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Waste as Wealth — India's Circular Economy Opportunity and the Policy Gaps Holding It Back

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INTERVIEW ANGLE

"NITI Aayog's circular economy reports reveal that India loses Rs 21,000+ crore annually from unrecovered e-waste alone, while ELVs will double to 50 million by 2030. What are the structural barriers preventing India from capturing its circular economy potential, and what policy interventions would work best?"

WHY IN NEWS

NITI Aayog released three reports at the International Material Recycling Conference (IMRC) in Jaipur quantifying India's e-waste (6.19 MMT growing to 14 MMT by 2030), waste tyre (1.5-2 million tonnes/year), and End-of-Life Vehicle (23 million growing to 50 million by 2030) challenges — with India recovering only 18% of its e-waste's economic value of Rs 51,000 crore annually.

THE PARADOX OF VALUABLE WASTE

India has a paradox at the heart of its waste challenge: the materials it discards as waste are, in many cases, more valuable per kilogram than the virgin resources it expensively imports from abroad.

E-waste contains 2 kilograms of gold per tonne of circuit boards — 400 times more gold per unit weight than gold ore

Spent lithium-ion batteries contain cobalt and lithium that India currently imports at 90%+ and 100% import dependence respectively

End-of-life vehicles contain premium scrap steel that India partly imports while also producing domestically

The NITI Aayog reports released at the International Material Recycling Conference (IMRC) in Jaipur on January 29, 2026 quantify the scale of this paradox. India is, in effect, mining its waste for a fraction of its value while simultaneously spending foreign exchange to import virgin equivalents of the same materials.

THREE WASTE STREAMS — THREE POLICY CHALLENGES

E-Waste: The Fastest-Growing Challenge

India's e-waste trajectory — 6.19 MMT today, projected to reach 14 MMT by 2030 — reflects its position as one of the world's fastest-growing digital economies. With 101.7 crore broadband users and smartphone penetration still expanding rapidly into rural India, the volumes will only accelerate.

The governance gap: India enacted the **E-Waste Management Rules** (originally 2011, significantly updated in 2016 and 2022) and created an **Extended Producer Responsibility (EPR)** system under which manufacturers and importers must collect and recycle a proportion of the electronics they sell. On paper, this is sophisticated regulation. In practice, ~80% of India's e-waste is processed by the informal sector — ragpickers, small processors in industrial areas like Moradabad (UP), Uluberia (West Bengal), and parts of Delhi — who use acid baths and open burning to extract metals, exposing themselves and surrounding communities to toxic heavy metals and carcinogenic fumes.

Why EPR alone is insufficient: EPR targets create an incentive for registered recyclers to collect e-waste — but the informal sector undercuts them on price (lower overhead; no safety or environmental compliance costs) and offers collection and pick-up services that formal players cannot match at the last mile. The EPR certificate trading system creates a paper market where compliance can be achieved without actual recycling.

What would work: A tiered system that integrates informal collectors into formal supply chains — paying kabadiwala networks collection fees, requiring them to channel waste to registered processors, and providing skilling and PPE — rather than trying to displace them. Delhi's experience with SWM (Solid Waste Management) contractor integration of informal sector workers provides a partial template.

End-of-Life Vehicles: The Scrappage Infrastructure Gap

The **Vehicle Scrappage Policy (2021)** is well-designed. Mandatory fitness tests for vehicles over 15 years (commercial) and 20 years (private), enforced through **Registered Vehicle Scrapping Facilities (RVSFs)**, are the right approach. The problem is implementation:

- India had only **61 RVSFs operational** as of early 2026, handling 1.5–2 lakh vehicles per year
- By 2030, with 50 million ELVs, India will need capacity to process **8–10 million vehicles per year** — a 40–50x scale-up
- RVSFs require significant capital investment (land, crushing equipment, de-pollution facilities) and face regulatory complexity (intersection of environment, motor vehicles, metals regulation)

The political economy is also challenging: vehicle owners resist mandatory scrapping, particularly in rural areas where 20-year-old tractors and trucks remain economically valuable to small farmers and transport operators. Enforcement is uneven.

The steel connection: Every scrapped vehicle yields 60–70% of its weight in steel scrap. With India's steelmaking sector projected to consume 300+ million tonnes of steel annually by 2030, and scrap steel as a more energy-efficient input than virgin iron ore in electric arc furnaces, the ELV stream is a strategic input to India's decarbonisation of steelmaking.

Waste Tyres: The Missing Framework

Of the three waste streams, waste tyres have the weakest policy architecture. Unlike e-waste (E-Waste Management Rules 2022) or vehicles (Vehicle Scrappage Policy 2021), **India has no dedicated EPR framework for waste tyres**. This is a gap NITI Aayog explicitly flags in its 2026 report.

With 1.5–2 million tonnes of waste tyres generated annually (and India as the world's 3rd largest tyre market), the consequences are:

> **Illegal burning** remains widespread — releasing dioxins, furans, and benzene (Group 1 carcinogens under IARC classification)
>
> **Mosquito breeding:** Tyres accumulate water and are major breeding grounds for dengue-carrying Aedes aegypti mosquitoes — a public health nexus between waste management and vector-borne disease
>
> **Missed opportunity:** Crumb rubber (from processed waste tyres) can substitute for virgin rubber in road construction, sports surfaces, and industrial products — reducing India's rubber import bill

THE INFORMAL SECTOR — BACKBONE AND OBSTACLE

Any honest analysis of India's circular economy must grapple with the informal recycling sector. India's estimated **1.5–2 million ragpickers and informal waste workers** are, paradoxically, both the backbone of India's current recycling economy (handling 70–80% of recyclables) and the biggest obstacle to safe, formal recycling.

The political economy of formalisation: Informal recyclers are predominantly from marginalised communities (Dalits, tribal communities, migrants). Their work is invisible in GDP statistics, unprotected by labour laws, and excluded from social security. Formalisation — bringing them under EPR systems, giving them identity and training, integrating them into formal supply chains — requires simultaneously addressing caste and class discrimination.

Movements like the **National Alliance of Waste Pickers (NAAWP)** and successful models in cities like Pune (SWaCH cooperative — self-employed women waste-pickers) demonstrate that integration is possible without displacement. Pune's SWaCH model has been recognised by the UN as a best practice.

THE CRITICAL MINERAL SECURITY DIMENSION

The most compelling argument for accelerating India's circular economy transition is not environmental but strategic. India imports:

Cobalt: >90% (from Democratic Republic of Congo via Chinese processing chains)

Lithium: ~100% (from Chile, Australia, Argentina)

Rare Earth Elements: 60%+ from China

India's **National Critical Mineral Mission (2025)** identifies domestic recycling as one of its supply security pillars. With India's EV ambition requiring millions of battery packs annually, and with China controlling 75% of global lithium-ion battery recycling, India's circular economy is inseparable from its national security calculations.

UPSC RELEVANCE

NITI Aayog IMRC Jaipur reports (Jan 29, 2026); E-waste: 6.19 MMT → 14 MMT by 2030; ₹51,000 crore value; 18% recovered; E-Waste Management Rules 2022 (Environment Protection Act, 1986); EPR (Extended Producer Responsibility); Vehicle Scrappage Policy 2021 (20 yr private; 15 yr commercial); RVSFs; waste tyres 1.5-2 mn tonnes/year; National Critical Mineral Mission 2025 (30 minerals); SWaCH Pune (women waste-pickers cooperative); NAAWP; Plastic Waste Management Rules 2021.

Circular economy principles and India's opportunity — quantifying the waste-as-wealth paradox; EPR framework — design vs implementation gap; informal recycling sector — economic contribution, environmental harm, formalisation challenges; Vehicle Scrappage Policy 2021 — infrastructure deficit and scale challenge; critical mineral security through urban mining; lithium-ion battery waste and India's EV transition; waste tyres and public health (dengue). **GS-2:** *Centre-State coordination in waste management; WPA Schedule I issues tangential to e-waste policy via hazardous substances.*

📌 FACTS CORNER — KNOWLEDGEPEDIA

CIRCULAR ECONOMY — INDIA DATA (NITI AAYOG 2026 REPORTS):

E-waste: **6.19 MMT** (2025) → **14 MMT** (2030)

E-waste economic value: ₹**51,000 crore/year**; only **18%** recovered; **60%** technically extractable

India's global rank in e-waste: **3rd** (after China, USA)

Waste tyres annually: **1.5–2 million tonnes**; India = **3rd** largest tyre producer + consumer

ELVs: **23 million** (2025) → **50 million** (2030)

KEY POLICY FRAMEWORKS:

E-Waste Management Rules, 2022: EPR-based; under Environment Protection Act, 1986; Ministry: MoEFCC

Vehicle Scrappage Policy, 2021: Private >20 years; Commercial >15 years; RVSFs

Plastic Waste Management Rules, 2021: EPR for plastic packaging; SUP ban

No tyre EPR framework yet — NITI Aayog 2026 recommends creating one

URBAN MINING:

E-waste circuit boards: **2 kg gold/tonne** vs gold ore: **5 g/tonne** (400x richer)

Informal sector handles ~**80%** of India's e-waste

Workers: ~**1.5–2 million** informal ragpickers/recyclers

CRITICAL MINERALS + CIRCULAR ECONOMY:

Cobalt import dependence: **>90%**

Lithium import dependence: **~100%**

REE dependence on China: **60%+**

China's global Li-ion battery recycling share: **75%**

National Critical Mineral Mission: **2025**; 30 minerals; domestic recycling = one pillar

GOOD PRACTICE MODELS:

SWaCH Pune: Self-employed women waste-pickers cooperative; UN-recognised; handles 800+ tonnes/day

NAAWP: National Alliance of Waste Pickers; advocates for informal sector rights

OTHER RELEVANT FACTS:

EPR certificate trading: Via CPCB portal — analogous to carbon credits

RVSFs operational (early 2026): **61** facilities; target: **300+** by 2027

SWM Rules 2016: Solid Waste Management Rules — governs bulk waste generators

IARC Group 1 carcinogens released by tyre burning: Dioxins, furans, benzene

Dengue nexus: Waste tyres = breeding ground for Aedes aegypti mosquitoes (dengue vector)

Steel from ELVs: 60-70% of vehicle weight; electric arc furnace prefers scrap steel over virgin iron ore for lower energy and emissions

Sources: NITI Aayog, The Hindu, MoEFCC, InsightsIAS

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