

Circular Economy Strategies Beyond Recycling

Complementary Solutions for Managing Plastic Waste

Overview

Recycling plays an important role in managing plastic waste and recovering valuable materials. However, recycling alone cannot address all the environmental, economic, and infrastructure challenges associated with plastics. Material losses occur throughout the recycling process, not all plastics are readily recyclable in our current system, and demand for recycled materials must exist for recycling systems to function effectively.

A circular economy seeks to keep materials in use for as long as possible through strategies that prioritize waste prevention, reuse, repair, and material recovery. These approaches align with the waste hierarchy, which prioritizes preventing waste before it is created and maximizing the value extracted from materials before disposal.

The Plastic Waste Hierarchy

1. **Prevent** – Avoid creating plastic waste through smarter product design and packaging choices.
2. **Reduce** – Use less plastic by minimizing material use and eliminating unnecessary packaging.
3. **Reuse** – Keep products and packaging in use longer through reuse, refill, repair, and refurbishment.
4. **Recycle** – Process used plastics into raw materials for new products and packaging.
5. **Recover** – Extract value from non-recyclable plastics through energy or resource recovery.
6. **Dispose** – Landfill or discard materials when no higher-value recovery option is available



Source: US EPA
<https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy>

Circular Economy Strategies for Plastics

No single strategy is appropriate for every product, application, or community. A circular economy relies on a combination of complementary approaches that reduce material use, keep products and materials in service for as long as practical, recover resources at the end of their useful life, and strengthen markets for recycled materials. The most appropriate strategy or combination of strategies depends on factors such as product design, available infrastructure, economics, environmental objectives, and local conditions.

Reduction and Source Prevention

What Is It?

Reduction and source prevention focuses on avoiding unnecessary plastic use before products are manufactured or waste is created. By reducing the amount of material entering the system, fewer resources are extracted, transported, and managed at end of life.

Best suited for:

- Eliminating unnecessary packaging
- Lightweighting packaging
- Product concentrates and refill systems
- Product redesign to use less material
- Replacing difficult-to-recycle packaging with simpler formats

When would you choose this strategy?

Reduction and source prevention is often considered first in the waste hierarchy because it prevents waste from being generated. It is most appropriate when product functionality can be maintained while using less material or eliminating unnecessary packaging. In some applications, however, reducing material use may require product redesign or alternative packaging solutions that must continue to meet performance, safety, and consumer expectations.



Reuse and Refill Systems

What is it?

Reuse systems keep products and packaging in circulation through multiple use cycles rather than being discarded after a single use. These systems rely on collection, cleaning, redistribution, and consumer participation.

Best suited for:

- Refillable beverage containers
- Reusable takeout containers
- Bulk refill stations
- Returnable transport packaging
- Reusable e-commerce packaging

When would you choose this strategy?

Reuse systems are most effective where products can be efficiently collected, cleaned, and redistributed. They are generally best suited for high-volume or closed-loop applications where infrastructure and consumer participation support multiple reuse cycles. Depending on the system design, transportation, washing, water use, and energy requirements should also be considered when evaluating overall environmental performance.

Product Life Extension

What Is It?

Product life extension keeps products in use longer through repair, refurbishment, upgrades, and replacement of individual components. Extending product lifespans reduces demand for new materials and delays disposal.

Best suited for:

- Appliance repair
- Electronics repair
- Replacement parts programs
- Product refurbishment
- Durable consumer goods

When would you choose this strategy?

This approach is most appropriate for durable products with remaining functional value. It is often selected when repairing or refurbishing a product requires fewer resources than manufacturing a replacement. Some products, however, may not be designed for repair, and replacement parts or repair services may not always be readily available.



Recycled Content

What is it?

Using recycled plastic in new products creates demand for recovered materials, helping support recycling markets and keep plastics in circulation within the economy.

Best suited for:

- Packaging containing post-consumer recycled (PCR) content
- Consumer products made with recycled plastics
- Construction materials
- Non-food-contact applications

When would you choose this strategy?

Recycled content is appropriate when quality, performance, and regulatory requirements can be met using recovered materials. It is commonly used to strengthen end markets for recyclable plastics and reduce reliance on virgin resin. Availability of recycled resin, performance requirements, regulatory approvals (particularly for food-contact uses), and cost can influence where recycled content is most practical.



Compostable and Alternative Materials

What is it?

Compostable and bio-based materials can complement other circular economy strategies in specific applications where traditional recycling may be impractical or contamination with organic waste is expected.

Best suited for:

- Food-service items contaminated with food waste
- Organics collection programs
- Certain agricultural applications
- Applications supported by commercial composting infrastructure

When would you choose this strategy?

These materials are generally most appropriate where dedicated collection and processing infrastructure exists. Compostable materials are not a replacement for waste reduction or recycling but may serve a complementary role in applications where composting provides the best overall recovery pathway. Where composting infrastructure is unavailable, these materials may not achieve their intended environmental benefits and can create challenges if mixed with conventional recycling streams.

Design for Circularity

What is it?

Design for circularity incorporates features that make products easier to reuse, repair, collect, sort, and recycle throughout their lifecycle.

Best suited for:

- Mono-material packaging
- Easily separable components
- Standardized packaging formats
- Products designed for repair or disassembly
- Packaging intended for reuse systems

When would you choose this strategy?

This strategy is most effective during product development, where design decisions can improve compatibility with existing collection and recycling systems before products reach consumers. Achieving these objectives may require balancing recyclability with other considerations such as product protection, cost, shelf life, and manufacturing requirements.



Circular Procurement

What is it?

Circular procurement uses purchasing decisions to increase demand for products that incorporate recycled content, are reusable, repairable, or otherwise support circular economy objectives.

Best suited for:

- Recycled-content purchasing requirements
- Reusable food-service products
- Circular procurement policies and standards
- Government purchasing
- Corporate sustainability programs

When would you choose this strategy?

Circular procurement is most effective when organizations want to strengthen markets for circular products and provide long-term demand that supports investment in recycling, manufacturing, and circular infrastructure. Some circular products may have higher upfront purchase costs or more limited availability than conventional alternatives, although these differences may change as markets continue to mature.

Key Takeaways for Policymakers

No Single Solution – No single strategy is appropriate for every product or application. A circular economy relies on selecting the right combination of approaches based on product design, infrastructure, economics, environmental objectives, and local conditions.

Prevention First – Reducing unnecessary material use helps prevent waste before it is created and is generally represented at the top of the waste hierarchy.

Keeping Materials in Use – Reuse, repair, recycled content, recycling, and other circular strategies work together to extend product life, recover resources, and reduce demand for virgin materials.

Design Matters – Products designed for circularity are easier to reuse, repair, collect, sort, and recycle.

Infrastructure & Markets – Collection, repair, cleaning, sorting, processing, manufacturing, and strong end markets all support a functioning circular economy.

Procurement Drives Demand – Purchasing decisions from governments, businesses, and consumers can help expand markets for circular products and encourage innovation.

True Cost Accounting – Considering lifecycle impacts including material use, energy, water, transportation, infrastructure, costs, and end-of-life management, can help inform more balanced decisions.

Collaboration is Essential – Advancing a circular economy requires coordination among governments, producers, retailers, recyclers, consumers, and end-market manufacturers.