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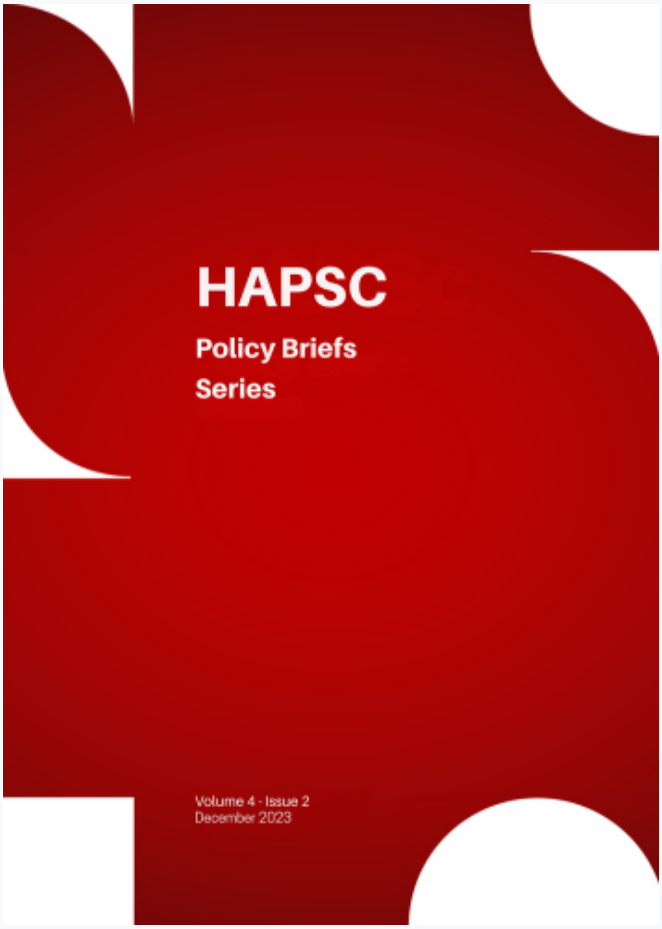

Alternative Approaches to Plastic Production and Recycling Policies

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Alternative Approaches to Plastic Production and Recycling Policies[1,2]

Emmanouela Boultadaki[3], Theodora Koutsoukou[4], Francesco Ratano[5], Ioanna Vatista[6], Eleni Vlachou[7] & Dimitra Vogiatzi[8]

Abstract

Plastics offer convenience to businesses and the supply chain, but their improper disposal and low recycling rates pose significant environmental and health challenges. Each year, millions of tons of plastic end up in oceans, with a recycling rate below 9%. Thus, urgent action is required to tackle this global plastic crisis. This policy brief proposes a Europe-wide ban on colored plastics to promote a circular economy and enhance plastic recycling, drawing insights from successful recycling policies in Japan and South Korea. This approach, despite initial challenges, can yield long-term benefits such as reduced exports, energy conservation, and increased consumer awareness. Collaboration, funding, and material design innovation are key to promoting sustainable practices and combatting plastic pollution. By seizing this opportunity collectively, we can make a lasting impact in the fight against plastic pollution and address the climate crisis before it is too late.

Keywords: plastic, recycling, colored plastic, Extended Producer Responsibility (EPR), Green Deal, circular economy, waste management.

Introduction

Plastics are widely recognized for their multiple benefits, such as being cheap, durable, and versatile. However, these very qualities can also lead to negative impacts on the environment and human health when plastics are not properly disposed of. The enormous amount of production and the lack of proper recycling exacerbate the problem, highlighting that, even if plastics are properly disposed of, a significant issue persists. Research indicates that every year 14 million tons of plastic end up in oceans (Marine Plastic Pollution, 2021, 1). The plastic epidemic is a global issue, with over 300 million tons of plastic produced each year and less than 9% of it being recycled (Pollution Facts | PlasticOceans.org/the-Facts, 2021). Out of this amount, packaging makes up more than 40% of the world's total plastic usage, with less than 14% of plastic packaging being recycled on a global scale (Ellen MacArthur Foundation, 2022).

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The UN has encouraged nations to significantly reduce plastic by 2030. Retailers are now trying to improve their plastic footprint by using alternative packaging, but this is not enough. Businesses need to find ways to reuse and recycle products in order to eliminate waste and pollution. The design phase of a product ultimately plays the biggest part in combating plastic pollution, as it accounts for up to 80% of its environmental impact (European Commission, 2020: 3).

This policy brief examines the EU's plastic recycling situation and uses Japan and Korea as case studies. We propose a ban on colored plastics as the initial step toward long-term plastic recycling and waste management solutions. Our goal is to facilitate the recycling process, establish good practices, raise consumer awareness, and pave the way for a sustainable circular economy.

Literature Review

Overview of Plastic

Nowadays, a diverse range of plastics exists, customized to meet specific requirements. Understanding plastic types is crucial, as it facilitates recycling, and provides insights into the potential health hazards linked to plastic materials. Each plastic type has different properties and uses, and some are more easily recyclable than others. Thus, proper disposal of plastic is crucial in the prevention of harming the environment and its ecosystems. The seven types of plastic, according to Hardin (2021) are:

1. Polyethylene Terephthalate (PET or PETE): one of the most common types of plastic, due to its lightweight, strength, and transparency. It is mostly used as food packaging (beverage bottles, food bottles), fabric, and rope.

2. High-Density Polyethylene (HDPE): strong and resistant to chemicals and moisture, making it appropriate for cartons, containers, and other building materials.

3. Polyvinyl Chloride (PVC or Vinyl): highly resistant to chemicals, hard and rigid. Often used in construction and medical applications, even though it is considered the most dangerous for human health.

4. Low-Density Polyethylene (LDPE): compared to HDPE, is softer, clearer, and more flexible. It is mostly used as plastic wrap.

5. Polypropylene (PP): the most durable, as it is heat resistant, and flexible, retaining its shape and strength. It is also used as a hot food container.

6. Polystyrene (PS or Styrofoam): insulates well, while it is rigid and low cost. Found mostly in takeout food containers.

7. Other: other or a mixture of the above. These can't be recycled. Examples include CDs, electronics, etc.

Plastics are important in the supply chain for various reasons (Pilz et al., 2010). Their durability and versatility make them ideal for packaging and transportation needs, as they can be customized to suit different products and applications. Compared to materials such as glass or metal, plastics are cost-effective, due to their lower price. Moreover, their lightweight nature facilitates efficient transportation, enabling mass transportation and thus reducing transportation costs. Plastics offer extended shelf life and protection during transportation and storage by acting as a barrier against moisture, oxygen, and contaminants, ensuring the safety and longevity of food products (British Plastics Federation, n.d.).

Circular Economy and Plastics

A circular economy is an economic system that minimizes waste and maximizes resource sustainability through continuous resource cycling. It promotes sustainable production, consumption, and economic growth while reducing environmental impact (McGinty, 2021).

To achieve a circular economy for plastic, three actions are necessary: eliminating unnecessary plastics, innovating reusable and recyclable materials, and ensuring the circulation of plastic items to minimize environmental harm (Ellen MacArthur Foundation, 2022). The EU has implemented measures, initiatives, and programs to address plastic sustainability concerns and promote the circular economy for plastics. This includes considering the entire product lifecycle and adopting strategies for sustainable production and consumption (European Parliament, 2018, 1).

Plastics and Circularity in the EU

According to European Parliament (2018), plastic production worldwide has increased significantly over the years. Specifically, the amount of plastic waste has grown from 1.5 million tons, as observed in the year 1950, to 359 million tons in 2018. Despite the EU's efforts to reduce plastic waste, challenges persist in achieving efficient plastic recycling. Complications arise from factors such as the price and quality disparities between recycled and unrecycled products. Additionally, the diverse composition of plastic's raw materials further impedes the recycling process, resulting in increased costs and potential compromises in the final product's quality.

Nevertheless, the EU has developed a comprehensive strategy, proposed by the European Commission, to address plastic waste. This strategy aims to ensure the reuse or recycling of plastic packaging by 2030, aligning with the directives of the Green Deal (European Commission, 2019). To support this goal, the European Parliament adopted legislation in 2015 that restricts the use of

lightweight plastic bags in the EU and promotes their replacement with environmentally friendly alternatives like compostable and biodegradable bags.

In 2019, the EU implemented new rules targeting the issue of marine litter, which currently exceeds 150 million tons in our oceans (The European Parliament and the Council of the European Union, 2019). As marine litter poses risks to marine life and causes economic losses in sectors such as tourism and fisheries, EU lawmakers decided to ban single-use plastics such as cotton bud sticks and straws to prevent further ocean pollution. Furthermore, in 2022, the European Commission proposed new rules concerning packaging, promoting the use of bio-based and recycled plastics, as well as the improvement of packaging design (European Commission, 2022). MEPs also agreed to ban the use of microplastics in personal care and cleaning products. Finally, in early 2023, the European Parliament expressed its stance on waste shipment regulations, advocating for the cessation of exports to non-OECD countries and a phased-out approach within four years, emphasizing the importance of recycling (European Parliament, 2023).

Case Studies: Japan and S. Korea

The goal of this case study is to investigate noteworthy plastic recycling policies, while simultaneously conducting an analysis of sub-optimal practices. Japan and South Korea are two great examples in this regard.

Plastic Recycling in Japan

Japan's plastic waste management performance is notable, as evidenced by its high Plastic Management Index (PMI) of 84.5 out of 100, the second highest globally, according to the Economist's Impact (Economist Impact, 2021). Additionally, Japan achieved an impressive PET bottle recycling rate of 86% in 2021 (Tiseo, 2023).

The country has embraced Extended Producer Responsibility (EPR), an environmental policy approach defined by the OECD, which extends a producer's responsibility for a product to the post-consumer stage (OECD, 2001). In Japan, EPR was introduced through the "Packaging Recycling Act" in December 1995 (Yamakawa, 2016). The act assigns specific roles to stakeholders: consumers are accountable for source sorting, municipalities handle sorted collection, and producers bear the responsibility for recycling, while each stakeholder has physical and financial obligations. The government actively promotes public awareness through education and initiatives like strategically placed PET bottle collection points, encouraging individuals to process their waste at home (García, 2020).

However, despite these efforts, Japan faces challenges in overall plastic waste management. Its plastic waste per capita in 2022 was 32.4 kg, second only to the US (40 kg) (Heinrich Boell Stiftung Hong Kong et al., 2022). In 2017, Japan was among the world's highest-rated exporters, exporting 1431.45 million kilograms of plastic waste (Klein, 2023). Moreover, the predominant method of plastic waste disposal in Japan is incineration, accounting for 75% in 2019, which contributes to greenhouse gas emissions, which severely contributes to climate change (Klein, 2022).

Plastic Recycling in S. Korea

The Republic of Korea first introduced EPR policies in 1992 through the Law for Promotion of Resources Saving and Reutilization (LRSR), which emphasized the legal role of the producers (Institute for Global Environmental Strategies, 2009). This law established the Producer Deposit Refund (PDR) system, operating under the deposit-refund principle to incentivize recycling. In 2003, the LRSR was amended, introducing the Producer Responsibility (PR) system, which sets Mandatory Recycling Targets (MRTs) for manufacturers based on packaging materials. Producers failing to meet obligations face recycling fees, while those exceeding obligations can carry over results for up to two years (Kim, 2010).

According to Statista in 2017 the Republic of Korea recycled approximately 22.7% of plastic waste as material and 39.3% as energy (SEA Circular Country Profile_SOUTH KOREA, 2020). However, a 2016 survey by Statistics Korea revealed that the country had the highest plastic consumption per capita globally for that specific year, at 98.2 kg (SEA Circular Country Profile_SOUTH KOREA, 2020).

Takeaways

Our case study highlights that Japan stands out in PET plastic bottle recycling. However, Japan faces challenges in overall plastic waste management, including high per capita plastic waste generation and reliance on incineration. Meanwhile, South Korea has achieved commendable recycling rates for plastic waste, despite its high plastic consumption per capita. Also, both countries have implemented Extended Producer Responsibility (EPR) policies to manage post-consumer plastic waste.

The overall effectiveness of PET bottle recycling implies that clear plastics facilitate the recycling process, ultimately reducing plastic waste. Although colored plastic handling is not explicitly mentioned in our findings, the success of bottle recycling shows the potential benefits of promoting clear plastic packaging and implementing a ban on colored plastics. This strategic approach could offer a valuable solution to enhance plastic recycling efforts and minimize plastic waste, leading to a circular and sustainable supply chain.

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Policy Recommendations

The Literature Review and Case Study provide valuable insights into the current state of plastic disposal and recycling practices across the globe. To establish sustainable solutions for plastic waste management, it is vital to tackle harmful practices such as overconsumption and the prevalent use of incineration and landfilling for end-stage plastics. By analyzing both successful and unsuccessful cases, we can embrace effective practices and steer clear of pitfalls, thereby solidifying our efforts toward sustainability.

Most plastics produced today are used for packaging, with colored plastics being particularly prevalent. To align with the Green Deal's target of recycling at least 55% of plastic packaging waste by 2030 (European Commission, 2019), we propose a Europe-wide ban on colored plastics used in packaging, targeting vibrant hues that pose challenges for effective recycling. This ban aims to drive a shift towards clear or transparent plastics, ensuring greater recyclability and reducing the need for additives that hinder the recycling process. The resulting color uniformity in plastic packaging is grounded in the principles of Extended Producer Responsibility (EPR), emphasizing the manufacturer's role during the production stage in facilitating subsequent recycling.

Implementing a ban on colored plastics for packaging would have far-reaching implications across the production and distribution supply chain. While initial challenges and potential negative effects on employment and production may arise, the ban offers opportunities for import savings and reduced energy consumption. Additionally, it promotes consumer awareness of eco-friendly practices, laying a solid foundation for future actions. This approach aligns with international programs and government standards, including NATO's recommendations for green economic systems (NATO, 2021; 2022). Therefore, it is vital to secure funding and industry support during the transition towards modern, sustainable, and affordable materials. Recognizing the benefits of the production deal, we strongly advocate for the swift implementation of the ban, allowing sufficient restructuring time for supply chain actors. If executing a tender is deemed excessively costly, it may involve goods not yet manufactured or pending purchases of fibers and additives.

It is important to emphasize that this approach also serves as a protective measure for the marine biome and public health. Microplastics, insoluble in nature, result from the decomposition of plastic waste when it enters the oceans. By implementing our proposal, we contribute to safeguarding the marine ecosystem and mitigating the risks associated with consuming seafood and fish that have been exposed to microplastics (United Nations Environment Programme, 2021).

The commitment to the environment and the implementation of relevant regulations are topics of intense debate. Urgency is fueled by the imminent climate crisis, demanding swift legislative action. The proposed ban, which entails a significant transformation of the entire production system and brings forth noticeable changes in product appearance, can yield substantial effects. By promoting sustainable practices and actively engaging consumers, we can significantly amplify the benefits and raise awareness about the importance of the transition.

Conclusions

Plastics offer convenience in various industries, but their improper disposal and low recycling rates cause significant environmental and health problems. Millions of tons of plastic reach our oceans annually, with less than 9% being recycled. Urgent action is crucial in order to tackle this global plastic crisis. Governments, businesses, and individuals must swiftly adopt sustainable practices and eco-friendly alternatives to combat plastic pollution and address the urgency of the climate crisis.

The study of plastic recycling policies in Japan and South Korea underscores the overall effectiveness of PET bottle recycling, which suggests that clear plastics facilitate the recycling process. These findings emphasize the importance of comprehensive approaches involving all stakeholders, including the successful implementation of Extended Producer Responsibility (EPR) policies, public education, and infrastructure development.

Our proposal for a Europe-wide ban on colored plastics is a practical solution to promote a circular economy and improve plastic recycling. Despite initial challenges and sector-specific impacts, the ban can lead to long-term benefits such as reduced imports, energy conservation, and increased consumer awareness of sustainability. Adopting the ban and fostering a circular economy will pave the way for a greener future. Through collaboration, funding, and material design innovation, we can significantly reduce plastic waste, protect ecosystems, and ensure a healthier planet for future generations. It is crucial to seize this opportunity and work collectively to achieve a lasting impact in the fight against plastic pollution.

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