# The Next Frontier for Plastics Regulations: Tackling Infrastructure Gaps and Material Challenges

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Sustainable actions — *communicated well* — pay off in the capital markets

# Overview

Regulatory pressures in the US and EU create opportunity for innovation in recycling and alternative materials as the global plastics problem continues to grow.

## BACKGROUND

In the United States and the European Union, pressures to reduce plastic waste and foster a more sustainable materials economy are reshaping the investment and innovation landscape. Traditional plastic production models—which have long relied on cheap, abundant feedstocks and minimal end-of-life accountability—are under increasing scrutiny as consumer awareness rises.

Policymakers in both the US and EU have enacted more stringent regulations to address plastics in the past decade, with the EU's overarching plastic strategy (e.g., Waste, Single-Use Plastics Directives) establishing common goals across member states, and the US' decentralized, patchwork approach leaving decision-making to state and local regulators. Concurrently, infrastructure shortfalls—such as limited recycling capacity, inconsistent collection systems and complexity in managing diverse plastic types—highlight urgent need for new approaches to waste management and product design.

Biopolymers, advanced chemical recycling technologies, and more sustainable packaging solutions are gaining traction, as are designs geared toward recyclability and resource efficiency. This evolution in materials and processes is being driven by a combination of environmental concerns, market pressure, and regulatory interventions designed to hold all players in the plastics value chain accountable for their impacts.

## INSIGHTS

**Market demand for plastics alternatives and compliance solutions is strong as regulators in the US and EU look to the address the global plastics problem, creating opportunity for innovation across multiple sectors.**

**The EU's progressive policies raise the bar for global best practice. However, member state progress toward EU goals varies widely due to infrastructure and capacity challenges, underscoring need for new solutions to close the gap.**

**In the US, states like California and Oregon are stepping up with Extended Producer Responsibility (EPR) programs in the absence of federal regulation. State efforts will likely continue to drive demand for sustainable solutions even as the Trump administration is expected to repeal environmental protections.**

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# Plastics consumption is growing, and that's an issue for everyone

## THE SIZE OF THE PROBLEM

Plastics are integral to numerous industries due to their versatility, durability, and cost-effectiveness. Global plastics use is projected to nearly double between 2020 and 2050, from 464 million tonnes (Mt) to 884 Mt, even with expected improvements in recycling rates.[1] The packaging sector is the largest user, accounting for about 40% of total plastic usage, followed by construction, automotive, and electronics industries.[2]

## CONSEQUENCES OF PLASTICS CONSUMPTION

Plastic waste in landfills poses significant environmental hazards. Plastics can take up to 1,000 years to decompose, during which they may leach toxic substances into the soil and groundwater, contaminating ecosystems and potentially entering the human food chain. Additionally, the accumulation of plastic waste in landfills contributes to the release of greenhouse gases, exacerbating climate change.[3]

When plastic waste infiltrates natural ecosystems, it disrupts habitats and endangers wildlife. Approximately 19-23 million tonnes of plastic waste enter aquatic ecosystems annually, leading to ingestion and entanglement of marine animals, which can result in injury or death. Furthermore, microplastics have been detected in diverse environments, from the depths of the Mariana Trench to human organs, raising concerns about their pervasive impact on both environmental and human health.[4]

## A FRAMEWORK TO ADDRESS PLASTIC WASTE

To address the plastics challenge, the **waste mitigation hierarchy**[5] provides a framework to prioritize waste management practices to minimize environmental impact. Regulators take a combination of approaches across the plastics lifecycle.


1 Global projections of plastic use, end-of-life fate and potential changes in consumption, reduction, recycling and replacement with bioplastics to 2050
2 OECD: Global Plastics Outlook
3 Statista: Global Plastics Packaging Industry
4 United Nations Environment Programme
5 United Nations Environment Programme
6 US EPA

# Growth and challenges in managing plastics waste

## CHALLENGES AND OPPORTUNITIES IN MANAGING PLASTIC WASTE

Effective plastic waste management is hindered by **inadequate infrastructure**, particularly in developing regions. Limited recycling facilities and inefficient waste collection systems result in significant amounts of plastic waste being mismanaged, leading to environmental pollution. Less than 10% of global plastic waste is recycled, with the majority ending up in landfills or the environment. In addition, the **diverse composition of plastic materials** complicates recycling efforts. Different polymers require specific processing methods, and the presence of additives and composites further complicates efficient recycling. This complexity often leads to contamination in recycling streams, reducing the quality and economic viability of recycled plastics.[1]

One area of opportunity to address plastic pollution is in **materials innovation.** Alternatives such as biopolymers, derived from renewable sources, are designed to be biodegradable, reducing environmental persistence. For example, compostable materials from seaweed that decompose in home composting systems don't add to plastics waste. However, challenges such as scalability, cost, and performance compared to conventional plastics remain.

## WHO IS MOST HEAVILY AFFECTED BY CHALLENGES IN THE REGULATORY LANDSCAPE?

### CONSUMERS

- Lack of clarity on recycling do's and don'ts
- Distrust of effectiveness of recycling
- High consumption economy and marketing for disposable products

### PRODUCERS

- Compliance with Extended Producer Responsibility (EPR)
- Recycled content composition minimums for products like bottles

### RECYCLING AND WASTE MANAGEMENT COMPANIES

- Scaling and implementing new technologies
- Lack of quality feedstock due to contamination

### MUNICIPAL GOVERNMENTS

- Lack of infrastructure to support collection and recycling
- High loss in sorting process
- Budgetary constraints and lack of enforcement mechanisms

1 Our World in Data: Plastic Pollution

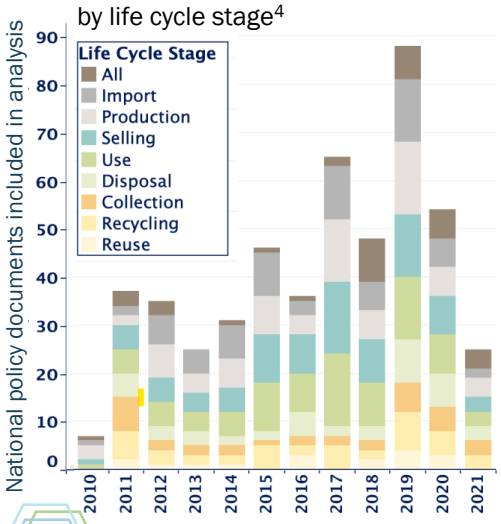
# Regulatory interventions in the US and EU designed to reduce plastics waste

## TWO DIVERGING REGULATORY APPROACHES

Regulators in the US and Europe face a growing plastics problem as recycling demand significantly outpaces capacity, exacerbated by increasing volumes of generated waste and a shrinking waste export market following China's import ban. As a result, the proportion of recycled plastics in the US has fallen from 8.7% in 2018 to 5-6% in 2021.[1] In the EU, overall recycling rates are growing, but recycling of some waste types- including packaging- has decreased in the past five years.

In response, **regulators are introducing policies and initiatives to address plastic waste** through two primary strategies with diverging effects on demand for sustainable plastics and recycling: 1) reducing plastic consumption and 2) improving recycling infrastructure. [2]

Global number of national policy documents targeting plastics per year by life cycle stage[4]




Regulatory interventions on plastics have grown significantly since 2010, primarily targeting import, production, sale and use

| | 1. Reduce plastic consumption | 2. Improve waste infrastructure |
|---|---|---|
| **Description** | Address plastic at the source by changing manufacturer and consumer behavior through bans, taxes and incentive schemes | Innovate new or improved technologies that enhance circularity across the plastics value chain |
| **Implications on demand** | **Decreases** demand for both traditional and sustainable plastics and recycling solutions | **Incentivizes** demand for sustainable plastics (e.g., recycled content) and recycling solutions |

### Example regulatory interventions in the plastics value chain


- No direct policies targeting raw materials for fossil fuel-based plastics producers identified[3]

- Taxes based on amount of non-recycled content or requirements for minimum recycled content
- Extended Producer Responsibility (EPR) holds manufacturers accountable for post-consumer waste treatment

- Bans and taxes on use of certain plastics (e.g., single-use consumer plastics)
- Carbon pricing imposes taxes on emissions or issues credits based on carbon footprint

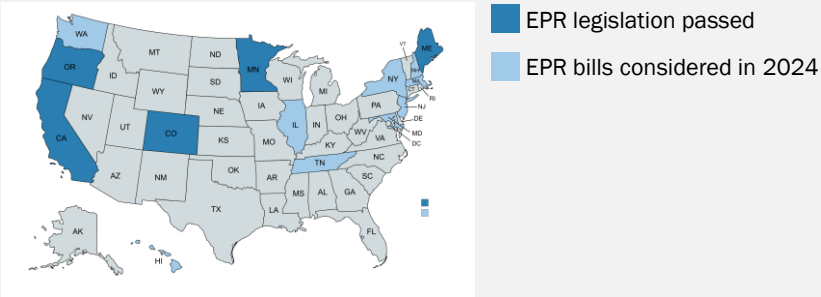
- Packaging deposit return schemes that refund buyers for returned containers

1 University of Buffalo: Impact of China's National Sword Policy on the U.S. Landfill and Plastics Recycling Industry
2 European Environment Agency: Waste Recycling in Europe
3 UNPRI: The Plastics Landscape; Does not include regulations on management of hazardous chemicals (e.g., REACH)
4 Duke University Brief: Annual Trends in Plastics Policy

# In-depth analysis: California EPR Regulation

The US has taken a patchwork, state-led approach to plastics regulation, with no federal law mandating recycling. Over the past two decades, state lawmakers have started to advance EPR laws, requiring producers to take responsibility for post-consumer waste. Success of these efforts has varied by state: EPR laws passed in five states, along with a framework for future EPR legislation in Maryland, but failed or stalled in eight others in 2024.[1] Where passed, producers will need to navigate a complex web of state-specific requirements, which are not consistent in issues such as how "producers" and "covered materials" are defined.

**EPR laws by state, 2024[1]**




California's Senate Bill 54 is among the US' most ambitious restrictions on single-use plastics and plastics, regulating both single-use plastic food service ware and single-use packaging (not limited to plastics) more broadly. Under the regulation, producers of covered material sold, imported or distributed in California must work to:

- Reduce single-use plastic packaging and food service ware by 10% by 2027, 20% by 2030 and 25% by 2032
- Make 100% of single-use plastic packaging and food service ware recyclable or compostable by 2032
- Recycle single-use plastic packaging and food service ware at rates of 30% by 2028, 40% by 2030 and 65% by 2032

To implement these requirements, the law requires producers to form and pay fees into a Producer Responsibility Organization (PRO) based on the amount and type of plastic they produce. EPRs across California and other states are funded by annual producer fees paid to PROs, which are then responsible for developing and implementing a comprehensive roadmap and budget to comply. However, California's law goes one step further than other states, requiring producers to pay $500 million annually into a new California Plastic Pollution Mitigation fund from 2027 to 2037. PROs must also provide performance data to CalRecycle (e.g., weight and number of plastic components sold or shifted to reusable packaging).

Even as the Trump Administration is expected to scale back federal environmental protections,[2] state-led EPR regulations will likely drive demand for circular economy solutions by incentivizing companies to switch to more sustainable materials to avoid fees paid based on the quantity and type of products sold.

1 DLA Piper: State EPR Roundup
2 World Resources Institute: Trump May Thwart Federal Climate Action, but Opportunities for Progress Remain

# In-depth analysis: EU Waste Directive Framework

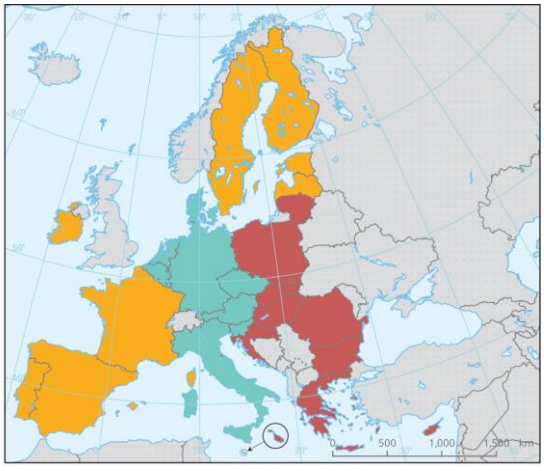
The EU approaches plastics waste management through directives like the Waste Framework Directive and the Single-Use Plastics Directive, establishing common goals and standards. Implementation varies significantly across member states due to differences in infrastructure, policy priorities, and enforcement capacity. Countries like Germany and the Netherlands have taken strong stances on extended producer responsibility that go beyond EU requirements; however, other member states, such as Bulgaria and Romania, still rely heavily on landfilling.

The amended EU Waste Directive includes ambitious 2025, 2030 and 2035 targets around recycling of household and municipal waste, with a focus on packaging and plastics.

- Municipal waste recycling target: Recycle 55% of municipal waste by 2025, 60% by 2030 and 65% by 2035 by weight
- Packaging waste recycling target: Recycle 65% by 2025 and 70% by 2030 by weight
- Plastics waste recycling target: Recycle 50% of plastics waste by 2025 and 55% by 2030 by weight

However, implementation across Member States has been challenging. As of 2023, eight Member States were at risk for missing the municipal waste recycling target by 2025 and 10 Member States were at risk for missing both the municipal waste and total packaging waste recycling targets by 2025.[1]

For many Member States, barriers include a lack of convenient collection infrastructure, insufficient treatment capacity and challenges with recycling plastic packaging driven by complex design and sorting losses during processing. These Member States will need to accelerate their efforts to meet the objectives of the Waste Directive, creating opportunity for new solutions that can directly address these challenges, such as more efficient recycling technologies or packaging designs that facilitate more effective sorting and processing.




**Prospects for EU Member States of meeting the recycling targets for municipal waste and packaging waste**

Risk score

- Member states not at risk for both targets
- Member States not at risk for the municipal waste recycling target but at risk for the total packaging waste recycling target
- Member States at risk for the municipal waste recycling target but not at risk for the total packaging waste recycling target
- Member states at risk for both targets
- Outside coverage

1 European Environmental Agency

# Emerging solutions to the plastics waste crisis

The plastics waste challenge and associated regulations provides opportunities for new solutions and companies. While not exhaustive, we expect to see investment and growth in the following solutions and sectors.

| Technology/Solution | Definition | Stage |
|---|---|---|
| *Biodegradable and Plant-Based Materials* | | |
| PLA (Polylactic Acid) | Compostable plastic from fermented plant starch (e.g., corn, sugarcane). | Commercial |
| PHA (Polyhydroxyalkanoates) | Biodegradable plastic from microbial fermentation. | Commercial |
| Algae-Based Plastics | Plastics made from algae biomass. | Experimental |
| Mycelium Packaging | Packaging grown from mushroom roots and agricultural waste. | Scaling |
| Bioplastics from Agricultural Waste | Plastics from by-products like bagasse, wheat bran, or rice husk. | Experimental |
| $CO_2$-Based Plastics | Plastics synthesized by incorporating $CO_2$. | Experimental |
| *Transforming Plastic Waste* | | |
| Enzymatic Recycling | Breaking down plastics into monomers with enzymes. | Experimental |
| Chemical Recycling | Breaking plastics into raw materials for reuse. | Commercial |
| Recycling into Construction Materials | Using plastic waste for bricks or paving stones. | Scaling |
| Recycling into Consumer Goods | Turning recycled plastics into clothing, accessories, or goods. | Commercial |
| *Reducing Plastic Waste* | | |
| Reusable and Returnable Packaging | Systems for multiple uses, like returnable containers. | Commercial |
| Refillable Retail Offerings | Products like refillable shampoo pods. | Scaling |
| Edible Packaging | Packaging made to be consumed. | Scaling |

1 Boston University, "Sustainable Solutions Through Innovative Plastic Waste Recycling Technologies", 2024

# Our advice: address both compliance requirements and opportunities associated with regulation to drive the most value

If current trends continue, plastic use in G20 countries could nearly double by 2050.[1] The plastics waste challenge and associated regulations create opportunities to scale innovative solutions.

## *How can my company prepare to navigate different regulatory approaches across US states and the EU?*

The patchwork of plastics regulations across US states can lead to new challenges for companies, with nuances in each statute creating a fragmented landscape of requirements. For example, California's definition for types of packaging considered "recyclable" or "compostable" differs from Colorado's and Oregon's. EU standards are more consistent across member states but are also more ambitious in targets and scope of materials covered. Companies operating across these markets should start to assess compliance risks early – even if your business is not directly subject to regulatory requirements, your customers might be, and they may require your support to help them comply. Collaboration with other companies (e.g., trade associations) can also provide best practice solutions to common challenges.

**Our advice:** Inventory current and proposed regulations to identify similarities and differences across geographies and develop an action plan to address risks or opportunities for your business. Work with customers and peers to identify opportunities for collaboration to address challenges.

## *How can regulations create or hinder opportunity for new technologies? How can new solutions stand out?*

Policies like EPR schemes and single-use plastics bans can increase costs and complexities for producers, retailers and other stakeholders needing to transition to alternative materials or redesign products, creating demand for innovative solutions that are scalable and cost-effective. Corporates under regulatory pressure are often motivated to partner with or invest in such companies through corporate venture capital (CVC) initiatives or M&A, helping scale these solutions. However, as the market grows, circular economy startups may need to compete for limited pools of funding and market share while consumer and investor concern over greenwashing continues to grow. New technologies can differentiate from competitors with transparent, science-based reporting that demonstrates how their solutions compare to alternatives, helping customers meet requirements, corporate sustainability goals and consumer expectations.

**Our advice:** If you are a circular economy startup looking to stand out develop a hypothesis on how your solution supports the circular economy and test it rigorously. Consider a Life Cycle Assessment (LCA) to evaluate the cradle-to-grave environmental impact of your solutions against market alternatives, highlighting sustainability strengths and opportunities.

If you are a corporate navigating the regulatory landscape, conduct a readiness assessment to understand how your business is positioned to mitigate risks or capitalize on growth opportunities driven by plastics regulations. Where gaps exist in capacity or expertise, explore potential for investments, pilot programs, or partnerships with innovative solutions.

1 Reuters: Plastic consumption on course to nearly double by 2050 - research

# About Impact Pathways at Independence Point Advisors

Impact Pathways at IPA is a partnership designed to help clients maximize value for their company in the capital markets and M&A, as well as for society.

IPA is a purpose-built modern investment bank and advisor bringing new voices and approaches to Wall Street. IPA's differentiated portfolio includes mergers and acquisitions advice, capital markets advice and underwriting, and strategic advice in investor relations.

Impact Pathways is helping accelerate the transition to a regenerative future. By attracting purpose-driven talent, providing authentic, evidence-based advice and investing in impact solutions, the global, impact-let consulting firm empowers organizations to create value for society while creating value for their business.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## It's just good business

Sustainable actions — *communicated well* — pay off in the capital markets.

# Appendix: Glossary of acronyms and terms

| Term | Definition |
|---|---|
| Bioplastics | Plastics derived from biopolymers. [1] |
| Biopolymers | Any large polymer (protein, nucleic acid, polysaccharide) produced by a living organism; includes some materials suitable for use as plastics.[1] |
| Extended Producer Responsibility (EPR) | Policy approach that makes producers responsible for their products along the entire lifecycle, including at the post-consumer stage. By doing so, it helps achieve environmental goals such as recycling targets. At the same time, EPR generates funding from producers that help to pay for the collection, sorting and recycling of waste products, as well as generates detailed information on production, products, waste generation and treatment.[1] |
| Life Cycle Assessment (LCA) | Process of evaluating the effects that a product has on the environment over the entire period of its life thereby increasing resource-use efficiency and decreasing liabilities. It can be used to study the environmental impact of either a product or the function the product is designed to perform. LCA is commonly referred to as a "cradle-to-grave" analysis.[2] |
| Municipal waste | Municipal waste from households including bulky waste, similar waste from commerce and trade, office buildings, businesses, as well as yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste if managed as household waste. [1] |
| Polymer | Chemical compounds, typically with very large molecules, that make up plastics, The size of the molecules, together with their physical state and the structures that they adopt, are the principal causes of the unique properties associated with plastics—including the ability to be molded and shaped.[3] |
| Producer Responsibility Organization (PRO) | Entity established and funded by manufacturers to fulfill legal obligations related to EPR requirements. Under California EPR, responsibilities include establishment of a comprehensive plan and budget; creation of a source reduction plan to meet EPR goals; and payment of all implementation costs.[4] |
| Single-use plastics | Plastic products that are used once, or for a short period of time, before being thrown away (e.g., balloons, food and beverage containers, plastic bags, cigarette butts). [5] |

1 OECD
2 European Environment Agency
3 Britannica
4 CalRecycle
5 EU Commission