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Putting people first in waste management

Waste is not only a material issue but also a social one. Our Focus on waste highlights the crucial role of the human perspective, and calls for the recentring of human experience, equity and local knowledge in waste management. A people-centred approach is essential for creating strategies that are both effective and equitable, and promote environmental, health and social justice for all.

Humans are wasteful. Imagine 16 million full-grown blue whales gathering. This is the amount of waste produced every year. Between 2.1 and 2.3 billion tonnes of municipal solid waste (everyday waste from homes, businesses, and institutions) have been generated annually in recent years, and this number is projected to be 3.8 billion tonnes in 2050. Each year, 19–23 million tonnes of plastic waste enter the ocean, adding to an estimated 75–199 million tonnes already there. Discarded electrical or electronic equipment (e-waste) is another type of waste that is of particular concern owing to its typically hazardous nature, and the quantities of e-waste are substantial. Sixty-two million tonnes were generated in 2020 alone. There is a clear gap between waste production and treatment: only 22.3% of e-waste was treated in an environmentally sound way in 2022, and just around 19% of municipal solid waste was recovered for recycling and composting. Humans are both harmed by the tonnes of waste produced and at the core of this problem's solution. This Focus issue aims to shine light on the crucial role of the human factor in waste management.

Waste is not only a material issue but also a social one. Food waste, for example, is tied to hunger and deprivation, as both reflect systemic failure and social inequities in the food distribution: who has access and who is left out. In 2022, over 1 million tonnes of food were wasted or lost, and more than 700 million people still faced hunger in 2023. It is unlikely that food waste or hunger can be solved through technical fixes alone.

The circular economy discourse often revolves around technological innovation and material flows. Systemic changes are necessary; however, we must not downplay the role of individual behaviour in both producing waste and managing its effects. An estimated 15 to 20 million waste pickers in the informal sector (that is, labour outside of government tax and regulatory systems) are playing a crucial part in waste collection and recycling, but their contributions have been largely ignored. Waste pickers were responsible for collecting nearly 60% of global plastic waste in 2016 (ref. 1). However, modern waste management centred on high-tech solutions undervalues – or even stigmatizes – their effort. More concerningly, waste pickers are disproportionately exposed to extreme weather and their health is threatened by the toxic substances released from e-waste.

Local knowledge and cultural contexts are important for waste solutions, but in many regions of the world this knowledge is overlooked, argues Assuah in a World View. Such neglect reinforces global asymmetries in power and responsibility, and fuels what has been called waste colonialism: the practice of wealthier nations exporting waste to less developed countries that often lack the technological or regulatory capacity to manage it safely[2]. Furthermore, the global illegal waste trade continues to exploit inequalities and places additional environmental and social burdens on underrepresented individuals and communities.

Ignoring the human dimension undermines the efficiency of waste management and deepens inequality, because behind each act of disposal and recycling are people who both shape and are shaped by how societies deal with waste. Effective waste management depends on how individuals and communities participate in waste systems, no matter whether it is through reducing household food waste, engaging in informal recycling or supporting sharing economies. Governance and business efforts to improve material flows and technologies are essential for sustainable waste management, but acknowledging the human dimension that underpins these systems is what makes them truly effective and equitable.

As such, it is time to rethink waste and recentre people in a circular economy. Stakeholders should ensure localized and human-centred waste solutions. For example, research can adopt grounded approaches to reveal regional needs and norms related to waste practices. Insights from such work will assist policymakers in designing interventions (for example, community-based composting initiatives) that are both technically sound and culturally inclusive.

Behavioural science is vital for promoting waste justice. It is necessary to understand how collective identity shapes social participation and inclusion. By examining how social recognition influences motivation, researchers can help to shift perceptions of waste work from marginal to essential. This will help to develop integrated waste management systems that strengthen self-advocacy and respect, and promote cross-sector trust and collaboration. Moreover, identifying behavioural barriers can enable scientists to design programmes that increase uptake of protective measures and foster inclusive cultures of environmental responsibility in the society. Policymakers and industries must work together to safeguard and empower informal waste workers by recognizing their contributions, ensuring fair pay and expanding access to healthcare. Importantly, climate adaptation planning is needed to strengthen the resilience of waste workers through social protection, such as emergency support for natural hazards and training in climate-resilient techniques (for

example, heat-adapted or flood-adapted waste collection).

Similarly, waste education is important for public participation. Early education can raise awareness that waste is not merely a byproduct to throw away but a daily responsibility, and thus foster habits of reduction and respect for materials. Public waste education encourages innovation and opportunity-seeking, rather than treating waste simply as an environmental burden. Governments must step up and provide essential infrastructure to the process of waste-to-value transformation. Researchers must partner with practitioners, and translate complex waste knowledge into accessible information. Such efforts can reverse the misconception that waste management is solely a technical task and show how waste practice connects to broader environmental and societal outcomes for everyone. Improved waste literacy will help to mitigate existing health and social disparities, too.

Technological development has greatly advanced waste reduction and recycling by enabling the smart tracking of material flows and efficient processing. However, digital tools are also being misused to facilitate illegal trade in waste, including cyber-enabled waste crime. The large-scale illegal waste trade across national borders, typically from higher-income to lower-income countries, is known as waste trafficking. Tackling this global challenge requires solid international collaboration, including agreement on regulatory frameworks, shared databases and, crucially, capacity building to strengthen enforcement in vulnerable regions. Only by combining technological innovation with equity-focused global governance can high-tech tools support human-centred waste justice rather than enabling new forms of exploitation.

Our Focus on waste shows that the path to sustainable waste management must put people first, and bear in mind human contributions and needs as well as vulnerabilities. Rethinking waste means recognizing that behind every discarded item are humans — waste pickers, households and communities — whose knowledge and actions shape the waste system and beyond. Waste management requires equitable solutions that discard the rights of no one.

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References

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