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A circular economy for tackling plastic pollution

Main messages

A circular economy for plastics:

- acknowledges the significant environmental impacts of our plastic waste,
- and the full value and cost of not utilising the resource to its full potential, thus creating a system that does.[1,2]
- requires products to be designed to ensure a viable circular economy.
- must include economically viable plastic reuse, repair and recycling.
- requires additives to be carefully considered, reduced, and used transparently when designing new products.
- should include a supportive policy environment for both the informal and formal sectors, considering economic viability and infrastructural support across a wide range of stakeholders, as well as social and environmental aspects.

Background

Our current conventional economic model for plastic products is linear, extracting finite raw materials (such as fossil fuels), producing products that become waste. A circular economy is an alternative model which promotes waste as a "resource".[3] It is a "system solution framework… based on three principles: eliminate waste and pollution, circular products and materials (at their highest value), and regenerative nature."[4] This means that the entire process changes, starting with extraction of raw materials, to design to prevent the creation of waste, keeping the material in circulation for as long as possible through reuse, repair, refurbishment, recycling and recovery of end-of-life products.[5] The circular economy model is presented as a solution to reduce plastic pollution by keeping plastic within the economic system by design and could prove a more ecologically sound choice.

The transition to a circular economy

In terms of the current plastic production, a circular economy is ideological[6] and is part of a paradigm shift in recognizing the value in our current waste and moving towards circular resource management. The circular economy has attracted strong theoretical support for tackling the plastic pollution problem,[7] and it has the power to attract a variety of stakeholders to sustainability work.[8,9] However, transition to a circular economy requires supportive policies and actions.[10] Furthermore, scientific research is needed to ensure that the environmental impacts of a circular economy work toward sustainability.[11]

Barriers to circularity of plastics

Plastics undergo weathering and fragmentation when exposed to UV radiation, certain additives can slow this process. Additionally, plastics may absorb chemicals from their environment or the products they carry. These additives and absorbed chemicals are a barrier to a circular economy, especially when reusing or recycling plastics into new toys or food-grade material.[12] Legacy toxic additives and polymers within existing plastics will need to be removed from the system in an environmentally friendly, economically feasible and transparent manner[13] to realise a circular economy for plastics. The presence of legacy toxic additives means that not all current plastic can be incorporated within a circular economy, and new clean polymers will need to be designed and manufactured with the circular economy in mind. The use of additives, which give desirable properties to plastics, need to be carefully considered, reduced and used with transparency, in the future design and production phase of any plastic to improve the opportunity to reuse and recycle. If removal of chemical contamination - both absorbed and added during manufacture - is not possible within the circular system, new polymers need to be produced as contaminated plastic is manufactured into lower-value products.

Reducing plastic waste, not production

The circular economy does not decrease plastic production or reduce problematic and avoidable plastic products, including short-lived and single-use plastic products, rather it aims to reduce plastic waste production. However, principles of reduction can be applied alongside the principles of the circular economy to align with the reuse, repair or recycle phases of the waste hierarchy, though not reduction. For a circular economy to work, plastic reuse, repair or recycling must be economically viable. This means that sturdy, longer-lasting products that can be reused and repaired need to be designed and manufactured. Once a product can no longer be reused or repaired, profitable end-use markets must be available for recycled and recyclable products.

Informal waste sector recycling

Policies supporting a circular economy should include support and expansion of existing waste collection and recycling systems. The informal sector is critical in the current waste management value chain and supporting the formal recycling systems.[14,15] The informal waste management system targets high-value recyclable materials from waste bins at kerbside or landfill sites and sells them into the recycling value chain.[16] The informal sector collected 58 % of post-consumer plastic waste for recycling in 2016.[17] A circular economy, designed to increase the value of low-value, non-collected items, and increase the number of items that can be recycled, needs to provide a positive environment for both the informal and formal sectors, considering economic, social and environmental aspects.

Advantages

- The informal and formal waste sectors target high-value recyclable materials. These existing systems must be supported and built on to expand the collection by increasing the value of currently non-recyclable materials.
- The circular economy can decrease plastic waste production and increase economic activity around repair, refurbishment and recycling.[18]

Disadvantages

- A circular economy requires a system change across a wide range of stakeholders, this transition needs to be done carefully and fairly.
- Current poor waste management undermines the opportunity to create a circular economy.[19]
- Contamination of conventional plastics with food and other organic waste reduces recycling potential. A circular economy and the collection of plastic waste for recycling need additional infrastructural support to remove organics-at-source.
- A circular economy of plastics requires a positive and supportive policy environment to be economically viable.
- The lack of transparency and sheer number of known additives complicate every stage of the plastic life cycle and challenge circular economy efforts. Toxic additives, chemicals and polymers of concern are a barrier to recycling and the circular economy.[20] Restricting the use of harmful substances will help simplify the management of plastic waste and protect the environment.[21]
- A circular economy requires clear communication with the public, separation-at-source, and appropriate collection and treatment.

The table below outlines alternative plastics and substitutes, specifically biodegradables, against the 13 options for elements as outlined in the Zero Draft of the Intergovernmental Negotiating Committee for a legal instrument to tackle plastic pollution, including in the marine environment.

Considerations for sustainability*

		A circular economy...
Option 1 Primary plastic polymers		• over time, can facilitate the reuse of primary plastic polymers, thus reducing their production . However, it currently relies on growing the plastic economy as primary polymers get contaminated and can only be recycled a limited number of times.[22,23,24]
Option 2 Chemicals & polymers of concern		• currently experiences substantial barriers due to the use of additives that are unknown, toxic and chemicals of concern. In order to transition from linear to circular, toxic and chemicals of concern need to be regulated/phased out.[25]
Option 3 Problematic & avoidable plastic products	**a.** Problematic and avoidable plastic products, including short-lived and single-use plastic products	**a.** does not directly eliminate problematic and avoidable plastic products. Its related principles, projects and campaigns should help eliminate problematic and avoidable plastic products, through smarter use.[26]
	b. Intentionally added microplastics	**b.** and its principles do not align with using intentionally added microplastics.
Option 4 Exemptions available to a Party upon request		• does not apply to legal exemptions
Option 5 Product design, composition and performance	**a.** Product design and performance	**a.** requires design for circular. Principles, policies and financing support should help transition to a circular system.[27,28,29,30]
	b. Reduce, reuse, refill and repair of plastics and plastic products	**b.** includes reuse refill, and repair, principles, research and financing mechanisms/incentives that can help support the reuse and repair of products. A circular economy does not have a reduction in plastic production.[31,32,33]

Considerations for sustainability*

		A circular economy...
	c. Use of recycled plastic contents	c. principles support the use of recycled plastic content.
	d. Alternative plastics and plastic products	d. principles support sustainability. However, scientific research is needed to ensure that the environmental impacts of alternative plastics work towards sustainability in a circular economy.[34]
Option 6 Non-plastic substitutes		• can also be applied to ensure sustainable design and management of non-plastic substitutes, encouraging innovation and investment toward safe, sustainable alternatives and substitutes.
Option 7 Extended Producer Responsibility (EPR)		• EPR can help provide the supporting financial incentives for a circular economy.
Option 8 Emissions and releases of plastic throughout its life cycle		• does not reduce the leakage of litter into the environment. However, it provides economic incentives to encourage reuse, repair, or recycling collection, which in turn should reduce leakage.[35]
Option 9 Waste management	a. Waste management	a. should help reduce the waste management burden for landfill and leakage through waste minimalisation. Poor waste management undermines collection efforts to support a circular economy.[36,37]
	b. Fishing gear	b. can be used to improve the design, use and waste management of fishing gears.
Option 10 Trade in chemicals, polymers and products, and in plastic waste	a. Trade in listed chemicals, polymers and products	a. principles can help provide incentives to help transition towards improving the use of safe and sustainable chemicals and polymers in plastic products, while also helping improve the transparency of industry and the supply chain through improved design.
	b. Transboundary movement of plastic waste	b. transboundary movement of plastic waste should only occur to support a circular economy through economies of scale. Contaminated plastic waste should not be transported under this guise.
Option 11 Existing plastic pollution, including in the marine environment		• will not reduce the amount of existing plastic pollution.
Option 12 Just transition		• should provide economic incentives to support the informal and formal waste sectors, thus supporting a just and inclusive transition.[38]
Option 13 Transparency, tracking, monitoring and labelling		• development should be supported by transparency throughout the plastic value chain with industries monitoring, tracking and reporting products and product components

*Plastics will still fragment and form microplastics. However, associated collection and sorting of plastics should reduce plastic leakage into the environment, and so microplastics, through this source.[39]
*As with the linear economy, the circular economy plastics and human health effects are still being fully defined.

Further reading

[16] Stafford, W. H. L., Russo, V., Oelofse, S. H. H., Godfrey, L., & Pretorius, A. (2022). Reducing Plastic Pollution: A Comprehensive, Evidence-Based Strategy for South Africa. Waste Research Development and Innovation Roadmap Research Report (Technical Report CSIR/SPLA/SECO/ER/2022/0050/A; Waste Research Development and Innovation Roadmap Research Report). CSIR.

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United Nations Environment Programme & Secretariat of the Basel, Rotterdam and Stockholm Conventions. (2023). Chemicals in plastics: A technical report. Geneva

Case study

PETCO: https://petco.co.za/

European Environmental Agency. (2023). Pathways towards circular plastics in Europe—Good practice examples from countries, business and citizens. https://www.eea.europa.eu/publications/pathways-towards-circular-plastics-in/pathways-towards-circular-plastics-in/download.pdf.static