

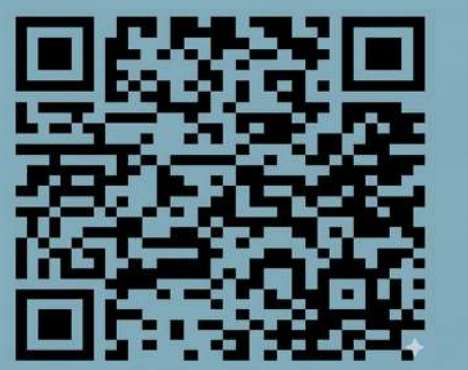


A MCDM AND GIS-BASED ASSESSMENT OF SOLAR ENERGY POTENTIAL IN THE MEDITERRANEAN REGION: THE CASE OF ADANA

İdil Duru Gök, Barış Özçimenli, Turan Berkut Altay, Nehir Özlen, Devim Akarer, Kenan Karaca, Selin Tepe
@itu.edu.tr (goki22, ozcimenli21, altayt21, ozlen21, akarer21, karacak22, tepe21)

Prof. Dr. Hande Demirel, Prof. Dr. Ahmet Özgür Doğru, Res. Asst. Koray Aksu
@itu.edu.tr (hande.demirel, ozgur.dogru, aksuko)

Istanbul Technical University, Faculty of Civil Engineering, Geomatics Engineering Department, 34469, Istanbul, Türkiye



website



poster

Aim & Scope

This study aims to identify suitable locations for solar power plants in Adana Province using GIS and Multi-Criteria Decision Making methods. Key factors are weighted through the Analytic Hierarchy Process (AHP), environmentally sensitive areas are excluded, and a GIS-based weighted overlay analysis is applied to generate the final land suitability map.

Definition of the Problem

Although the Mediterranean region has high solar energy potential, unplanned solar installations threaten sensitive ecosystems. Therefore, this study focuses on identifying environmentally and technically optimal solar panel locations in Adana province to support sustainable and informed site selection.

Constraints

- Law No. 2863 on the Protection of Cultural and Natural Assets
- Forestry Law No. 6831 and Protected Areas Legislation
- Environmental Impact Assessment (EIA) Regulation
- Proximity to Residential Areas and Buffer Zones
- Distance to High Voltage Transmission Lines
- Slope and Aspect Constraints
- Wetlands and Water Resources Protection Zones

Standarts

- OGC
- TUCBS
- ISO19115

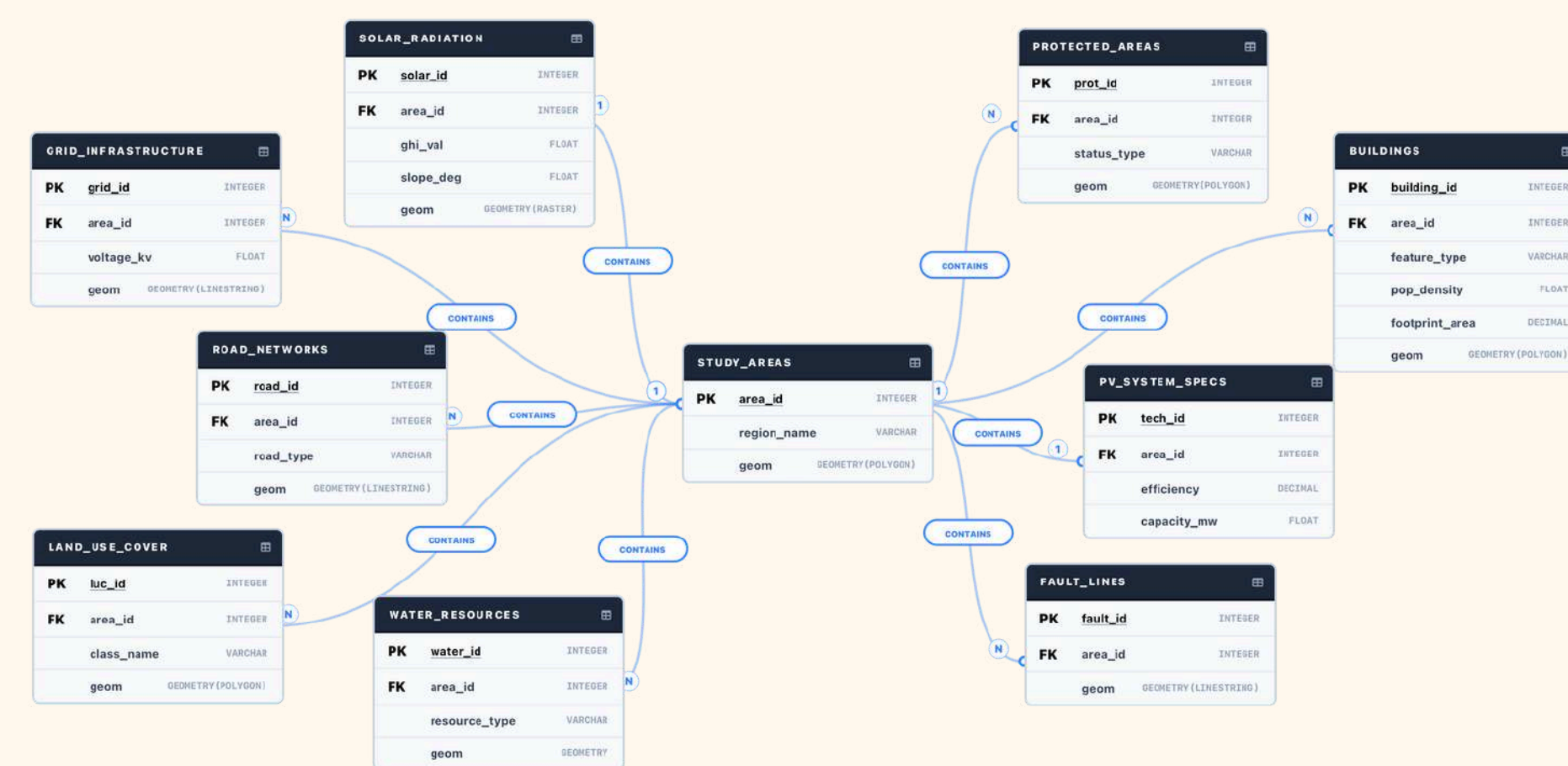
SDG's



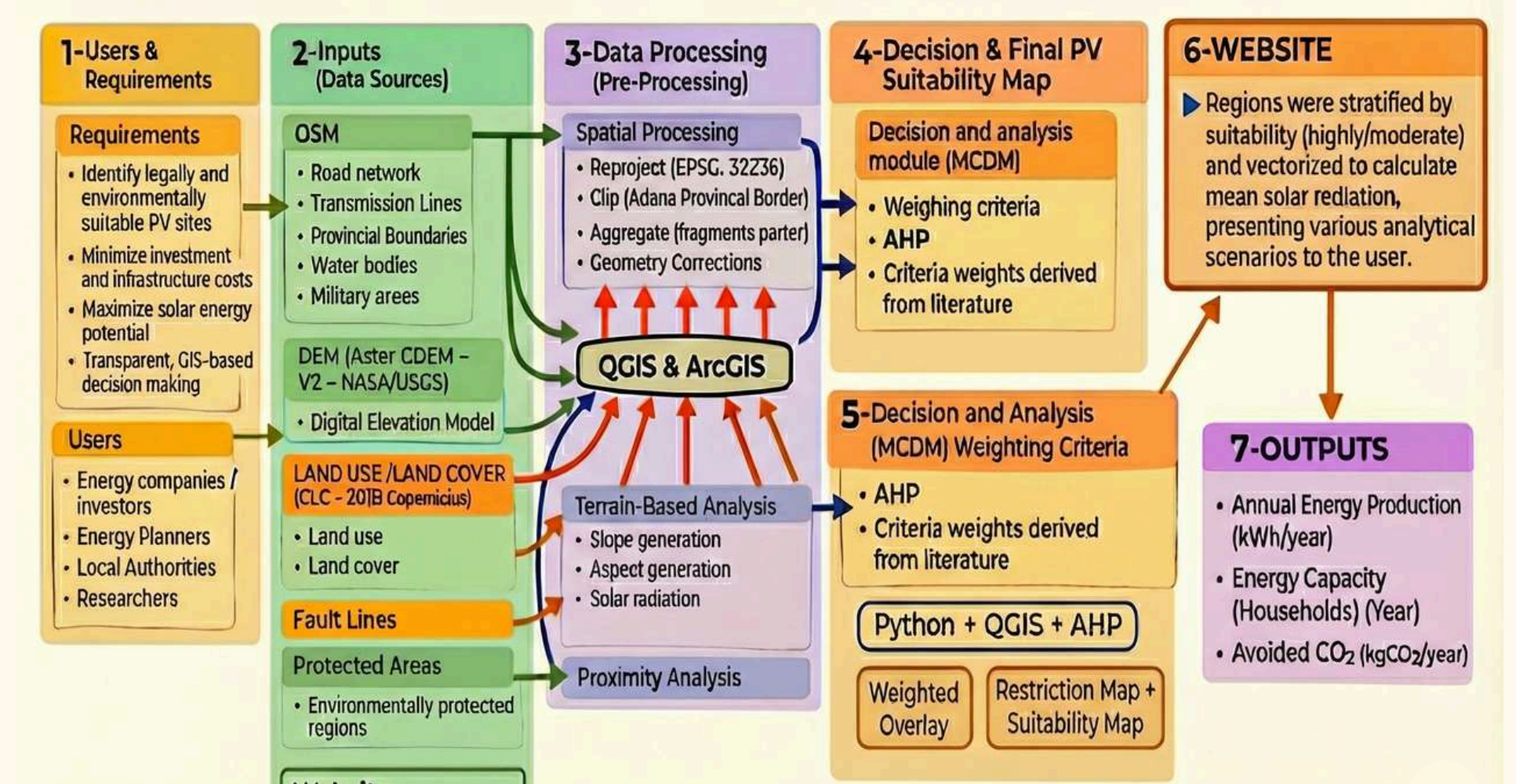
Method

This project integrates AHP and WLC methods to evaluate Adana's solar energy potential. Criteria weights were calculated in QGIS using a Python-based pairwise matrix, based on parameters and constraints derived from the literature. The weighted layers were then combined through WLC to produce the final suitability map.

Logical Design

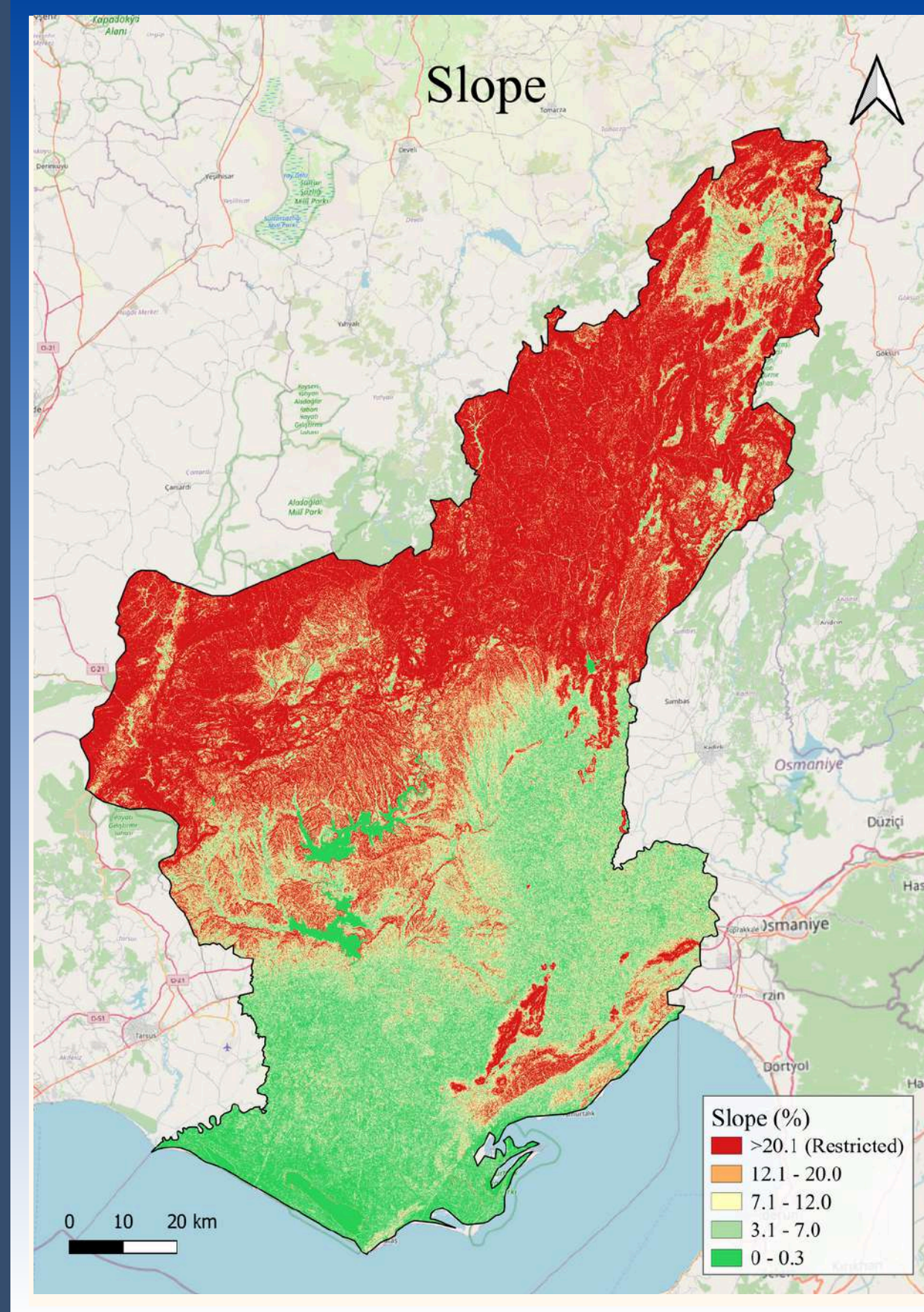


System Architecture

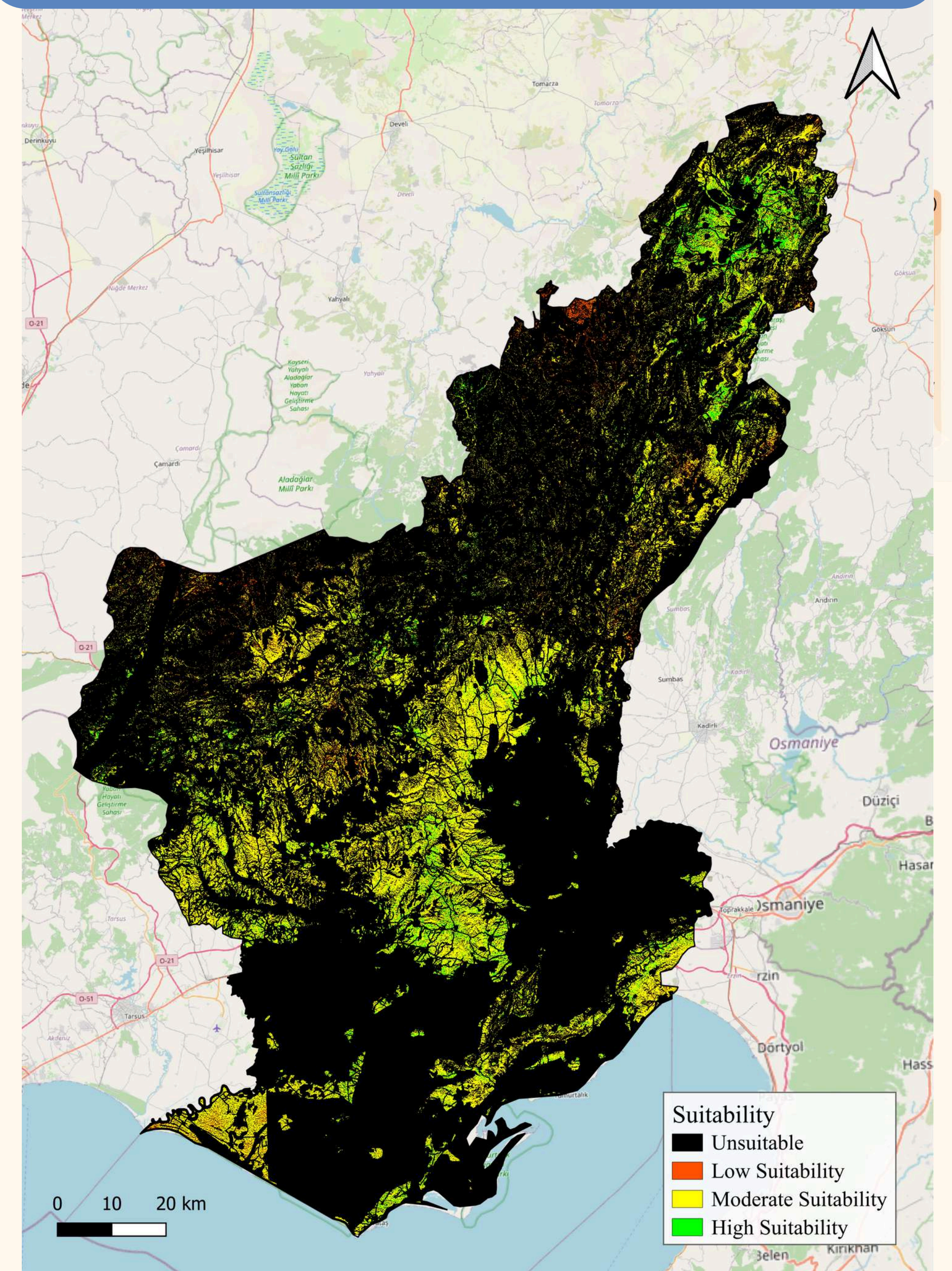


Parameter Weights

Solar Irradiation	→	24.15%
LU/LC	→	22.76%
Aspect	→	14.41%
Distance to Transportation Network	→	11.61%
Distance to Transmission Lines	→	11.42%
Distance to Urban Areas	→	9.36%
Slope	→	6.30%



Final Suitability Map



Results and Recommendations

Suitability Classes	Annual Energy Production (kWh/year)	Energy Capacity (households) (year)	Adana's Demand Met	Avoided CO ₂ (kgCO ₂ /year)
Only Highly Suitable	207.300.316	46.067	4,45%	93.285.142
Only Moderately Suitable	1.585.744.597	352.388	34,02%	713.585.068
Highly + Moderately Suitable	1.793.044.912	398.454	38,47%	806.870.211

* PV technology and efficiency rate used in the table: c-Si (13.1%), coverage ratio = 1%

Even if solar power plants are installed on only *1%* of the *highly* and *moderately suitable* areas in Adana (approximately *20.05 km²*), the resulting electricity generation would be sufficient to meet the annual electricity demand of **38.47%* of the city's buildings.

