# Global waste crisis demands urgent action and innovative solutions



In 2023, the world generated a staggering 2.3 billion tonnes of municipal waste, highlighting a pressing environmental challenge. Municipal waste encompasses residues from households, retailers, and small businesses. On average, this amounts to 284 kilograms of waste produced per person annually, or roughly 5.5 kilograms weekly. Projections by the World Bank indicate that global waste production could reach 3.4 billion tonnes by 2050.

One immediate illustration of waste management challenges is the prolonged strike by garbage collectors in Birmingham, England. Since 11 March 2024, waste collection ceased in the city of over a million residents, resulting in rubbish accumulating on streets. Black bags, overflowing with food scraps, dirty diapers and household rubbish, crowded pavements, accompanied by a rise in rodent activity. The human and logistical strain was so severe that military planners were enlisted to assist with waste clearance operations. Residents also organised volunteer teams to help manage the rubbish until a resolution is reached. Despite efforts, a proposed pay agreement was rejected in mid-April 2024, prolonging the crisis with fresh negotiations scheduled for 1 May.

Traditional waste disposal methods, such as landfilling and incineration, are proving increasingly unsustainable. Approximately 37% of the world’s waste is deposited in landfills, with 33% openly dumped, 11% incinerated, and 19% recycled or composted. Landfills take up valuable land and emit methane, a greenhouse gas with greater heat-trapping potential than carbon dioxide. Methane emissions from landfills contribute to roughly 11% of global methane emissions, and are expected to increase by around 70% by 2050, propelled by population growth. Additionally, though modern landfills aim to contain toxic waste, leaks still pose environmental and health risks. Open dumping further releases hazardous chemicals into ecosystems, damaging biodiversity and potentially contaminating human food supplies.

Ocean pollution represents another critical issue. The Great Pacific Garbage Patch, a vast expanse of marine debris in the North Pacific, covers an area estimated at 1.6 million square kilometres—larger than the size of Texas. Marine life may consume plastics mistaken for food, which can fatally harm them and introduce plastic particles into the oceanic food web and eventually into human diets.

The burning of waste, notably plastics, produces toxic gases and air pollutants that endanger health and the environment. Although modern incinerators are increasingly designed as waste-to-energy plants to recover electricity, the process remains a significant source of greenhouse gases and hazardous air emissions. Experts highlight that reliance on incineration undermines recycling efforts and conflicts with circular economy principles by destroying potentially reusable materials. Reflecting this, the European Union has excluded waste-to-energy incineration from its list of sustainable economic activities.

Emerging technological solutions offer possibilities for improved waste management. Artificial intelligence is being deployed to enhance waste sorting with robotics and machine learning enabling faster and more precise separation of recyclables. UK firm Recycleye, for example, has developed a computer vision system capable of distinguishing different materials and packaging types, currently used in locations such as Northern Ireland and France.

Biotechnological approaches like composting and anaerobic digestion convert organic waste into biogas, an energy source. Advanced waste-to-energy methods, including pyrolysis, break down waste thermally in the absence of oxygen, producing bio-oil and syngas with fewer emissions than incineration.

However, technology is only part of the solution. Many innovations are still emerging and require investment and infrastructure to scale. International cooperation is also essential to regulate waste movement and share expertise. For instance, in August 2024, two container ships carrying hazardous waste from Albania to Thailand were turned away by Singapore due to lack of consent from the receiving country, in compliance with the Basel Convention.

Global efforts to reduce plastic pollution have seen progress and setbacks. Negotiators failed to reach agreement on a legally binding international treaty to end plastic pollution in December 2024, with further talks planned for August.

Regionally, platforms such as the Asean Municipal Solid Waste Management Enhancement (Amuse) facilitate waste management improvements across Cambodia, Thailand, Laos and Vietnam through projects supporting local tourism-dependent cities to manage waste sustainably.

Initiatives in various countries also target waste reduction at the source. In the Philippines, residents are encouraged to use refill stations at small stores to reduce plastic packaging, while community-led programmes in Darjeeling, India, promote zero-waste practices and composting to manage the 30 to 45 tonnes of daily waste generated, exacerbated by tourism.

Mechanical engineering professor Seeram Ramakrishna from the National University of Singapore’s College of Design and Engineering commented to The Straits Times, “Humanity will be better off by reducing the per capita consumption in every country, especially high-income nations. Less waste means reduced greenhouse gas emissions and reliance on limited resources, and most importantly, improved human health and ecological health.”

Singapore itself is advancing multiple strategies to tackle packaging waste amid declining recycling rates. Since 2013, the national recycling rate has fallen from 62% to 52% in 2023, with household recycling stagnating at 12%. To address this, the Ministry of Sustainability and the Environment introduced a 133-page guideline in March 2024 aimed at reducing packaging waste in e-commerce. The guidelines recommend measures such as avoiding packing tape that hampers recyclability and substituting fresh filler materials with shredded cardboard.

Additionally, Singapore plans to implement a beverage container return scheme whereby consumers pay a 10-cent deposit on bottled or canned drinks, refundable upon returning empty containers at designated points. This aims to incentivise recycling and proper disposal.

Infrastructure developments, including the Tuas Nexus waste and water treatment facility, will enable sorting of household recyclables and processing of food waste alongside industrial water treatment, with phased completion starting 2025.

Since 2022, companies are also mandated to report on packaging usage and reduction plans to encourage corporate responsibility. Senior Minister of State Amy Khor noted in March 2024, “Our net-zero targets necessitate the promotion of sustainable consumption and production practices. This requires us to reduce resource consumption, reuse where possible, before recycling.”

Despite challenges, Singaporeans produced an average of 0.88 kilograms of rubbish per person daily in 2023, an improvement from 0.9 kilograms in 2022 and 1.08 kilograms in 2013.

The Straits Times highlights that addressing waste requires a comprehensive effort encompassing technological innovation, regulatory frameworks, international cooperation, and behavioural changes aimed at reducing consumption and promoting sustainable handling of materials across the lifecycle.

Source: [Noah Wire Services](https://www.noahwire.com)

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