Solar E-Waste

According to a recent study conducted by an energy consultancy firm Bridge To India (BTI) Ltd., I**ndia's PV (photovoltaic) waste volume is estimated to grow to 2,00,000 tonnes by 2030 and around 1.8 million tonnes by 2050.**

Highlights

PV module

- A PV module is essentially made up of glass, metal, silicon and polymer fractions.
- Glass and aluminium, together constituting around 80% of total weight, are non-hazardous.
- But a few other **materials used including polymers,** metals, metallic compounds and alloys are **classified as potentially hazardous.**
- For instance, Leaching of lead has **huge environmental impact** including loss in biodiversity, decreased growth and reproductive rates in plants and animals, and several other **health hazards** like adverse impact on kidney function, nervous, immune, reproductive and cardiovascular systems.

PV Waste Recycling

- PV waste recycling is still **at a nascent stage globally,** both in terms of technical standards and physical infrastructure. The waste is usually sent to laminated glass and metal recyclers that recover 70-80% of the material by weight.
- PV module recycling is still **not commercially viable** as total estimated cost including transportation can vary between USD 400-600/ tonne, far exceeding value of the recovered material.

Status in India

- India is among the leading markets for solar cells in the world, buoyed by the government's commitment to install 100 GW of solar power by 2022. So far, India has installed solar cells for about 28 GW and this has been done largely from imported solar PV cells.
- **India is poorly positioned to handle PV waste** as it doesn't yet have a policy guideline on the same.
- Most of the central bidding documents rest the responsibility of handling and disposing PV waste on the developers as per the E-waste (Management and Handling) Rules, 2011. However, the **E-waste rules make no mention of solar PV waste.**
- Unavailability of even basic recycling facilities for laminated glass and e-wastes.
- Despite the e-waste regulation being in place for over seven years, only less than 4% of estimated e-waste is recycled in the organised sector.

Regulations for PV recycling in other countries

- **The European union (EU) has a Waste Electrical and Electronic Equipment (WEEE) directive,** based on the Extended Producer Responsibility (EPR) concept that mandates all member states to implement a regulation for setting up tracking, collection and waste treatment

mechanisms. It also has an **eco-design directive** for reducing environmental impact of energy-related products throughout their lifecycle.
- There are **no federal regulations** for module waste management **in the US** but regulatory initiatives have been undertaken at the state-level to manage it.
- **Voluntary guidelines** to ensure proper recycling of solar PV modules have been issued **by the Japan Photovoltaic Energy Association** (JPEA).
- **China's 13th five-year plan (2016-2020)** states that the principle of EPR will be imposed on waste treatment in general but a regulatory framework specific to module waste is yet to be adopted.

Suggestions For India

- Mandating **module manufacturers to use environmentally sustainable design and materials** with end-of-life in mind (similar to the eco-design initiative of the EU).
- Specifying liability and responsibility of each stakeholder for waste management and treatment.
- Laying down **standards for PV waste collection, treatment and disposal.**
- Encouraging mutual recycling responsibility agreements between module suppliers, project developers and power purchasers.
- Undertaking regular surveys of recycling facilities to understand technology and capacity levels.
- **Identifying investment and technical requirements for dedicated PV recycling facilities with focus on high-value recovery.**