

Case Study on Site Analysis for Solar Panel installation using GIS

Nikitha Nechikkat¹, Archana.S², Sugatha Kumari P R³, P Geetha⁴

^{1,2,3} PG Scholar, Amrita Vishwa Vidyapeetham

⁴ Assistant Professor, Amrita Vishwa Vidyapeetham

Remote Sensing and Wireless Sensor Network Division (CEN)

Amrita Vishwa Vidyapeetham, Coimbatore -641112, India

Abstract:

This study aims to conduct a site analysis for solar panel installation using Geographical Information Systems (GIS). In today's world, due to growing energy needs and increasing environmental problems, it is necessary to find out an alternative for non-renewable resources, which does not cause pollution. Most appropriate solution for such a problem is solar energy. Solar energy is the pure and most reliable form of renewable energy sources. Before installing the solar panels, analysis of areas where the solar panels can be installed, significantly gives an understanding about the performance of the system after installation. Amrita Vishwa Vidyapeetham, Coimbatore campus was selected as the case study area. The solar irradiation value at the specified location can be used for the analysis of maximum power that can be generated using panels installed in the mapped regions.

About the Author:



Ms. Nikitha Nechikkat

Received B.Tech degree in Electronics and Communication from Amrita Vishwa Vidyapeetham University in 2013. Pursuing M.Tech degree in Remote Sensing and Wireless Sensor Networks in Amrita Vishwa Vidyapeetham.

E mail ID: nikitagireesan@gmail.com

Contact No: +91- 9600735057

Introduction

Solar energy is the beaming light and heat generated by sun which has been used by human beings since the time immemorial. The hydrogen gas in the core of the sun undergoes nuclear fusion process resulting from the conversion of hydrogen nuclei to helium nuclei and high energy photons. Energy produced during this process is transported from core to solar surface and emitted as light or ejected as high energy particles.

This emitted light is captured using the solar panels and converted to electrical energy for human needs. It is essential to ensure that maximum power can be generated using the system to be installed. Placement of the panels randomly in flat surfaces, may not give the maximum throughput. So, a background study is necessary before the implementation of the system. Amrita Vishwa Vidyapeetham, Coimbatore campus was chosen as the case study area. The flat surfaces in the campus buildings were mapped using ArcGIS so as to find the total available area. The maximum power that can be generated using various panels can be calculated using available software's.

Solar power fundamentals

Solar power is a renewable source of energy, which has become most popular in recent era. It has obvious advantages over non-renewable energy sources such as coal, oil and nuclear energy. It is reliable, non-polluting and can produce energy anywhere that there is sun light available, so its resources are not going to come to an end soon. It has advantages over other renewable energy sources such as wind and water power. Solar power is generated using solar panels, which do not require much mechanical parts. Since solar energy is completely natural, it is considered as clean energy source. It does not disturb the environment or create any harmful effect to Eco-systems as oil and some other energy sources may cause. It does not produce greenhouse gases, consequently, not causing air or water pollution. The chemicals and solvents that are used during the manufacture of the photovoltaic cells creates only a feeble impact on environment. The photovoltaic cells are used to convert the solar energy into electricity. Compared to the hazards created by oil spills on the environment this is a diminutive problem.

ArcGIS

Esri's ArcGIS is a geographic information system (GIS) that enables site selection, data analysis, route optimization and advanced predictive modeling. It is used to compile geographic data and to analyze the mapped information. It helps us to allocate and determine geographic information and to use the maps and geographic information for wide range of applications. The geographic information can be managed in a database.

Amrita Vishwa Vidyapeetham

Amrita Vishwa Vidyapeetham or Amrita University is a multi-campus, multi-disciplinary research University in India. The University Headquarters is at Ettimadai in an 800 acres well-planned campus with scenic beauty near the foothills of the Western Ghats, about 22 km from Coimbatore City. Fig: 1 shows the aerial view of Amrita Vishwa Vidyapeetham, Ettimadai campus.



Fig 1: Aerial view of Amrita Vishwa Vidyapeetham, Ettimadai

Methodology

In order to find out the available flat rooftop areas in Amrita Vishwa Vidyapeetham, Coimbatore the campus map was taken. Using the available tools in ArcGIS, map the flat surfaces. Choose the flat surface such a way that the selected areas can be used for Solar Panel installation. Use the campus map after mapping, to estimate the total area available for solar Panel installation.

Results and Discussions

The flat rooftops were mapped using the available tools in ArcGIS. Fig: 2 shows the mapping of available flat areas in the campus. The mapped figure is used to calculate the total area which can be used for further evaluation.



Fig: 2– Mapped areas of Ettimadai Campus

Conclusion and Future Works

The available area at Amrita Vishwa Vidyapeetham, Coimbatore for solar panel installation was mapped and analyzed using ArcGIS 9.3. The mapping and analysis before the installation is essential for better throughput.

The work can be further continued for calculating maximum power that can be generated by installing solar panels in the mapped areas. This helps to find the total electricity that can be generated within the campus and enables the efficient utilization of the renewable energy. The solar irradiation value at the specified location can be used for the analysis of maximum power that can be generated using panels installed in the mapped regions.

References

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