UNIVERSITY OF PORTSMOUTH
GLOBAL PLASTICS POLICY CENTRE

Global Plastics Treaty

POLICY BRIEF

DEFINING PLASTICS CIRCULARITY

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FOR THE GLOBAL PLASTICS TREATY TO BE EFFECTIVE, THE DEFINITION OF PLASTICS CIRCULARITY MUST BE STANDARDISED INTERNATIONALLY FOR CONSISTENT IMPLEMENTATION AND COHERENT POLICIES ACROSS COUNTRIES.

Plastics circularity has been a core topic in the Global Plastics Treaty negotiations and discussions, highlighting the need for a clear, consistent definition. **This brief identifies a set of core conditions that define plastics circularity and accompanying principles to guide decision-making.** The analysis is based on a coded inventory of over 200 definitions from the academic literature and published reports, expert interviews, and a workshop with policy specialists [1].

1

Six core criteria define the plastics circularity.
A circular plastics material, product, process, business, or service:

- Decouples economic activity from resource use and extraction;
- Covers the full life cycle of plastics from upstream to downstream;
- Follows the zero waste hierarchy;
- Maintains the value of materials by keeping them in use as long as possible;
- Removes or reduces waste, and;
- Balances environmental integrity and social sustainability with economic value.

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2

Decisions on circular plastics activities should follow five principles to ensure they fully embody circularity.
Any activity in line with plastics circularity must:

- Protect, restore or regenerate nature;
- Ensure inclusive outcomes, quality job creation, fair and safe working conditions and that human rights are upheld and strengthened;
- Minimise pollution, including emissions and chemical leakages from plastics production, processing and disposal;
- Transition away from the production of virgin materials, in line with the zero waste hierarchy, and;
- Ensure dynamic safeguarding to identify and mitigate unintended consequences

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3

Circularity for plastics must be built on measurable targets such as reduction of plastic leakage, increased economic contributions to local communities, reduction in greenhouse gas emissions, enhanced biodiversity, or increased investment into circular economy initiatives.

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BACKGROUND & UNDERSTANDING: Defining plastics circularity

The **current linear plastics economy results in resource inefficiency, waste, and pollution.** This creates social, economic and environmental problems which distinguish the global plastic pollution crisis. A transition to a **circular plastics economy** is a solution which aims to retain materials in the economy for as long as possible, minimising waste and pollution. Several countries have adopted circular economy policies, and circularity is a key topic in the Global Plastics Treaty negotiations. However, defining plastics circularity is challenging due to varying interpretations and **inconsistent definitions.** A clear and systemic approach to plastics circularity is needed to have any substantive role in the Global Plastics Treaty and associated national policies for its delivery.

1 Defining a plastic material, product, process, business, or service as circular is based on six criteria:

A definition for plastics circularity serves as a foundational framework to evaluate whether a specific activity, material, product, or system aligns with the circular economy. The definition has been developed as a set of criteria or benchmarks that must be met for an activity, material, product, or system to be considered circular. **If a material, product or system fails to meet all of the criteria in the definition, it cannot be classified as fully circular.**

CRITERIA #1

Decoupling economic activity from resource use or extraction

Achieving circularity in the plastics economy requires a fundamental shift away from reliance on new resource extraction to focusing on retaining the value of products and materials currently in circulation [2]. The shift aims to promote reducing resource use and sustaining economic activity whilst reducing environmental impact. This means disassociating a product or service from its natural resource base [3], or prioritising its function rather than the material itself (industrial dematerialization). **Fundamentally, circularity cannot be achieved without this decoupling [4].** The continued reliance on extracting new resources perpetuates a linear model of consumption, which is the opposite of the circularity concept. Without decoupling, there is little incentive to innovate, as the focus remains on producing new items rather than rethinking how to best use existing materials.

Example intervention:

The circular value ecosystem (CVES) framework [5] considers regional conditions and system dynamics related to circularity. Applying the CVES framework can help inform decision makers on how to 1) decrease natural resource consumption through substitution; 2) generate alternative economic benefits with increasing returns; 3) mitigate adverse environmental impacts; and 4) stimulate self-sustaining wealth for the economy, environment, and social development of the majority of stakeholders in these areas.


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CRITERIA #2

Cover the full life cycle of plastics

The full life cycle approach ensures that plastics are managed comprehensively from resource extraction to end-of-life. Whilst the definitions of life cycle assessments vary, the stages relating to circularity commonly include natural resource extraction and refining, design and manufacture, packaging and distribution, sale, reuse, collection and disposal [6].

A life cycle approach aims to ensure that every stage of a plastic material or product's life contributes to a more efficient system which produces less waste and pollution.

Example intervention:
Life Cycle Assessment (LCA) is a tool to ensure that adopted circular economy approaches meet the expected reduced economic and environmental impacts. LCAs analyse the impact and potential synergies of a material or a product at different stages within the life cycle [7]. LCAs can also identify optimal product or material lifespans and the most environmentally friendly options for a product or material. As alternative resources and materials come with trade-offs, LCAs help to ensure that the most sustainable option is adopted by balancing these trade-offs.

CRITERIA #3

Follow the zero waste hierarchy

The zero waste hierarchy (Figure 1) emphasises waste prevention as its top priority. It encompasses all of the 'Rs', of which many provide a vehicle for the delivery of the circularity concept. **By integrating the zero waste hierarchy into the definition of plastics circularity, the focus shifts towards designing out waste rather than managing it once it's created.** Following the waste hierarchy encourages the efficient use of resources by promoting practices which conserve resources and reduce the need for new plastic production. Public investment and policies in the lower half of the waste hierarchy have solidified societal assumptions that linear waste management infrastructure will be sufficient to manage the volumes of waste generated [8]. However, the future volumes of plastic waste will likely exceed the current waste management capacity [9]. Therefore, plastic-related policies are urgently needed at the upper stages of the zero waste hierarchy to reduce the flow of waste into the waste management infrastructure [10].

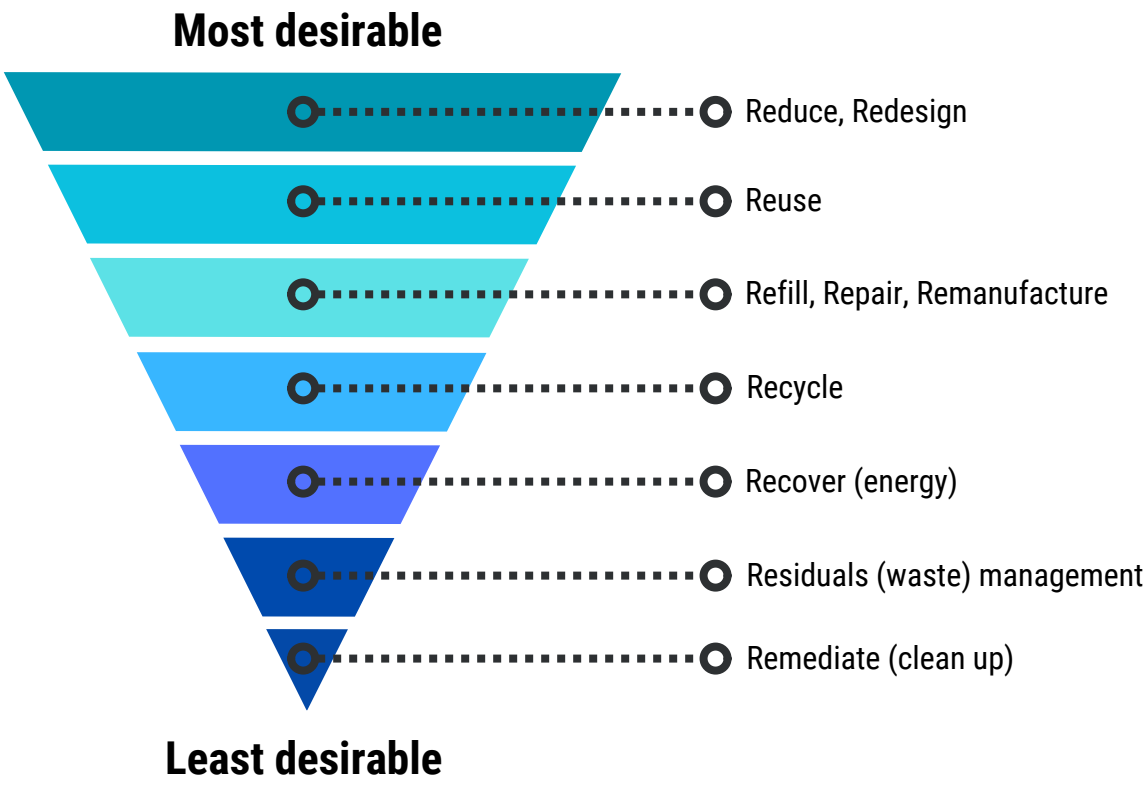

Figure 1. Plastics zero waste hierarchy [12]

Since the launch of the 3R Initiative in 2005 [11], circular economy approaches have been guided by many combinations of the "Rs", including reduce, reuse, recycle, refill, repair, redesign, remanufacture, and others. These Rs have been widely referenced in government and corporate policies, national action plans on waste management and pollution prevention, and the United Nations Sustainable Development Goals. However, the Rs do not define whether a material, product or system is circular; rather, they identify mechanisms to deliver circularity. All Rs sit within the zero waste hierarchy (Figure 1), and should be treated as potential pathways to achieve circularity.

Example intervention:

Introduce a national reusable food packaging programme requiring food retailers and takeaway services to offer durable, standardised reusable containers for items like takeaway meals and fresh produce. Supported by a deposit-return system, consumers would pay a small deposit when using these containers, which they can reclaim by returning them at collection points nationwide. This system would reduce reliance on single-use plastics, create a reuse network for food packaging, and be supported by incentives for businesses to participate and invest in cleaning and logistics infrastructure [13].

CRITERIA #4

Maintaining the value of materials by keeping them in use as long as possible

Extending the lifespan of plastic materials and products displaces the need for new resource extraction. Circular approaches reinforce the need to maintain materials' economic and perceived value. Maintaining the value of materials helps change the perception of reused or repaired products or recycled materials from inferior to virgin materials or products to being valued for their quality and sustainability [14]. This change in perception will drive consumer behaviour and influence manufacturers' design choices [15]. However, the use of renewable resources should be balanced with considerations of biodiversity, land and water use, and overall environmental impact.

Example intervention:

Implement an Extended Product Responsibility (EPR) scheme that incentivises manufacturers to design plastic products for durability, repairability, and recyclability. The scheme could include fee modulations rewarding companies that produce easily repairable or recyclable products and penalising those that generate products with short lifespans or complex compositions. This approach encourages businesses to maintain the value of materials and keep them in use for as long as possible, shifting design and production practices toward longer lifespans, reduced environmental impact and cost savings for businesses [16].

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CRITERIA #5

Eliminate or reduce waste

Eliminating or reducing waste is fundamental to circularity, as it directly addresses the problem of plastic (and other) pollution by minimising waste leaking into the environment in the first place. Rethinking and redesigning products and processes according to circular principles prevents waste creation from the outset, rather than managing it later in the lifecycle.

Example interventions:

Changing polymerisation or manufacturing processes to use fewer resources, including chemicals and additives to generate less waste, e.g. returning 'waste' from the manufacturing process into the system (closed loop manufacturing) or selling it to a different company as a raw material (industrial symbiosis), lightweighting (reducing material used), using monomaterials instead of multilayer materials [17]. Additionally, **adopting modular design approaches** will allow for easy disassembly, repair, or replacement of parts instead of discarding the entire product.

CRITERIA #6

Balance environmental integrity and social sustainability with economic value

Incorporating the potential for economic benefits into circularity is key to generating buy-in from actors across the value chain. Simultaneous and collaborative engagement of environmental, economic, and social dimensions and their actors has the potential to result in successful transitions to circularity [18].

A circular approach to the whole plastics life cycle not only has the potential to be environmentally beneficial but economically viable [19]. Concerns that sustainable practices lead to higher costs can be addressed by highlighting the economic opportunities and efficiencies from circular practices, including quality job creation in remanufacturing sectors, lower structural unemployment, increased material productivity, innovation in materials processing, and long-term cost savings through resource conservation [20].

Example intervention:
A Socio-Economic Impact Assessment can be applied to evaluate the broader effects of circular plastics interventions on communities and economies. This assessment measures indicators such as job creation, economic resilience, shifts in income distribution, and social equity, alongside environmental benefits, to ensure that circular practices support sustainable economic growth and social well-being in tandem with reducing environmental impact.

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2 Decision-making for circular activities should follow five principles to ensure actions embody circularity

The purpose of establishing a set of principles for plastics circularity alongside a definition is to provide practical guidelines that operationalize the core concepts of the definition. While the definition determines whether or not a material, product or system is circular, **the principles act as "guard rails," guiding actions and decisions aligned with the overarching goal of circularity.**

Any decision, policy, activity or process related to plastics should conform to all of these principles. The principles follow no hierarchy, and should all be considered equally.

PRINCIPLE #1

Protect, restore or regenerate nature

The principle of protecting, restoring, or regenerating nature guides actions towards minimising harm and actively contributing to ecological restoration [21]. It extends the scope of plastics circularity from waste management to holistic environmental stewardship, emphasising the restoration of ecosystems affected by all stages of the plastic life cycle, including fossil fuel extraction, plastic production, waste and pollution [21]. The principle recognises that **the economy is dependent on healthy ecosystems.**

PRINCIPLE #2

Ensure inclusive outcomes, quality job creation, fair and safe working conditions and that human rights are upheld

It is important to foster a system where the benefits of the plastic life cycle and any new circular approaches are equitably shared, while the harms are minimised for all affected groups [22], particularly underrepresented and marginalised communities [24]. Focusing on generating new employment opportunities and enhanced working conditions across the entire plastics value chain ensures a fair and just transition that respects and prioritises human rights.

Informal waste workers play an important role in waste collection and recycling around the world. Through the introduction of circularity without ensuring a just transition and inclusive outcomes, these essential workers are at risk of becoming pushed out of the value chain and their livelihoods threatened. Some countries have made efforts to include informal waste workers in modernising waste management systems by creating synergies with local authorities, private business and citizens [25].

PRINCIPLE #3

Minimise pollution, including emissions and chemical leakages across the entire plastics lifecycle

This principle acknowledges that the **environmental footprint of plastics extends beyond the point of their disposal,** covering the full plastics life cycle. This includes significant greenhouse gas emissions and chemical leakages during polymerisation, manufacturing, processing, and recycling [26]. Moreover, the downstream stages of this life cycle heavily impact the health conditions of informal waste workers. Therefore, by prioritising the reduction of these previously overlooked aspects of greenhouse gases, chemical risks, and human health impacts, along with tackling the direct pollution caused by plastics, this principle advocates for a more holistic approach to pollution management across the full plastics lifecycle [22]. Adopting this principle is expected to drive innovation and efficiency within the plastics industry [27], encouraging the development and adoption of cleaner, more sustainable production technologies and practices. This push for innovation can lead to more efficient use of resources, energy savings, and the development of new, less polluting materials.

This principle directly aligns with commitments required under the Paris Climate Agreement and the Kunming-Montreal Biodiversity Framework.

Example interventions:

Managing chemical leakages can include developing stringent safety and sustainability criteria for chemicals and materials, clear guidelines and goals for achieving chemical simplicity in plastics, and incentivising research and development into simpler plastic materials. **Minimising GHG emissions from the upstream** (which is most emission-intensive part of the life cycle) can include reducing demand for virgin and/or fossil-fuel based plastics with alternative materials and reuse systems [28] and gradually phasing them out when innovations of more benign materials are available [29]. **Minimising pellet loss** from transports and production processes through implementation of spill procedures, control programmes and increased awareness throughout the production and transport processes [30].

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PRINCIPLE #4

Transition away from the production of virgin materials, in line with the zero waste hierarchy

This principle emphasises the importance of minimising the demand for new plastic production [31]. Compliance with this approach **reduces reliance on finite natural resources and decreases the overall environmental impact associated with extracting and processing virgin materials.** This principle supports a systemic change in the plastics industry, encouraging innovation in reuse and recycling technologies and the development of more sustainable alternative materials. It has the potential to guide businesses and policymakers to prioritise sustainable sourcing and invest in circular economy models that have proven to be successful.

PRINCIPLE #5

Ensure dynamic safeguarding

In the pursuit of circular plastics, all actions and strategies must be continually assessed to ensure they do not exacerbate existing environmental, economic or social problems nor create new ones.

Dynamic safeguarding involves a proactive rather than reactive approach to identifying and mitigating unintended consequences [32]. Recognising that systems and contexts evolve over time, this principle requires that actions and strategies are proactively assessed, adjustment of practices and continuous monitoring of measurable, metric-based targets to remain relevant and effective. Regular reviews and adaptations as a result of dynamic safeguarding aim to ensure that the net impact of circularity actions is beneficial, and prevents undue harm to the environment and society.


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3 Plastics circularity must be built on measurable targets

Measurable targets enable progress tracking, which fosters a culture of accountability and transparency [9]. Quantifying efforts to adopt circularity principles enables comparisons, providing benchmarks for performance and guiding decision-making [33]. The quantifiability of circular approaches allows for more objective evaluations of different strategies and interventions, helping to determine which approaches are most effective. Examples of effective metrics can be found in the Circularity Metrics Lab run by the European Environment Agency which provides evidence to track progress towards the circular economy. It is intended to complement other monitoring frameworks by providing additional evidence on circularity [34].

As circularity is likely to be included in the Treaty, our research suggests that it must have a globally uniform definition with metrics and targets that enable tracking against global circularity targets. If these measurable targets are inconsistent between governments and businesses, tracking actions towards common goals will be challenging. The same is true at the national level, where if circularity for plastics is to be embedded in national implementation, such as through national plans, a uniform definition and metrics for assessment will contribute to more robust implementation of circularity.

A series of possible metrics or measurable targets for each circularity principle are presented below (Table 1). The examples for each metric are hypothetical and will need to be determined more specifically based on careful consideration of the current industry, social and environmental context, available data, local conditions, and the most up to date data.

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Table 1. Possible metrics or measurable targets for each guide rail principle

Principle	Indicative measurable targets
Protect, restore or regenerate nature	• Increase in biodiversity • Increased habitat restoration • Increased carbon sequestration
Deliver inclusive outcomes, job creation, and economic stability	• New quality jobs created • Higher income and safer working conditions of waste workers • Increased economic contribution to local communities • Higher industry growth rates • Increases in investment for circular economy initiatives • Increased business stability
Minimise pollution, including emissions and chemical leakages from plastics production and processing	• Reduction in greenhouse gas emissions • Reduction in plastic leakage • Improved hazardous chemicals control • Improved health status of waste workers
Transition away from the production of virgin materials, in line with the zero waste hierarchy	• Increase in recycled material use • Reduction in virgin material use • Increased waste diversion rate
Ensure dynamic safeguarding	• Reduced incidence of negative impacts • Faster response time of adaptability measures

CONTRIBUTOR INFORMATION

Based at the University of Portsmouth, UK, the **Global Plastics Policy Centre** is an independent knowledge broker, facilitating effective plastics policy-making in government and the private sector. The Centre provides evidence-based guidance at the interface of government, businesses, citizens, and researchers, including supporting the process to develop a legally binding instrument to end plastic pollution.

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ABOUT THIS POLICY BRIEF

The review to find and evaluate definitions and principles of a circular economy and discuss what they mean for plastics was undertaken in four parts: a desk-based review of existing literature on circularity, the development of a coded database with 204 definitions or principles for circularity, six remote structured interviews with actors in the plastics and circular economy field, coding and analysis of both the database and interview data, and a workshop with eight policy specialists from different disciplines.

For more information, please contact globalplastics@port.ac.uk

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Scan the QR code for more relevant resources for circular economy and its connection with the Global Plastics Treaty, collated on the Global Plastics Policy Centre website.

For more of our research, visit
https://plasticspolicy.port.ac.uk/research/

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