4. Scientific Solar Mapping - Environment

With Scientific Solar Mapping and Training Initiatives, India is Building a Self-Reliant Clean Energy Future - Union Minister Pralhad Joshi. India's new assessment reveals a massive solar potential of 3,343 GWp, crucial for its 'Panchamrit' goal of 500 GW non-fossil capacity by 2030. While government schemes boost growth, challenges like weak DISCOMs, import dependency, and solar waste management must be addressed.

New Solar Initiatives and Climate Goals

Recently, the Union Minister of New & Renewable Energy launched two key initiatives at the National Institute of Solar Energy (NISE), Gurugram - the Solar PV Potential Assessment Report 2025 and the first Solar Manufacturing Training Programme. These initiatives, launched under the Seva Parv, are aligned with India's Panchamrit climate commitments made at COP26 and are aimed at achieving energy independence by 2047 and net-zero emissions by 2070.

India's 'Panchamrit' Commitments (COP26, Glasgow)

At the 26th UN Climate Change Conference (COP26), India announced its five-point climate action plan, or 'Panchamrit,' to balance its developmental needs with climate responsibility.

1. Achieve 500 GW of non-fossil fuel energy capacity by 2030.
2. Source 50% of its total energy requirements from renewable energy by 2030.
3. Reduce total projected carbon emissions by 1 billion tonnes by 2030.
4. Reduce the carbon intensity of its economy to less than 45% by 2030 (from 2005 levels).
5. Achieve the target of net-zero carbon emissions by 2070.

Key Findings of the Solar PV Potential Assessment Report 2025

This new report significantly revises India's ground-mounted solar potential upwards from the 2014 estimate of 749 GWp.

Feasible Potential - The report identifies a ground-mounted solar potential of approximately 3,343 GWp using just 6.69% of the nation's identified wasteland.

Methodology - The assessment used advanced tools, including high-resolution geospatial mapping, refined land-use models, shading analysis, and proximity to infrastructure like substations and transmission lines.

Geographic Spread - While Rajasthan and Gujarat remain prime locations, the report highlights significant potential in states like Maharashtra, Karnataka, and Madhya Pradesh.

Policy Utility - It provides an investment-ready framework for state governments and private players to identify viable sites and plan infrastructure.

About Solar Energy Technology

Solar power is energy derived from the sun's radiation, which is converted into either thermal or electrical energy.

Technology	Process	Primary Use
Photovoltaic (PV)	Directly converts solar radiation (sunlight) into electricity using semiconductor cells.	Generating electricity for residential, commercial, and utility-scale applications.
Concentrating Solar Power (CSP)	Uses mirrors or lenses to concentrate sunlight onto a small area, creating a high-temperature heat source to drive a turbine and produce electricity.	Large-scale power generation.

Solar Energy in India - Status and Growth

India's solar energy sector has witnessed exponential growth over the last decade, becoming a cornerstone of its energy transition strategy.

2030 Target - India aims to source about 500 GW of its electricity from non-fossil fuel sources by 2030, with at least 280 GW coming from solar power.

Installed Capacity Growth - Solar capacity has surged over 39 times, from 2.82 GW in 2014 to 110.9 GW in 2025.

Manufacturing Boost (2014-2025) - Solar PV module manufacturing capacity grew 38-fold (from 2.3 GW to 88 GW). Solar PV cell manufacturing capacity grew 21-fold (from 1.2 GW to 25 GW).

Key Government Initiatives to Promote Solar Energy

India has rolled out a comprehensive suite of policies and schemes to accelerate solar adoption.

PM Surya Ghar - Muft Bijli Yojana - A flagship scheme targeting 1 crore households to provide up to 300 units of free electricity per month through rooftop solar, supported by substantial subsidies.

PM-KUSUM Scheme - Empowers farmers to install solar pumps and grid-connected solar power plants on their barren land, promoting energy and water security.

Solar Parks & Ultra-Mega Projects - A scheme to set up large-scale solar parks (53 parks with ~40 GW capacity sanctioned) to facilitate utility-scale solar generation at lower costs.

PLI Scheme for High-Efficiency Modules - A ₹24,000 crore Production-Linked Incentive (PLI) scheme to boost domestic manufacturing of the entire solar supply chain, from ingots and wafers to cells and modules.

International Solar Alliance (ISA) - A global initiative co-founded by India and France to mobilize $1 trillion in solar investments by 2030 and promote solar energy across its 122 signatory countries.

One Sun, One World, One Grid (OSOWOG) - A visionary project to create an interconnected global electricity grid to transmit solar power across borders, based on the principle that "the sun never sets."

Challenges Facing India's Solar Sector

Despite rapid growth, the sector faces several significant hurdles.

Weak Financial Health of DISCOMs - Debt-ridden state power distribution companies (DISCOMs) are often reluctant to support rooftop solar and have poor compliance with Renewable Purchase Obligations (RPOs).

Import Dependency - India heavily relies on imports, particularly from China, for critical components like solar cells and modules, creating supply chain vulnerabilities.

Grid Integration and Intermittency - India's existing grid infrastructure is not fully equipped to handle the variable and intermittent nature of renewable energy, leading to instability and energy wastage.

Growing Solar Waste Burden - India is projected to generate 340 kilotonnes of solar waste by 2030, but currently lacks a comprehensive policy for recycling and managing end-of-life solar panels.

The Way Forward

Addressing the existing challenges requires a multi-pronged strategy.

1. **Solar Waste Management** - Create a robust policy framework and market incentives for recycling solar panels to manage the growing waste stream sustainably.
2. **Grid Modernisation** - Invest in a smart, flexible grid and integrate energy storage solutions like Battery Energy Storage Systems (BESS) and Pumped Hydro Storage (PHS) to manage intermittency.
3. **Structural Power Sector Reforms** - Implement urgent reforms to improve the financial health and operational efficiency of DISCOMs, including strict RPO compliance and privatization where necessary.
4. **Boost Domestic R&D** - Increase investment in domestic research and development to reduce import dependency and foster innovation in solar technology.
5. **Skilling and Workforce Development** - Expand training programs, like the one at NISE, to create a skilled workforce capable of supporting the entire solar value chain.

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