

# **Towards a Spherical Economy: Rethinking Plastic Pollution Management for a Sustainable Future**



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**Marianna Manfrino**  
**Oscar di Montigny**

# Towards a Spherical Economy: Rethinking Plastic Pollution Management for a Sustainable Future

## INTRODUCTION

Addressing the global plastic pollution crisis demands a fundamental re-evaluation of our current approaches. Despite the rise of circular economy principles aimed at reducing waste and promoting recycling, the pervasive issue of plastic waste persists, necessitating a paradigm shift. This paper introduces a new economic theory - the Spherical Economy - which extends beyond the limitations of circularity to encompass a broader, more holistic perspective. Drawing on principles of environmental sustainability and social responsibility, the Spherical Economy acknowledges the multidimensional nature of the plastic pollution challenge. Unlike the linear and circular models, the spherical approach recognizes the intrinsic linkages between environmental preservation, societal well-being, and economic prosperity.




*"Plastic waste is now found in the most remote areas of the planet. It kills marine life and is doing major harm to communities that depend on fishing and tourism." – António Guterres, UN secretary general.*

## PLASTIC SOUP

Estimated quantities of plastic in major marine areas, total and by size, in billion pieces (rounded numbers).





### NORTH ATLANTIC 930 BILLION PIECES

324		532	
2		73	

### MEDITERRANEAN SEA 247 BILLION PIECES

85		146	
0.4		16	

### NORTH PACIFIC 1990 BILLION PIECES

688		1,160	
3		132	

## INTRODUCTION

The unsustainable production of plastic packaging is extremely wasteful and impacts earth's ecosystems, on which we depend [1]. Due to poor product design and lack of political infrastructure, the majority of plastic waste is sent to landfills or disposed of into the environment. 8 million tons of plastic is dumped in the ocean every year. Plastic pollution threatens wildlife, alters ecosystems and poses risks to human health.

Plastic waste surrounds us – it is found in the air we breathe, in glacial ice on Mount Everest, in the water we drink, in fish we eat, and it was even recently discovered in human placenta. Plastics also have indirect negative impacts across its lifecycle, the consequences of which are neither visible nor obvious.

When not recycled or disposed of in a controlled manner, discarded plastic waste generates GHG emissions when exposed to solar radiation both in air and water.

More plastic than fish in the oceans by 2050, dying coral reefs and increase of plastic production: this is why we need to stop plastic pollution.

By reducing plastic consumption, improving recycling practices, enhancing waste management systems, fostering innovation, and raising public awareness, we can combat this global crisis and protect our planet for future generations.

No matter how well-educated consumers are and how many garbage bins are put in public spaces, there are always plastic polluters, indifferent people that keep on throwing plastic in the streets. Therefore, much plastic waste could be prevented by making producers responsible for the waste phase of their products. In other words, they remain the owners of the plastic they sold and must also accept it back after use. Extended producer responsibility (EPR) aims to reduce the total environmental impact of a product. The products are returned or collected after use so that the raw materials can be reused. Unfortunately, companies are wary of the costs that this would entail. And if they fear that their competitive position will be affected, they will soon find the government on their side.

When the plastic soup is discussed, solutions as 'recycling' or 'circular economy' are often mentioned. Theoretically, no plastic would end up in the environment if all the used plastic would be recycled and reused as virgin material. Unfortunately, the reality is less bright.

- to recycle all plastic is technically complicated;
- which makes the cost for collecting separated plastic and recycling high (for most countries too high);
- because new (virgin) plastic is very cheap and of better quality than recycled plastic, producers rather choose new plastic;
- a lot of the plastic ends up in the environment because of wear and can as such not be recycled.

### SIZE O

 0.5

 1

 4

 2

 EARTH PACIFIC

FOUNDATION

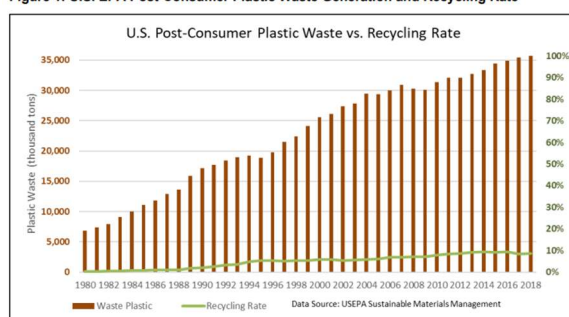


## THE REAL TRUTH ABOUT PLASTIC RECYCLING

The substantial recycling rates achieved for post-consumer paper, cardboard, and metals underscore the effectiveness of recycling in reclaiming valuable natural material resources [2]. However, the challenge lies not in the concept or process of recycling, but rather in the nature of the material itself – plastic recycling has consistently fallen short. Despite the ongoing export of millions of tons of waste plastic to China annually, the plastic recycling rate has struggled to surpass 10%. Despite this glaring failure, the plastics, packaging, and products industries have engaged in a protracted misinformation campaign, perpetuating the misconception that plastic is easily recyclable.

As depicted in Figure 1, from 1980 to 2018, plastic waste generation in the U.S. surged five-fold, from 7.4 to 35.7 million tons per year, yet the plastic recycling rate has consistently remained below 10%.

Figure 1: U.S. EPA Post-Consumer Plastic Waste Generation and Recycling Rate



The volume of plastic waste exports previously categorized as "recycled" has been declining, primarily driven by import bans imposed by China and Turkey, as well as contamination restrictions established by countries adhering to the Basel Convention Plastic Waste Amendments. According to data from the U.S. Plastic Waste Export, the total volume of plastic waste exported from the United States decreased from 1.84 million tons (1.7 billion kg) in 2017 to 0.61 million tons (0.56 billion kg) in 2021, as illustrated in Figure 2.

Figure 2: U.S. Plastic Waste Exports (2017-2021)

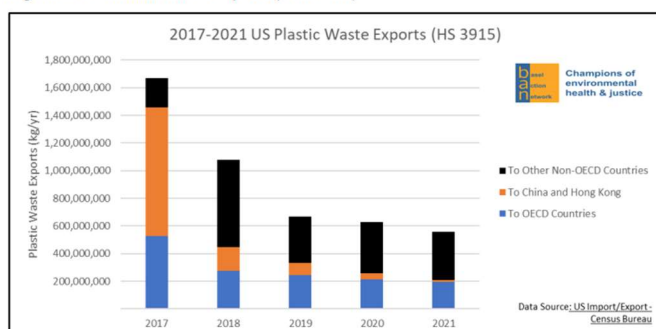
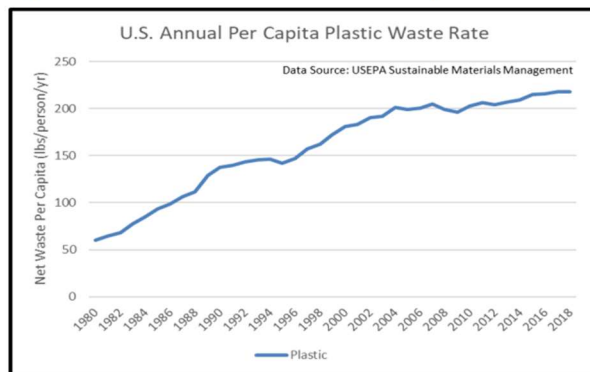


Figure 3 illustrates the escalation in per capita plastic waste production from approximately 60 pounds per person annually in 1980 to 218 pounds per person annually in 2018. This surge in plastic waste generation in the United States can be attributed to the proliferation of various types of single-use plastics offered to consumers. Unfortunately, many of these plastic products were inaccurately marketed as recyclable, leading to legal actions against major brands for deceptive advertising. Consequently, plastic has supplanted other packaging materials such as paper, metal, and glass, which are genuinely recyclable. This substitution leaves consumers with limited alternatives, compelling them to purchase products packaged in non-recyclable plastic waste.

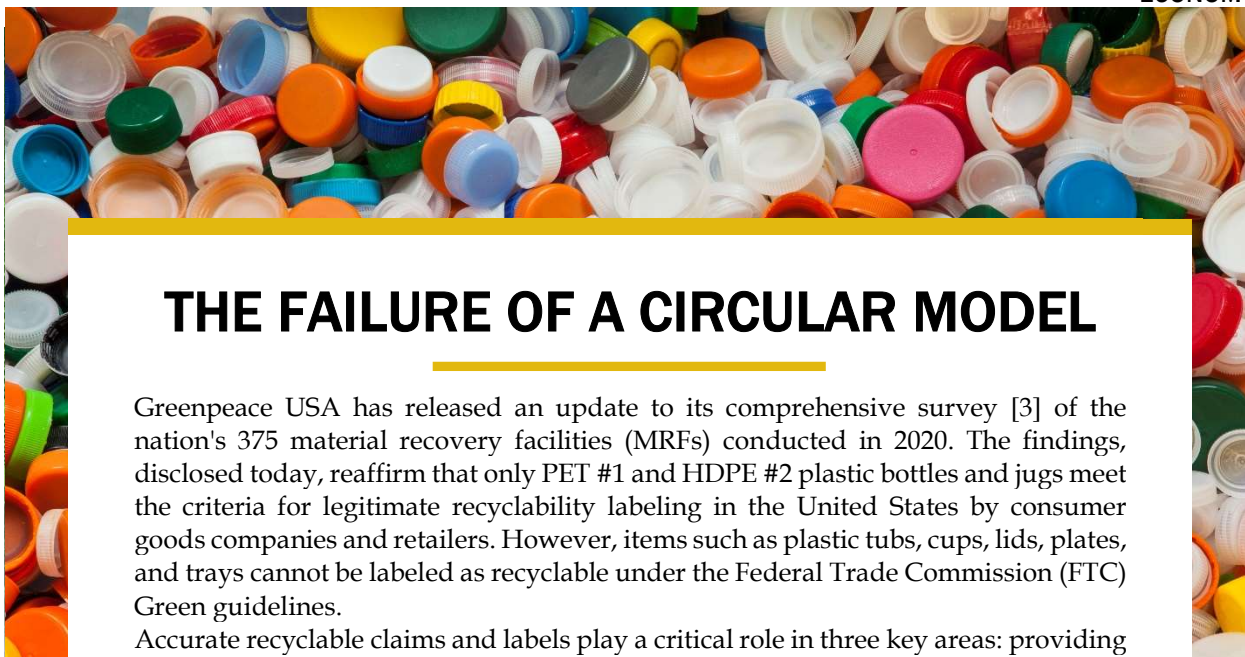
**Figure 3: U.S. EPA Plastic Waste Generation Per Capita**



It is valuable to contrast the shortcomings of plastic recycling with the achievements of paper recycling during the same period. Illustrated in Figure 4, the paper recycling rate in the U.S. surged from 21.3% in 1980 to 68.2% in 2018.

**Figure 4: U.S. EPA Paper Waste Generation & Recycling Rate Data**





## THE FAILURE OF A CIRCULAR MODEL

Greenpeace USA has released an update to its comprehensive survey [3] of the nation's 375 material recovery facilities (MRFs) conducted in 2020. The findings, disclosed today, reaffirm that only PET #1 and HDPE #2 plastic bottles and jugs meet the criteria for legitimate recyclability labeling in the United States by consumer goods companies and retailers. However, items such as plastic tubs, cups, lids, plates, and trays cannot be labeled as recyclable under the Federal Trade Commission (FTC) Green guidelines.

Accurate recyclable claims and labels play a critical role in three key areas: providing truthful information to consumers, preventing harmful contamination in the nation's recycling system, and identifying products that should be eliminated or redesigned to reduce plastic waste and pollution.

Key insights from the survey include:

1. Toxicity and economic factors present significant barriers to plastics recycling.
2. The plastics recycling rate in the U.S., as projected in the 2020 report, has declined from 8.7% in 2018 to approximately 5% in 2021.
3. Similar to findings in 2020, only select types of PET #1 and HDPE #2 plastic bottles and jugs can legitimately bear recyclable labels in the U.S. No plastic packaging currently meets the Ellen MacArthur Foundation's (EMF) definition of a recyclable product.
4. Various common plastic pollution items, such as single-use plastic food service and convenience products, do not meet the criteria for legitimate recyclability claims in the U.S. Refer to our Fast Food Plastic Survey for further details on product and labeling requirements.

As we continue to grapple with escalating environmental challenges, it becomes increasingly apparent that the circular model, while a step in the right direction, may not suffice as a long-term solution for waste management.

The circular model predominantly focuses on material flows and resource efficiency within closed-loop systems. While this addresses the immediate need to reduce waste and minimize resource depletion, it may overlook broader systemic issues such as social equity, cultural values, and long-term environmental resilience.

Current circular economy initiatives often operate in isolation, addressing specific waste streams or industries without considering their interconnectedness. This fragmented approach may result in missed opportunities for synergies and holistic solutions that tackle multiple challenges simultaneously.

The circular economy, by its nature, tends to evolve incrementally, addressing challenges as they arise rather than proactively anticipating future needs. In a rapidly changing world with evolving environmental threats and socio-economic dynamics, this reactive stance may prove insufficient to address emerging crises effectively.

While the circular economy emphasizes resource efficiency and material cycles, it may overlook the central role of human behavior and values in shaping consumption patterns and waste generation. Neglecting human responsibility and consciousness risks perpetuating unsustainable behaviors despite efficient material flows.



## THE RISE OF SPHERICAL ECONOMY

Given these limitations, the concept of a Spherical Economy [4] emerges as a compelling evolution beyond the circular economy. The Spherical Economy reconceptualizes waste management within a broader framework that places human responsibility at its core. Here's why it offers a more robust and sustainable approach:

**Human-Centric Design:** At the heart of the Spherical Economy lies a profound recognition of human responsibility and agency. By prioritizing values such as stewardship, empathy, and reciprocity, it empowers individuals and communities to make conscientious choices that prioritize the well-being of both people and the planet.

**Holistic Integration:** The Spherical Economy integrates environmental, social, and economic considerations into a cohesive framework, recognizing the interdependence of these dimensions. By addressing waste management in concert with broader societal values and ethical principles, it fosters more resilient and equitable outcomes.

**Proactive Anticipation:** Unlike the circular economy's reactive stance, the Spherical Economy adopts a proactive approach, anticipating future challenges and designing resilient systems capable of adapting to dynamic conditions. This forward-thinking mindset enables us to address emerging threats and opportunities before they escalate into crises.

**Continuous Learning and Adaptation:** Embracing the principles of adaptive management and co-creation, the Spherical Economy fosters a culture of continuous learning and innovation. It encourages experimentation, collaboration, and knowledge sharing, enabling us to iteratively improve our waste management strategies in response to evolving challenges.

**Cultural and Ethical Dimensions:** The Spherical Economy acknowledges the cultural diversity and ethical considerations inherent in waste management practices. It celebrates cultural heritage, traditional knowledge, and indigenous wisdom, recognizing the value of diverse perspectives in shaping sustainable futures.

In essence, while the circular economy laid the groundwork for reimagining waste management, the Spherical Economy represents a paradigm shift towards a more inclusive, resilient, and human-centered approach. By placing human responsibility at the center of the system and embracing complexity, diversity, and foresight, it offers a transformative vision for creating a sustainable future for generations to come.

In a world shaped by new dynamics, the model of Spherical Economy become the functional condition for establishing a winning balance between progress, individual and collective responsibility, and the centrality of human responsibility. To ensure sustainable growth in their operations (whether for-profit or non-profit), public entities, financial players, and companies must equip themselves - as organizations - with an entrepreneurial mindset, a social heart, and an ecological soul. In doing so, a virtuous cross-contamination between the public, private, and research sectors will be activated, driving the system towards the realization of conscious sustainability and the conscious affirmation of human centrality.

Today's world, as demonstrated by many theoretical sciences (quantum physics, cosmogony, or astronomy) but also practical ones (computer science, human physiology, or meteorology), shows us a horizon of great complexity: a reality often indecipherable enough to produce a doctrine, which complexity philosophy studies. This complexity becomes even more evident as the tools we use, especially new technologies, become sophisticated and pervasive. The revolution of computers, perpetual connectivity, and AI have led to the dramatic Orwellian dream that machines themselves could not only seek answers but be 'the' answer.





## Example of Spherical Approach: Reduce Plastic Waste and Pollution

Governments play a crucial role in shaping the transition towards a Spherical Economy by implementing supportive policy and regulatory frameworks. This may include measures such as plastic bans or restrictions, incentives for eco-friendly alternatives, and taxes or levies on single-use plastics. By aligning policies with the principles of the Spherical Economy, policymakers can create an enabling environment for innovation, investment, and sustainable business practices that drive positive change.

### **Bans on single-use plastic**

A single-use plastic items are made of low-value material that makes them widely available but economically impractical to collect and recycle. Legislative action to restrict single-use plastic bag distribution has resulted in a reduction of plastic bag pollution around the world. Bans on other single use plastics in food service applications have been adopted by the European Commission [5].

The Spherical Economy places a strong emphasis on education and cultural transformation. By fostering awareness about the environmental impacts of plastic pollution and promoting sustainable behaviors, individuals become empowered to make informed choices. Educational initiatives, community outreach programs, and media campaigns can all play a pivotal role in driving this cultural shift towards responsible consumption and waste management.

### **Water refilling stations**

A proven strategy to cut plastic beverage bottle waste and pollution is to make it easy for people to use fewer disposable bottles by providing public water refilling stations. Cities and their water agencies benefit from installing water stations which offer a filling function in addition to a drinking fountain, providing residents with free sources of high-quality drinking water and leading to a reduction in plastic waste. Every airport, train station, bus station, public building, and public space should install water refill stations. Water filling stations provide free, high quality drinking water to the public, without any of the downsides of single-use plastic waste and pollution.

One of the key principles of the Spherical Economy is designing products with end-of-life considerations in mind. This entails reimagining product design to prioritize recyclability, durability, and resource efficiency. Innovations such as biodegradable plastics, compostable packaging, and reusable alternatives can significantly reduce the accumulation of plastic waste in the environment.

### **Reusable container programs for food and beverage service**

As detailed by Upstream Solutions [6], the science shows that reuse clearly beats single-use in the environmental metrics on which they've been compared: Greenhouse gas emissions (GHG), water consumption, resource extraction, waste generation, litter generation, and plastic pollution. Companies like Costa Coffee in the U.K., who have listened to consumers and accepted the science and economic benefits of reuse [7], are now offering reusable cup programs that reward consumers with a free beverage after just four purchases



## THE NEXT PROBLEM: E-WASTE RECYCLING

As the world grapples with the urgent need to address plastic recycling to mitigate environmental degradation, it becomes increasingly evident that we are confronted with yet another substantial challenge: electronic waste (e-waste) recycling. While efforts to manage and recycle plastics have garnered significant attention due to their pervasive presence in our daily lives and their detrimental impact on ecosystems, the disposal and recycling of electronic waste pose equally pressing concerns that demand our immediate attention.

The main threats posed to the environment and human health by e-waste come from its heavy metals, persistent organic pollutants, flame retardants, and other potentially dangerous substances [8]. The hazard primarily arises from the release of pollutants into the environment during the dismantling process of electronic products, both formally and informally. These pollutants are then dispersed across various environmental media, including air, dust, soil, and water. They subsequently enter the ecosystem through geochemical cycles and biological pathways. The air serves as a medium for the volatilization of dust, heavy metals, and persistent organic pollutants, while incineration flue gas emits sulfur, nitrogen elements, dioxins, and heavy metals, contributing to atmospheric pollution. These pollutants undergo accumulation, migration, and transformation within animal and plant communities, as well as human populations, via the water cycle, soil, and groundwater, ultimately posing health risks.

The principles of the Spherical Economy are inherently intertwined with the global challenge of e-waste recycling. To address this challenge effectively, it is essential to align e-waste management practices with the core tenets of the Spherical Economy.

The principle of waste minimization underscores the need for thorough decomposition of e-waste in a manner that minimizes environmental harm. Trained labor should be employed to ensure safe and environmentally responsible handling of e-waste throughout the recycling process. This includes strict monitoring of heavy metals and persistent organic pollutants in water, air, soil, and solid waste to prevent contamination and mitigate health risks for both human populations and ecosystems. Additionally, the principle of technological innovation plays a crucial role in advancing green recycling practices for e-waste. Continuous development of fine separation technology enables more efficient and effective recovery of valuable materials from electronic devices, further enhancing resource utilization and reducing environmental impact.

By adhering to the principles of the Spherical Economy and integrating them into e-waste recycling efforts, we can move towards a more sustainable approach to resource management. This not only addresses the immediate challenge of e-waste pollution but also contributes to the broader goals of environmental protection, resource conservation, and sustainable development.



## CONCLUSION

We cannot afford to continue producing waste at current levels due to its detrimental impact on both the environment and human well-being. The linear model of production and consumption, which follows a "take-make-dispose" approach, is inherently unsustainable. It leads to the depletion of finite resources, environmental degradation, and the accumulation of waste, posing significant challenges for future generations.

Transitioning towards a new economic model is imperative, one that prioritizes sustainability and places humane responsibility at its core. In this model, often epitomized by the principles of the Spherical Economy, individuals, organizations, and governments act with an entrepreneurial mindset, a social heart, and an ecological soul.

An **entrepreneurial mindset** entails innovative thinking and a willingness to embrace new approaches and technologies that promote sustainability. It involves reimagining traditional business models to minimize waste generation, optimize resource utilization, and create products and services that contribute positively to society and the environment.

A **social heart** reflects a commitment to fostering equitable and inclusive societies, where the well-being of all individuals is valued and prioritized. In this economic model, considerations of social justice, human rights, and community welfare guide decision-making processes, ensuring that economic progress is not achieved at the expense of marginalized or vulnerable populations.

An **ecological soul** means a deep reverence for the natural world and a recognition of our interconnectedness with it. In this paradigm, economic activities are conducted in harmony with nature, respecting its intrinsic value and preserving its ecosystems and biodiversity. This involves adopting sustainable practices across all sectors, minimizing pollution and habitat destruction, and striving for regenerative solutions that enhance ecological resilience.

The Spherical Economy, as an evolution of the circular economy model, embodies these principles by emphasizing holistic and systemic approaches to resource management and economic development. It seeks to create closed-loop systems where resources are continually reused, recycled, and regenerated, minimizing waste generation and maximizing resource efficiency.

By embracing the principles of the Spherical Economy and integrating an entrepreneurial mindset, social heart, and ecological soul into our economic systems, we can pave the way for a more sustainable and resilient future. This transformative approach not only addresses the pressing environmental challenges we face but also fosters a more equitable, prosperous, and compassionate society for generations to come.



**Circularity is an urgent approach to respond to the demands of this time, but it is not the final solution. If we act consciously, before introducing new solutions and innovations into the system, we will no longer have problems.**



Contact  
MARIANNA MANFRINO  
Vice President  
Grateful Foundation  
[marianna.manfrino@gmail.com](mailto:marianna.manfrino@gmail.com)





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