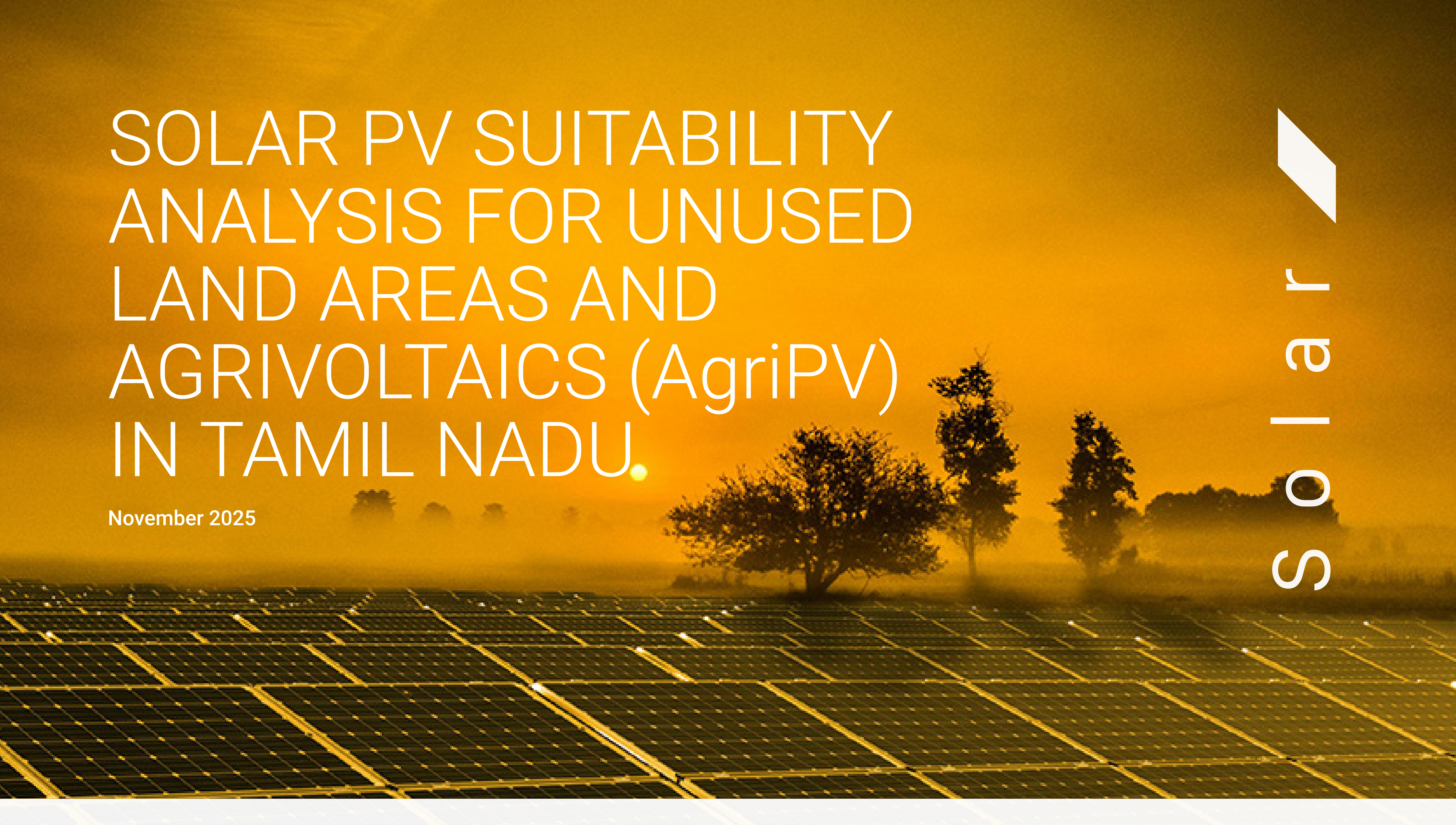
# SOLAR PV SUITABILITY ANALYSIS FOR UNUSED LAND AREAS AND AGRIVOLTAICS (AgriPV) IN TAMIL NADU

November 2025




AurovilleConsulting

LiLa
Earth Intelligence for Climate Action

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November 2025

solar

# ACKNOWLEDGEMENT

This publication forms part of the Sustainable Energy Transformation, Tamil Nadu (ARE-TN) series of documents and activities. ARE-TN aims to facilitate higher clean energy deployment in the state by working with all stakeholders to find sustainable and equitable solutions. ARE-TN is a collaborative initiative by Auroville Consulting (AVC), The author acknowledges the use of LifeLands (LiLa) an innovative digital tool that uses satellite imagery, AI & GIS Mapping and creates land-cover maps at high spatial resolution for any area of interest, detects degraded/unused lands and evaluates these lands in regard to climate mitigation and adaptation interventions such as sustainable water management, forestation and solar energy generation.

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# ABOUT LILA

LifeLands (LiLa) is an innovative digital tool that uses satellite imagery, AI & GIS Mapping and (i) creates land-cover maps at high spatial resolution for any area of interest, (ii) detects degraded/unused lands and (iiI) evaluates these lands in regards to climate mitigation and adaptation interventions such as sustainable water management, reforestation and solar energy generation.

Examples on how Lila can be used:

- It can detect degraded lands with high spatial resolution and shortlist lands that are best suited to meet India's reforestation target.
- It can undertake a high level water demand assessment of any area of interest and identify best locations for surface and ground water management.
- It can monitor land-use change over time and help in reporting increase or decrease in forest cover.
- It can identify degraded lands that are best suited for distributed solar energy to meet energy security targets and inform utilities and project developers.
- It can inform land-use and zoning exercise at the local and state level.
- It combines socio-environmental and advanced physical terrain analysis to generate blueprints for sustainable rural development

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# Solar

# KEY FINDINGS

## Land Cover Statistics – Tamil Nadu

Tamil Nadu has a total geographical area of 130,325 km².
The land cover is distributed as follows:

### Land Cover Statistics

| Unused | Cropland | Other land |
|---|---|---|
| 26% | 35% | 39% |

Cropland is the dominant land cover, followed by unused or fallow lands, which together represent 61% of the state's geographical area.

**State's solar energy target 20 GW by 2030**

### Unused Land Potential

| Technical Potential | Highest Potential |
|---|---|
| 150 GW | 10 GW |
| 6,01,701 acres | 40,289 acres |
| 31,619 plots | 239 plots |
| 752% of target | 50% of target |

### Cropland Potential

| Technical Potential | Highest Potential |
|---|---|
| 149 GW | 18 GW |
| 1,393,833 acres | 166,275 acres |
| 76,854 plots | 2,069 plots |
| 743% of target | 89% of target |

### Insights

- Tamil Nadu has very high solar potential: ~150 GW from unused land and ~149 GW from cropland, well above the 20 GW target.
- Top potential areas: 239 unused land plots (40,289 acres), 10 GW; 2,069 cropland plots (166,275 acres), 18 GW (89% of target).
- There is sufficient suitable land to achieve the 20 GW solar target while balancing cropland and unused land use.

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# 01 INTRODUCTION

This report presents a geospatial land suitability assessment for solar energy development in Tamil Nadu, focusing on two key land categories—unused land and cropland. The objective is to identify land parcels viable for ground mounted solar or Agri Photovoltaic (Agri PV) systems, and to assess their collective potential toward the state's goal of adding 20 GW of solar capacity by 2030 (TEDA, 2023).

Balancing land demand is essential inefficient land use can heighten risks such as drought, flooding, and ecosystem degradation (Verburg et al., 2011; IPCC, 2019). A targeted suitability assessment provides evidence for planning that reconciles energy development with environmental and socio-economic priorities.

This solar capacity goal aligns with India's revised Nationally Determined Contribution, targeting 50% of total power capacity from non fossil sources by 2030 (MoEFCC, 2022). Meeting 20 GW is projected to require approximately 80,000 acres, or about 0.25% of Tamil Nadu's geographical area (MNRE, 2022). Unused lands present immediate candidates for ground mounted solar, while cropland—when carefully evaluated—can accommodate Agri PV systems that enable simultaneous food production and energy generation (Barron Gafford et al., 2019). This dual land strategy maximizes land utility and minimizes land use conflict.

By producing two spatial suitability outputs—for unused land and cropland—this study equips policymakers, developers, and local authorities with actionable geospatial insights to expedite solar deployment while safeguarding food security and ecological integrity.

# 02 METHODOLOGY

This study adopts a geospatial, multi-criteria evaluation (MCE) approach to assess the suitability of unused lands and croplands in Tamil Nadu for solar photovoltaic (PV) development. The methodology integrates spatial datasets related to land cover, terrain, infrastructure, ecological sensitivity, and legal exclusions to support informed and sustainable land-use planning.

Land-use and land-cover information is sourced from the Tamil Nadu Blue-Green Network (Auroville Consulting, 2025). This dataset provides year-round land classification at the pixel level and distinguishes consistently unused lands from actively cultivated croplands based on temporal land-use signatures.

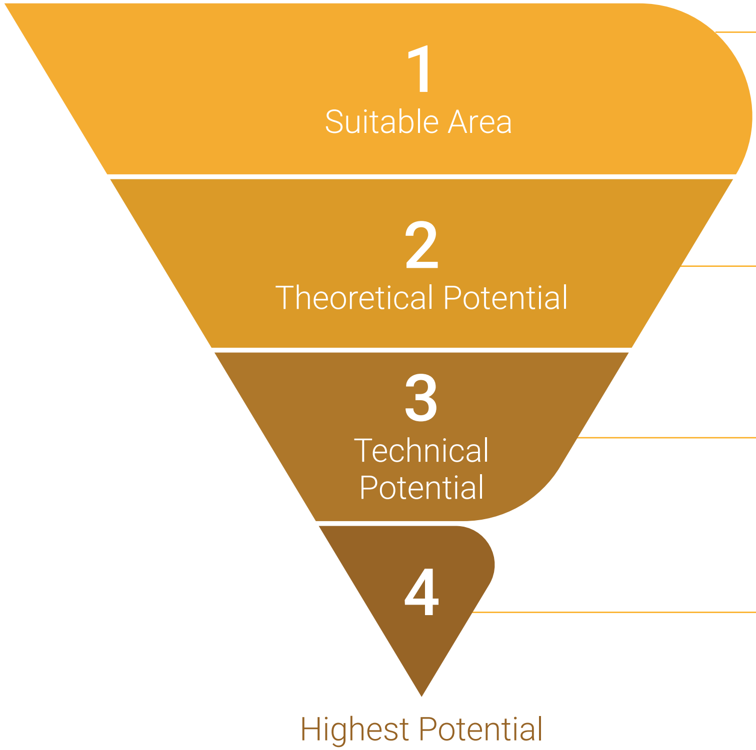
Terrain constraints—slope, aspect, and elevation—are evaluated using digital elevation models (DEMs), with sites exceeding 8% slope excluded due to engineering and economic limitations for ground-mounted solar systems (Kabir et al., 2018).

All spatial datasets are integrated into Lila, a proprietary geospatial platform, which allows for dynamic land evaluation using a customizable criteria matrix. This system supports user-defined filters based on regional goals, stakeholder needs, and infrastructure feasibility.

For cropland areas, the platform assesses potential for Agrivoltaics (Agri-PV)—the co-location of solar infrastructure with active farming. This dual-use strategy improves land efficiency and supports agricultural continuity alongside renewable energy deployment (Dupraz et al., 2011).

## EVALUATION STEPS

The land suitability assessment is undertaken in a 4-step filtration process to identify unused lands that consecutively meet theoretical, technical and highest potential criteria (refer to tables below).




Cropland:
Land used for annual cropland grown and harvested within 12 months.

Unused lands:
All lands that have not been cultivated for a period of one year.

Theoretical Potential:
All lands suitable for distributed solar PV generation.

Technical Potential:
All suitable lands meeting a minim set of commercial criteria.

Highest Potential:
Lands with the highest commercial potential for solar energy development.

| ECO-IMPACT SUITABILITY ASSESSMENT | |
|---|---|
| **Criteria** | **Description** |
| Flood risk | The identified unused lands and croplands account for more than 30% of the flood-prone areas. |
| Soil risk | The identified unused lands and croplands account for approximately 30% of the areas classified as having high and medium soil erosion risk |
| Habitat of bird migration (CR&EN) | The identified unused lands and croplands intersect with the migratory routes of bird species classified as endangered and critically endangered, with a minimum of seven such species recorded, as per the IUCN Red List and Birdlife International |

## THEORETICAL POTENTIAL

| Criteria | |
|---|---|
| Slope | < 8% |
| Distance to water body | > 100 m |
| Distance to railway | >200 m |
| Distance from highways | >500 m |
| Distance to Airport | >500 m |

## TECHNICAL POTENTIAL

| Criteria | Unused land | Crop land |
|---|---|---|
| Min. land size | 5 acres | 3 acres |
| Global Horizontal Irradiance (GHI) | 4.5 W/m2 | 4.5 W/m2 |
| Distance to evacuation infra | <5 km | <5 km |
| Distance to road access | <2 km | <2 km |
| Distance to tiger reserves, wildlife sanctuaries, Ramsar sites, bird sanctuaries, mangroves, and national parks | <1 km | |
| Distance to biosphere | <3 km | <1 km |

Note: Unused lands sited within potential tree-cover corridors, and within the administrative boundaries of villages situated within reserve forest were filtered out.

## HIGHEST POTENTIAL

| Criteria | High | Medium | Low |
|---|---|---|---|
| Plot Size - Unused Land (acres) | 60 ≤ | 20≤ to 60 | 5< to 20 |
| Plot Size - Crop Land (acres) | 20 ≤ | 5≤ to 20 | 3< to 5 |
| Distance to substation (km) | ≤2 | 2 to ≤5 | 5< |
| Distance from road (km) | ≤1 | 1 to ≤2 | 2< |

## LAND DISTRIBUTION

| Category | Unused land | Crop land |
|---|---|---|
| Low | >5 to 20 acres | >3 to 5 acres |
| Medium | >20 to 60 acres | >5 to 20 acres |
| High | >60 acres | > 20 acres |

# 03 KEY DATA LAYERS

**KEY TERMS:** The following table provides further details on the key terms utilized for this land suitability assessment.

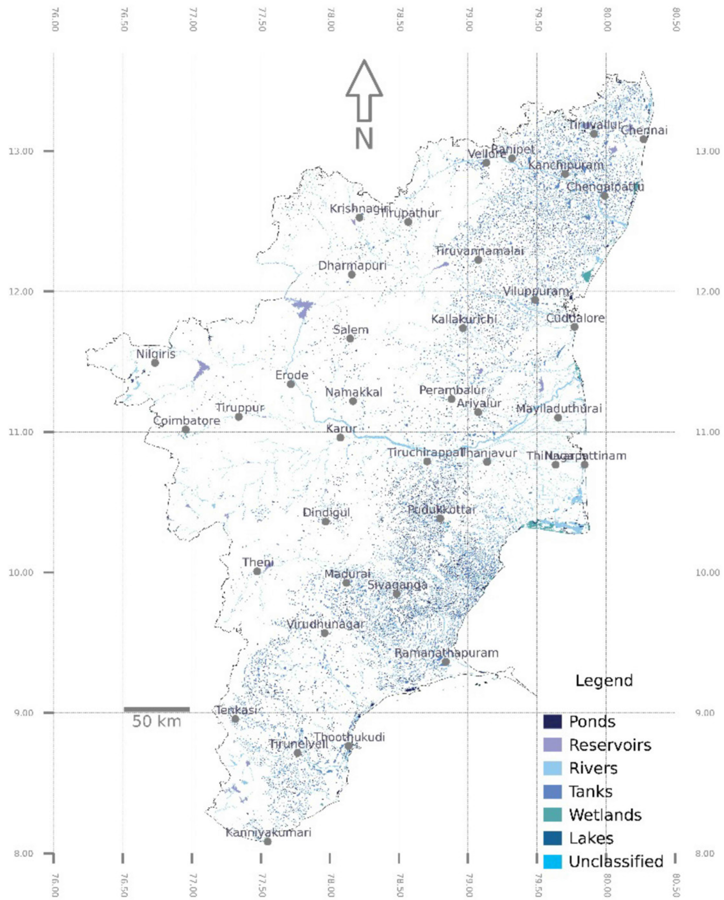
| Term | Description |
|---|---|
| Theoretical potential | Identified unused lands that met a defined set of criteria indicating basic potential for solar development; the criteria used are detailed above. Similarly, croplands suitable for Agri-PV were identified based on factors such as land use classification, cropping intensity, and compatibility with solar infrastructure. |
| Technical potential | A set of criteria was used to characterize both unused lands and croplands with relatively good potential for solar development, taking into account social, economic, and environmental factors. The specific criteria applied to each land type are listed above. |
| Low potential | A sub-category of technical potential criteria. This is a minimum criteria. |
| Medium potential | A sub-category of technical potential criteria, satisfying a higher number of criteria than 'low'. It relates to the distance to the nearest substation, the size of the unused land, and the distance to the nearest road. |
| High potential | A sub-category of technical potential criteria, satisfying the highest number of criteria. It relates to the distance to the nearest substation, the size of the unused land, and the distance to the nearest road. |
| Land use | The Lila algorithm identifies 6 categories of land use: unused/barren, sparse vegetation, cropland, tree cover, water and built-up. Land is recognized under each of these categories by the algorithm based on the pixel properties obtained through satellite imagery. |
| Roads | Different types of pathways are recognized as roads, including highways, primary, secondary, tertiary and residential roads. The roads included in this analysis consider those sufficient to allow mini-trucks to pass. |
| Water body | A water body is a natural or artificial accumulation of water, such as a river, lake, pond, or reservoir. |
| Elevation | The elevation of any land is measured relative to the highest point of the watershed it is in. Ex: lands with elevation > 0.8 are lands that lie above 80% of the region's watershed elevation. |
| Protected areas | These are areas allocated for reserve forests and other such classified lands. |
| Evacuation infrastructure | This criteria indicates whether the identified unused land is positioned within a specified distance to the nearest transmission line or substation (in a straight line). |
| Global Horizontal Irradiance (GHI) | This is the total (direct and diffuse) solar energy intercepted by a unit of horizontal surface. The figure used in the report is a yearly average, measured in kWh/m2/day. |
| Soil Risk | Lands prone to erosion, contamination, or high agricultural value. Mitigation needed for solar projects. |
| Flood Risk | Areas with frequent inundation. Avoid or elevate solar infrastructure. |
| Endangered Species | Habitats of critically endangered/migratory bird species. Requires avian-safe designs and buffer zones. |
| Eco-Impact Suitability Assessment | The Eco-Impact Suitability Assessment (EIA) helps identify ecologically sensitive areas to avoid during solar development. |

‘Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in suboptimal use of resources. By examining all uses of land in an integrated manner, it makes it possible to minimize conflicts, to make the most efficient trade-offs and to link social and economic development with environmental protection and enhancement, thus helping to achieve the objectives of sustainable development.’ - United Nations (SDG Goal 15)

Source: United Nations (n.d) ‘Description: Desertification, land degradation and drought.’ Available at: https://sdgs.un.org/topics/desertification-land-degradation-and-drought (accessed on 28th October 2025).

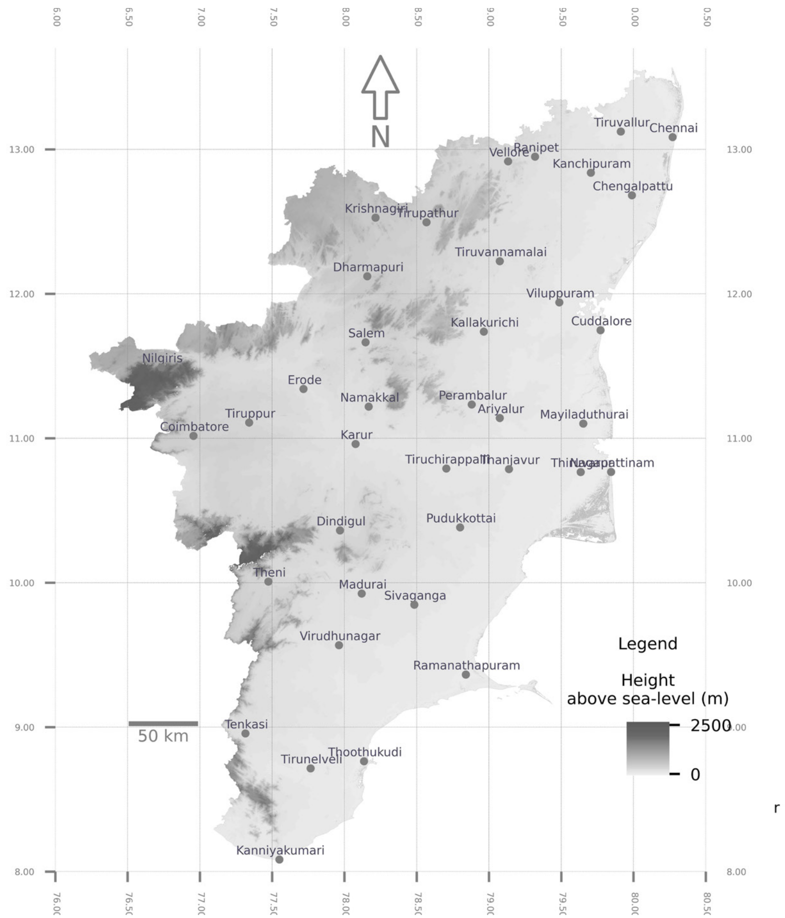
## WATER BODIES

Large water bodies, if available, could be utilized for floating solar plants.



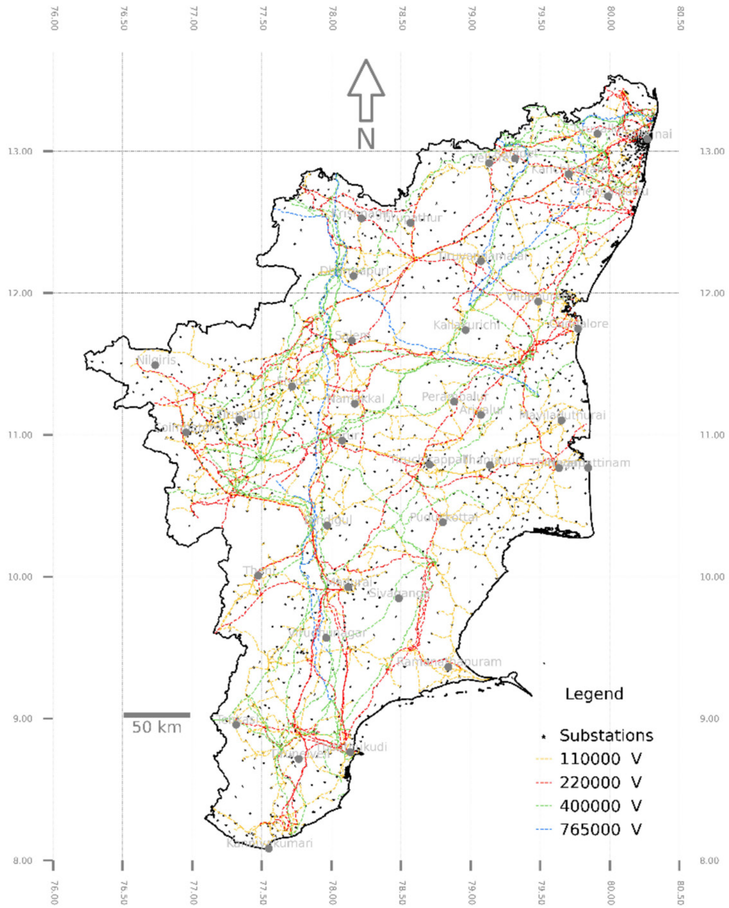

## ELEVATION

Lands with a slope larger than 8% may increase the capital cost of the project and thereby are excluded from the lands with technical potential. The height of the land above sea-level is indicative of the



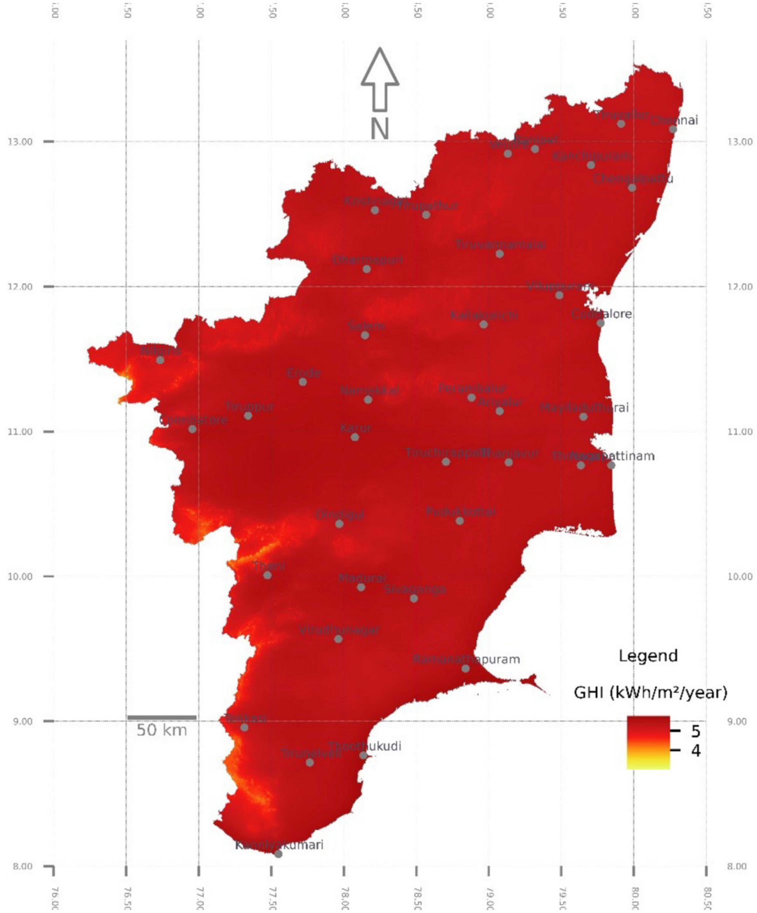
## POWER EVACUATION

Availability and accessibility of adequate power evacuation infrastructure is one of the key criteria for deciding on the location of a solar plant.



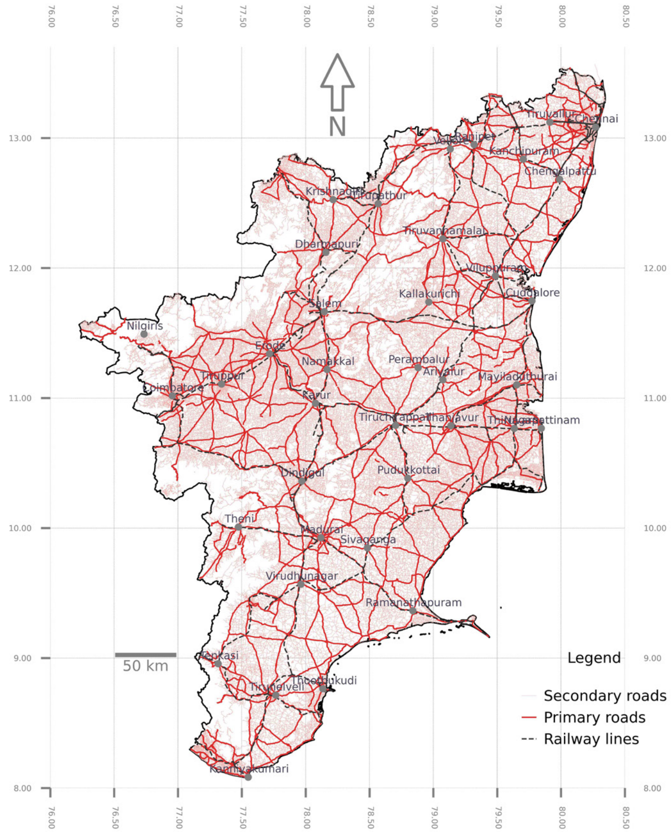

## GLOBAL HORIZONTAL IRRADIATON

The GHI of a site is a key determining factor for the energy generation potential of a solar plant.



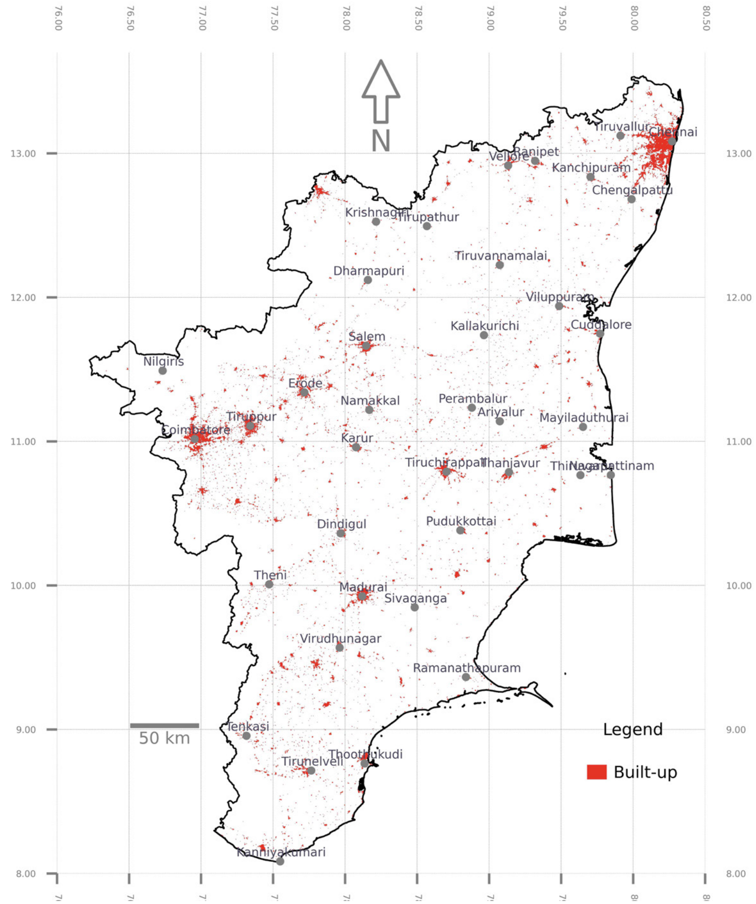
## MAJOR ROADS

Vicinity to a road that can accommodate load carriers is essential for the deployment of a solar system.



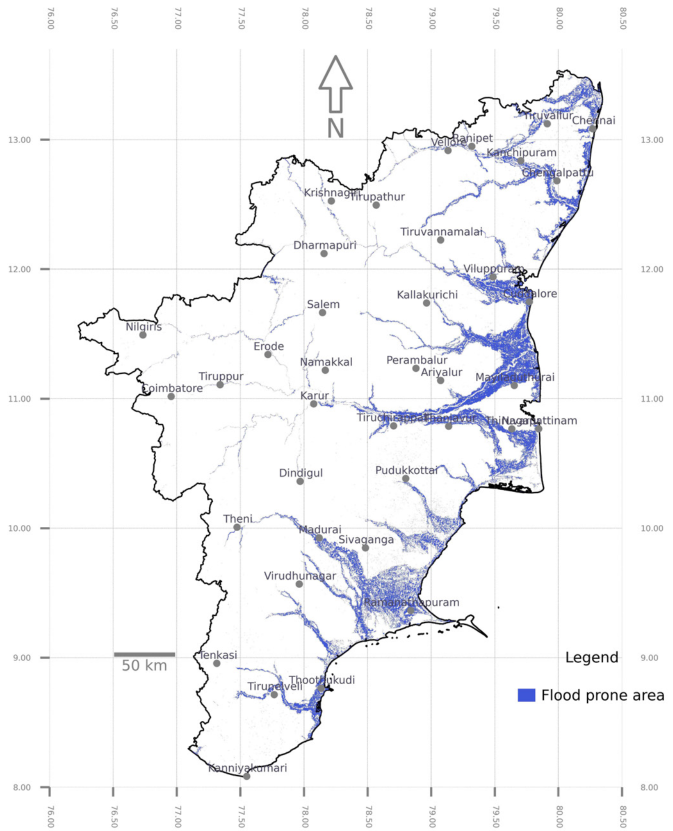

## BUILT UP

Built-up area can indicate high load centres and rooftop solar potential.



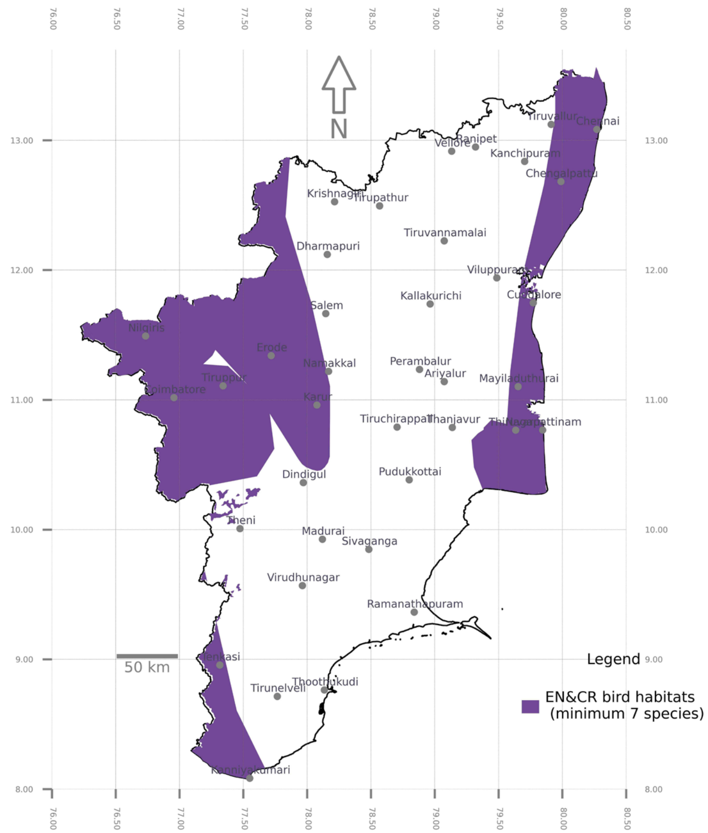
## FLOOD RISK

Availability and accessibility of adequate power evacuation infrastructure is one of the key criteria for deciding on the location of a solar plant.



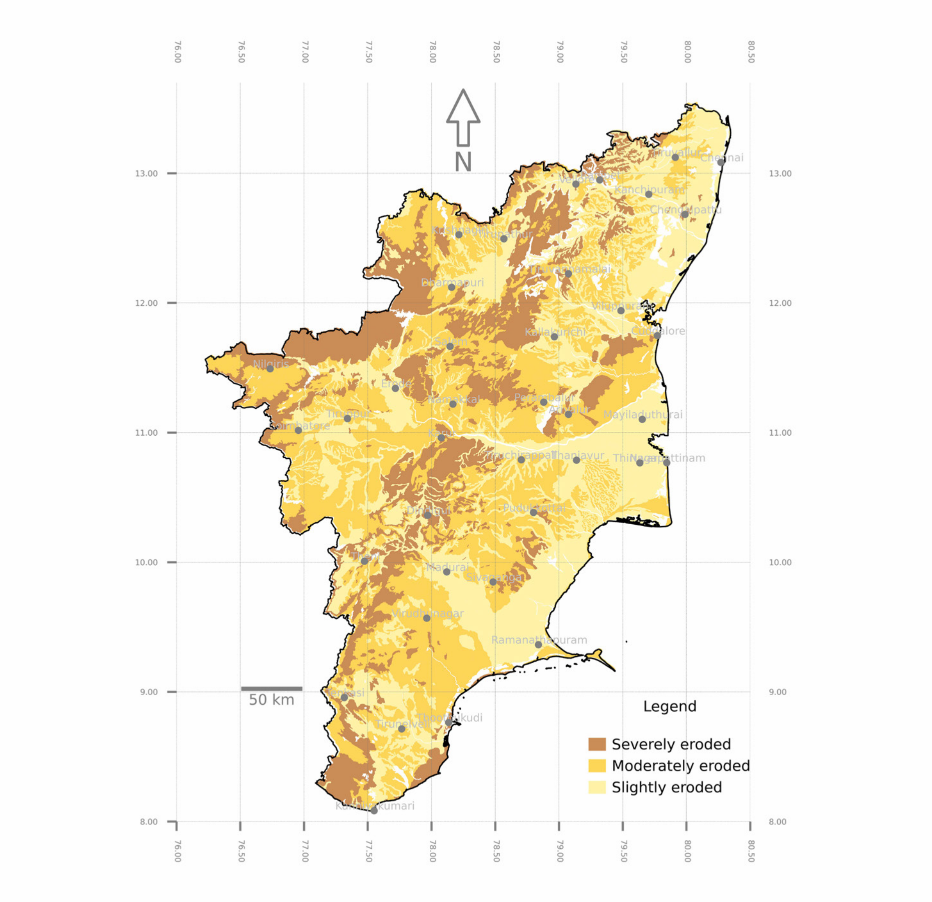

## ENDANGERED SPECIES BIRD

The GHI of a site is a key determining factor for the energy generation potential of a solar plant



## Soil Risk

Land parcels were evaluated for erosion vulnerability, and only those outside high-risk zones were retained as suitable for solar infrastructure development.



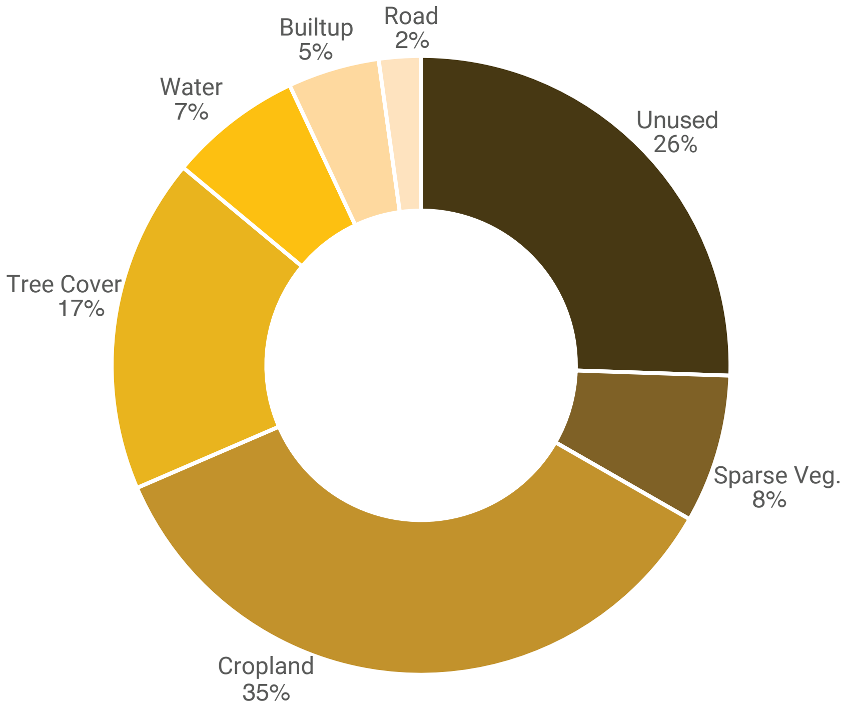
## LANDCOVER DEFINITIONS:

| | |
|---|---|
| Unused Lands | Lands that have been unused throughout the year (in terms of cultivation/built-up/water/trees) and does not belong to any of the other categories, and could be in barren condition sometimes. |
| Sparse Vegetation | Includes scrubs, grassland and sparse vegetation. Land covered with annual cropland that is sowed/planted and harvestable at least once within the 12 months after the sowing/ planting date. |
| Cropland | The annual cropland produces a herbaceous cover and is sometimes combined with some tree or woody vegetation. Note that perennial woody crops will be classified as the appropriate tree cover or shrub land cover type. Greenhouses are considered as built-up. |
| Tree-cover | This class includes any geographic area dominated by trees with a cover of 10% or more. Other land cover classes (shrubs and/or herbs in the understorey, built-up, permanent water bodies, …) can be present below the canopy, even with a density higher than trees. Areas planted with trees for afforestation purposes and plantations (e.g. oil palm, olive trees) are included in this class. This class also includes tree covered areas seasonally or permanently flooded with fresh water. |
| Water Bodies (Permanent) | This class includes any geographic area covered for most of the year (more than 9 months) by water bodies: lakes, reservoirs, and rivers. They can either be fresh or salt-water bodies. |
| Built-up | Land covered by buildings. Buildings include both residential and industrial building. |
| Roads | Land covered by roads |

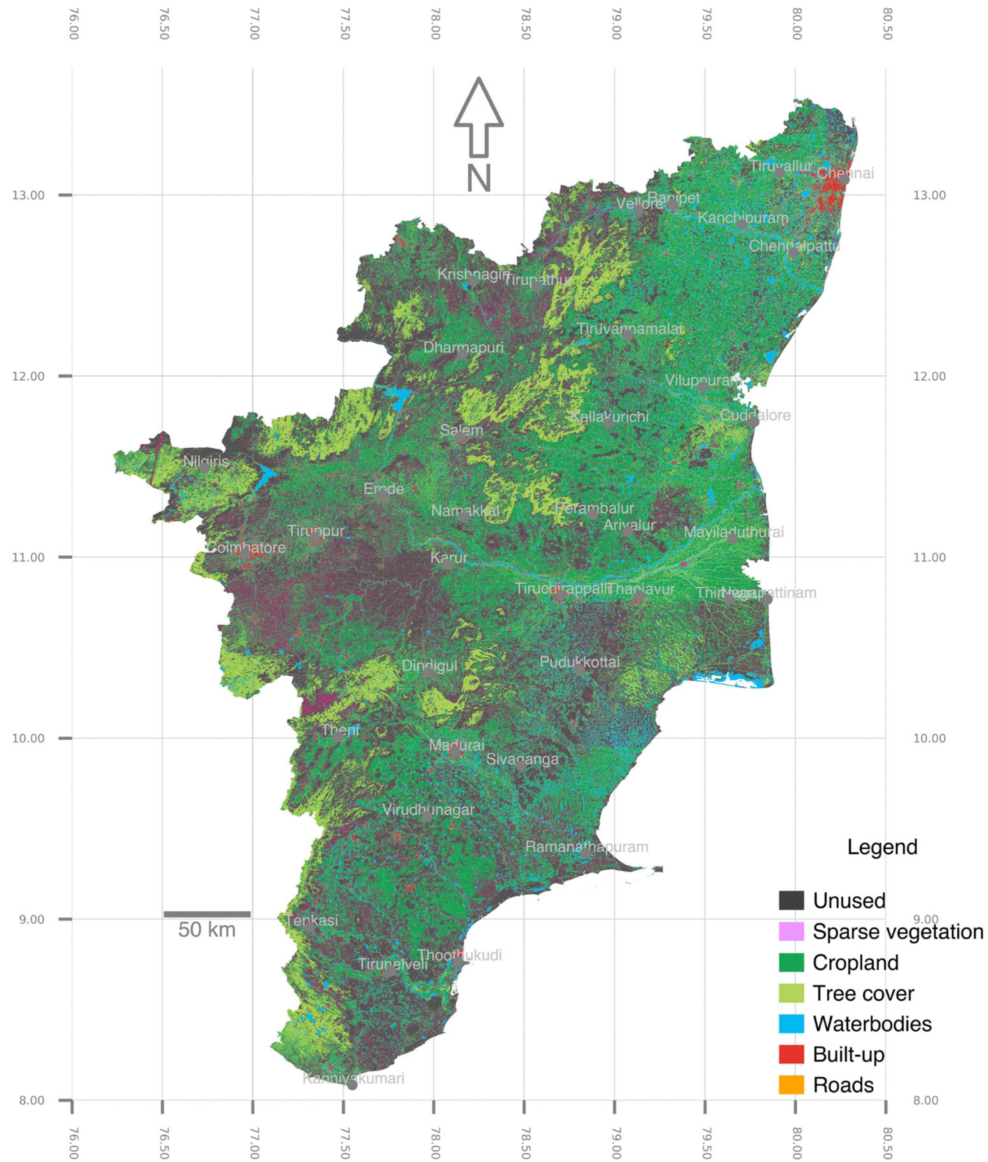
# 04 LANDCOVER

The districts land cover has been identified as per details below:

| Land Cover | Area (km2) | %of total |
|---|---|---|
| Unused | 33,274 | 25.7% |
| Sparse Veg | 10,101 | 7.8% |
| Cropland | 45,921 | 35.5% |
| Tree Cover | 22,834 | 17.7% |
| Water | 9,094 | 7.0% |
| Built up | 6,240 | 4.8% |
| Road | 2,861 | 2.2% |
| **Total** | **1,30,324** | **100%** |




The State's land cover is dominated by agriculture, 35.5% of TGA is under crop land. It has 17.7% of its land under tree cover. Unused or fallow lands account for the second highest recorded land-use in the district, with 25.7 % of TGA or 33,274 km2. The high availability of unused lands could present rich opportunities for climate mitigation and adaptation actions, including distributed solar energy deployment.


N
50 km
Legend
Unused
Sparse vegetation
Cropland
Tree cover
Waterbodies
Built-up
Roads
Chennai
Kanchipuram
Vellore
Ranipet
Krishnagiri
Dharmapuri
Salem
Nilgiris
Erode
Namakkal
Tiruppur
Coimbatore
Karur
Perambalur
Ariyalur
Mayiladuthurai
Cuddalore
Kallakurichi
Dindigul
Pudukkottai
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Tirunelveli
Thoothukudi
Kanniyakumari

# 05 SOLAR RESULTS

## Technical suitability

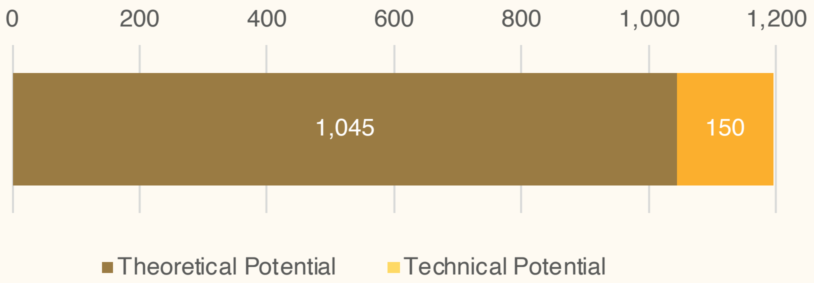
### KEY RESULTS

| | | |
|---|---|---|
| Suitable land | 6,01,701 | acres |
| Share on total area | 1.9% | % |
| Share of unused area | 10% | % |
| Share of solar target | 752% | % |

**RESULTS**

| Category | Plots (nos) | Area (acres) | Capacity (GW) |
|---|---|---|---|
| No Potential | 10,60,184 | 11,05,145 | - |
| Theoretical Potential | 34,73,681 | 41,78,210 | 1,045 |
| Technical Potential | 31,619 | 6,01,701 | 150 |

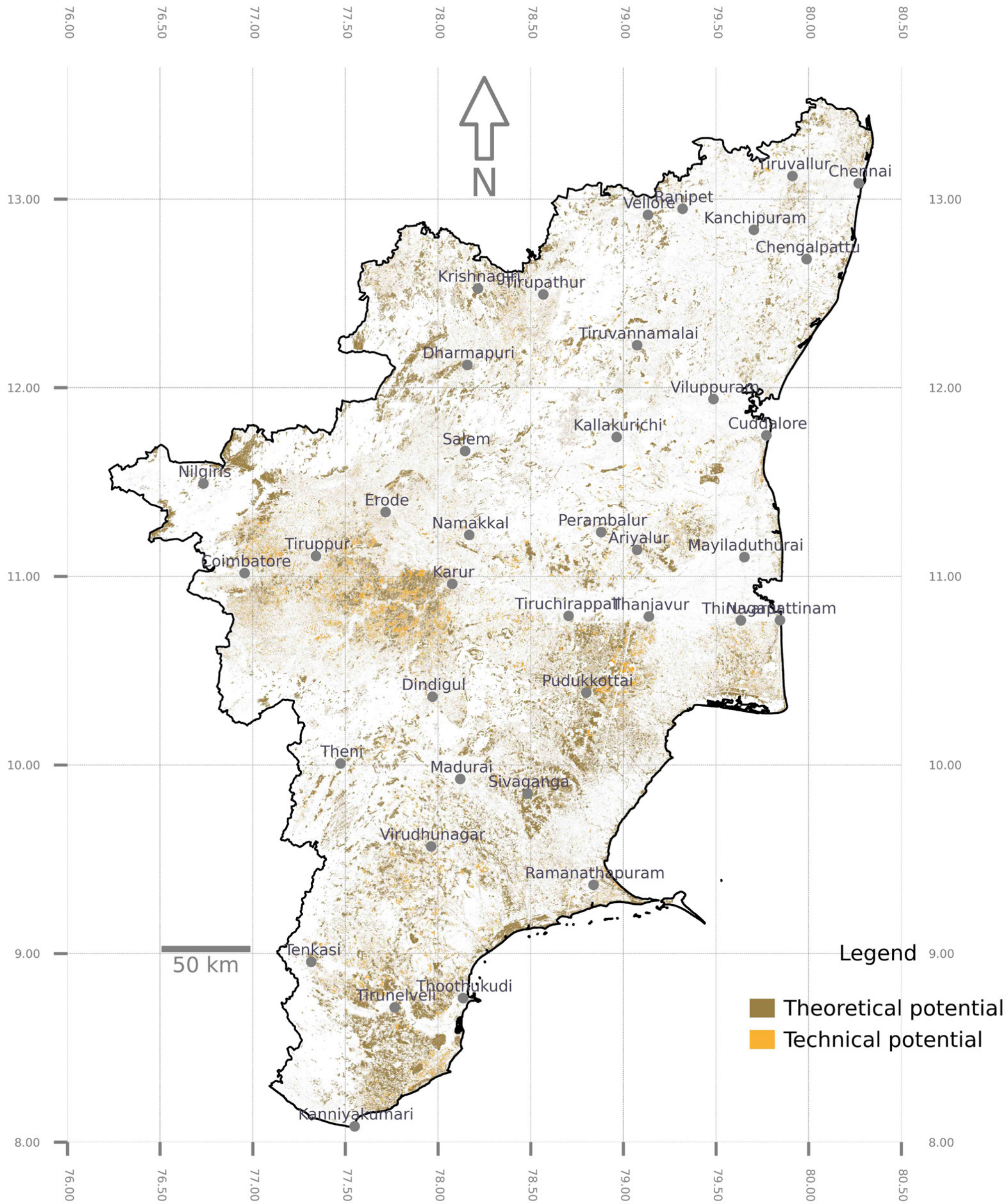
### Cumulative Capacity




No Potential
11,05,145 acres

Theroetical Potential
41,78,210 acres

Technical Potential
6,01,701 acres



N
Tiruvallur
Chennai
Vellore
Ranipet
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Kallakurichi
Cuddalore
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Nagapattinam
Dindigul
Pudukkottai
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
50 km
Legend
Theoretical potential
Technical potential
76.00
76.50
77.00
77.50
78.00
78.50
79.00
79.50
80.00
80.50
8.00
9.00
10.00
11.00
12.00
13.00

# Distribution by plot size

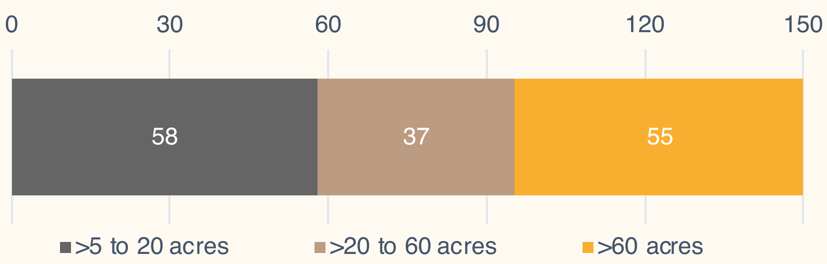
## KEY RESULTS

| | | |
|---|---|---|
| Largest plot | 1,467 | acres |
| Plots>60 acres | 1,485 | nos |
| Sum of capacities >20 acres | 92 | GW |
| Sum of capacities >60 acres | 55 | GW |

**RESULTS**

| Plot sizes (acres) | Plots (nos) | Area (acres) | Capacity (GW) |
|---|---|---|---|
| >5 to 20 | 25,546 | 2,32,181 | 58 |
| >20 to 60 | 4,588 | 1,49,273 | 37 |
| >60 | 1,485 | 2,20,248 | 55 |

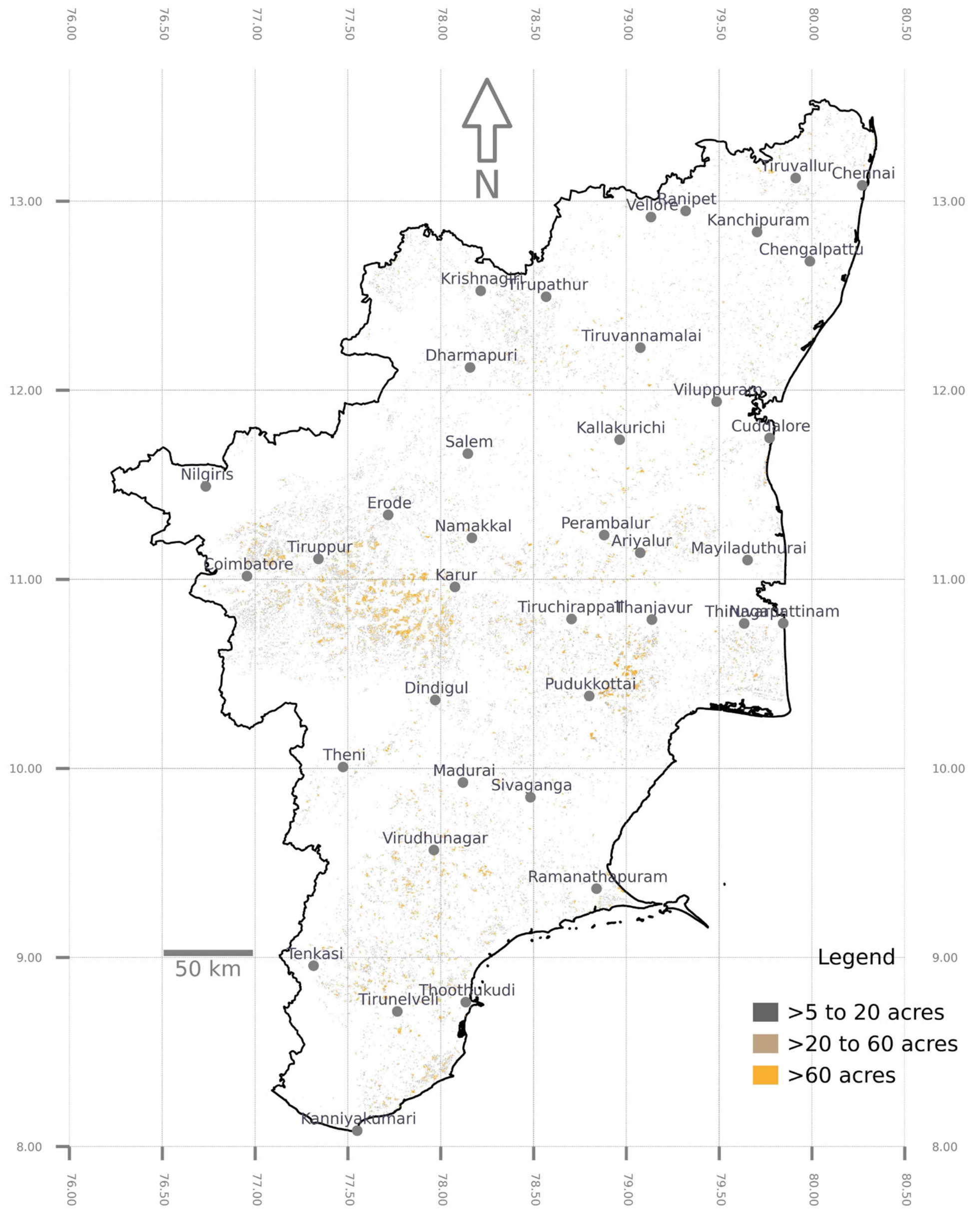
### Cumulative Capacity




>5 to 20
2,32,181 acres

>20 to 60
1,49,273 acres

>60
2,20,248acres



N
Tiruvallur
Chennai
Ranipet
Vellore
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Kallakurichi
Cuddalore
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Thiruvarur
Nagapattinam
Dindigul
Pudukkottai
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
50 km
Legend
>5 to 20 acres
>20 to 60 acres
>60 acres
76.00
76.50
77.00
77.50
78.00
78.50
79.00
79.50
80.00
80.50
8.00
9.00
10.00
11.00
12.00
13.00

# High Potential

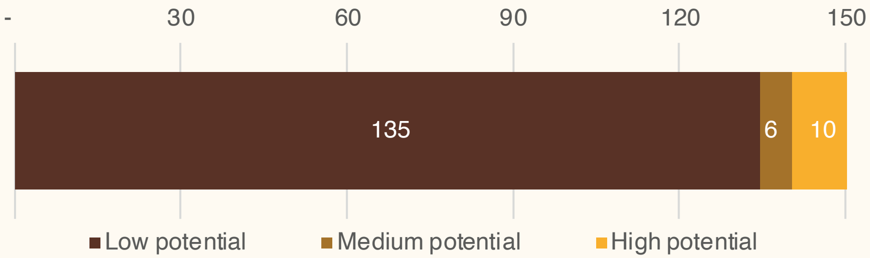
## KEY RESULTS

| | | |
|---|---|---|
| Total area | 40,289 | acres |
| Plots | 239 | nos |
| Solar | 10 | GW |
| Share of target | 50% | % |

**RESULTS**

| Potential | >5 to 20 (acres) | >20 to 60 (acres) | >60 (acres) |
|---|---|---|---|
| Low | 2,32,181 | 1,26,417 | 1,79,892 |
| Medium | - | 22,856 | 67 |
| High | - | - | 40,289 |

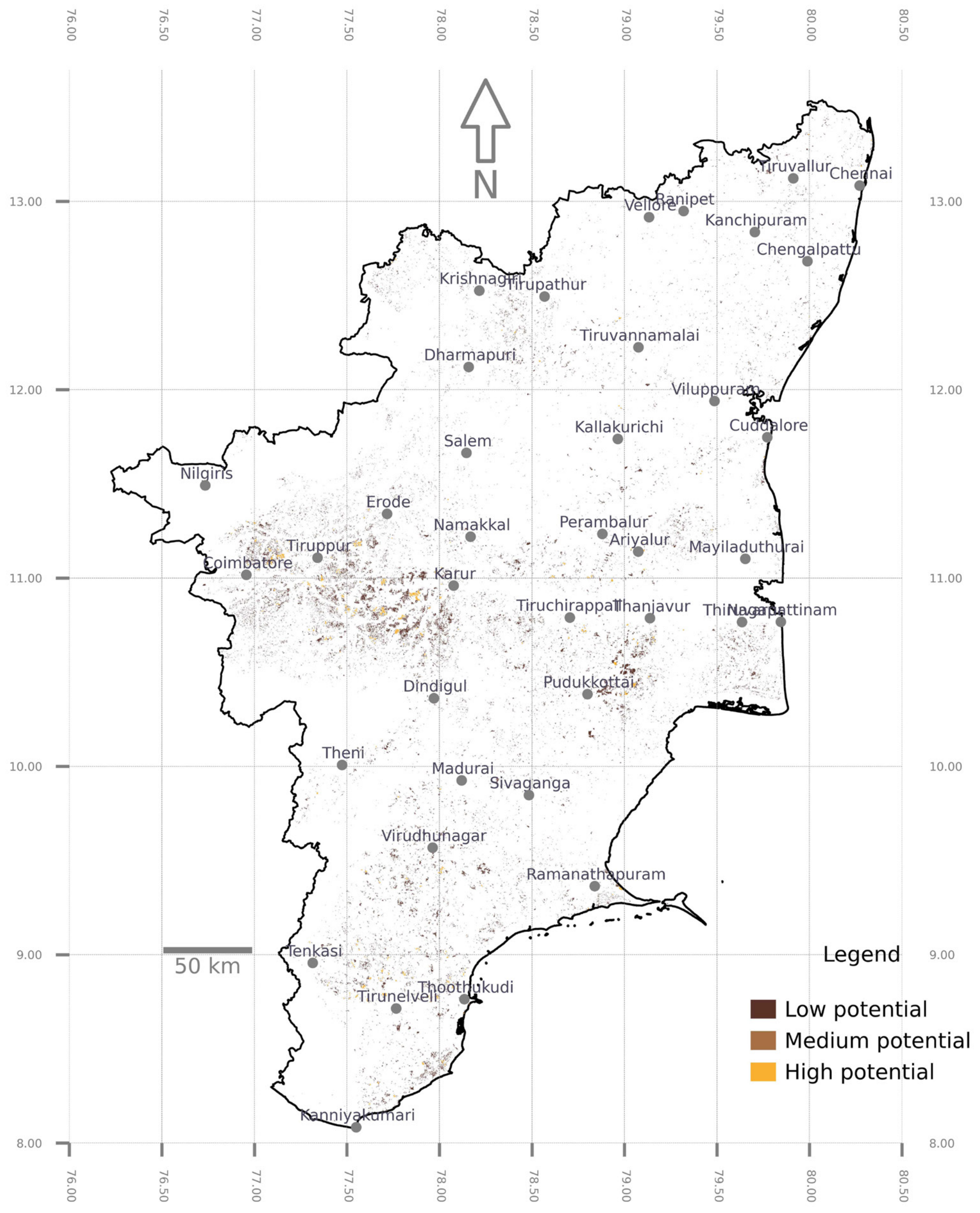
## Cumulative Capacity




Low
5,38,490 acres

Medium
22,923 acres

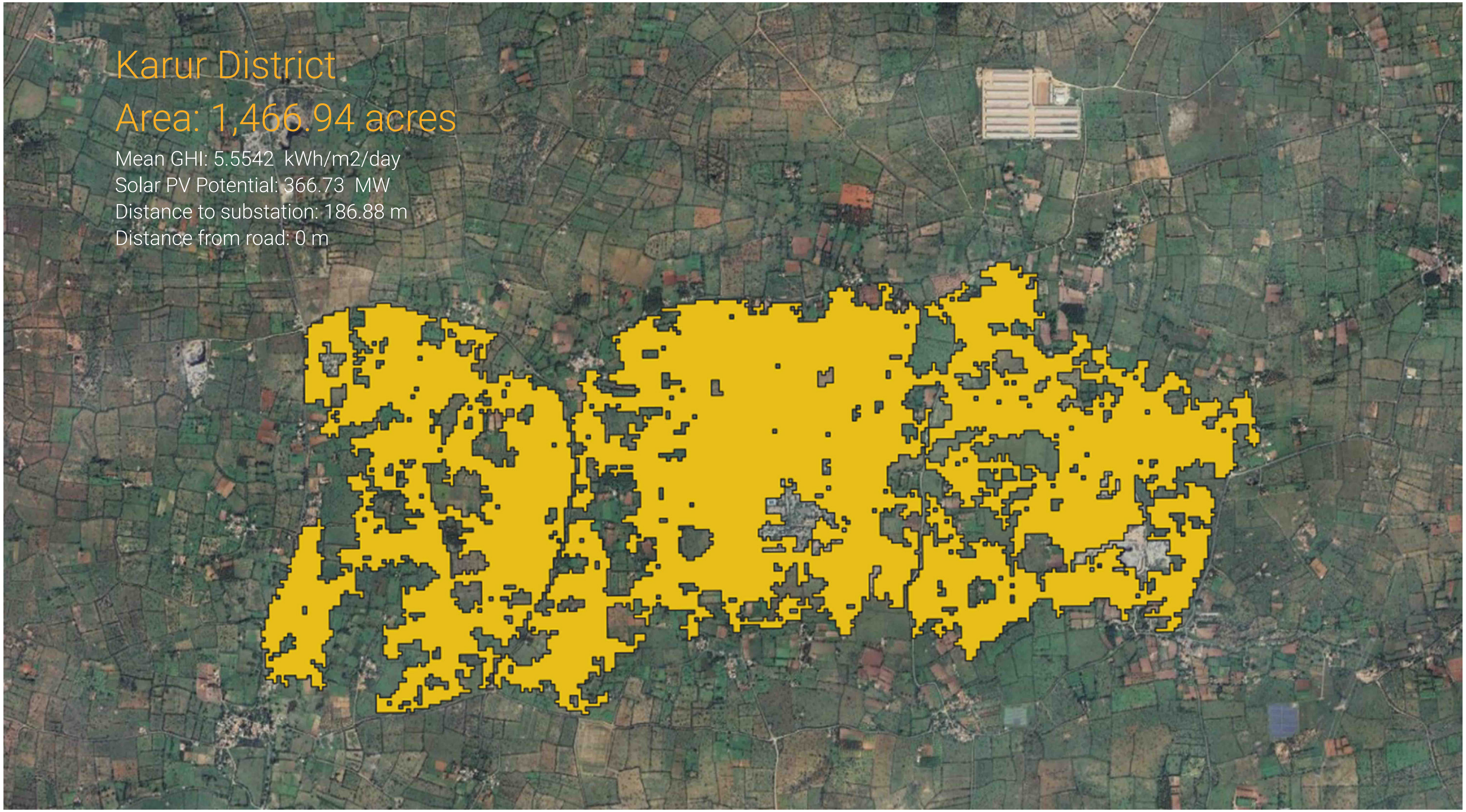
High
40,289 acres



N
Tiruvallur
Chennai
Ranipet
Vellore
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Cuddalore
Kallakurichi
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Thiruvarur
Nagapattinam
Pudukkottai
Dindigul
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
50 km
Legend
Low potential
Medium potential
High potential

# High potential sites

This section highlights a contiguous unused land polygon with a high potential for solar energy deployment. Out of all the highly rated lands, this example has the largest area.



# 06 CROP LAND

## Technical suitability

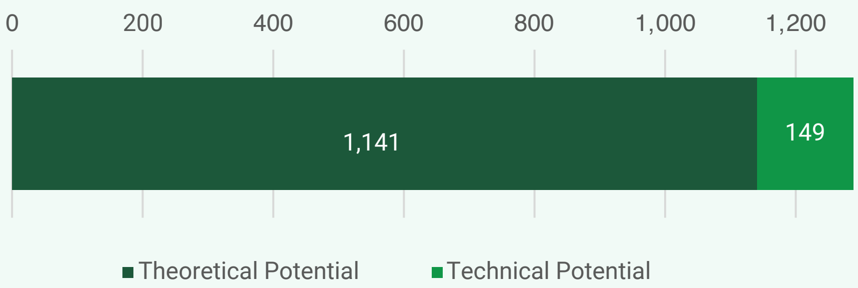
### KEY RESULTS

| | | |
|---|---|---|
| Suitable land | 13,93,833 | acres |
| Share on total area | 4.3% | % |
| Share of unused area | 24% | % |
| Share of solar target | 743% | % |

**RESULTS**

| Category | Plots (nos) | Area (acres) | Capacity (GW) |
|---|---|---|---|
| No Potential | 10,60,184 | 7,46,081 | - |
| Theoretical Potential | 34,28,446 | 1,07,00,634 | 1,141 |
| Technical Potential | 76,854 | 13,93,833 | 149 |

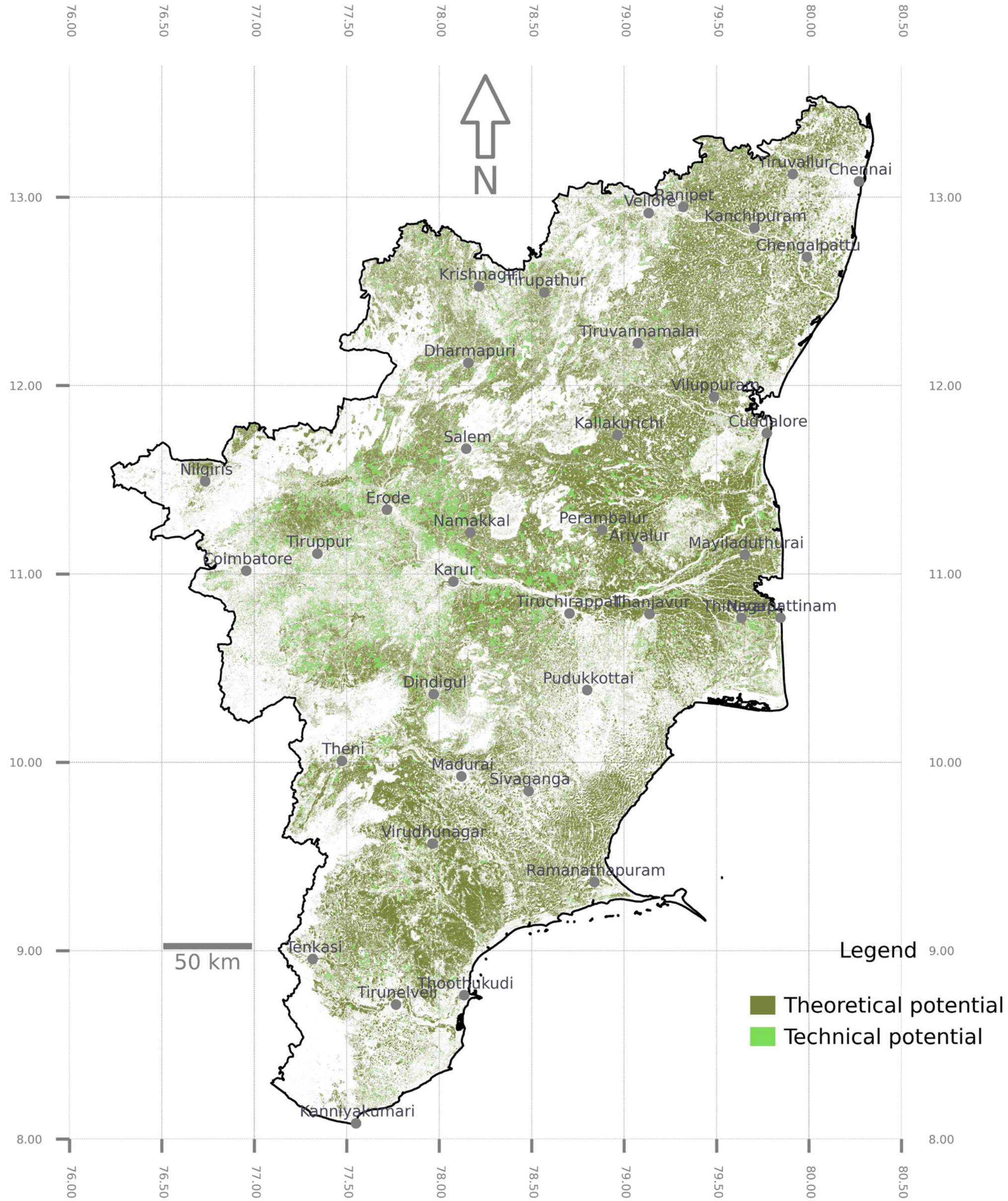
## Cumulative Capacity




No Potential
7,46,081 acres

Theroetical Potential
1,07,00,634 acres

Technical Potential
13,93,833 acres



N
Tiruvallur
Chennai
Ranipet
Vellore
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Kallakurichi
Cuddalore
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Nagapattinam
Dindigul
Pudukkottai
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
50 km
Legend
Theoretical potential
Technical potential
76.00
76.50
77.00
77.50
78.00
78.50
79.00
79.50
80.00
80.50
13.00
12.00
11.00
10.00
9.00
8.00

# Distribution by plot size

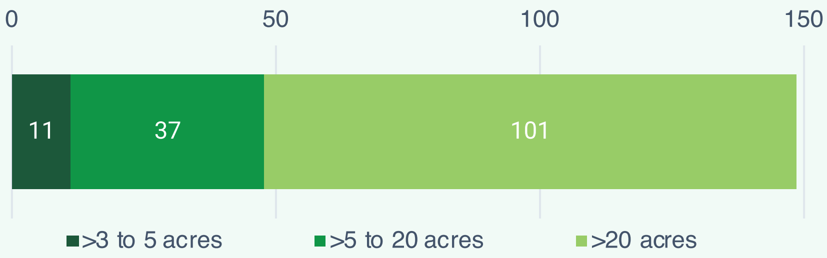
## KEY RESULTS

| | | |
|---|---|---|
| Largest plot | 2,194 | acres |
| Plots>20 acres | 13,519 | nos |
| Sum of capacities >5 acres | 138 | GW |
| Sum of capacities >20 acres | 101 | GW |

**RESULTS**

| Plot sizes (acres) | Plots (nos) | Area (acres) | Capacity (GW) |
|---|---|---|---|
| >3 to 5 acres | 27,088 | 1,05,213 | 11 |
| >5 to 20 acres | 36,247 | 3,43,611 | 37 |
| >20 acres | 13,519 | 9,45,010 | 101 |

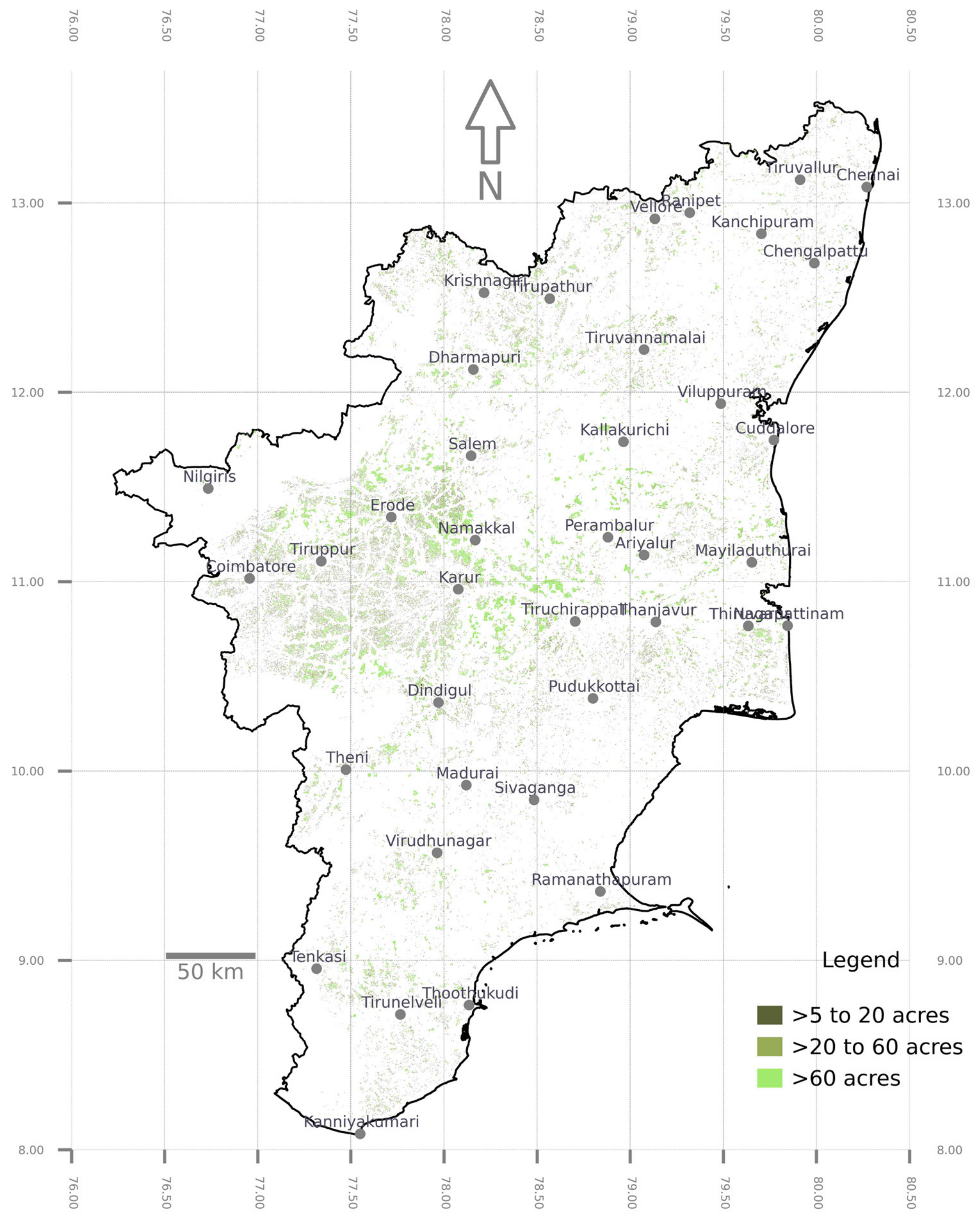
## Cumulative Capacity




>3 to 5
1,05,213 acres

>5 to 20
3,43,611 acres

>20
9,45,010 acres


N
Tiruvallur
Chennai
Vellore
Ranipet
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Kallakurichi
Cuddalore
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Thiruvarur
Nagapattinam
Pudukkottai
Dindigul
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
50 km
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
Legend
>5 to 20 acres
>20 to 60 acres
>60 acres
76.00
76.50
77.00
77.50
78.00
78.50
79.00
79.50
80.00
80.50
8.00
9.00
10.00
11.00
12.00
13.00

# High Potential

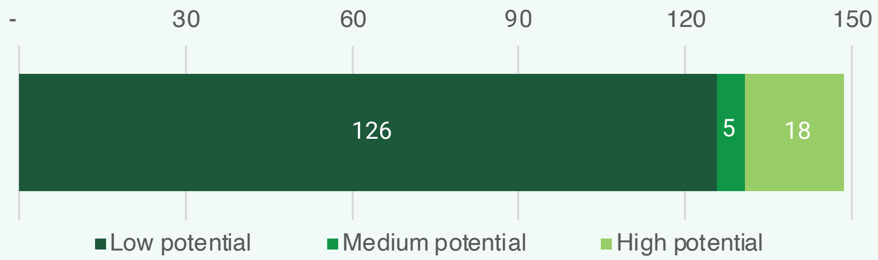
## KEY RESULTS

| | | |
|---|---|---|
| Total area | 1,66,275 | acres |
| Plots | 2,069 | nos |
| Solar | 18 | GW |
| Share of target | 89% | % |

**RESULTS**

| Potential | >3 to 5 (acres) | >5 to 20 (acres) | >20 (acres) |
|---|---|---|---|
| Low | 1,05,213 | 2,96,732 | 7,78,630 |
| Medium | - | 46,879 | 104 |
| High | - | - | 1,66,275 |

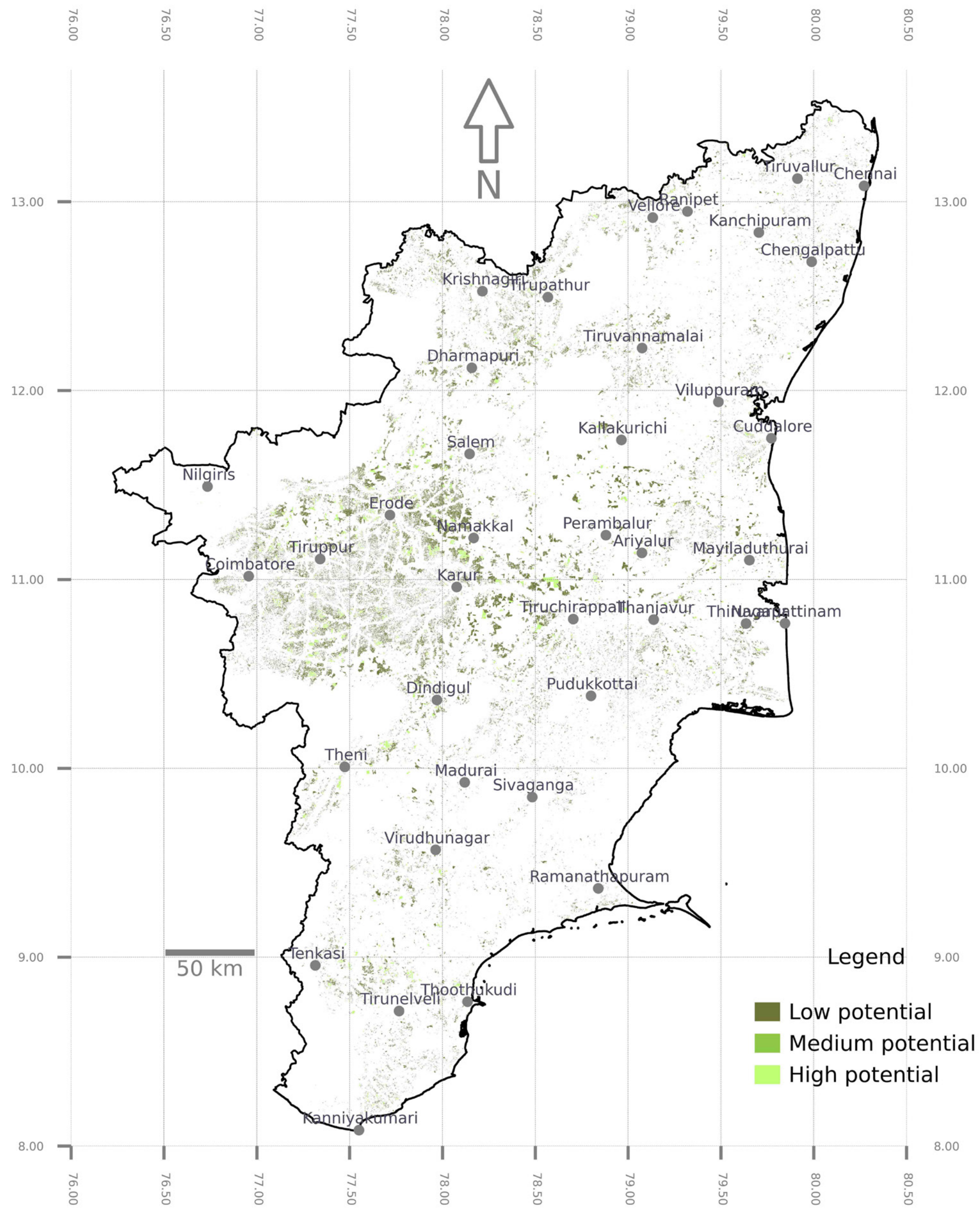
## Cumulative Capacity




Low
1,180,575 acres

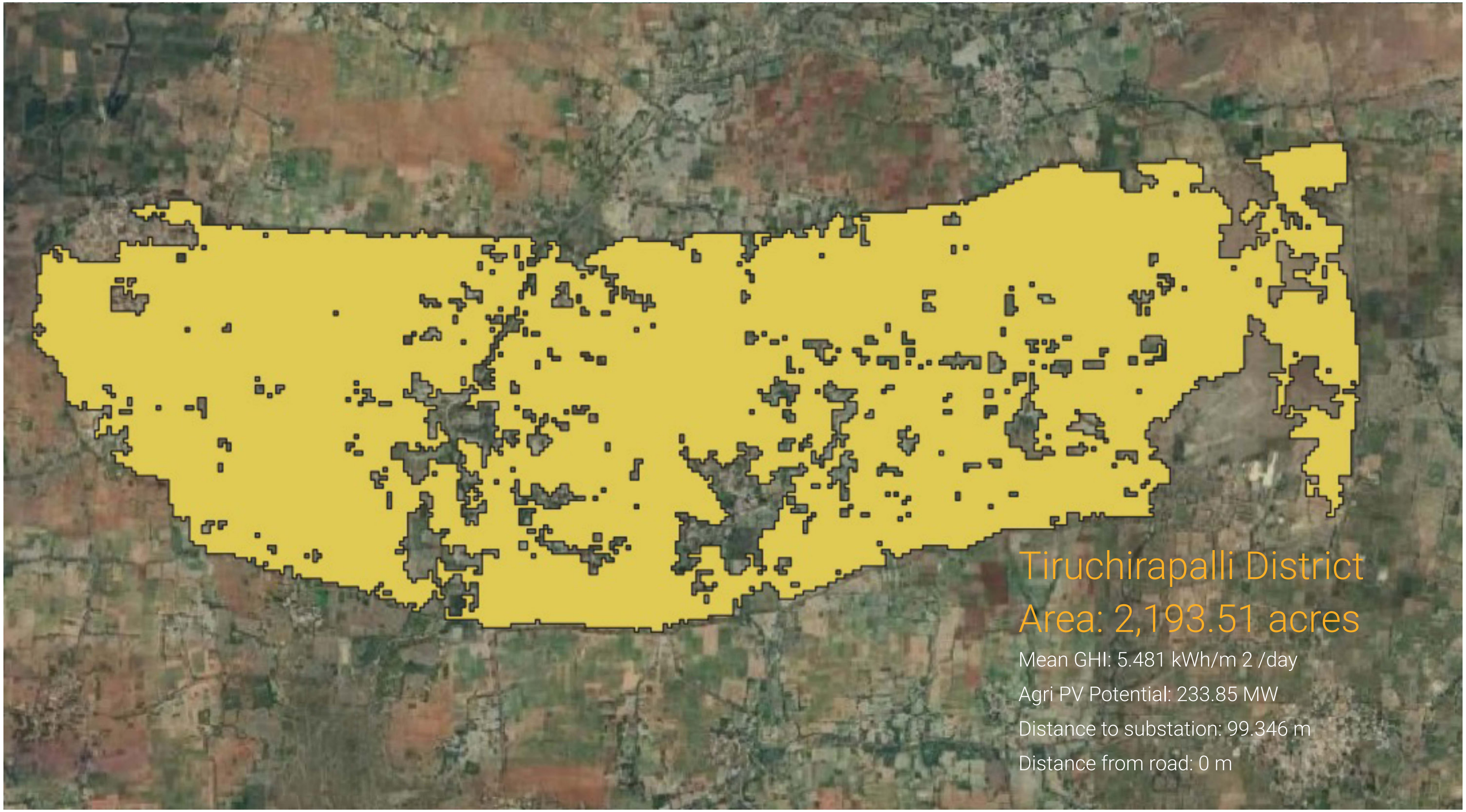
Medium
46,983 acres

High
1,66,275 acres


N
Tiruvallur
Chennai
Vellore
Ranipet
Kanchipuram
Chengalpattu
Krishnagiri
Tirupathur
Tiruvannamalai
Dharmapuri
Viluppuram
Kallakurichi
Cuddalore
Salem
Nilgiris
Erode
Namakkal
Perambalur
Ariyalur
Mayiladuthurai
Tiruppur
Coimbatore
Karur
Tiruchirappalli
Thanjavur
Thiruvarur
Nagapattinam
Pudukkottai
Dindigul
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Tenkasi
Thoothukudi
Tirunelveli
Kanniyakumari
50 km
Legend
Low potential
Medium potential
High potential

# High potential sites

This section highlights a contiguous unused land polygon with a high potential for Agri pv energy deployment. Out of all the highly rated lands, this example has the largest area.



# 07 DISTRICT-LEVEL ANALYSIS

The analysis conducted at the district level shows the potential for ground-mounted solar energy, given the availability of unused land within the administrative boundaries. The analysis results for each district are presented in detail in Annexure II.

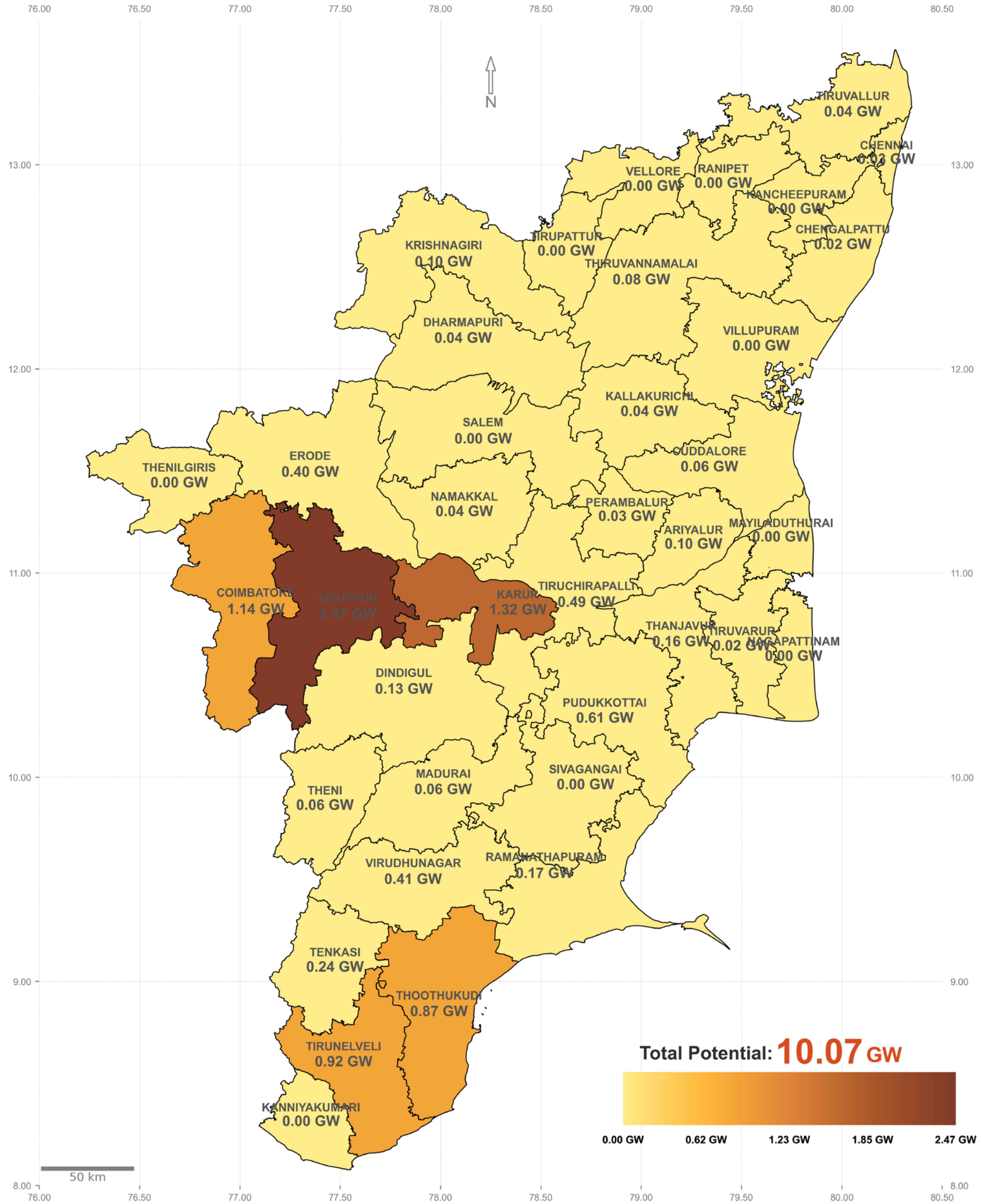
Using remote sensing, district-specific insights were derived. These include: the total geographic area (TGA), existing land use patterns, and the extent of unused lands with technical potential for solar energy development. The solar energy potential at the district level is represented in terms of total potential generation capacity (MW). Similarly, the potential for agri-PV was estimated for each district in terms of the total potential generation capacity (MW).

The maps below show the potential of each district achievable with the highest suitable parcels of land. These unused and croplands have areas greater than 60 acres and 20 acres, respectively, and are in proximity to road access (≤ 1 km) and evacuation infrastructure (≤ 2 km).

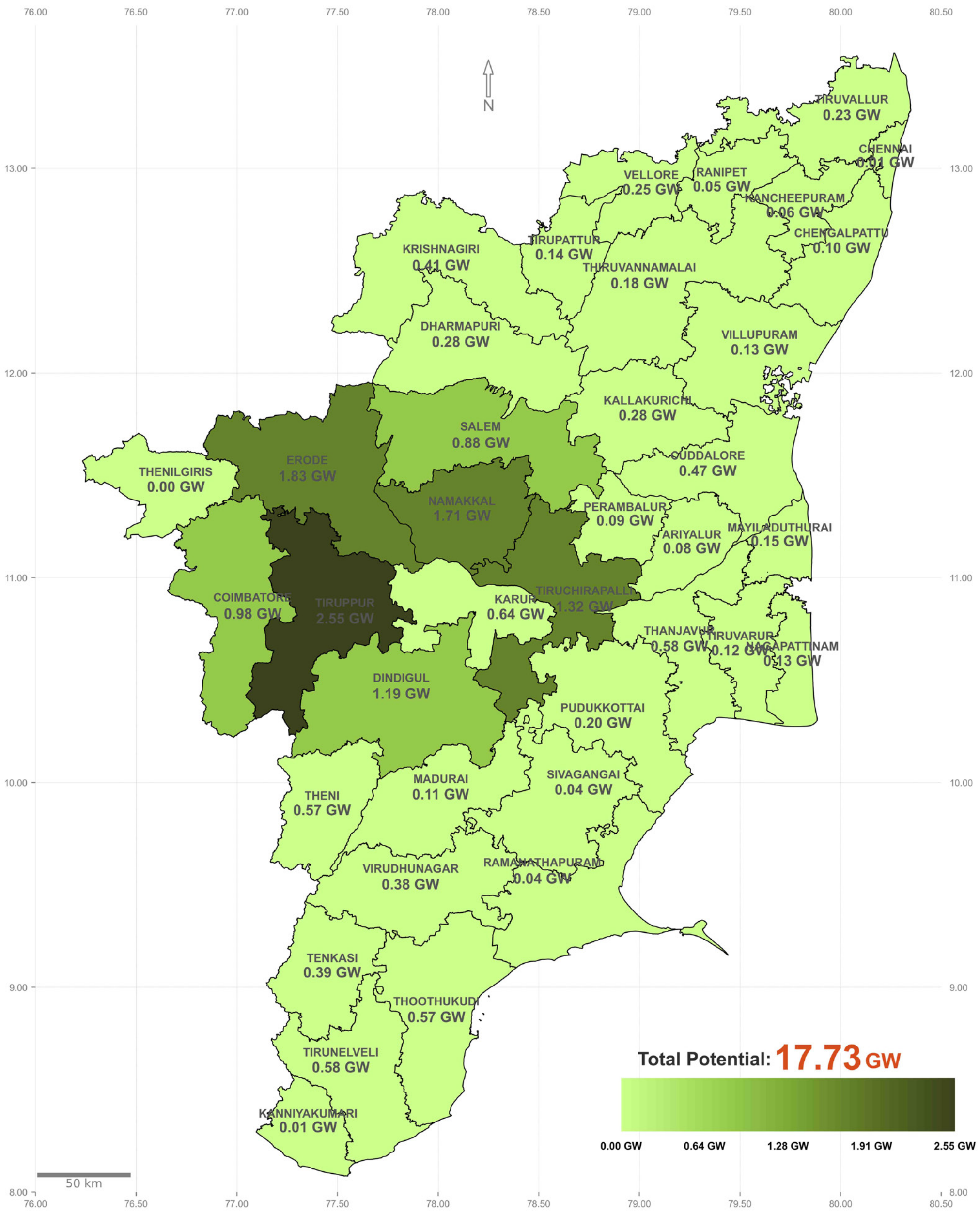
The results indicate that the districts with the highest potential lie mainly across the central part of the state. Districts with highly suitable unused lands with potentials greater than 1 GW include Tiruppur (2.47 GW), Karur (1.32 GW), and Coimbatore (1.14 GW). Districts such as Tirunelveli, Thoothkudi, and Pudukottai have the potential to contribute more than 0.5 GW each.

With respect to highly suitable lands for agri-PV, districts with potentials greater than 1 GW include Tiruppur (2.55 GW), Erode (1.83 GW), Namakkal (1.71 GW), Tiruchirappali (1.32 GW), and Dindigul (1.18 GW). Additionally, seven districts have highly suitable cropland areas that could contribute to more than 0.5 GW. These areas: Coimbatore, Salem, Karur, Thanjavur, Tirunelveli, Thoothkudi, and Theni.

It may be noted that to ensure sustainable deployment, areas within legally protected areas such as reserve forests, Ramsar sites, and sanctuaries were excluded from the analysis. Furthermore, an analysis was conducted to estimate the number of technically and highly suitable plots that are exposed to environmentally sensitive issues such as flood risk, endangered and critically endangered bird species, and soil erosion. Thus, while the plots are suitable, environmental parameters may be taken into account for prioritization of action.


N
TIRUVALLUR
0.04 GW
CHENNAI
0.03 GW
VELLORE
0.00 GW
RANIPET
0.00 GW
KANCHEEPURAM
0.00 GW
CHENGALPATTU
0.02 GW
TIRUPATTUR
0.00 GW
KRISHNAGIRI
0.10 GW
THIRUVANNAMALAI
0.08 GW
DHARMAPURI
0.04 GW
VILLUPURAM
0.00 GW
KALLAKURICHI
0.04 GW
SALEM
0.00 GW
ERODE
0.40 GW
THENILGIRIS
0.00 GW
CUDDALORE
0.06 GW
NAMAKKAL
0.04 GW
PERAMBALUR
0.03 GW
ARIYALUR
0.10 GW
MAYILADUTHURAI
0.00 GW
COIMBATORE
1.14 GW
TIRUPPUR
2.47 GW
KARUR
1.32 GW
TIRUCHIRAPALLI
0.49 GW
THANJAVUR
0.16 GW
TIRUVARUR
0.02 GW
NAGAPATTINAM
0.00 GW
DINDIGUL
0.13 GW
PUDUKKOTTAI
0.61 GW
THENI
0.06 GW
MADURAI
0.06 GW
SIVAGANGAI
0.00 GW
VIRUDHUNAGAR
0.41 GW
RAMANATHAPURAM
0.17 GW
TENKASI
0.24 GW
THOOTHUKUDI
0.87 GW
TIRUNELVELI
0.92 GW
KANNIYAKUMARI
0.00 GW
50 km
Total Potential: 10.07 GW
0.00 GW
0.62 GW
1.23 GW
1.85 GW
2.47 GW

| District | Ground-mounted solar on unused lands High potential sites | | |
|---|---|---|---|
| | Plots (no.) | Area (acres) | Solar capacity (MW) |
| Ariyalur | 5 | 407 | 102 |
| Chengalpattu | 1 | 62 | 15 |
| Chennai | 1 | 126 | 32 |
| Coimbatore | 28 | 4,560 | 1,140 |
| Cuddalore | 3 | 235 | 59 |
| Dharmapuri | 1 | 161 | 40 |
| Dindigul | 7 | 532 | 133 |
| Erode | 10 | 1,615 | 404 |
| Kallakurichi | 2 | 178 | 44 |
| Kancheepuram | 0 | 0 | 0 |
| Kanniyakumari | 0 | 0 | 0 |
| Karur | 18 | 5,294 | 1,323 |
| Krishnagiri | 4 | 402 | 101 |
| Madurai | 2 | 257 | 64 |
| Mayiladuthurai | 0 | 0 | 0 |
| Nagapattinam | 0 | 0 | 0 |
| Namakkal | 2 | 149 | 37 |
| Perambalur | 1 | 133 | 33 |
| Pudukkottai | 11 | 2,437 | 609 |
| Ramanathapuram | 3 | 661 | 165 |
| Ranipet | 0 | 0 | 0 |
| Salem | 0 | 0 | 0 |
| Sivagangai | 0 | 0 | 0 |
| Tenkasi | 11 | 972 | 243 |
| Thanjavur | 5 | 629 | 157 |
| The Nilgiris | 0 | 0 | 0 |
| Theni | 2 | 240 | 60 |
| Thiruvannamalai | 2 | 317 | 79 |
| Thoothukudi | 24 | 3,494 | 874 |
| Tiruchirapalli | 12 | 1,973 | 493 |
| Tirunelveli | 23 | 3,676 | 919 |
| Tirupattur | 0 | 0 | 0 |
| Tiruppur | 49 | 9,879 | 2,470 |
| Tiruvallur | 2 | 165 | 41 |
| Tiruvarur | 1 | 94 | 24 |
| Vellore | 0 | 0 | 0 |
| Villupuram | 0 | 0 | 0 |
| Virudhunagar | 9 | 1,639 | 410 |



TIRUVALLUR
0.23 GW
CHENNAI
0.01 GW
VELLORE
0.25 GW
RANIPET
0.05 GW
KANCHEEPURAM
0.06 GW
CHENGALPATTU
0.10 GW
KRISHNAGIRI
0.41 GW
TIRUPATTUR
0.14 GW
THIRUVANNAMALAI
0.18 GW
DHARMAPURI
0.28 GW
VILLUPURAM
0.13 GW
KALLAKURICHI
0.28 GW
SALEM
0.88 GW
ERODE
1.83 GW
THENILGIRIS
0.00 GW
CUDDALORE
0.47 GW
NAMAKKAL
1.71 GW
PERAMBALUR
0.09 GW
ARIYALUR
0.08 GW
MAYILADUTHURAI
0.15 GW
COIMBATORE
0.98 GW
TIRUPPUR
2.55 GW
KARUR
0.64 GW
TIRUCHIRAPALLI
1.32 GW
THANJAVUR
0.58 GW
TIRUVARUR
0.12 GW
NAGAPATTINAM
0.13 GW
DINDIGUL
1.19 GW
PUDUKKOTTAI
0.20 GW
THENI
0.57 GW
MADURAI
0.11 GW
SIVAGANGAI
0.04 GW
VIRUDHUNAGAR
0.38 GW
RAMANATHAPURAM
0.04 GW
TENKASI
0.39 GW
THOOTHUKUDI
0.57 GW
TIRUNELVELI
0.58 GW
KANNIYAKUMARI
0.01 GW
N
50 km
Total Potential: 17.73 GW
0.00 GW
0.64 GW
1.28 GW
1.91 GW
2.55 GW

| District | Ground-mounted solar on unused lands High potential sites | | |
| --- | --- | --- | --- |
| | Plots (no.) | Area (acres) | Solar capacity (MW) |
| Ariyalur | 15 | 730 | 78 |
| Chengalpattu | 22 | 900 | 96 |
| Chennai | 2 | 104 | 11 |
| Coimbatore | 180 | 9,198 | 981 |
| Cuddalore | 72 | 4,455 | 475 |
| Dharmapuri | 29 | 2,628 | 280 |
| Dindigul | 124 | 11,118 | 1,185 |
| Erode | 205 | 17,155 | 1,829 |
| Kallakurichi | 22 | 2,613 | 279 |
| Kancheepuram | 16 | 587 | 63 |
| Kanniyakumari | 1 | 70 | 7 |
| Karur | 40 | 6,001 | 640 |
| Krishnagiri | 73 | 3,855 | 411 |
| Madurai | 15 | 988 | 105 |
| Mayiladuthurai | 27 | 1,383 | 147 |
| Nagapattinam | 11 | 1,176 | 125 |
| Namakkal | 149 | 16,056 | 1,712 |
| Perambalur | 4 | 856 | 91 |
| Pudukkottai | 38 | 1,847 | 197 |
| Ramanathapuram | 9 | 352 | 38 |
| Ranipet | 7 | 504 | 54 |
| Salem | 102 | 8,283 | 883 |
| Sivagangai | 8 | 352 | 38 |
| Tenkasi | 39 | 3,660 | 390 |
| Thanjavur | 74 | 5,463 | 582 |
| The Nilgiris | 1 | 28 | 3 |
| Theni | 39 | 5,317 | 567 |
| Thiruvannamalai | 31 | 1,713 | 183 |
| Thoothukudi | 54 | 5,377 | 573 |
| Tiruchirapalli | 61 | 12,377 | 1,320 |
| Tirunelveli | 92 | 5,443 | 580 |
| Tirupattur | 18 | 1,352 | 144 |
| Tiruppur | 338 | 23,931 | 2,551 |
| Tiruvallur | 38 | 2,170 | 231 |
| Tiruvarur | 16 | 1,137 | 121 |
| Vellore | 28 | 2,338 | 249 |
| Villupuram | 22 | 1,227 | 131 |
| Virudhunagar | 47 | 3,528 | 376 |

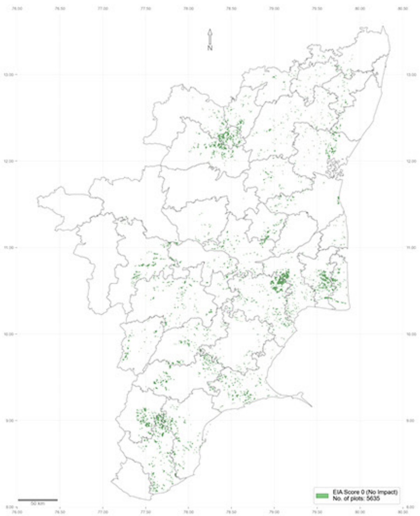
# 08 ECO-IMPACT SUITABILITY ASSESSMENT

The Eco-Impact Suitability Assessment (EIA) helps identify ecologically sensitive areas to take caution in during solar development. It is applied to both ground-mounted solar (unused land) and agri-PV (cropland) zones, classified into technical and high-potential categories. Each land parcel is scored using a binary system (0 or 1) based on the presence of key environmental constraints. The more constraints the parcel of land is exposed to, the higher its rating. The total EIA score ranges from 0 to 3, indicating increasing environmental sensitivity. This scoring allows us to quantify how many parcels in each suitability category—across both ground-mounted and Agri-PV—are environmentally constrained.

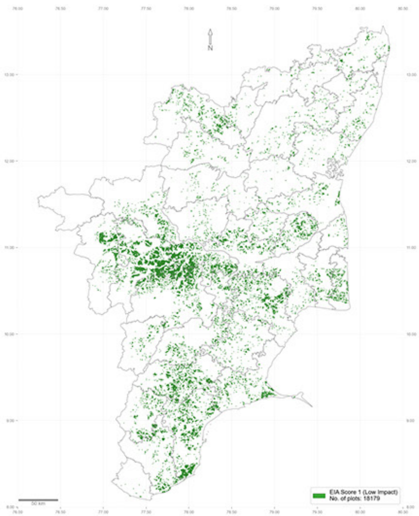
The table below provides the number of plots or parcels of land with technical and high potential meeting the levels of EIA scores.

| EIA Score | Unused land | | Croplands | |
|---|---|---|---|---|
| | Technical potential (plots) | High potential (plots) | Technical potential (plots) | High potential (plots) |
| 0 | 5,635 | 24 | 14,102 | 307 |
| 1 | 18,179 | 163 | 45,332 | 1,059 |
| 2 | 6,290 | 39 | 17,282 | 693 |
| 3 | 9 | 0 | 138 | 10 |

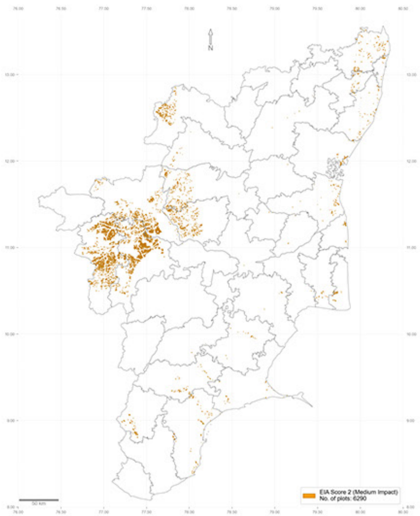
Considering both technically and highly suitable unused lands and croplands, the majority of the plots are exposed to a maximum of 1 environmental parameter. Relatively few plots are exposed to more than 1 parameter. A positive result is that no highly suitable unused lands for solar deployment having an EIA rating of 3. Overall, this broad analysis indicates that most of the suitable lands for solar and agri-PV are not located in environmentally sensitive locations.



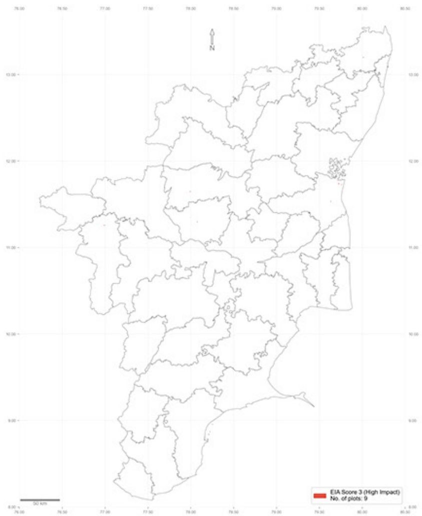

No Impact
No of plots: 5635



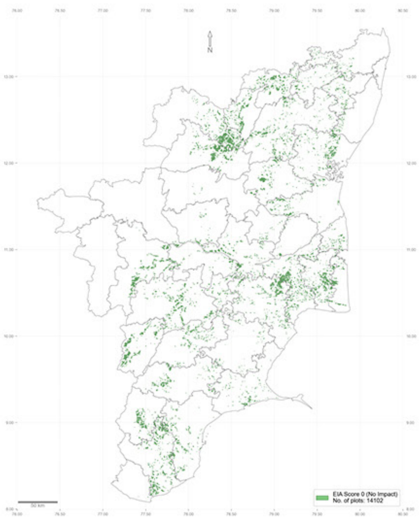

Low Impact
No of plots: 18179



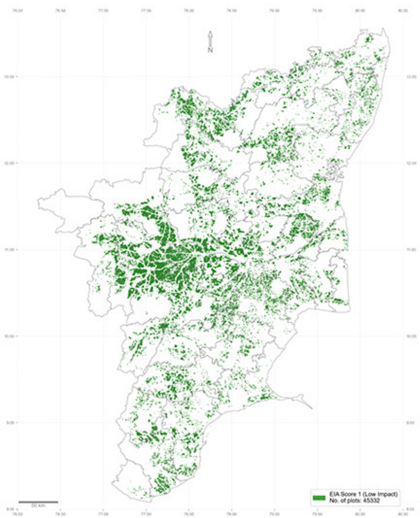

Medium Impact
No of plots: 6290



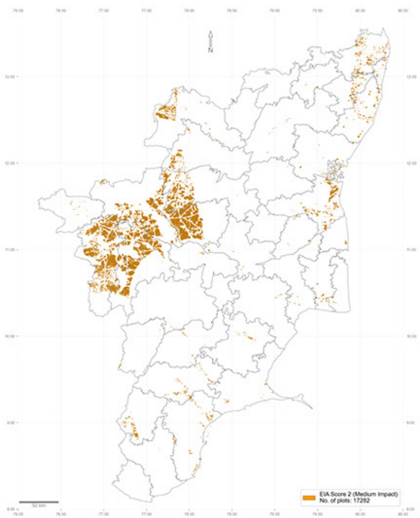

High Impact
No of plots: 9



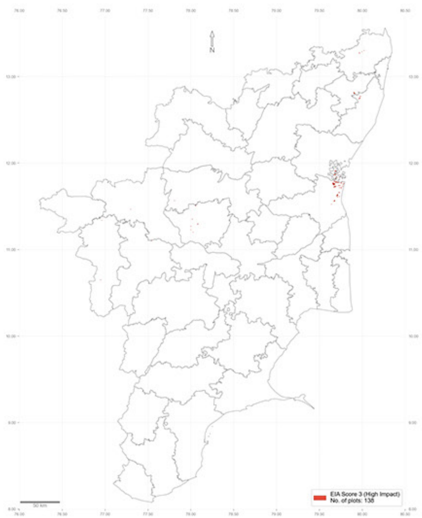

No Impact
No of plots: 14102




Low Impact
No of plots: 45332




Medium Impact
No of plots: 17282




High Impact
No of plots: 138

# 09 RECOMMENDATIONS

**1. Strategically Utilise Verified Unused Lands**
Technically viable unused lands can be leveraged for ground-mounted solar projects, particularly through solar-ready zones or cluster-based solar parks with shared infrastructure. Publishing verified land inventories can improve transparency and investment confidence. Land development should be aligned with local needs, environmental safeguards, and long-term land stewardship principles.

**2. Scale Up Sustainable Agri-Photovoltaics (Agri-PV)**
Croplands identified as suitable for solar may support Agri-PV systems, enabling dual land use for farming and clean energy. A dedicated Agri-PV policy—including technical standards, economic incentives, and farmer support mechanisms—can unlock rural energy potential while safeguarding food systems and soil health.

**3. Reform Grid Interconnection to Support Distributed Generation**
To enable equitable and cost-effective solar deployment, Tamil Nadu should revise current policies to allow grid interconnection at existing low and medium-voltage feeders. Facilitating virtual net metering, simplified approvals, and localised energy sharing models will improve energy access and enhance grid resilience.

**4. Conserve Ecologically Valuable Land**
Certain areas with technical solar potential also serve as high-priority sites for forestation and ecosystem restoration. These should be reserved for environmental regeneration to support the State's green cover targets and biodiversity goals. A dual-screening approach, integrating ecological and energy criteria, is essential for land-use sustainability..

**5. Establish Solar-Compatible Zoning and Land-Use Guidelines**
Large-scale solar development must respect existing land-use dynamics and community rights. Tamil Nadu should formulate solar-specific zoning guidelines that define development corridors, protection buffers, and exclusion zones. These should be integrated into broader spatial and ecological planning frameworks.

**6. Promote Integrated, Climate-Resilient Land Use**
Solar development can be co-located with initiatives such as rainwater harvesting, afforestation, and climate adaptation to maximise land efficiency and impact. The State should pilot and scale multi-functional land-use models, promoting convergence across energy, water, and environment sectors for long-term sustainability.

# 10 SUMMARY

The results reveal that Tamil Nadu has a significant surplus of land suitable for solar energy development, with technical potential plots far exceeding the state's 20 GW solar target for 2030. Unused lands alone could support up to 150 GW of ground-mounted solar installations, and suitable croplands offer an additional 149 GW through Agri-PV systems, indicating considerable headroom for clean energy expansion. Combined, highly suitable unused lands and croplands have a potential of 28 GW.

The spatial distribution highlights that high-potential plots are concentrated in districts such as Tiruppur, Karur, and Coimbatore, which allows for strategic, district-specific planning and investment. Environmental and legal exclusions, such as protected zones, have been rigorously applied; most suitable parcels are not overly exposed to critical ecological risks like flooding, soil erosion, or endangered bird habitats. This underscores the feasibility of rapid scaling while maintaining high environmental and social standards.

Further, the dual-use approach—using croplands for Agri-PV—aligns energy deployment with agricultural productivity, maximizing land utility without undermining food security. The eco-impact suitability assessment demonstrates that most high-potential lands have minimal environmental sensitivity, bolstering the case for immediate action. Policy recommendations drawn from the analysis include leveraging verified unused clusters for solar parks, institutionalizing Agri-PV policy frameworks, enhancing grid interconnection at the local level, and integrating ecosystem conservation into siting protocols. These insights provide a robust evidence base for policymakers to harmonize renewable energy growth with broader development and conservation objectives in Tamil Nadu.

# 11 REFERENCES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# 12 ANNEXURE

The table below describes the estimation for the area of AgriPV installable for every acre of cropland:

| Crop types in Tamil Nadu | Area | | | Density | AgriPV potential assuming theoretical cropland | |
|---|---|---|---|---|---|---|
| | ha | acre | % | (kWp/ha) | Available land (ha) | Potential (TWp) |
| **Cereals** | 30,54,010.00 | 75,46,611.41 | 49.93% | 250.00 | 60,59,281.30 | 1.51 |
| **Pulses** | 7,17,021.00 | 17,71,794.74 | 11.72% | 300.00 | 14,22,599.12 | 0.43 |
| **Sugar** | 1,51,687.00 | 3,74,826.16 | 2.48% | 150.00 | 3,00,953.24 | 0.05 |
| **Spices and condiments** | 1,26,377.00 | 3,12,283.89 | 2.07% | 650.00 | 2,50,737.16 | 0.16 |
| **Fruits** | 4,13,820.00 | 10,22,569.91 | 6.77% | 300.00 | 8,21,035.88 | 0.25 |
| **Vegetables** | 3,12,201.00 | 7,71,464.28 | 5.10% | 650.00 | 6,19,419.61 | 0.40 |
| **Other food crops** | 8,695.00 | 21,485.78 | 0.14% | 150.00 | 17,251.24 | 0.00 |
| **Non food crops** | 13,32,805.00 | 32,93,427.80 | 21.79% | 150.00 | 26,44,339.87 | 0.40 |
| **Total** | **61,16,616.00** | **1,51,14,463.97** | **100.00%** | - | **1,21,35,617.41** | **3.20** |

| Parameter | Value | Unit |
|---|---|---|
| Total theoretical potential land for AgriPV | 1,21,35,617.41 | ha |
| Average AgriPV installation density | 263.51 | kWp/ha |
| Average AgriPV installation density | 106.64 | kWp/acre |
| Average land requirement per MW of AgriPV | 9.38 | acre/MW |

The table below provides the district-wise technical and high-potential areas for solar and Agri-PV, with unused and croplands, respectively.

| District | Unused land (Ground-mounted solar) | | | | | | Cropland (Agri PV) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Technical | | | High potential | | | Technical | | | High potential | | |
| | Plots (no.) | Area (acres) | Equivalent capacity (MW) | Plots (no.) | Area (acres) | Equivalent capacity (MW) | Plots (no.) | Area (acres) | Equivalent capacity (MW) | Plots (no.) | Area (acres) | Equivalent capacity (MW) |
| Ariyalur | 628 | 11,013 | 2,753 | 5 | 407 | 102 | 1,234 | 19,866 | 2,118 | 15 | 730 | 78 |
| Chengalpattu | 371 | 5,217 | 1,304 | 1 | 62 | 15 | 1,117 | 13,314 | 1,419 | 22 | 900 | 96 |
| Chennai | 34 | 492 | 123 | 1 | 126 | 32 | 82 | 587 | 63 | 2 | 104 | 11 |
| Coimbatore | 2,885 | 49,118 | 12,280 | 28 | 4,560 | 1,140 | 5,750 | 69,992 | 7,462 | 180 | 9,198 | 981 |
| Cuddalore | 493 | 9,738 | 2,435 | 3 | 235 | 59 | 2,285 | 48,129 | 5,131 | 72 | 4,455 | 475 |
| Dharmapuri | 654 | 8,477 | 2,119 | 1 | 161 | 40 | 2,127 | 43,372 | 4,624 | 29 | 2,628 | 280 |
| Dindigul | 1,708 | 30,230 | 7,557 | 7 | 532 | 133 | 3,631 | 88,675 | 9,454 | 124 | 11,118 | 1,185 |
| Erode | 1,492 | 22,081 | 5,520 | 10 | 1,615 | 404 | 4,640 | 103,712 | 11,057 | 205 | 17,155 | 1,829 |
| Kallakurichi | 201 | 3,682 | 920 | 2 | 178 | 44 | 601 | 16,752 | 1,786 | 22 | 2,613 | 279 |
| Kancheepuram | 188 | 2,372 | 593 | 0 | 0 | 0 | 761 | 8,522 | 909 | 16 | 587 | 63 |
| Kanniyakumari | 20 | 167 | 42 | 0 | 0 | 0 | 76 | 724 | 77 | 1 | 70 | 7 |
| Karur | 1,671 | 53,037 | 13,259 | 18 | 5,294 | 1,323 | 3,635 | 81,653 | 8,705 | 40 | 6,001 | 640 |
| Krishnagiri | 1,424 | 18,461 | 4,615 | 4 | 402 | 101 | 4,115 | 59,575 | 6,351 | 73 | 3,855 | 411 |
| Madurai | 641 | 11,564 | 2,891 | 2 | 257 | 64 | 1,095 | 16,099 | 1,716 | 15 | 988 | 105 |
| Mayiladuthurai | 149 | 1,719 | 430 | 0 | 0 | 0 | 431 | 9,132 | 974 | 27 | 1,383 | 147 |
| Nagapattinam | 614 | 8,594 | 2,149 | 0 | 0 | 0 | 566 | 7,542 | 804 | 11 | 1,176 | 125 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Namakkal | 674 | 9,113 | 2,278 | 2 | 149 | 37 | 4,164 | 117,547 | 12,532 | 149 | 16,056 | 1,712 |
| Perambalur | 281 | 4,870 | 1,217 | 1 | 133 | 33 | 421 | 14,913 | 1,590 | 4 | 856 | 91 |
| Pudukkottai | 1,969 | 45,050 | 11,263 | 11 | 2,437 | 609 | 3,329 | 34,002 | 3,625 | 38 | 1,847 | 197 |
| Ramanathapuram | 982 | 15,658 | 3,914 | 3 | 661 | 165 | 925 | 10,050 | 1,071 | 9 | 352 | 38 |
| Ranipet | 101 | 1,501 | 375 | 0 | 0 | 0 | 460 | 7,793 | 831 | 7 | 504 | 54 |
| Salem | 585 | 6,410 | 1,603 | 0 | 0 | 0 | 2,691 | 60,072 | 6,404 | 102 | 8,283 | 883 |
| Sivagangai | 632 | 9,075 | 2,269 | 0 | 0 | 0 | 1,221 | 12,266 | 1,308 | 8 | 352 | 38 |
| Tenkasi | 764 | 14,655 | 3,664 | 11 | 972 | 243 | 1,188 | 22,200 | 2,367 | 39 | 3,660 | 390 |
| Thanjavur | 598 | 8,875 | 2,219 | 5 | 629 | 157 | 2,253 | 35,569 | 3,792 | 74 | 5,463 | 582 |
| The Nilgiris | 4 | 49 | 12 | 0 | 0 | 0 | 20 | 132 | 14 | 1 | 28 | 3 |
| Theni | 306 | 4,545 | 1,136 | 2 | 240 | 60 | 1,275 | 23,240 | 2,478 | 39 | 5,317 | 567 |
| Thiruvannamalai | 551 | 9,189 | 2,297 | 2 | 317 | 79 | 2,484 | 38,259 | 4,079 | 31 | 1,713 | 183 |
| Thoothukudi | 1,803 | 40,813 | 10,203 | 24 | 3,494 | 874 | 1,898 | 28,786 | 3,069 | 54 | 5,377 | 573 |
| Tiruchirapalli | 1,116 | 22,961 | 5,740 | 12 | 1,973 | 493 | 2,560 | 95,904 | 10,224 | 61 | 12,377 | 1,320 |
| Tirunelveli | 1,026 | 21,408 | 5,352 | 23 | 3,676 | 919 | 2,298 | 31,050 | 3,310 | 92 | 5,443 | 580 |
| Tirupattur | 292 | 3,308 | 827 | 0 | 0 | 0 | 1,130 | 17,875 | 1,906 | 18 | 1,352 | 144 |
| Tiruppur | 3,698 | 92,040 | 23,010 | 49 | 9,879 | 2,470 | 9,466 | 155,705 | 16,600 | 338 | 23,931 | 2,551 |
| Tiruvallur | 476 | 7,591 | 1,898 | 2 | 165 | 41 | 1,467 | 17,399 | 1,855 | 38 | 2,170 | 231 |
| Tiruvarur | 649 | 10,393 | 2,598 | 1 | 94 | 24 | 1,153 | 18,540 | 1,977 | 16 | 1,137 | 121 |
| Vellore | 119 | 1,464 | 366 | 0 | 0 | 0 | 1,268 | 17,994 | 1,918 | 28 | 2,338 | 249 |
| Villupuram | 462 | 5,843 | 1,461 | 0 | 0 | 0 | 1,192 | 14,995 | 1,599 | 22 | 1,227 | 131 |
| Virudhunagar | 1,358 | 30,928 | 7,732 | 9 | 1,639 | 410 | 1,845 | 31,896 | 3,400 | 47 | 3,528 | 376 |

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