

# REPORT TITLE :

## Global Plastic Waste Production 2023 Report

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### Introduction

Plastic waste has become a major environmental challenge worldwide. In 2023, plastic production and mismanagement continue to threaten ecosystems, marine life, and human health. This report provides a data-driven analysis of global plastic waste generation, and management to mitigate its impact including disposal methods, and potential solutions. Humans currently produce more than 350 million metric tons of plastic waste annually.

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Without changes to current policies, this figure is projected to triple by 2060, reaching a staggering one billion metric tons of plastic waste.

## Plastic Waste “MIS”-Management Practices

As of 2021, global plastics production reached nearly 400 million metric tons per year. Currently, less than 10% of plastic waste is recycled each year. Its majority is either landfilled or incinerated, emitting harmful pollutants into the environment. Approximately 43% of global plastic waste is mismanaged, leading to significant environmental pollution.

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## Objectives of Analysis

- Analyze global plastic waste production and distribution across 165 countries.
- Identify the major contributors to plastic waste.
- Examine countries production and recycling rates in the year.
- Propose data-driven solutions for improved plastic waste management.

## Data Source

- **Kaggle Global Waste Dataset:** A comprehensive dataset titled "Global Plastic Waste 2023: Country-wise Analysis" is available, providing detailed insights into plastic waste production and management across 165 countries for the year 2023.
- **World Bank and UN Reports :** Information on waste management.
- **OECD Report:** The "Global Plastics Outlook" report by the OECD offers an in-depth analysis of current plastics production, use, and waste generation, uncovering underlying economic drivers and mapping related environmental impacts.
- **Plastics in the oceans: a 2023 update:** [Plastic in the oceans: A 2023 Update | OnboardOnline](#)

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## Dataset Overview

- Country : object datatype, countries in the world.
- Total\_Plastic\_Waste\_MT: Float64 data type, This is the total plastic waste production in million metric tons.
- Main\_Sources: Object data type, they are the main sources of plastic waste in each country.
- Recycling\_Rate: Float64 data type, is the national recycling rate in (%) of each country.
- Per\_Capita\_Waste\_KG: Float64 data type is the per capita waste production (kg/person).
- Coastal\_Waste\_Risk: Object data type, is the coastal waste risk on our coastlines and water bodies.

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df.head()
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	Country	Total_Plastic_Waste_MT	Main_Sources	Recycling_Rate	Per_Capita_Waste_KG	Coastal_Waste_Risk
0	China	59.08	Packaging_Industrial	29.8	41.2	High
1	United States	42.02	Packaging_Consumer	32.1	127.5	Medium
2	India	26.33	Consumer_Goods	11.5	19.3	High
3	Japan	7.99	Packaging_Electronics	84.8	63.2	Medium
4	Germany	6.28	Automotive_Packaging	56.1	75.6	Low

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## Methodology

- Leveraged the Python tool, mainly Jupyter Notebook to clean the dataset and carry out exploratory analysis.
- Began by sourcing the dataset on Kaggle, downloading it and imported into a Jupyter Notebook on Anaconda platform.
- View the dataset by using the 'shape', 'describe', 'head', 'dtypes' and 'isnull' to check the number of rows and columns, the data type, the information within the rows and lastly to check for null values.
- Next, began EDA, by finding out key metrics and performance indicators important in the data and our research

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## Analytical Insights

- **High-Income Countries:** These nations dominate plastic waste exports, with seven of the top ten exporters being European countries. Collectively, they account for 71% of all plastic waste exports, totaling more than 4.4 million tonnes annually.
  - **Developing Nations:** Countries like India generate an estimated 9.4 million metric tons of plastic waste annually, with only 50% being collected and processed. The remainder often ends up in landfills, water bodies, or is incinerated, leading to ecological degradation and health risks.
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## Environmental and Health Impacts

- **Pollution:** Mismanaged plastic waste contributes to the contamination of terrestrial and aquatic ecosystems, affecting wildlife and human health.
- **Health Risks:** To date, about 1,300 marine species have been found to ingest plastics (Science). A review of research published from 2019-2020 revealed 60% of fish studied globally contained microplastics, and carnivorous fish more microplastics than omnivores

## Key Findings

### Global Plastic Waste Production

- **Total Plastic Waste Generated in 2023:** **284.38** million metric tons.
- **Top 10 Plastic Waste-Producing Countries:** This is a list of the top 10 plastic waste producing countries for 2023, with China and the United States leading the list.

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	Country	Total_Plastic_Waste_MT
0	China	59.08
1	United States	42.02
2	India	26.33
3	Japan	7.99
4	Germany	6.28
5	Brazil	5.96
6	Indonesia	5.85
7	Russia	5.84
8	United Kingdom	5.03
9	France	4.98

- **Per Capita Plastic Waste Contribution:** The top 10 countries per capita plastic waste contribution

	Country	Per_Capita_Waste_KG
79	Iceland	1564.4
78	Malta	1331.5
76	Montenegro	1004.8
77	Luxembourg	957.8
164	Nauru	927.8
163	Tuvalu	833.3
72	Estonia	534.6
75	Cyprus	531.1
74	Trinidad and Tobago	478.6
162	Palau	437.2

- **Recycling Rate:** This gives us the %rate of plastic recycling in each country, with Japan leading with a recycling rate of 84.4% of plastics produced .

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	Country	Recycling_Rate
3	Japan	84.8
44	Singapore	59.8
14	South Korea	59.1
33	Austria	56.4
4	Germany	56.1
22	Netherlands	55.9
79	Iceland	55.6
32	Sweden	50.6
77	Luxembourg	48.9
8	United Kingdom	46.2

- **Landfilling:** X% (Contribution to pollution and soil degradation).
- **Incineration:** X% (Emission concerns and energy recovery potential).
- **Unmanaged Waste:** X% (Dumped in oceans, rivers, and illegal sites).

## Environmental and Social Impact

- **Marine Pollution:** Every year, 11 million metric **tons** of **plastics** enter our **ocean** on top of the estimated 200 **million** metric **tons** that currently circulate our marine environments.
- **Microplastic Contamination:** It has been confirmed that volumes of micro and nano plastic particles are now by far the largest mass of waste pollutants in the oceans, with the microscopic nano plastics having an immeasurable volume. An overall estimate indicates that the percentage of ocean litter presently made up of plastic is 85% and, unless urgently and strictly reduced, the total volume could triple by 2060.
- **Health Risks:** Increased respiratory and reproductive health concerns from plastic-related toxins.

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## Insights

1. **Waste Generation Disparities:** The analysis shows significant disparities in plastic waste generation, with a small number of countries responsible for a large percentage of the total waste produced globally.
2. **Main Sources Identified:** The primary sources of plastic waste vary by country, highlighting the need for targeted interventions that address specific waste management challenges.
3. **Correlation between Recycling and Waste Risk:** There is a notable relationship between coastal waste risk levels and recycling rates, suggesting that countries facing higher risks may need to enhance their recycling efforts to mitigate environmental impacts.
4. **Success Stories:** A few countries demonstrate exemplary recycling rates and low total plastic waste, serving as models for effective waste management strategies such as Japan and Singapore.

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## Recommendations

1. Targeted Policies: Policymakers should develop targeted interventions aimed at the primary sources of plastic waste, focusing on industries and practices that contribute the most to waste generation. For example, Lagos state government in 2025 put a ban on sachet water in a bid to reduce plastics nylon bags
2. Enhancing Recycling Programs: Countries with low recycling rates should invest in and promote recycling initiatives, including education campaigns to raise awareness about the importance of recycling.
3. International Collaboration: Countries should collaborate internationally to share best practices and technologies for waste management, leveraging successful models from best-performing nations.
4. Monitoring and Reporting: Implementing regular monitoring and reporting mechanisms can help track progress in waste management efforts and hold countries accountable for their waste generation and recycling practices.
5. Corporate Responsibility: Encouraging companies to adopt biodegradable alternatives.
6. Consumer Behavior Changes: Promoting reusable products and sustainable habits.



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## Conclusion

Addressing plastic waste requires a collaborative effort among governments, corporations, and individuals. The global plastic waste crisis demands immediate and coordinated action from governments, industries, and individuals. This analysis underscores the urgent need for effective waste management strategies that prioritize reduction at the source and improve recycling rates. By understanding the landscape of plastic waste generation and identifying best practices, we can work together to mitigate the environmental impact of plastic waste and protect our ecosystems for future generations. The insights drawn from this analysis should serve as a foundation for developing robust policies aimed at addressing the pressing issue of plastic waste globally.