



Solar Energy Waste Management

This editorial is based on [“Clean Energy Should use the Battery of A Circular Economy”](#) which was published in The Hindu on 17/03/2022. It talks about the scenario of solar energy waste management and the significance of the circular economy in this regard.

For Prelims: Council on Energy, Environment and Water (CEEW), International Renewable Energy Agency (IRENA), Net-Zero Target 2070, Renewable Energy Waste Management, Circular Economy, 2030 Agenda for Sustainable Development, Extended Producer Responsibility (EPR)

For Mains: Solar Energy - India's achievements, waste generation and management, Role of Circular Economy in handling renewable energy waste, Sustainable Development, Extended Producer Responsibility (EPR).

In the Budget speech, the Finance Minister of India emphasised the role of cleaner technologies such as **solar energy and batteries in India's future economic growth**.

A study by the [Council on Energy, Environment and Water \(CEEW\)](#) has estimated that **India would need over 5,630 GW of solar** and 1,792 GW of wind energy to **achieve its net-zero target in the year 2070**.

While India has set ambitious solar power installation targets, it **does not yet have a firm policy on managing waste that results from used solar panels** or from the manufacturing process.

A robust **renewables waste management and recycling ecosystem** could help people and India reduce environmental harm, provide energy security, and also create new jobs.

What are India's Achievements in Installed RE Capacity?

- India has completed its target of **achieving 40% of its installed electricity capacity from non-fossil energy sources** by 2030 in November 2021.
 - The country's installed **Renewable Energy (RE) capacity stands at 150.54 GW (solar: 48.55 GW, wind: 40.03 GW, Small hydro Power: 4.83, Bio-power: 10.62, Large Hydro: 46.51 GW)** as on 30th Nov. 2021 while its nuclear energy based installed electricity capacity stands at 6.78 GW.
- The **installed solar energy capacity has increased by over 15 times**, and has now **surpassed 50 GW of cumulative installed solar capacity** (as on 28th February 2022). Its annual RE addition has been exceeding that of coal based thermal power since 2017.
 - India added a record 10 Gigawatt (GW) of solar energy to its cumulative installed capacity in 2021. This has been the **highest 12-month capacity addition**, recording nearly a **200% year-on-year growth**.

What is the Waste Generation Scenario?

- According to the [International Renewable Energy Agency \(IRENA\)](#), the cumulative **waste generated by India's total installed solar capacity** could be as high as **325 kilotonnes by 2030**.
 - It has also estimated that the global value of recoverable materials from solar PV waste could **exceed USD15 billion**.
 - Currently, only the [European Union](#) has taken decisive steps in managing solar PV waste.
- IRENA estimated that the **global photovoltaic waste will touch 78 million tonnes by 2050**, with **India expected to be one of the top five** photovoltaic-waste creators.
- While **photovoltaics generate only about 3% of global electricity**, they **consume 40% of the world's tellurium**, 15% of the world's silver, a substantial chunk of semiconductor-grade quartz and lesser but still significant amounts of indium, zinc, tin and gallium.
- The **renewable energy recycling ecosystem**, beyond sustainability, could **offer quality employment opportunities** for the future generations as new jobs would be created across the entire value chain of waste management and recycling.
 - **Majority of India's recycling sector is informal** and workers have to work in unsafe environments without standardised wages.

What are the Concerns regarding Waste Management?

- In the absence of any regulation, **landfilling is the cheapest and most common practice** to manage renewable energy waste which is undoubtedly environmentally unsustainable.
- All clean energy technologies thrive on metals and non-metals with different levels of toxicity. If the waste equipment is dumped in the open, then these **elements could leach into the environment and enter the food chain**.
- Burning the polymeric encapsulant layer in solar photovoltaic modules **releases toxic gases such as sulphur dioxide** and some volatile organic compounds.
- **Access to finance is a major roadblock** for players in the recycling ecosystem. There has to be a creation of innovative financing routes for waste management.
- Substandard components generate **considerable waste due to early life damage** that is often irreplaceable and the components often have to be discarded.
- India currently **considers solar waste a part of electronic waste** and does not account for it separately. Moreover, there is **no commercial raw material recovery facility** for solar e-waste operational in India.

What is a Circular Economy?

- It is an economy where products are designed for durability, reuse and recyclability and thus almost everything gets **reused, remanufactured, and recycled into a raw material** or used as a source of energy.
 - It includes **3 R's (Reduce, Reuse and Recycle), Refurbishment, Recover, and Repairing** of materials.
- [Circular Economy](#) can lead to the emergence of more sustainable production and consumption patterns, thus providing opportunities for developed and developing countries to achieve economic growth and inclusive and sustainable industrial development (ISID) in line with the [2030 Agenda for Sustainable Development](#).

Can Circular Economy be a Prudent Way Forward in this Regard?

- **Revising Existing e-Waste Management Rules:** These rules are based on [Extended Producer Responsibility \(EPR\)](#) that identifies component producers as responsible entities to manage their waste products.
 - The Indian renewable energy industry has a complex structure that comprises various manufacturers, assemblers, importers and distributors.
 - The revised regulations should clearly **define the responsibilities of various stakeholders** involved in the renewable energy value chain and **provide annual targets for the collection and the recycling of waste**.

- **R&D Investments:** The renewable energy industry should invest in the research and development of recycling technologies.
 - Recycling is a multistep process that includes dismantling (mainly a manual process), disassembly (done mechanically, thermally or chemically) and extraction.
 - Besides these traditional methods, investments in R&D could help **discover new ways of recycling that result in higher efficiency and a less environmentally damaging footprint.**
 - **Industries should also explore technology transfers** with global recycling firms for establishing domestic waste recycling facilities.
- **Innovative Routes for Waste Management:** The central government should nudge public and private sector banks to **charge lower interest rates on loans** disbursed for setting up **renewable energy waste recycling facilities.**
 - Assurance of a minimum waste quantum to run these facilities and **issuing performance-based green certificates** to recyclers **that could be traded to raise money for waste management** would also help ease the financial burden.
 - A **market for recycled materials** could also be created through mandatory procurement by the renewable energy and other relevant manufacturing industries.
- **Handling Toxic Waste: Dumping and burning** of different components should be **banned** and there needs to be an **improvement in product design and quality.**
 - Renewable energy component manufacturers should **find substitutes for toxic metals such as cadmium and lead** used in their products and **simplify product designs to reduce recycling steps.**
 - Such improvements in process efficiencies could go a long way in curbing waste creation at the source and its subsequent impact on the environment.
 - To **prevent premature end-of-life of components** and consequent waste creation, the Union and State governments should **set stringent quality control standards** for components used in their tenders.

Drishti Mains Question:

“The call for a creation of a circular economy is significant since an efficient waste management ecosystem would be necessary to manage the enormous waste generated by renewable energy projects in the coming decades”. Discuss.

Previous Year Questions:

Q. Consider the following statements: (2016)

1. The International Solar Alliance was launched at the United Nations Climate Change Conference in 2015.
2. The Alliance includes all the member countries of the United Nations.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (a)

Q. With reference to solar power production in India, consider the following statements: (2018)

1. India is the third largest in the world in the manufacture of silicon wafers used in photovoltaic units.

2. The solar power tariffs are determined by the Solar Energy Corporation of India.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (d)

Q. 'Net metering' is sometimes seen in the news in the context of promoting the (2016)

- (a) Production and use of solar energy by the households/consumers
- (b) Use of piped natural gas in the kitchens of households
- (c) Installation of CNG kits in motor cars
- (d) Installation of water metres in urban households

Ans: (a)

Q. The term 'Domestic Content Requirement' is sometimes seen in the news with reference to (2017)

- (a) Developing solar power production in our country
- (b) Granting licences to foreign T.V. channels in our country
- (c) Exporting our food products to other countries
- (d) Permitting foreign educational institutions to set up their campuses in our country

Ans: (a)