating SF6 CB • Use of adequate & properly calibrated SF6 gas detector by maintenance staff • SF6 gas monitoring alarm to monitor leakage of gas on regular basis	CCMC & Contractor	Project Cost
Site aesthetics	• Examine feasibility and develop greenery around the facility with trees in as per the land availability to improve aesthetical appearance without affecting by shading the performance of the solar panels.	CCMC & Contractor	Project Cost

Implementation Arrangements

Coimbatore City Municipal Corporation shall be the implementing agency for this subproject. Existing Project Implementation Unit (PIU) will support in implementation of the 2 MW(AC) solar PV project and in coordinate, monitoring and implementation of safeguards at subproject level.

Safeguards Compliance Responsibilities: Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL have overall responsibility of safeguard compliance with ADB SPS 2009. ESS Managers report to Vice President in the Projects Wing. ESS Managers (TNUIFSL) will report to the Head, Projects Division. At CCMC, CCMC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject.

PMU Safeguard Responsibilities: Key tasks and responsibilities of the TNUFIP for this subproject include the following:

DPR finalization and Bidding stage:

(i) Ensure that all design related measures of the EMP are included designs

(ii) Ensure that EMP is included in bidding documents and civil works contracts including requirement for Environmental, Health and Safety (EHS) supervisor with the contractor

(iii) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards

(iv) Ensure that staff required for implementation of EMP (EHS officer) is included in the bid requirements

(v) Ensure that EMP cost is included in the project cost

(vi) Ensuring H&S requirements for COVID-19 are followed as per established protocols and ADB guidelines

(vii) Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of subproject are in place

Construction stage:

I. **Prior to start of construction:** Ensure that all necessary clearances/permissions/licences, including that of contractors are in place prior to start of construction. provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIUs and contractors.

II. Oversee and provide guidance to the PIU to properly carry out the environmental monitoring asper the EMP

III. Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained

IV. Consolidate quarterly environmental monitoring reports from PIU and submit semiannual monitoring reports to ADB

V. Oversee site closures to ensure that all work / facility sites are restored properly prior to issuing work completion certificate to the contractor

VI. Ensuring H&S requirements for COVID-19 are followed as per established protocols and ADB guidelines

Operation stage: Ensure that operation of water supply system as discussed earlier is in compliancewith all government regulations, standards and conditions.

PIU Safeguard Responsibilities: Key tasks and responsibilities of the PIU for thissub project include the following:

Detailed Project Report finalization and Bidding stage:

(i) Include design related measures of the EMP in the project design and DPR

(ii) Include EMP in the bidding documents and civil works contracts, including

(iii) requirement of staff (EHS supervisor) with contractor for EMP implementation

(iv) Provide necessary budget in the project as IEE for EMO Implementation

(v) Ensure that the bid/contract documents include specific provisions requiring

(vi) contractors to comply with all applicable labour laws and core labour standards including:

a. Labour welfare measures and provision of amenities

b. prohibition of child labour as defined in national legislation for construction andmaintenance activities;

c. equal pay for equal work of equal value regardless of gender, ethnicity, or caste;
d. elimination of forced labour;
e. the requirement to disseminate information on sexually transmitted diseases, includingHIV/AIDS, to employees and local communities surrounding the project sites.

(vii) In the pre-bid meeting, provide insight into EMP measures, and overall compliance requirementsto the bidders

(viii) Obtain all clearance/permissions as required for implementation of subproject, prior to invitationof bids and/or prior to award of contract / prior to construction as appropriate

Construction stage:

I. Identify regulatory clearance requirements and obtain all necessary clearances prior to start of construction; ensure construction work by contractor is conducted in compliance with all government rules and regulations including pollution control, labour welfare and safety etc.,
II. Prior to start of construction organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
III. Ensure contractor compliance with staff resources as per the IEE/EMP/Bid
IV. Guide contractor on updating EMP / preparing Site Environmental Plan at the start of the project
V. Update IEE and EMP; ensure that IEE reflects the final design being implemented by contractor
VI. Conduct public consultation and information disclosure as necessary
VII. Take necessary action for obtaining rights of way
VIII. Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan;
IX. Supervise ambient environmental monitoring by contractors
X. Take corrective actions when necessary to ensure no environmental impacts
XI. Submit quarterly environmental monitoring reports to PMU
XII. Conduct continuous public consultation and awareness
XIII. Address any grievances brought about through the grievance redress mechanism in atimely manner as per the EMP
XIV. Monitor Contractor's compliance with the measures set forth in the EMP and any corrective or preventative actions set forth in a safeguards monitoring report that the PMUwill prepare from time to time;
XV. Implement corrective or preventative actions in case of non-compliance or new/ unanticipated impacts;
XVI. Inform PMU promptly in case if any significant impacts surfaces, which were not identified inthe IEE and develop necessary corrective actions as necessary and ensure implementation by the contractors; include all such impacts and suggested actions in the Quarterly Environmental Monitoring Reports
XVII. Implementation grievance redress system, and undertake appropriate actions to redress the complaints; ensure that complaints/grievances are addressed in a timely manner and resolutions are properly documented;
XVIII. Review and approve monthly progress reports submitted by Contractor on EMP compliance,

XIX. Prepare quarterly environmental monitoring reports and submit to PMU /TNUIFSL

XX. Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB

Environment Monitoring Plan

Environment monitoring plan has been developed and depicted as below;

Before start the project: Air quality, water quality and noise level to be monitored; water from one location, air from

three locations and noise from three locations to be collected and tested.

Pre-construction phase:

Monitoring field	Monitoring parameters	Frequency	Responsibility
Water quality assessment for surface water and ground water monitoring	Physical, Chemical and Biological Parameters	One location and three times	Contractor
Ambient air quality	PM10, PM2.5, NO2, SO2,CO	Three locations and Monthly	Contractor
Ambient noise level	Day time and night time noise levels	Three locations and Monthly	Contractor

Constructionstage:

Table 30: Environmental monitoring plan

Monitoring field	Monitoring parameters	Frequency	Responsibility
Construction disturbances, nuisances, public and worker safety	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures	Weekly during construction	Contractor
Water quality assessment for ground water monitoring	Physical, Chemical and Biological Parameters	Monthly	Contractor
Ambient air quality	PM10, PM2.5, NO2, SO2, CO	Monthly	Contractor
Ambient Noise levels	Day time and night time noise levels	Weekly	Contractor

Estimated budget for testing of environmental parameter before start of project (during pre-constructionphase) are as below;

- Water testing: Rs. 10000/- per sample. Samples from one location (Ground water) and frequency three times willcost Rs. 30,000/-.
- Air & noise quality testing: Rs. 7500/- per sample. Samples from three locations will cost Rs.

22500/-.

- This costing is included in O&M cost.
- Testing will be done as per CPCB norms.

Estimated budget for testing of environmental parameter during construction phase are as below;

- Water testing: Rs. 10,000/- per sample. Samples (Ground water) from one locations and frequency of four times will cost Rs. 40,000/- per annum
- Air & noise quality testing: Rs. 7500/- per sample. Samples from three locations will cost Rs. 22500/- per month and frequency of four times will cost Rs. 90,000/-per annum
- This costing is included in O&M cost.
- Testing will be done as per CPCB norms.

Apart from the routine monitoring, in case of any additional testing requirements additional budget of Rs.50,000/- is assigned.

IX. Conclusion and Recommendations

As already mentioned, the project activity will contribute to generation of clean power into the state grid through 2.4 MWp/2MW Solar PV Power project. The project will not only boost the economic and industrial development of the area but will also contribute towards energy security.

This study of environment examination assessed various existing environmental parameters in and around the project and evaluated the required actions to minimize any significant negative impact. It is observed that the planned measures have to be implemented at the project site during the pre-construction and construction phase.

The project site is not located in a sensitive ecosystem, and is not significant from the historical and cultural perspective. It has been observed that identified land is a non-agricultural Government land,. This type of the project land coupled with the clean nature of solar power generation ensures that the project will not cause any significant adverse environmental and social impacts during construction and operation phases. The same is evident from the observations delineated in the previous sections of the report.

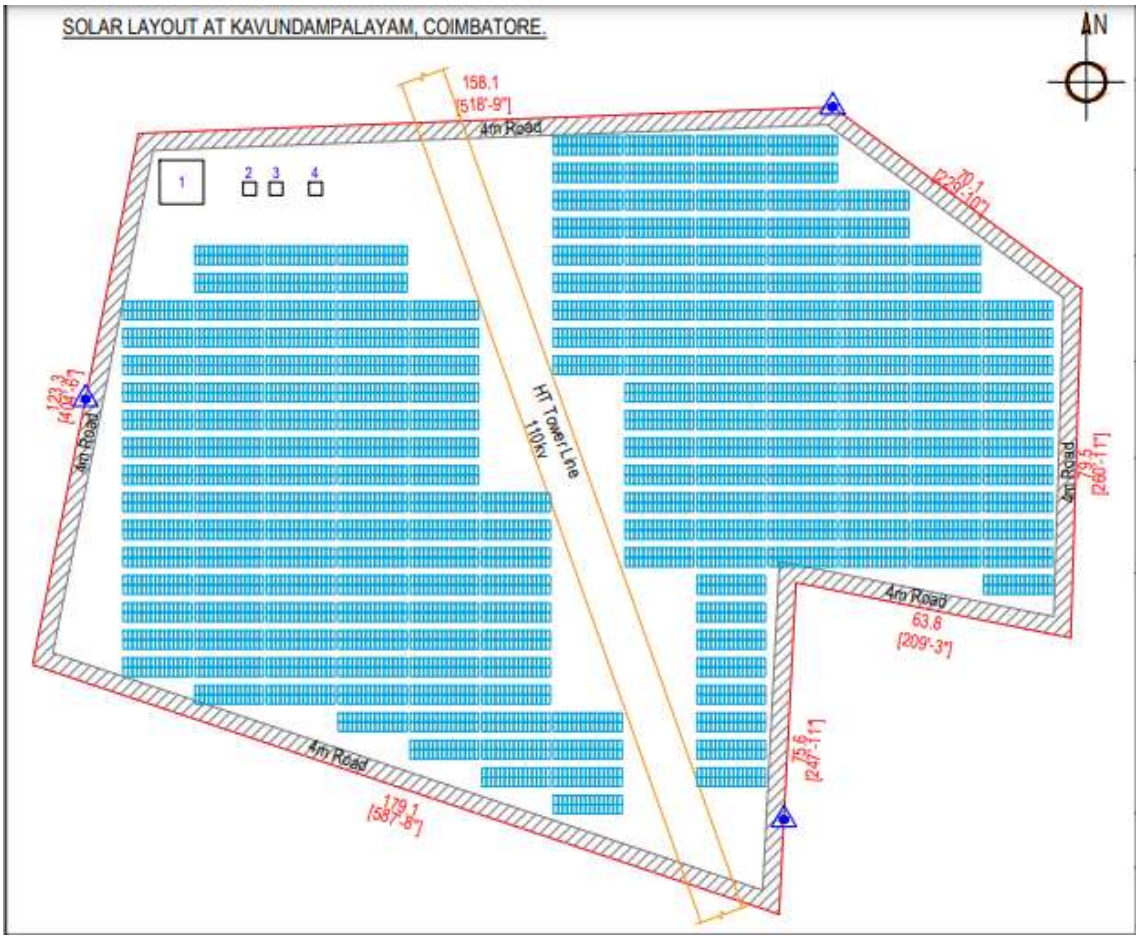
The main project associated impacts are associated with clearing of shrub vegetation, waste management and management of labour camps at the site. Moreover, most of the associated impacts are limited to the extent of construction phase and are temporary in nature. Adequate mitigation actions are undertaken in line with management and monitoring of the set of recommended mitigation measures. Regular monitoring of the recommended mitigation measures shall also be carried out during the implementation phase of the project.

In fact, various initiatives proposed in the project's ESMMP such as the green belt development, community development programmes, etc. are likely to enhance the environmental and economic development in and around the project area. The company may take initiatives to further strengthen its process/procedures on waste management with special emphasis on handling of broken solar panels and handling and storage of oils/chemicals

Annexure: 1 Plant Layout

Site Plant

Solar PV plant layout



COIMBATORE CORPORATION MUNICIPAL CITY
WEST ZONE - KAVUNDAMPALAYAM(36.00 Acre)

Annexure 2: ADBs Rapid Environmental Assessment (REA) Checklist

Rapid Environmental Assessment (REA) Checklist

Country/ProjectTitle: 2 MW Solar power plant at Kavundampalayam in Coimbatore Corporation

Sector Division: Solar Plant

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?		x	No
· PHYSICAL CULTURAL HERITAGE SITE		x	No
· LOCATED IN OR NEAR TO LEGALLY PROTECTED AREA		x	No
· LOCATED IN OR NEAR TO SPECIAL HABITATS FOR BIODIVERSITY (MODIFIED OR NATURAL HABITATS)		x	No
· WETLAND		X	No
· MANGROVE		X	No
· ESTUARINE		X	No
· OFFSHORE (MARINE)		X	No
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…		X	No impact
· large scale land disturbance and land use impacts specially due to diversion of productive lands?		**X**	No impact
· involuntary resettlement of people? (physical displacement and/or economic displacement)		**X**	No
· disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		**X**	**No impact**
· noise, vibration and dust from construction activities?	**√**		**No vibration, and negligible during construction activates**
· an increase in local traffic during construction?	**√**		**Nil**
· environmental disturbances such as soil erosion, land contamination, water quality deterioration, air pollution, noise and vibrations during construction phase?	**√**		**Minimal, during construction.**
• aesthetic degradation and property value loss due to establishment of plant and ancillary facilities?		**X**	Nil

· changes in flow regimes of the water intake from surface water or underground wells due to abstraction for cooling purposes?		**X**	**No**
· pollution of water bodies and aquatic ecosystem from wastewater treatment plant, from cooling towers, and wash- water during operation?		**X**	**Nil**
· a threat to bird or bat life from colliding with the project facilities and/or being burned by concentrated solar rays?		**X**	**Nil**
· industrial liquid (dielectric fluids, cleaning agents, and solvents) and solid wastes (lubricating oils, compressor oils, and hydraulic fluids) generated during construction and operations likely to pollute land and water resources?	**√**	**X**	Nil
· Soil/water contamination due to use of hazardous materials or disposal of broken or damaged solar cells (photovoltaic technologies contain small amounts of cadmium, selenium and arsenic) during installation, operation and decommissioning?	**√**		. Handling of disposal in compliance with E-waste management
· noise disturbance during operation due to the proximity of settlements or other features?		**X**	Nil, negligible during construction
· visual impacts due to reflection from solar collector arrays resulting in glint or glare?	**√**	**X**	Nil
· large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		**X**	Nil
· social conflicts between local laborers and those from outside the area?	**√**	**X**	**Nil**
· risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during construction, installation, operation, and decommission?		**X**	Nil
· risks to community health and safety due to the transport, storage, and use and/or disposal of materials and wastes such as explosives, fuel and other chemicals during construction, and operation?		**X**	Nil
· community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		**x**	Nil

A Checklist for Preliminary Climate Risk Screening

	Screening Questions	**Score**	**Remarks[1]**
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weatherrelated events such as floods, droughts, storms, landslides?	1	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea- level,peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro- meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	1	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities)	1	

	throughout their design life time?		

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 andthat no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium

Other Comments:

Prepared by: _CCMC

If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea levelmight affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the

maintenance cost/scheduling of project outputs.

Annexure: 3: Sample Grievance registration form

SAMPLE GRIEVANCE REGISTRATION FORM
(To be available in Tamil and English)

The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.
Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing "(CONFIDENTIAL)" above your name. Thank you.

Date	Place of registration	Project Town Project:

Contact information/personal details

Name		Gender	* Male * Female	Age	
Home address					
Place					
Phone no.					
E-mail					

Complaint/suggestion/comment/question: Please provide the details (who, what, where, and how) of your grievance below:

If included as attachment/note/letter, please tick here:

How do you want us to reach you for feedback or update on your comment/grievance?

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)

Mode of communication:
Note/letter
E-mail
Verbal/telephonic

Reviewed by: (Names/positions of officials reviewing grievance)

Action taken:

Whether action taken disclosed:	Yes No

Means of disclosure:

Annexure: 4: Stakeholder Consultation - Minutes of the Meeting

Coimbatore Corporation
Dt : 06.12.2021

Minutes of the meeting held by Commissioner, Coimbatore Corporation on 06.12.2021 at 01.30 p.m. in the Corporation Main Office Conference Hall
Present : Thiru Raja Gopal Sunkara, I.A.S.,

Subject : Consultation Meeting on Solar Layout at Koundampalaym

Participants :

CCMC
Dr M.Sharmila, Dy.Commissioner
Mr C.Sundarraj, AEE-East
Tmt T.Hemalatha, AEE-West
Mr R.Uthaman, AE
Mr C.S.Rajesh Venugopal, JE
Mr N.Nagaraj, JE i/c
Mr C.Muralidharan, JE i/c

Residents near the proposed Solar Plant at Koundampalayam :

1. Mr N.Sathiyakumar
2. Mr S.Karthik Raja
3. Mr S.Dhanaraj
4. Mr A.P.Krishnan
5. Mrs N.Mansura Begum
6. Mrs V.Shanthi

In the meeting the following points were discussed and instructions issued :

The meeting was convened with the residents of Koundamapalayam area to have their consent for the 2 Mega watt Solar plant which is prposed at the compost yard area.

Mr C.Sundarrajan, AEE briefed about the project :

- 2 Mega watt Solar Plant was proposed in the Koundampalayam compost yard area and the people were requested to put up their objections if any.
- Representatives from Jeeva Nagar, Prabhu Nagar and Ambethkar Nagar raised a doubt whether any of their land will be acquired and houses / shops will be disturbed / demolished.

1

- Engineers explained that no land will be acquired and it is planned in the already existing compost yard area.

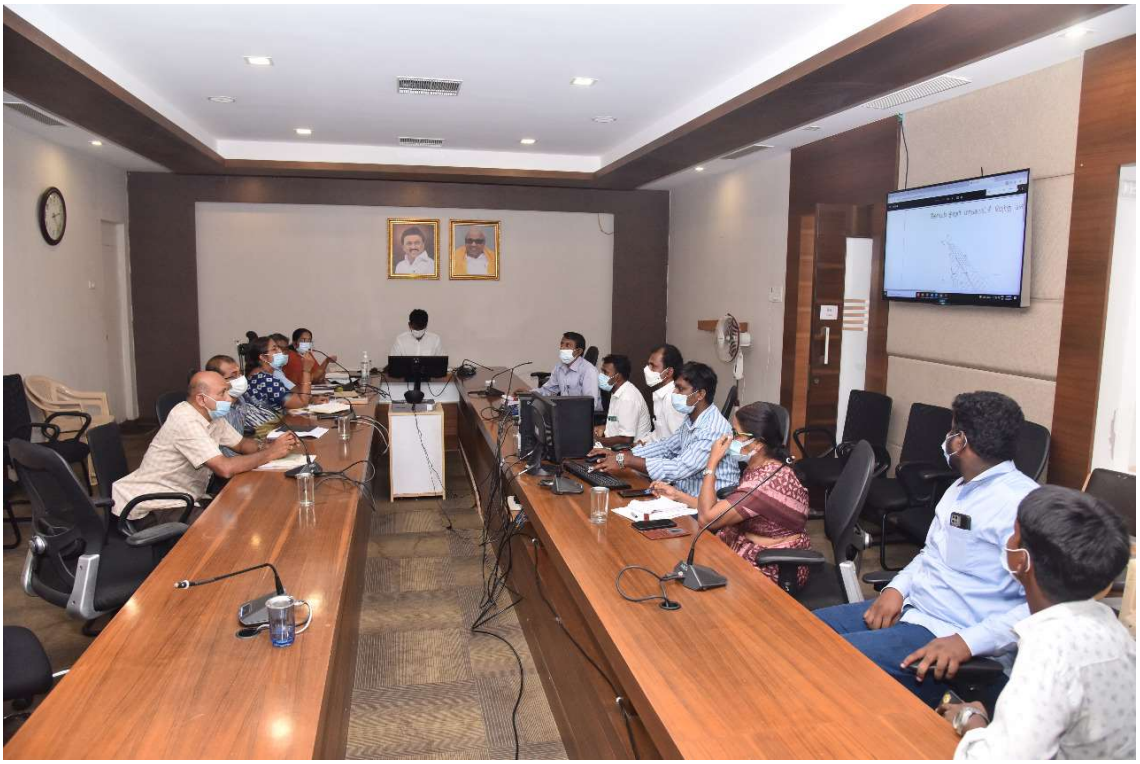
- Moreover, if Solar plant is proposed, that area will be maintained very clean and garbage dumping will be avoided.

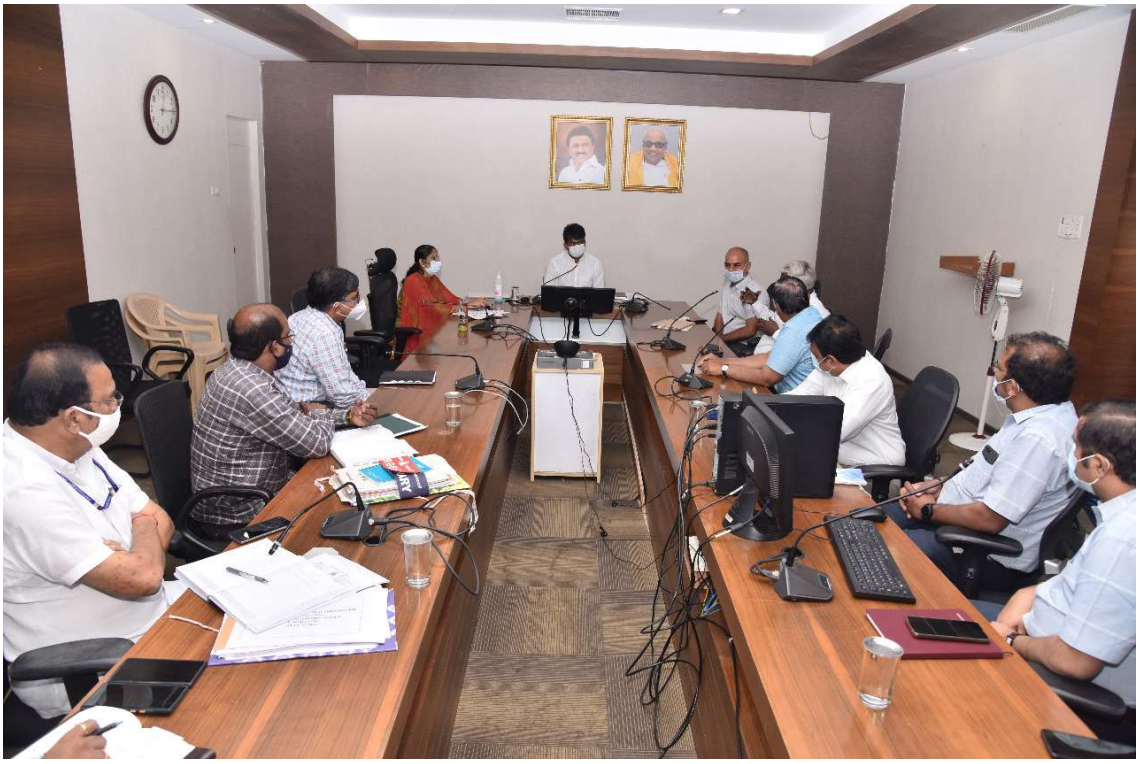
The representatives are convinced with the assurance given by the CCMC Engineers and expressed their consent for the proposed Solar Plant at Koundampalayam compost yard.

10.12.21

Commissioner
Coimbatore Corporation.

10/12/21





Annexure 3 Photographs of Consultation Meeting