

# Solar Waste Management

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## Context:

A report titled 'Enabling a Circular Economy in India's Solar Industry - Assessing the Solar Waste Quantum' shed light on India's escalating solar waste crisis. It was conducted by the Ministry of New and Renewable Energy (MNRE) in collaboration with experts from the Council on Energy, Environment and Water.

## Background:

Recycling solar waste to recover materials will reduce import dependency and enhance India's mineral security.

## Key highlights of the Report:

1. The current solar capacity of India, as of FY23, has generated about 100 kilotonnes (kt) of cumulative waste, which will increase to 340 kt by 2030. This volume will increase 32 times by 2050 resulting in about 19000 kt of cumulative waste. 77% of the cumulative waste generated by 2050 will be due to new capacities.
2. Around 67% of the projected waste by 2030 is expected to be produced by five states - Rajasthan, Gujarat, Karnataka, Tamil Nadu, and Andhra Pradesh. Rajasthan will account for 24% of the waste generated by 2030, followed by Gujarat accounting for 16%, and Karnataka accounting for 12%.
3. Discarded solar modules contain critical minerals essential for India's economic development and national security, including silicon, copper, tellurium, and cadmium. The projected 340 kt of waste by 2030 is estimated to comprise 10 kt of silicon, 12-18 tonnes of silver, and 16 tonnes of cadmium and tellurium.

## Recommendations made by the Report:

1. The Ministry of New and Renewable Energy (MNRE) should maintain and periodically update a database of the installed solar capacity (containing details such as module technology, manufacturer, commissioning date, etc.) for accurate mapping of plausible waste generation centres.
2. The Ministry of Environment, Forest and Climate Change should issue guidelines for collecting and storing solar waste. Furthermore, it should promote the safe and efficient processing of stored waste.
3. Solar cell and module producers should start developing waste collection and storage centres to adhere to the responsibilities assigned in the Electronic Waste Management Rules 2022.

## Challenges for recycling Solar Waste in India:

1. The absence of specific comprehensive laws governing solar waste management hinders the

establishment of standardised recycling practices and may contribute to inconsistent recycling efforts.

2. Solar panels contain various materials like silicon, glass, aluminium, and toxic elements like lead and cadmium. Separating these components for effective recycling requires specialised technology, which is often expensive and not widely available in India.
3. A large portion of solar waste ends up with informal recyclers who lack proper safety measures and often resort to environmentally harmful practices.
4. In India, the lack of adequate demand for materials such as silicon wafers or glass cullet from recycled panels undermines the economic feasibility of recycling efforts.

#### **Ways to manage Solar Waste in India:**

1. India can create a comprehensive regulatory framework to guide collection, recycling, and material-specific recovery targets for solar waste. The framework can also encourage incentives like green certificates to encourage recycling and mineral recovery. It should also include developing and implementing comprehensive policies to promote circular economy principles within the solar industry, encouraging resource efficiency, recycling, and reuse.
2. Integrating informal recyclers into the formal system through training programs and providing them with proper equipment. This ensures safe, environmentally sound practices and also provides them a secured employment.
3. By establishing dedicated refurbishment facilities, India can clean, repair, and retest slightly damaged panels, diverting them from the waste stream and providing affordable options for consumers.
4. Encouraging and incentivising green innovators to design and prototype new sustainable products using recycled solar materials, thereby fostering creativity and effective utilisation.

