

PLASTIC RECYCLING: NECESSITY AND HIDDEN DANGER

Urgent action is necessary to tackle plastic pollution. The current plastic lifecycle is predominantly linear, involving plastic extraction, production, and disposal. [According to the OECD](#), from 2000 to 2019, plastic production and waste more than doubled, yet only 9% of plastic is recycled. By 2060, plastic waste is projected to nearly triple, with around half ending up in landfills and less than 20% being recycled. Greenhouse gas emissions from plastics could rise by 63% by 2040, which conflicts with the goals of the Paris Climate Agreement. The increase in plastic waste is driven by growing populations and incomes, resulting in higher plastic consumption, particularly in short-lived products like packaging and textiles. Environmental pollution from plastics is anticipated to double, with both microplastics contributing to the issue. The OECD Global Plastics Outlook urges strict, global measures to mitigate plastic pollution, such as extending product lifespans and enhancing waste management and recyclability.

Different sectors contribute differently to plastic waste generation

According to the [Statista](#) page, packaging is the most significant contributor to plastic waste generation, projected to increase from 142 million metric tons in 2019 to 380 million metric tons by 2060. It accounts for almost 40% of total plastic waste. Clothing is expected to generate 52.81 million metric tons of plastic waste by 2048, while other textiles are projected to contribute 25.33 million metric tons.

Construction is estimated to produce 61.97 million metric tonnes of plastic waste by 2048, and consumer products will generate 89.68 million metric tonnes.

The electrical and electronic sector will contribute 28.19 million metric tons by 2048, while tires are expected to generate 10.42 million metric tons, and vehicles are estimated to produce 87.3 million metric tons by the same year.

Is all plastic recyclable?

Plastics are sorted by resin type (Resin Identification Code), with numbers ranging from 1 to 7. Plastics with lower resin codes are more likely to be recyclable.

Number 1: PET - polyethylene terephthalate

One of the most common types of plastic is PET, a polymer used to make items such as thin food containers and plastic bottles for water or soft drinks. PET is highly recyclable.

Number 2: HDPE - high-density polyethylene

This type of plastic is more rigid than PET. It is used in more “durable” products such as detergent bottles,

food and beverage containers, bottle caps, thicker shopping bags, and disposable plastic items such as toys, helmets, and edging. Again, this type of plastic is widely recycled.

Number 3: PVC (V) - polyvinyl chloride

PVC is considered one of the most versatile and common types of plastic. It is used for water and sewer pipes (due to its resistance to chemical and biological damage), flooring, signage, furniture, and more. While some methods of recycling PVC are available, they are uncommon and rarely found in conventional plastic recycling kits. This is largely due to the toxicity of PVC.

Number 4: LDPE - Low Density Polyethylene

Although not as strong as HDPE, this low-density plastic is very flexible and is used in many products, such as containers, playgrounds, and plastic garbage bags. This type of polymer is recyclable, but many products (such as plastic bags) may be excluded because they pose a risk of clogging equipment and are considered inappropriate for recycling.

Number 5: PP - Polypropylene

Polypropylene is a common plastic used in injection moulding. It is used in products ranging from bottle caps to surgical instruments to clothing. Although polypropylene is recyclable, processing centres often reject it because of the problems it creates, resulting in a much lower recycling rate than that of other plastics.

Number 6: PS - Polystyrene

This plastic is often used as single-use plastic food containers, as insulated containers, and in packaging materials. Despite its abundance, polystyrene is rarely recycled because it is not cost-effective (its most common form, polystyrene foam or Styrofoam, contains 95% air) and requires more energy than it saves to recycle.

Number 7: Other types of plastic

This category includes everything else, including combinations of any of the previous six and lesser-used plastics. Non-petrochemical plastics, such as new plastics, polymers, and bioplastics, are also included in this classification. Therefore, anything labelled as 7 is not typically included in plastic recycling but may have other waste solutions.

Plastic recycling faces many challenges. For example, plastics can be contaminated by food and other substances, making them too dirty to be reused. Unlike glass and aluminum, **plastics cannot be recycled indefinitely**, which means that with each subsequent processing, the recycled material degrades, and its quality is worse than that of virgin materials.

Global Variations and Challenges

Recycling Infrastructure: The effectiveness and scope of plastic recycling vary significantly among countries. Developed nations often have more comprehensive recycling programs, while developing countries may lack the necessary infrastructure to manage all types of plastics.

Material Acceptance: Even with a standardized coding system, the materials accepted can vary. For instance, certain types of plastics may be recyclable in one region but not in another due to variations in local recycling capabilities and market demand for recycled materials.

Legislation and Policy: Policies that govern plastics' use, labelling, and recycling can differ. Some countries enforce stricter regulations that influence how plastics are sorted and recycled.

Consumer Awareness: The success of recycling programs also hinges on public awareness and participation, which can differ widely.

Global and Regional Efforts Toward Harmonization

- **ISO Standards:** The International Organization for Standardization (ISO) has developed standards (e.g., ISO 11469) for identifying and marking plastic products to aid recycling efforts. Source: <https://cdn.standards.iteh.ai/samples/63434/f460de8a1261420a92f1195a8e329213/ISO-11469-2016.pdf>
- **Global Initiatives:** Organizations like the United Nations Environment Programme (UNEP) and the World Economic Forum (WEF) are working towards global agreements and strategies to improve plastic waste management and recycling. Source: <https://www.unep.org/resources/global-waste-management-outlook-2024> Source: https://www3.weforum.org/docs/WEF_Plastics_the_Circular_Economy_and_Global_Trade_2020.pdf
- **Regional Efforts:** The European Union, for instance, has implemented policies like the Single-Use Plastics Directive to standardize and improve recycling efforts across member states. Source: https://environment.ec.europa.eu/topics/plastics/single-use-plastics_en
- **Regional Efforts:** The Eurasian Economic Union (EAEU) 's development strategy until 2025 includes investigating the potential for gradually banning the import, export, and production of single-use plastic products, such as bags. According to the organization, this issue is currently a priority. The EAEU member states focus on implementing this project using "green" technologies and environmental protection. Source: <https://aurora.red/plastiku-boy-strategiya-razvitiya-eaes-do-2025-goda>
- **Country efforts:** South Korea, Germany, and Austria have the highest plastic recycling rates. Germany leads with a 65% recycling rate, followed by South Korea at 59%. These nations are global leaders in composting and recycling their waste. Source: <https://www.plasticexpert.co.uk/what-country-recycles-the-most-plastic/>

Conclusion

The effectiveness of plastic recycling varies widely between countries. Developed nations typically have more advanced recycling programs, while developing countries may lack the necessary infrastructure. Despite a standardized coding system, plastics' recyclability can differ by region due to local capabilities and market demand. Policies on plastic use, labeling, and recycling also vary, with some countries having stricter regulations. Public awareness and participation play crucial roles in the success of recycling programs.

Although the Resin Identification Code helps identify plastic types, recycling processes and acceptance criteria differ globally. Efforts are being made to harmonize and improve recycling practices, but significant regional differences remain.

Contacts

Health and Environment Justice Support (HEJSupport)
info@hej-support.org

Follow us on LinkedIn:
<https://bit.ly/3A0L93C>

HEJSupport Website:
www.hej-support.org

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