Transforming E-Waste Management in India

This editorial is based on the article "The Missing Link in India's Battery Waste Management," published on 05/08/2025 in The Hindu. It addresses India's rising e-waste crisis and highlights the challenges of managing e-waste in India while stressing the need for stronger regulations and efficient recycling practices.

For Prelims: Electronic waste (e-waste), Extended Producer Responsibility (EPR), Conventions Related to E-waste Management, **Lithium**

For Mains: E-waste Management in India: Challenges & Way Forward

India's rapid digital transformation, driven by increased reliance on electronic devices, is propelling its journey toward **Viksit Bharat**. However, this growth has a by-product—**electronic waste (e-waste)**. As one of the **world's top e-waste generators, alongside China, the US, Japan, and Germany**, India faces a significant challenge in managing the rising volume of e-waste. The growing demand for **lithium batteries**, spurred by **EV adoption** and **renewable energy** storage, is **further contributing to the crisis**, with lithium batteries alone accounting for 700,000 of the **1.6 million metric tonnes of e-waste generated in 2022**.

What is the Status of E-waste in India?

- **Current Scenario: India has emerged as the world's third-largest generator of e-waste after China and the USA, with 3.8 MMT (million metric tonnes) produced in FY24.**
  - India's **e-waste volumes soared by 151.03% in six years (2017-24)**.
    - The 65 cities generate more than 60% of the total generated e-waste, whereas**10 states generate 70% of the total e-waste**.
  - The **sharpest rise in e-waste generation occurred between 2019-20 and 2020-21** , driven by increased electronic consumption for work-from-home and remote learning during the **Covid-19 pandemic**.

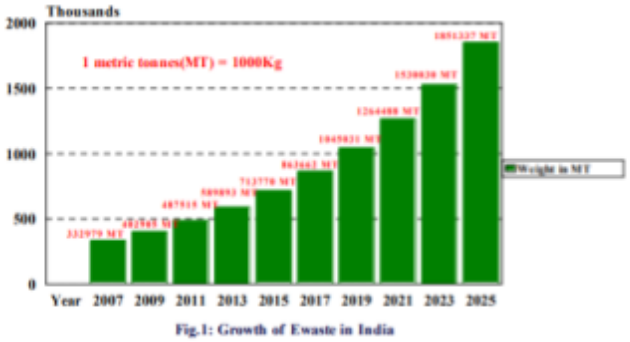

Fig.1: Growth of Ewaste in India

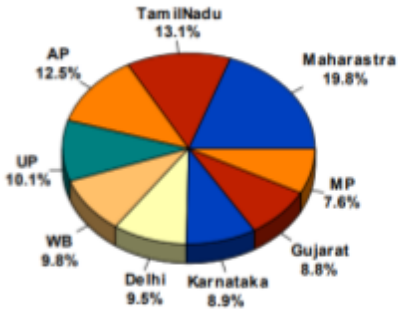

Fig 2 State wise E-waste Generation in India (Tonnes/year)

- **E-Waste (Management) Rules:**
  - E-Waste (Management) Rules 2022:
    - **Extended Producer Responsibility (EPR):** Producers are mandated to achieve annual recycling targets via registered recyclers.
    - **Expanded Product Coverage:** Inclusion of 106 Electrical and Electronic Equipment (EEE) items from FY 2023-24 (up from 21 items).
    - **Integration of Bulk Consumers:** Public institutions and offices must dispose of e-waste via registered recyclers/refurbishers.
  - **E-Waste (Management) Second Amendment Rules, 2023:** Under Rule 5 of E-Waste (Management) Rules, 2022, a new clause was added to ensure safe, accountable, and sustainable refrigerant management in refrigeration and air-conditioning manufacturing.
  - **E-Waste (Management) Amendment Rules, 2024: The Central Government may establish platforms for trading EPR certificates as per guidelines issued by the** Central Pollution Control Board **with its approval.**
    - The CPCB has set the **price range for EPR certificates at 100% (maximum) and 30% (minimum)** of the environmental compensation for non-compliance.

What Are the Major Challenges Hindering Effective E-Waste Management in India?

- **Weak Enforcement Mechanisms:** The enforcement of recycling regulations is currently insufficient in India. There is a **lack of robust audit systems, tracking of EPR certificates**, and penalties for non-compliance or fraud.
  - While the E-Waste (Management) Rules, 2022, encourage recycling, they give **only limited attention to repair as a preventive strategy**.
  - This weak enforcement allows illegal recycling activities to proliferate, complicating efforts to control e-waste.
    - For instance, in 2023, a significant audit by the CPCB revealed that over**600,000 fake plastic recycling certificates were issued by companies** in Gujarat, Maharashtra, and Karnataka.
- **Inadequate EPR Floor Price & Market Distortions:** The EPR system, which compels producers to fund battery collection and recycling, relies on an EPR floor price. However, the current price is too low to sustain proper recycling operations.
  - This **insufficient pricing makes it economically unviable for legitimate recyclers** to meet the demands for battery recycling, resulting in a reliance on informal and often harmful practices.
  - These actors **often issue false recycling certificates or illegally dump hazardous waste**.
    - Such practices distort the market, **undermine the integrity of recycling systems**, and ultimately threaten India's circular economy goals.
- **Resistance to Compliance by Large Manufacturers:** Many large electronics and battery manufacturers, especially those operating in developing countries, resist complying with recycling regulations.
  - In April 2025, **major multinational companies like Daikin, Hitachi, and Samsung filed lawsuits** against the Indian government, opposing a new e-waste policy that mandates a minimum price for recyclers handling electronic appliances.

        - This **resistance leads to a significant gap in compliance** , further hindering the establishment of a sustainable battery recycling ecosystem.
- **Unaccounted Financial Costs:** It is estimated that improper battery recycling could cost India over USD 1 billion in **foreign exchange losses by 2030**. These financial repercussions, alongside the environmental costs, pose a serious risk to India's economic stability if corrective actions are not taken promptly.
    - The inefficiency in e-waste recycling leads to significant resource loss, as **valuable materials like lithium, cobalt, nickel, copper, gold, and silver are not effectively recovered**.
    - Improper processing methods prevent the efficient recovery of these materials, and while formal recycling processes could help recover them, they **are often costly and not widely implemented**, leaving valuable resources untapped.
- **Illegal E-Waste Imports: India faces significant challenges in managing e-waste imports, both legal and illegal. Many developed countries export their e-waste to India. The illegal trade of e-waste adds to the already overwhelming challenge of managing domestic waste.**
    - Between 2019 and 2022, the **Indian government identified 29 instances of illegal e-waste imports** across various states, including Tamil Nadu, Maharashtra, Gujarat, West Bengal, and Uttar Pradesh.
- **Infrastructure Gaps and Regional Disparities: India faces a severe lack of proper infrastructure to manage e-waste. This includes insufficient recycling facilities, a lack of technical expertise, and a dearth of safe disposal practices.**
    - As a result, a large portion of e-waste is either dumped in landfills or burned in open spaces, exacerbating air, soil, and water pollution.
    - While some states like Telangana have made progress in e-waste processing, others, such as Chandigarh, face challenges due to the lack of accessible, formal recycling facilities.
        - **This uneven distribution hampers effective nationwide e-waste management**.
- **Limited Awareness Among Consumers:** There is a general lack of awareness among consumers about the proper disposal of e-waste. Most people continue to dispose of electronic waste through informal channels, which often involve unsafe practices.
    - A **study conducted in Delhi in 2021** revealed that 70% of electronic repair workers and 79% of scrap dealers were **unaware of e-waste**.
        - Additionally, only 17% of electronic repair workers and 13% of scrap dealers were aware of government legislation on e-waste.
- **Lack of Clear Roles for Stakeholders: The roles and responsibilities of stakeholders involved in e-waste management, including producers, recyclers, and consumers, are not well-defined.**
    - For instance, producers lack clarity under the EPR framework, recyclers operate informally without oversight, and consumers remain unaware of proper disposal methods, hindering effective e-waste management, further increasing environmental and health risks.
        - This lack of clarity **hinders the development of a cohesive and effective e-waste management system**.

How Can India Transform E-Waste Management for Greater Sustainability and Efficiency?

- **Transforming the Informal Sector for Sustainable E-Waste Recycling: The informal sector handles a significant portion of e-waste in India, often using unsafe methods that pose serious environmental and health risks.**
    - To address this, efforts should focus on transforming the informal sector by providing training, enhancing infrastructure, and supporting formal certification.
        - For instance, **rag pickers can be effectively integrated into e-waste management systems**, transforming them from informal waste collectors into **"e-waste heroes"** by formalizing their role, providing training, and recognizing them as key contributors to a sustainable recycling process.
        - **Incentivizing participation in recycling programs**, such as offering tax rebates or financial subsidies to producers and consumers, can further encourage this

transformation.
    - **Simplifying the collection and return processes for electronic devices** would make it easier for both informal and formal sectors to engage in sustainable recycling practices.
- **Strengthening E-Waste Recycling through EPR Pricing and Enforcement:** A fair EPR floor price ensures recyclers are properly compensated for their infrastructure, technology, and labor investments. This will **make recycling economically viable** and prevent informal, fraudulent recycling practices.
    - Effective enforcement requires robust audit systems, **digitization of EPR certificate tracking**, and strict penalties for non-compliance or fraud.
        - This would help curb illegal recycling and ensure adherence to proper disposal practices.
    - India **can adopt and refine a similar EPR model to South Korea's** , where around 70% of e-waste is collected by producers.
- **Stronger Enforcement of E-Waste Rules:** The enforcement of E-Waste (Management) Rules needs to be strengthened. This includes better monitoring and penalizing companies or individuals involved in illegal dumping or improper recycling of e-waste.
    - Effective implementation of regulations is necessary to ensure compliance with set standards.
        - **Local authorities should be more actively involved** in enforcing e-waste management rules, especially in urban and industrial areas where e-waste generation is high. **They can collaborate with the MoEFCC and CPCB** for better ground-level monitoring and reporting.
- **Promoting Consumer Awareness for Proper E-Waste Disposal:** Awareness among consumers about the proper disposal of e-waste is crucial. The government and **NGOs must run extensive awareness campaigns** to educate people on the dangers of improper disposal and the importance of recycling.
    - The potential to engage **Resident Welfare Associations (RWAs) and Self-Help Groups (SHGs)** to promote awareness and guide people toward responsible e-waste disposal would play a crucial role in improving community participation.
        - Additionally, educating consumers about existing disposal systems, such as **collection points and safe recycling practices**, will encourage them to adopt sustainable behavior.
- **Reducing Environmental Impact by Promoting Safer Materials in Electronics:** The reduction of hazardous substances such as lead, mercury, and cadmium in electronic products would reduce the environmental impact of e-waste.
    - This can be achieved by encouraging manufacturers to adopt **design-for-environment (DfE) principles**, which promote the use of safer materials.
        - Encouraging manufacturers to use lead-free solders in electronic components to avoid lead contamination. **Tin-silver-copper (SAC) alloys** and other non-toxic alternatives can be used in place of traditional lead-based solders.
- **Advancing E-Waste Management:** Promoting systems that allow the recovery of valuable materials from spent batteries would reduce India’s dependence on imports.
    - This approach supports the creation of a **circular economy**, where materials are recycled and reused, contributing to long-term sustainability.
        - Additionally, **aligning with Mission LiFE (Lifestyle for Environment), introduced in COP 26**, these steps will encourage sustainable consumption patterns and environmentally responsible recycling practices
    - India has launched its **Right to Repair portal,** but it provides only basic information such as customer care details and service centers. It **does not address the Right to Repair in the way it is truly intended**, as seen in the EU.
        - **India’s portal must learn from the EU’s approach** , particularly in areas such as mandating manufacturers to offer spare parts and tools at reasonable prices and preventing the use of software or hardware techniques that hinder repairs.
    - **More investment in research and development (R&D)** is needed to improve battery recycling processes, increase efficiency, and recover valuable materials while minimizing environmental risks.
- **Establishing a National E-Waste Collection Target**: Setting a national e-waste collection target, similar to the **European Union's per capita goal**, would help India significantly increase its recycling rates.

- This initiative would involve establishing clear collection and recycling targets for manufacturers and other stakeholders, **ensuring that e-waste is properly managed and processed**.
    - By implementing such a target**, India can promote responsible disposal practices**, enhance recycling infrastructure, and contribute to a more sustainable e-waste management system.

- **Expanding Infrastructure for Greater Accessibility and Efficiency:** Expanding formal e-waste recycling facilities across India is essential.
    - Establishing more collection centers and modernizing existing ones will ensure better processing of e-waste.
        - The **Delhi government's initiative to develop India's first integrated e-waste recycling eco-park** exemplifies a dedicated space for sustainable e-waste management.
        - **E-Waste Bank** can serve as a successful model for e-waste management, as seen globally with collection points for old electronics. Also, **Bhopal's e-waste clinic has proven effective in streamlining the recycling process** , and more such units can be established across India to make e-waste recycling more accessible and efficient.

Conclusion

Addressing India's e-waste crisis offers a significant opportunity to foster sustainable development and economic growth. By enhancing the regulatory framework, strengthening enforcement mechanisms, and promoting innovation in recycling technologies, India can effectively mitigate environmental and health risks while simultaneously creating economic value. This strategy **aligns with SDG 12 (Responsible Consumption and Production)**, transforming e-waste into a driver of green growth and contributing to the establishment of a truly circular economy.

Drishti Mains Question

Q. Examine the challenges faced by India in managing its growing e-waste crisis. What steps can be taken to improve e-waste recycling and promote a circular economy in the country?

UPSC Civil Services Examination, Previous Year Questions

Prelims

Q. Due to improper/indiscriminate disposal of old and used computers or their parts, which of the following are released into the environment as e-waste? (2013)

1. Beryllium
2. Cadmium
3. Chromium
4. Heptachlor
5. Mercury
6. Lead
7. Plutonium

Select the correct answer using the codes given below:

(a) 1, 3, 4, 6 and 7 only
(b) 1, 2, 3, 5 and 6 only
(c) 2, 4, 5 and 7 only
(d) 1, 2, 3, 4, 5, 6 and 7

Ans: (b)

Mains

Q. What are the impediments in disposing of the huge quantities of discarded solid waste which are continuously being generated? How do we safely remove the toxic wastes that have been accumulating in our habitable environment? (2018)