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13th May 2025



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13th May 2025

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India's rising e-waste, the need to recast its management

Why in News?

- Rising e-waste in India

Syllabus

- GS Paper 2 – Governance & Social Justice
- GS Paper 3 – Environment & Ecology

India's rising e-waste, the need to recast its management

India's journey toward Viksit Bharat is being powered by a rapid digital transformation, with an increasing reliance on electronic devices. From smartphones and laptops to advanced industrial and medical equipment, technology has become the backbone of economic growth, connectivity and innovation. However, this growing dependence on electronic devices has a by-product – electronic waste (e-waste) – which must be managed effectively to ensure sustainable progress. Ranking among the world's top e-waste generators (China, the United States, Japan, and Germany) India confronts a formidable challenge of managing e-waste. India's e-waste volumes soared by 151.03% in six years, from 7,08,445 metric tonnes in 2017-18 to 17,78,400 metric tonnes in 2023-24, with an annual increase of 1,69,283 metric tonnes.

Extended Producer Responsibility (EPR) mandates producers, importers and brand owners to manage waste from their products' end-of-life. It holds them accountable for environmental impacts throughout the product lifecycle, promotes sustainable design, integrates environmental costs into pricing, and supports efficient waste management, reducing the burden on municipalities.

Impact of improper e-waste management

The consequences of improper e-waste management extend beyond environmental degradation. India loses more than \$10 billion annually due to water pollution from the disposal of cyanide and sulphuric acid solutions, air pollution caused by lead fumes, open coal burning, and plastic incineration, and soil pollution. Beyond the environmental impact, improper e-waste recycling causes a social loss of over \$20 billion annually, as most of the hazardous processing is conducted by informal, illegal recyclers (women and children comprise the majority workforce). Tragically, their average lifespan is less than 27 years due to prolonged exposure to toxic substances. Additionally, India forfeits over ₹80,000 crore annually in lost critical metal value due to rudimentary



Dhanendra Kumar

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A focus on floor price will help transform e-waste recycling and its management in India

extraction methods in informal recycling. In addition, at least \$20 billion in annual tax revenue is lost as informal recycling is largely cash-based and unaccounted for.

Importance of stable pricing

The E-waste (Management) Rules, 2022 introduced a floor price for EPR certificates, a game-changer for India's e-waste management. This provision ensures fair returns for registered recyclers, curbing informal, hazardous recycling (practices that dominate 95% of the sector). Without a strong floor price, India may miss the chance to lead in sustainable waste management. Stable pricing incentivises formal recyclers to adopt safe, advanced technologies, unlocking e-waste's valuable materials such as gold and copper. It prevents chaos seen in sectors such as plastic waste and drives investment in infrastructure, turning e-waste into a resource and supporting a circular economy.

This economic pivot carries profound environmental benefits. Fair compensation motivates recyclers to prioritise material recovery over disposal, shrinking landfill burdens and halting the seepage of toxins such as lead and mercury into soil and waterways. It recasts e-waste as an asset rather than as a liability, redefining India's waste narrative toward sustainability. Globally, EPR fees paid by original equipment manufacturers are significantly higher than the floor EPR prices fixed by the Government of India, in alignment with global best practices. The minor impact of floor EPR prices on product costs is outweighed by the significant environmental and social benefits of formal recycling and sustainable practices.

An effective floor price levels the playing field by offsetting the informal sector's cost advantage. It makes formal recycling viable, reduces waste leakage, and ensures more responsible processing. This not only corrects market imbalances but also drives compliance, helping producers meet EPR targets through certified recyclers. When recyclers are adequately paid, they can expand operations, deliver verifiable

outcomes, and reduce producers' incentives to bypass obligations. In a country where only 10% of e-waste reaches formal recycling, this stability is a game-changer. Without it, certificate prices could collapse, starving recyclers of funds and exposing producers to unpredictable costs, destabilising EPR markets. A predictable pricing framework fosters trust, ensuring the system doesn't erode into a free-for-all.

Critics argue that a floor price hikes producer costs, potentially raising consumer prices. This concern, while valid, misses the broader calculus. The cost of inaction – environmental ruin, health crises and lost resources – dwarfs the modest burden of fair pricing. Producers can offset expenses by innovating durable, recyclable designs, which is a core EPR goal. The plastic industry's misstep with low prices, which spawned sham recyclers and eroded trust, underscores the peril of under-pricing. Far from stifling progress, a floor price could surge innovation, rewarding efficiency and technological breakthroughs. India's e-waste crisis demands audacious solutions, aligning with economic and ecological imperatives.

Need for a recycling vision

The stakes of EPR floor pricing transcend financial concerns. Inadequate pricing imperils more than profits. It endangers rivers with pollution, soils and agriculture produce with harmful ingredients, damages communities with toxic exposure, and squanders valuable potential. By valuing recycling efforts, India can formalise its e-waste sector, spur advanced infrastructure, and champion resource efficiency, ensuring responsible practices.

As India vies for sustainability leadership, this floor price is the bedrock of its recycling vision – a bold move to transform e-waste into opportunity, setting a global standard. The numbers demand action: a 73% e-waste surge in five years is a clarion call. With an adequate floor price, economic vitality and environmental care can coexist, securing the future with sustainability.





Key Takeaways from the Article

• Magnitude of the E-waste Problem:

- ♦ India is among the **top global ewaste generators** (after China, USA, Japan, Germany).
- ♦ E-waste in India increased by **151.03%** in 6 years:
- ♦ From **7,08,445 metric tonnes (2017-18)**
- ♦ To **17,78,400 metric tonnes (2023-24)**
- ♦ Annual rise: **1,69,283 metric tonnes**

• Consequences of Improper E-waste Management:

♦ Environmental Losses:

- ♦ \$10 billion annually due to pollution (water, air, soil).
- ♦ Improper disposal of cyanide, sulphuric acid, lead, plastic incineration.

♦ Social Losses:

- ♦ Over **\$20 billion annually** due to unregulated, unsafe processing.
- ♦ Dominated by **informal sector**, including women and children with **lifespan under 27 years**.

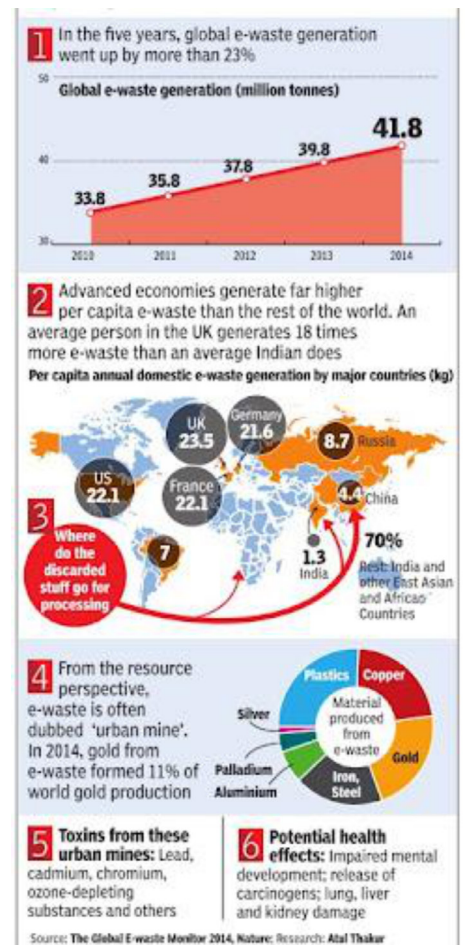
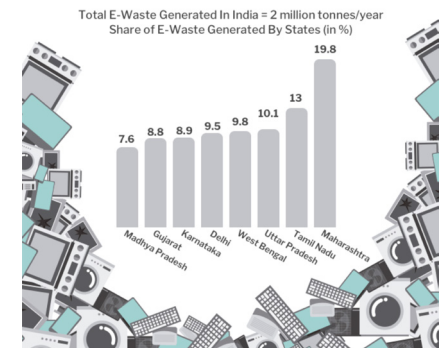
♦ Economic Losses:

- ♦ ₹80,000 crore/year loss due to inefficient metal recovery (gold, copper).
- ♦ \$20 billion/year lost in unaccounted tax due to informal recycling.

• Extended Producer Responsibility (EPR):

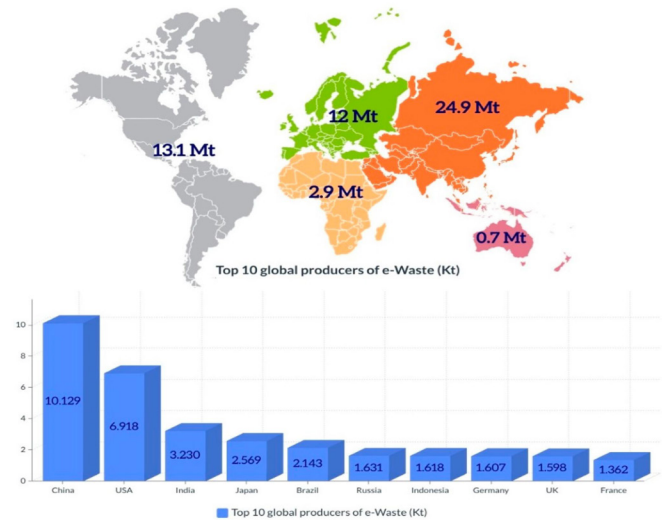
- ♦ Producers, importers, and brand owners are responsible for **entire product lifecycle**.
- ♦ Introduced **E-waste (Management) Rules, 2022**:
- ♦ Includes **floor price for EPR certificates** – stabilises recycling economics.
- ♦ Incentivises formal recycling over informal/hazardous methods.
- ♦ Helps achieve **EPR targets** by encouraging recycling through certified operators.

E-Waste Generation In India State Wise



- **Need for a Stable Floor Price:**

- ◆ Curbs dominance of **informal sector** (which handles 95% of e-waste).
- ◆ Encourages adoption of **modern, safe recycling technologies**.
- ◆ Ensures consistent income for recyclers and deters black-market practices.
- ◆ Prevents market collapse (as seen in the plastic waste sector).
- ◆ Aligns with **global best practices** where EPR fees are significantly higher.

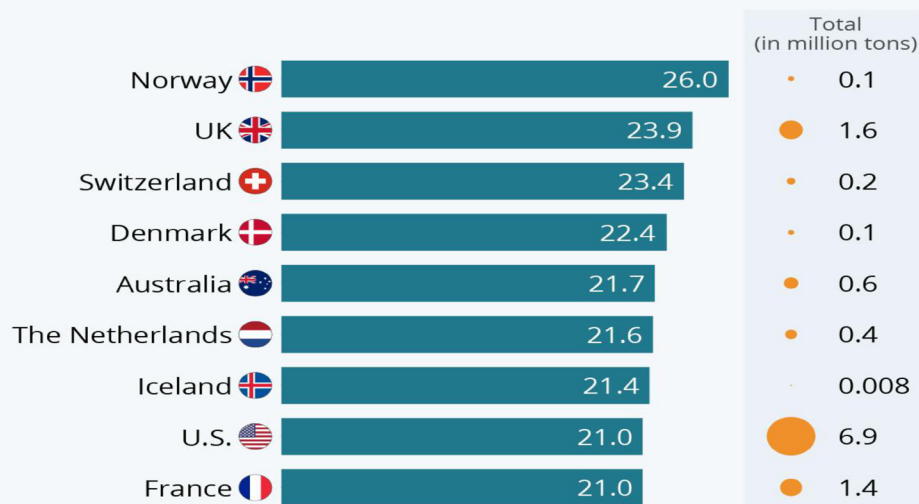


- **Criticism and Response:**

- ◆ **Criticism:** Increased costs for producers may raise consumer prices.
- ◆ **Response:** Minimal cost impact is offset by **huge environmental, social, and economic gains**.
- ◆ Encourages **innovation** in ecodesign and durable products.

The Countries Producing the Most E-Waste

The countries which produced the most e-waste per capita in 2019



Source: Global E-Waste Monitor 2020

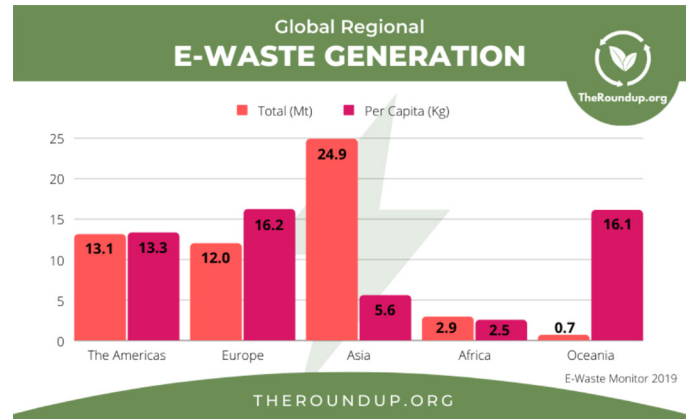


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- **Vision for Circular Economy:**

- ◆ **E-waste as a resource, not a liability.**
- ◆ **Calls for investment in formal infrastructure, resource efficiency, and sustainability leadership.**
- ◆ **Projected 73% e-waste increase in 5 years is a “clarion call” for urgent policy reforms.**



Germanium Export Restrictions

- ◆ **China banned exports to the U.S. in Nov 2023, and earlier imposed licensing restrictions for other countries.**
- ◆ **India is 100% import-dependent on germanium.**
- ◆ **Used in semiconductors, solar cells, infrared sensors, and fibre optic cable preforms.**
- ◆ **India is importing it via the United Arab Emirates, increasing costs and supply time.**

India engaged with China on germanium export restrictions, says embassy

The Indian embassy in Beijing listed germanium as the only element mentioned in grievances from Indian industry players regarding China's export restrictions of rare earth elements

Aroon Deep
NEW DELHI

India is engaging with the Chinese government to navigate export restrictions on germanium, a critical mineral that is used for manufacturing semiconductors, fibre optic cables, and solar panels. The export restrictions for the element – over half of its annual output comes from China – may have caused some friction in electronics manufacturing and other industries that require the element.

In response to a Right to Information application from *The Hindu*, the Indian Embassy in Beijing listed germanium as the only element mentioned in grievances from Indian industry players regarding China's export restrictions of rare earth elements (REEs). Germanium is not listed as an REE, a category that includes 17 heavy metals that China has a practical monopoly in refining.



The exports of germanium and gallium to the United States were largely banned last November. REUTERS

Germanium and gallium's exports to the United States were largely banned last November, and a year before, were placed under "export licensing" for other countries.

Fully reliant on imports
India makes no germanium, and is completely reliant on imports for the element. According to a financial daily's report in 2024, India is relying on imports of germanium

through suppliers in the United Arab Emirates, a process that has inflated costs for Indian importers.

The embassy in Beijing declined to disclose specific representations and meetings with Chinese officials on the issue. "The matter has been taken up with Ministries/Departments concerned on the Chinese side through formal communications as well as during meetings," the embassy said in its response to *The Hindu*.

Germanium oxide is used in the "core of the preform" for fibre optic cables, an industry expert said. "Preforms are solid cylinders of glass which are used to draw optical fibres in specialised furnaces."

While relations with China have cooled down in recent months, the country is reportedly thwarting certain projects with export curbs and even travel restrictions. For instance, Apple, Inc.'s contract manufacturer for iPhones, Foxconn, was reportedly prevented from allowing personnel to travel from China to India, and more recently, moving heavy machinery needed to make the phones. "I guess these are matters which pertain to Foxconn and several other Indian private entities so they would be looking into it," External Affairs Ministry spokesperson Randhir Jaiswal said in response to a query on these curbs in January.





Clientelism, Patronage & Freebies

- ♦ **Clientelism** is a reciprocal exchange where voters receive material benefits in return for their electoral support.
- ♦ **Patronage** refers to the hierarchical allocation of state resources through political loyalty, often outside electoral seasons.

On differences in clientelism, patronage and freebies

In most political commentaries, there is a tendency to conflate these different phenomena, since there are some overlaps between these practices. However, such conflation leads to overlooking harmful relationships

Sarthak Bagchi

In recent times, a lot of scholarship has emerged espousing a call to end the politics of patronage and clientelism, advocating a move away from the politics of distribution of 'freebies' and calling an end to the use of populist schemes. The opposition to populist schemes has been mostly advanced as an academic argument by both economists and political scientists as such redistributive practices are seen as negatively affecting the political culture of a polity, enfeebling the democratic credentials of voters and making them dependent on the distribution of such largesse.

However, we often see that in such commentaries there is a tendency to conflate many different phenomena, since there are some overlaps between these practices. This article will highlight some subtle yet important differences between clientelism, patronage and 'freebie' distribution.

On clientelism

Clientelism or clientelistic politics is defined typically as a kind of reciprocal exchange in which politicians offer or promise to offer certain tangible material benefits to voters based on the offer or promise of their electoral support. This reciprocal relationship, between those who can deliver the resources and those who can give support in return for these resources has been the focal point of many studies in political science, anthropology and sociology. The delivery of selective distribution of resources in clientelism is contingent on the continuance or expectation of electoral support in terms of voting and/or campaign participation. This reciprocity factor means that while politicians are offering gifts, money or other distributive largesse to their supporters, they too in return, must be able to monitor the voting action of their supporters and ensure that the supporter who is receiving this benefit is also returning the 'favour' by voting in support of the politician. Politicians ensure this reciprocity by monitoring the compliance of their supporters. Such monitoring is often done by dense networks of local level leaders, political brokers or *karyakartas* (party workers). An important distinction between a clientelistic exchange and any other type of distributive politics is the threat of retribution on non-compliance of reciprocity.

Clientelistic relationships or patron-client ties are typically asymmetrical in nature, in which politicians as patrons and voters as clients are linked through bonds of hierarchy, caste-identity or resources, or both. As the Indian polity has undergone democratic upsurges that have levelled some hierarchies of caste and made democratic politics more representative, the asymmetry of resources has only increased, as the wealth of India's politicians has increased manifold as compared to their voters. So, it is quite possible that a wealthy politician will be in a position to punish a poor voter for not voting for him/her.

However, we don't usually see such situations. This is in part due to the



Collective good: A large number of women wait to travel on BMTCL buses, one year after the launch of free bus travel, in Bengaluru on June 5, 2024. MURALI KUMAR K

robustness of India's secret ballot system which enables voters to believe that their voting action cannot be monitored efficiently by politicians. Voters therefore do not feel compelled or forced to vote for the politician from whom they receive a gift or money, and instead tend to take gifts across parties (even demand in some cases, as our fieldwork shows). Another factor affecting the ability of politicians to monitor the compliance of their supporters is a decline and lack of dense networks of party activists, that are typically found in political machine models populating the favelas of Rio De Janeiro or the slums of Buenos Aires.

In India, a high voting population and large constituency size restricts a politician's ability to implement effective monitoring strategies to check the voting actions of their voters. These limitations are only multiplied with an increasing democratic culture imbibed by voters through repeated participation in elections, which has been captured as a deepening of democracy in the Indian context. To put it simply, clientelism in the Indian context, operates in an atypical manner, in which neither are voters suppressed clients who are compromising their autonomy of voting choice nor are

patrons or politicians able to punish their voters for their non-compliance, even if there exists a hierarchy of resources between the two.

Patronage networks and freebies

Another manner in which this hierarchy of unequal resources is manifested is through patronage networks, which allow politicians to disburse resources of a permanent nature, such as jobs, loans or subsidies, to cultivate electoral loyalty among their supporters. While clientelistic exchanges takes place in the immediate proximity of elections and usually involves the exchange of tangible material benefits like money, liquor, food, gifts, clothes, phones etc., patronage ties are more long-standing relationships, in which the interaction between the distributing politician and the receiving voter is more recurring and reiterative. Patronage ties are usually not one-time exchanges between politicians and voters.

Freebies can be classified as universally distributed goods, which are not selectively distributed based on individual targeting (whether a person has voted for me or not, or will vote for me or not). The distributive criteria for freebies is more inclusive than in clientelism. Freebies are

typically distributed to an entire population group or a class of voters like women, or female children above the age of 15 or men under the age of 30. The idea is to expand the scope of distribution on a large scale, by defining the contours of that scale very clearly, in order to justify the distribution. Theoretically, freebies do not carry any reciprocity condition or retribution, though there is always a hope of garnering electoral support. But, such hope can be embedded in each and every action taken by a politician and not just in shaping schemes of universal distribution. Moreover, the distribution of freebies does not necessarily need to be monitored by political agents to check reciprocal compliance by recipients. In fact, by the introduction of Direct Benefit Transfer (DBT) and increased usage of banking channels for such distribution, the role of party brokers and *karyakartas* in mediating such welfare schemes is waning. Goods distributed through such universal distribution schemes or what political scientist James Manor has called, post-clientelistic schemes, can also bring important transformations at the household level as well as the societal level.

Some 'freebies' like free bus rides for women in Delhi and Karnataka or free bicycles for female school going children in Bihar and West Bengal can have positive effects on women's participation in the work force and education by increasing school enrolment numbers as research has shown. DBT cash transfers to women's bank accounts could also have positive effects on household spending patterns, although longitudinal data for such schemes is yet to come.

In such a scenario in which universal distributive schemes are not mediated or monitored (or at least less monitored) through political workers, and do not bring along any retributive clauses based on reciprocity in terms of electoral support, a criticism of freebies as undemocratic or violating the voters' right to vote freely or promoting the suppression of voters is not a fair criticism.

More scrutiny on clientelistic networks

Politicians taking part in India's highly competitive electoral market are distributing a lot of resources besides what are called 'freebies'. Much of the spending in India's exorbitant election campaigns are done via politician's private resources which are often mobilised to pay for hiring campaign teams, loudspeakers, stages, vehicles and transportations for mega rallies, publicity and social media advertisements, political consultants and on distributing tangible material benefits like gifts, money or liquor – in short on actual clientelistic distribution, that is largely informal in nature and therefore undocumented.

Formal distribution in the form of freebies are much open for audits and therefore also open for restructuring and subsequent reforms at a later stage. However, conflating these practices often leads to overlooking informal clientelistic transfers which need more researched focus to capture their long-term impact on democracy and economy. Focusing the criticism on universal distributive schemes which are more inclusive in their distributive criteria and have shown positive affects in the long-term, instead of looking at actual clientelistic practices that are exclusionary in nature and undermine the quality of democracy, is therefore akin to missing the woods for the trees.

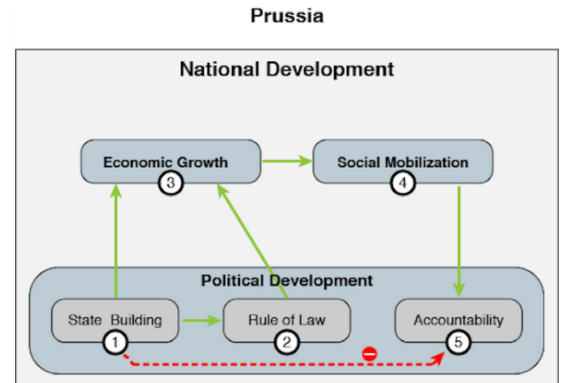
Sarthak Bagchi teaches courses on Indian politics and populism in Ahmedabad University and studies politics of clientelism and patronage in Bihar and Maharashtra.





Clientelism, Patronage & Freebies

- ♦ **Freebies** are **universal welfare goods/services** given without direct reciprocity, often aimed at public welfare or electoral appeal.
- ♦ Conflating these three obscures understanding of **democratic distortions** and their **differential impact on voter behaviour** and public trust.



Single Use Plastics in Himalayan Region

- ♦ **84.2% of plastic waste** in Indian Himalayan regions is from **food and beverage packaging**, mainly single-use.
- ♦ **71% of this waste is non-recyclable**, comprising multilayered plastics and tetra packs.
- ♦ Largest contributors to waste: **Sikkim, Darjeeling, Ladakh**, followed by Nagaland and Uttarakhand.
- ♦ Study led by **Zero Waste Himalaya Alliance**, with data from **450 sites** and **15,000 volunteers**.



Single-use food packaging 84% of Himalayan plastic waste

Rohit Karmakar

Single-use food and beverage packaging forms more than 84% of the plastic waste in the eco-sensitive Himalayan region, an anti-waste collective of NGOs has found. According to the Zero Waste Himalaya Alliance, about 70% of the plastics collected from across the Himalayas hark from Ladakh to Arunachal Pradesh are non-recyclable and hard to make value. The gravity of the environmental reality came to light at the Zero Waste Himalaya Network Meet held in Himachal Pradesh's Shimla in April, where the contributors of the alliance lamented the failure of the current policies in addressing the unique challenges of mountain ecosystems. The alliance was initiated by Zero Waste Himalaya, an organisation based in Sikhar's Gangtok, and the Integrated Mountain Initiative based in Dehra Dun, Uttarakhand. The 100+ organisations have been spearheading the Himalayan Cleanup (THC), one of the largest movements against plastic pollution in the Indian Himalayan region, since 2018. The 1st convergence of anti-plastic groups was held a month before their annual plastic waste collection from May 26-31. A statement issued by the alliance on May 9 said, "Over the past six years, the data has indicated that the Himalayan waste crisis is fundamentally a production and systems issue rather than a plastic consumption waste management issue." A report released by THC said the 2018 waste collection drive was conducted at more than 250 sites by volunteers of 300 organisations. In 2024, more than 15,000 members of 160 organisations collected plastic waste from 450 locations.

71% of the plastic waste was non-recyclable, mainly, multilayered plastics and tetrapacks. These are not collected by waste pickers and are found littering mountains, choking waterways and filling up landfills.

Among the nine Himalayan states targeted in 2025, Sikkim generated the most trash items. A total of 52,844 (44% of the total pieces of litter were collected across 80 sites. This was followed by West Bengal's Darjeeling with 34,840 items collected across 37 sites. The authorities in Ladakh picked up and collected 1,108 pieces of trash across 18 sites. Nagaland and Uttarakhand followed Ladakh to take the fourth and fifth spots.

The exercise across the nine states yielded 1,23,779 pieces of trash, of which 1,04,047 were plastic, mostly single-use, divided into six categories: food packaging, household products, personal care products, smoking material, packaging material, and others.

The report said 64.2% of the plastic waste was found to be food and beverage packaging. These packages have been audited to gather data on the top corporate polluters in the Himalayas belt.

Within food packaging, 71% of the plastic waste was non-recyclable. THC 2022 and THC 2023 showed 72% and 77% of all plastic collected was non-recyclable, mainly, multilayered plastics and tetrapacks. These problematic plastics are not collected by any waste pickers and trap rodents and are found littering mountain landscapes, choking waterways and filling up landfills, it said.

"Thus, there is a need to look at solutions beyond the recycling bin," it added. The THC 2024 was conducted across villages, schools, tourist spots, and





Prelims PYQs (2019)

Q. As per the **Solid Waste Management Rules, 2016** in India, which one of the following statements is correct?

- (a) Waste generator has to segregate waste into **five categories**.
- (b) The Rules are applicable to **notified urban local bodies, notified towns, and all industrial townships only**.
- (c) The Rules provide for **exact and elaborate criteria** for the identification of sites for **landfills and waste processing facilities**.
- (d) It is mandatory on the part of waste generator that the **waste generated in one district cannot be moved to another district**.

