OPEN ACCESS

Quick Response Code:

Website: https://wgges.us

Manuscript ID:
IJWGAFES-2025-021210

DOI: 10.5281/zenodo.18739980

DOI Link:
https://doi.org/10.5281/zenodo.18739980

Volume: 2

Issue: 12

December

Year: 2025

E-ISSN: 3066-1552

Submitted: *06 Nov.2025*

Revised: *11 Nov.2025*

Accepted: *04 Dec 2025*

Published: *31 Dec. 2025*

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How to cite this article:
Rajendra O. Parmar (2025).Study of the Potential for Solar Power Stations in More Hilly Regions in Raigad District of Maharashtra. International Journal of World Geology, Geography, Agriculture, Forestry and Environment Sciences, 2(12), 53–56.

Study of the Potential for Solar Power Stations in More Hilly Regions in Raigad District of Maharashtra

Dr. Rajendra O. Parmar

Abstract

Energy is considered a prime agent in the generation of wealth and a significant factor in economic development. Energy is also essential for improving the quality of life. Development of conventional forms of energy for meeting the growing energy needs of society at a reasonable cost is the responsibility of the Government. Limited fossil resources and environmental problems associated with them have emphasized the need for new sustainable energy supply options that use renewable energies. Development and promotion of non-conventional/alternate/new and renewable sources of energy such as solar, wind and bioenergy, etc., are also getting sustained attention. Alternative energy news source has long asserted that there are fortunes to be made from smart investments in renewable energy. Solar power is one of the hottest areas in energy investment right now. The Raigad district is comprised of 15 tahsils and 1967 villages. Many of these villages are present in the hilly areas of Raigad district which have the potential for solar power generation. This technology can play an integral role in improving the life of people living these areas. So, this paper attempts to study of the potential for solar power station in the hilly villages of Raigad district in the state of Maharashtra

Keywords: *Hilly regions, solar energy potential, solar energy generation, Importance*

Introduction

Solar energy is non-conventional energy and freely available in the world. Solar power is the generation of electricity from sunlight. Generation of solar energy has tremendous scope in India. The geographical location of the country stands to its benefit for generating solar energy The reason being India is a tropical country. Thus, India has massive plan for Solar Energy generation that may not only fulfil the deficit of power generation but also contribute largely in Green Energy Production to help to reduce the Climatic Changes globally. Solar Power a clean renewable resource with zero emission, has got tremendous potential of energy which can be harnessed using a variety of devices. This paper presents the solar energy potential stations of the villages in the more hilly region of Raigad district.

Literature review

Solar energy is non-polluting and easily available in the world. Raigad district of Maharashtra have the locations to setup and develop the solar panels in mostly hilly villages. Which will beneficial to the peoples lining in this district. For this study we have used the various thesis, books, research papers, magazines etc. following are the literature review used for the research. (Sivaram 2018) The book Taming the Sun studies the big picture concerning solar energy. The book is meant to inform those who are curious about solar energy of the positive effects it can have on our environment, economy, and the future of our planet. Taming the Sun encourages us to engage with solar.

As per the geographical location of the country, India stands to its benefit and has tremendous scope of generating solar energy. Solar Power Generation alone can cater more than 60-65% of our entire need of power. According to (Singh and Singh 2012) Solar energy is environment friendly. Solar power is inexhaustible. In an energy deficient country like India, where power generation is costly, solar energy is the best alternate means of power generation (Singh and Singh 2012).

Solar Energy a clean renewable resource with zero emission, has got tremendous potential of energy which can be harnessed using a variety of devices (Srivastava and Srivastava 2013).

Solar thermal electricity technologies produce electric power by converting the sun's energy into high temperature heat using various mirror configurations, which is then channelled to an on-site power plant and used to make electricity through traditional heat-conversion technologies. The plant essentially consists of two parts; one that collects Solar energy and converts it to heat, and another that converts the heat energy to electricity.

Objectives

The following are the major objectives for the study.

1. To convert sunlight into electricity.
2. To provide electricity in villages of Raigad.

Study area

Raigad district is situated in Konkan region of Maharashtra State. It lies between 17^0 15' N. and 19^0 50' N. latitude and 72^0 51' E. and 73^0 40' E. longitude. It is surrounded by Mumbai Sub urban district to the Northwest, Thane district to the north, Pune district to the east, Satara district to the southeast, Ratnagiri district to the south and Arabian Sea to the west. The study region has an area of 7152 sq. kms. This is about 2.32 percent of the total area of the state. For administrative purpose the district is divided into 15 Tahsils. Raigad district has 42 towns and 1967 villages. The region of more hilly villages is chosen for the setup of solar power stations in Raigad district.

Data Source and Research Methodology

The present research study is based on secondary data. The information was collected from Primary Census Abstract and Census Handbook of India and Maharashtra, and District Census Handbook of Raigad district (Directorate of Census Operations Maharashtra 2011). For this study, information and data from a wide variety of sources has been used, which includes theoretical knowledge of solar energy technology, for both solar PV and solar thermal power plants, available in standard literature (Sukhatme and Nayak 2017). Data for solar radiation has been analyzed from sources such as the Handbook of Solar Radiation for India (Mani n.d.) India Meteorological Department (IMD), National Aeronautics and Space Administration (NASA), National Renewable Energy Laboratory (National Renewable Energy Laboratory (NREL) 2023)

Software analysis It has been found that data from the above sources varies over a wide range, depending on whether it is collected from monitoring stations, extrapolated, or derived from satellite information. Data from the above-mentioned sources is analyzed using software such as PVSyst (Mermoud and Wittmer 2014) and RETScreen (Natural Resources Canada 2021). This facilitates easy comparison of irradiation levels from different sources, and power output from solar plants, with variation in type and make of panel used, the angle of tilt of the panel, the use of tracking mechanism, local weather conditions such as temperature, and losses such as panel degradation, inverter losses and so on. This paper uses the data from Census of India and some literature reviews, and bi-variate analysis.

Results and discussion

The results are discussed on the study of the potential for solar power station of most hilly villages in Raigad district of Maharashtra. More hilly villages where we can place solar panels are 396 out of 1967.

Hilly regions (for direct sunlight) solar panels are mounted on rooftops, but they can also be placed on the ground, over parking lots and exterior corridors, or even close to walls. Depending on the conditions and setting of the property, as well as the amount of energy required, any of these positions may provide for maximum sunlight.

Village-level solar power supply represents a promising potential for access to electricity services. Increased knowledge is needed for the development of solutions that work for the users and are viable in the long run.
Villages where we can place solar panel for solar energy generation are given in below table.

Table-1
Raigad District: Tahsil and Villages having Potential for Solar Panel Setup

Sr. No.	Tahsil	Total Villages	More Hilly Villages having Potential for Solar Energy Setup
1	Alibag	216	9
2	Karjat	197	5
3	Khalapur	125	12
4	Mahad	184	121
5	Mangaon	185	22
6	Mhasla	84	14
7	Murud	74	9
8	Panvel	166	3
9	Pen	172	113
10	Poladpur	87	40
11	Roha	171	18
12	Shrivardhan	80	12
13	Sudhagad	99	9
14	Tala	63	5
15	Uran	64	4
	Total	**1,967**	**396**

Source: (Directorate of Census Operations Maharashtra 2011)

Table No. 01 deals with total villages and More Hilly Villages having Potential for Solar Energy Setup in Raigad district. Alibag is a Town and Tahsil having 216 villages but only 9 more hilly villages for solar energy setup. Mahad tahsil having more 121 hilly villages, Pen tahsil having 113 hilly villages and Panvel tahsil having only 3 hilly villages for solar panels setup.

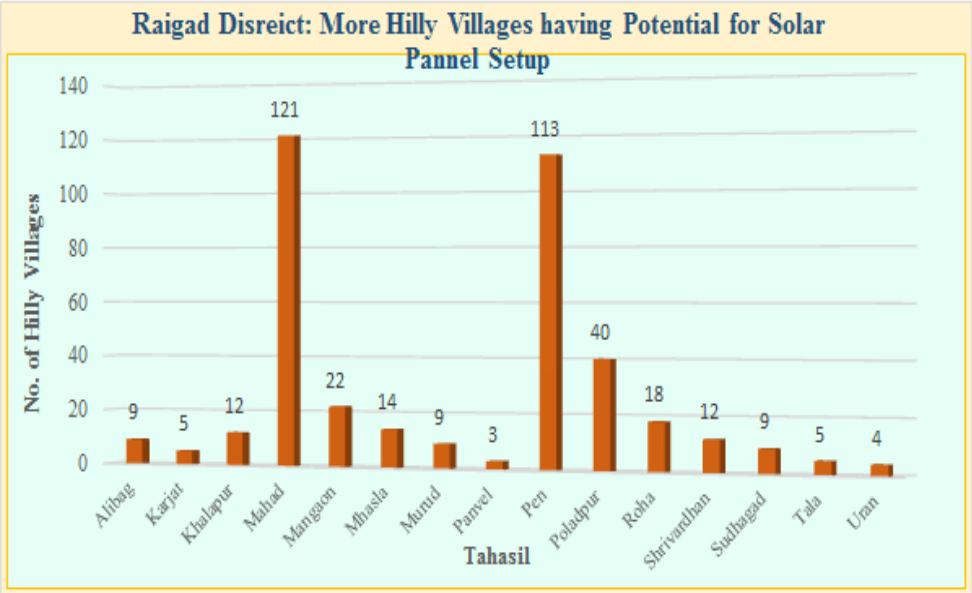

Figure No.1: Raigad District: Tahsil and Villages having Potential for Solar Panel Setup

Conclusion and Suggestions

As per the geographical location of the area, it has benefit and has tremendous scope of generating solar energy we have to focus on Roof Top Solar Energy Generation that may cut down our need to more than 50% need of every household. Most of the people are aware about non-renewable energy resources. Solar energy has become increase more popular due to their economic benefits. By on Battery Backup, Solar Energy can even provide Electricity 24x7, even on cloudy days and at night. This also used with inter-grid System with Continuously Power supply. It has more benefits compared to other forms of energy like fossils fuels and petroleum deposits. It is an alternative which is promise and consistent to meet the high energy demand. Research on solar cell and solar energy is promise has a future worldwide.

India is blessed with abundant solar energy potential with 300 days of sunlight. About 5,000 trillion kWh per year energy is experienced over India's land area (Ministry of New and Renewable Energy 2022) with most parts receiving 4-7 kWh per sq. m per day. The government henceforth aims to create solar schemes to use this renewable source of energy efficiently. Some of the most successful and known solar schemes in India. 1) Jawaharlal Nehru National Solar Mission, 2) Government Yojana: Solar Energy Subsidy Scheme, 3) Development of Solar Park Scheme, 4) Ujjwal Discom Assurance, 5) Solar Energy Corporation of India Scheme, 6) Kusum Solar Rooftop Scheme (Ministry of New and Renewable Energy 2022) With the help of these schemes, we have to setup the solar panels in above mentioned villages in Raigad district, for fulfilment of their need of electricity.

When we place Solar panels connected in a calculated manner in the sunlight, they start producing current and voltage in the form of Direct current (DC) but in most of the countries in the world appliances and equipment runs on Alternative current (AC) so we need to connect to all Solar panels to an Inverter which then converts DC into AC for home use.

Acknowledgment

The author expresses sincere gratitude to the Directorate of Census Operations, Maharashtra, for providing valuable secondary data through the District Census Handbook and Census of India publications, which formed the backbone of this study.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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