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A solar map of India shows how much sunlight energy different regions receive throughout the year. This energy is called solar radiation and it is the base of solar power generation. Engineers and students use these maps to understand where solar plants will perform better.

What is Solar Radiation?

Solar radiation is the energy that comes from the sun in the form of electromagnetic waves. When this energy reaches the earth's surface, it can be measured and used to produce electricity using solar panels.

Common Units Used

- kWh/m²/day
- kWh/m²/year

On solar maps, colors are used to show intensity:

- Dark / warm colours – higher solar energy
- Light / cool colours – lower solar energy

Solar Radiation Types

Solar radiation is mainly divided into three parts:

- Beam radiation
- Diffuse radiation



- Global radiation

Understanding these three types helps in solar system design, panel tilt selection, and energy estimation.

Beam Solar Radiation (Direct Radiation)

Beam radiation (also called **direct radiation**) is the sunlight that comes **straight from the sun** to the earth without being scattered.

- Travels in a straight line
- Strong on clear sky days
- Produces sharp shadows
- Very important for **concentrated solar power (CSP)** systems
- Maximum around noon time

In India, high beam radiation is found in: Rajasthan Gujarat, Ladakh, Parts of Andhra Pradesh

These regions have clear skies and low cloud cover.

Diffuse Solar Radiation

Diffuse radiation is the sunlight that gets **scattered by clouds, dust, and air molecules** before reaching the ground.

- Comes from all directions
- Present even on cloudy days
- Does not form sharp shadows
- Useful for flat plate solar panels
- More stable but lower in intensity than beam radiation

In India, diffuse radiation is higher in: Coastal regions North-East states.

Areas with more humidity and cloud cover.

Global Solar Radiation

Global radiation is the total solar radiation received on a surface.



Global Radiation = Beam Radiation + Diffuse Radiation

- Most important value for solar PV system design
- Used in solar maps for project planning
- Measured on a horizontal surface, called **Global Horizontal Irradiance (GHI)**
- Directly related to solar energy output

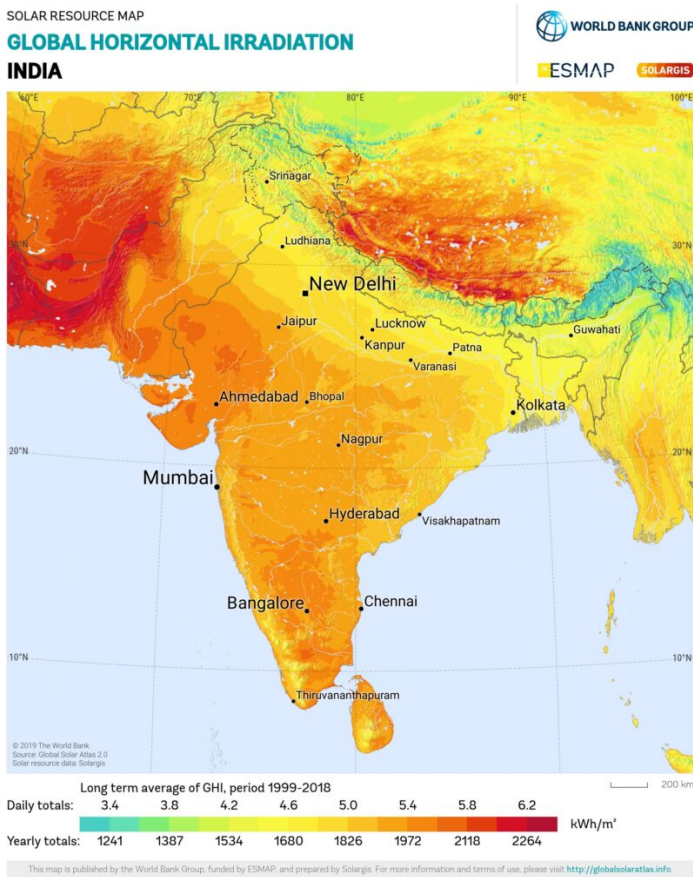


Image courtesy:- **Solar resource map © 2021 Solargis.**

Solar Radiation Zones in India

India is one of the best countries for solar energy because it receives high solar radiation across most regions.

High Solar Radiation Zones

- Rajasthan desert region



- Gujarat
- Parts of Maharashtra
- Telangana
- Karnataka plateau

Typical values: 5.5 – 6.5 kWh/m²/day

Medium Solar Radiation Zones

- Central India
- Parts of Tamil Nadu
- Madhya Pradesh
- Andhra Pradesh

Typical values: 4.5 – 5.5 kWh/m²/day

Lower Solar Radiation Zones

- North-East India
- Himalayan regions
- High rainfall zones

Typical values: 3.5 – 4.5 kWh/m²/day

FAQ — Solar Radiation in India

What is the difference between beam and diffuse radiation?

Beam radiation comes directly from the sun, while diffuse radiation is scattered by clouds and dust before reaching the ground.

Which radiation value is used for solar panel design?

Global radiation (GHI) is mainly used for solar PV system design.

Which state in India has the highest solar radiation?

Rajasthan and Gujarat have the highest average solar radiation levels.



Can solar panels work with diffuse radiation?

Yes. Solar PV panels can generate power from both beam and diffuse radiation.