

# Plastic Packaging Waste Management: A Case in Implementation of Extended Producer Responsibility Policies in Minnesota

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**Executive summary:** The plastic pollution crisis is a global challenge affecting governments, private citizens, and the environment. Plastic packaging, which makes up approximately 40% of all plastic material produced globally, accounts for less than 10% of recycled material. This discrepancy highlights the rapid growth of various plastic types and difficulty for local governments to implement needed waste management practices or meet required capacities. Extended producer responsibility (EPR) is a model for multiple waste streams that places the post-consumer responsibility of a product on the producer. As governments seek to develop legislation to better manage plastic waste, EPR is a policy tool that will promote circularity. This paper discusses the successes and challenges of EPR policies in the European Union (EU), and in states that have enacted them, particularly in California. Many states have introduced or are seeking to introduce legislation on EPR for plastic packaging in the next few years. The Packaging Waste and Cost Reduction Act, a bill for a product stewardship program for plastic and paper packaging materials was recently introduced in the Minnesota state legislature in 2024. This policy paper discusses several EPR policy options and recommendations to improve transparency and success of future EPR bills in states seeking to enact legislation, including Minnesota.

## I. Plastics: a tool for mankind but a global waste management challenge

Plastics are inexpensive, low-weight, and durable materials with tunable properties, making them suitable for various consumer, industrial, and commercial applications. The discovery of polyethylene (PE) in 1933 and its industrialization post World War II have led to plastics being increasingly present in many sectors. However, as plastics have become a mainstay of daily life, they have also become a source of significant waste with damaging environmental effects (World Economic Forum 2016; Schneiderman and Hillmyer 2017; Geyer, Jambeck, and Law 2017; Hopewell, Dvorak, and Kosior 2009). Most polymers that make up these plastics are derived from non-renewable petrochemical feedstocks. Additionally, these materials cannot be degraded within reasonable

timescales and remain in landfills indefinitely (Schneiderman and Hillmyer 2017; Geyer, Jambeck, and Law 2017). Improper plastic disposal can also harm natural ecosystems with microplastic contamination and organic pollutants leaching into the environment (Schneiderman and Hillmyer 2017). The development of single-use plastics for packaging has become one of the most wasteful categories of the plastic industry, with materials designed to be used and discarded within a year of production (Hopewell, Dvorak, and Kosior 2009). There is a significant disparity between the usage lifespan of these materials and their degradation time spans which range from tens to hundreds of years. In addition, estimates show that by 2050, plastic production will account for nearly 20% of global annual oil consumption (Schneiderman and Hillmyer 2017; Hopewell, Dvorak, and Kosior 2009).

These issues illustrate the need to develop regulatory policies to curb the production and improper disposal of plastic waste.

## II. Current routes and challenges to manage plastic packaging waste

Low density polyethylene (LDPE), polyethylene terephthalate (PET) and polypropylene (PP) are low-density, cost-effective packaging materials that have shown significant improvements in minimizing food waste. However, such packaging plastics make up 40% of the total production of plastic products and a substantial portion of municipal waste systems in the United States (Research Institute Credit Suisse 2023). Currently, less than 10% of plastic waste is recycled in the US (D'ambrières 2019), with majority going to landfills, a smaller percentage going to waste incinerators for energy recovery, and even less being sent to recycling facilities. In landfills and natural environments, plastics can take hundreds if not thousands of years to degrade. Alternatives like incineration result in the highest CO<sub>2</sub> emissions among other waste management systems despite energy offsets from fossil fuels according to an analysis by the Global Alliance for Incinerator Alternatives. In Hennepin County, Minneapolis, Minnesota, the Hennepin Energy Recovery Center (HERC), the county's largest incinerator, accounts for 27% of waste management for county residents (Minnesota Department of Energy 2022). However, community activists argue that these incinerators are damaging air quality near these locations with toxic air pollutants including carbon monoxide, hydrochloric acid, nitrogen oxides, sulfur dioxide, and particulate matter (Domingo et al. 2020). While Minnesota has good overall recycling rates (46% for packaging products compared to 36% nationally), incinerators like the HERC received renewable energy tax credits as late as 2023, which provided no incentive to divert waste from incineration (Edwards and Eunomia Research & Consulting Inc. 2023). Only this past year were these tax credits removed with a 2023 legislation eliminating the HERC as a source of renewable energy. It is therefore important to expand infrastructure to support increases in recycling to divert waste from landfills and incinerators.

Sorting plastics is another difficulty in recycling spaces. Often, mixed plastics cannot be readily recycled, and even recyclable plastics are often

downcycled into lower-value materials. Additionally, the presence of additives, colorants, and multi-layer packaging makes recycling single-use plastic materials challenging. Eureka Recycling Center in Minnesota has robust recycling strategies for high density polyethylene (HDPE), PET, and PP. The viability of the recycled plastics market is robust for PE, PET, and PP, but economical recycling remains low for plastics like polyvinyl chloride (PVC), polystyrene (PS), and flexible film plastics. Though these challenges exist, new companies are tackling plastic recycling challenges. MyPlas, a company focused on plastic film recycling, has recently opened a plant in Rogers, Minnesota and aims to produce millions of pounds of postconsumer resin from recyclable plastic film. In 2023, the Minnesota Pollution Control Agency (MPCA) conducted a study on Minnesota waste management and found that 2/3 of what is landfilled or incinerated could be reduced, reused, recycled, or composted (Bergen and Latham 2023). Extended producer responsibility policies can help Minnesota increase its recycling rates and redirect a lot of its waste that currently goes to incinerators.

## III. Extended Producer Responsibility

One approach to move from a linear plastics economy to a circular economy is adopting Extended Producer Responsibility (EPR), a policy tool to drive legislation for sustainable waste management. EPR is an environmental policy approach which places financial responsibility of the end-of-life management of a product on the producer (Organization for Economic Co-operation and Development 2016). The goal is to shift the burden of disposal of plastic waste away from the consumer and municipalities and onto the businesses that produce these products. EPR is a framework that can be used to require manufacturers to bear responsibility for their products throughout the end of their life cycle which includes covering the total costs of collection, sorting, treatment, and disposal of this waste. Because of this shift in responsibility, producers have more incentive to sell products that are long-lasting, recyclable, low-cost, and less toxic.

EPR policies have been implemented across different industries since the 1980s and have worked well in electronic waste management, battery, and paint sectors (Cassel, 2016; Nash and Bosso 2013). Sustainable production and consumption, reduced

disposal, and increased recycling rates are some benefits of EPR schemes. Minnesota enacted an EPR scheme for electronics recycling in 2008, increasing e-waste recycling and diverting millions of pounds of waste (Alev et al. 2019). E-waste and paint EPR laws in states like Minnesota and Rhode Island have been successful in increasing residential recycling rates.

EPR systems can be established through either individual or collective producer schemes. The first is established directly by the producer in which all costs associated with collection and recycling are borne by the producer. Collective producer schemes exist when several producers collaborate through a shared responsibility system established by a Producer Responsibility Organization (PRO) (Pouikli 2020; Dempsey and McIntyre 2009). These PROs manage a producer responsibility plan, including assessing and collecting fees from producers and managing responsibility to reach goals centered around reducing packaging waste through investment in recycling infrastructure, reuse, and refill systems. Production companies of plastic packaging operate through a fee-based system and must enroll with PROs that act as regulatory bodies. Fees are assessed based on type and quantity of product, and how easily products can be collected, sorted, and recycled using local infrastructure (Watkins et al. 2017). Costs established by PROs should clearly reflect the costs of collection, processing, transportation of recyclable packaging material, and associated administrative costs. Fee-modulation in PROs drives the development of sustainable design for plastic packaging materials. This includes fees based on the level of recyclability, presence of nonhazardous additives, and packaging to promote proper sorting and recycling. In Austria, Germany, and the Netherlands, fees for packaging materials containing bio-based or biodegradable plastics are less expensive indicating successful fee-modulation imposed by PROs (Watkins et al. 2017).

#### **IV. EPR for plastic packaging in the EU and the US**

Plastic packaging consumption in the European Union (EU) is expected to increase to 50 million tons annually according to the European Commission. To mitigate production and improper waste management, EPR schemes have been established across EU countries and have shown increased collection and recycling rates. Of the 26 million tons

of plastic waste produced in 2015, 40% was recycled which is well above the 22.5% goal (Oke et al. 2020; Filho et al. 2019) established by the EU Packaging and Packaging Waste Directive in 2008. This demonstrates an improvement of 17% over 7 years. Current targets also include recycling 55% of plastic packaging waste by 2030 (Ragonnaud 2023). In addition to EPR schemes, efforts to replace single-use plastics with reusable packaging and to increase public awareness through campaigns are improving the overall success of plastic waste reduction efforts. Several member states have also adopted EPR schemes for agricultural plastics like mulch films (LeMoine et al. 2021).

Following the successes of EPR policies in Europe, Maine was the first American state to enact an EPR bill for plastic packaging in 2021, soon followed by Oregon, Colorado, and California. California's Plastic Pollution Prevention and Packaging Producer Responsibility Act was enacted in 2022 to manage and report packaging and plastic food service ware. A key success for this legislation includes its competitive targets for recycling rates of plastics and single-use packaging, which all must be recyclable or compostable by 2032. California has also created the Plastic Pollution Mitigation Fund, which will require plastic producers to fund projects to mitigate and monitor plastic pollution in low-income and rural areas (State of California 2022). Other states including New York, Connecticut, Illinois, and Maryland have all introduced similar bills focused on EPR for packaging.

The state of Minnesota joined these efforts in 2022 with a proposed State Senate bill SF 4518 (Dziedzic 2022), which outlined a product stewardship program for packaging materials and labeling requirements. The main goals of this bill were to reduce environmental impacts, incentivize sustainable packaging, and increase funding for reuse and recycling, including infrastructure, to meet recycling targets and decrease costs for consumers. While this bill did not pass in 2022, modifications to language, stakeholder partnerships and oversight have been added to a new EPR bill called The Packaging Waste and Cost Reduction Act which was recently introduced in the 2024 Minnesota legislative session (Morrison et al. 2024). This initiative, brought forth through partnerships with various stakeholders including the Partnership on

Waste and Energy in Hennepin, Ramsay, and Washington counties aims to meet the needs of residents, communities, and companies while reducing waste. Minnesota, among other states seeking to pass similar legislation, can learn from states that have developed EPR laws for a more sustainable waste management system for plastics.

## V. Considerations for successful EPR policies

*i. Successful EPR policies, whether individual or collective-based, should include clear definitions of acceptable packaging types, total costs, producers included in these schemes, their responsibilities, and any exempt groups.*

Clear definitions of packaging types improve sorting and make direct comparison of success of EPR schemes easier. High quality collected waste materials are more readily processed and recycled into secondary raw materials. This requires a working knowledge of local infrastructure and waste streams. Additionally, listing banned toxic substances in packaging products increases consumer safety. States can add wording to EPR packaging bills that covers banned toxic compounds like bisphenols, poly and perfluorinated substances (persistent chemicals known for their negative immune system impacts) to ensure recycled materials do not face increased risks of toxic chemical leaching. Exemptions to medical device packaging materials which must adhere to international standards and may be more difficult to recycle could be amended in the proposed bill.

*ii. Fees should be established to promote environmentally friendly packaging and no fees imposed on reusable packaging.*

Through fee-modulation, the level of recyclability, amount of recycled plastic content, biodegradability, and compostability should be considered rather than the weight of the product (Laubinger et al. 2021). This would circumvent weight-based targets that focus on achieving high collection rates rather than pushing for eco-design. Non-recyclable plastic like PS can begin being phased out with increased fees which will ease the burden on recycling centers for sorting recyclable and non-recyclable plastics.

*iii. Establish eco-design incentives for producers to promote environmentally friendly packaging and easier recycling.*

This can include credits or lower fees for certain producers. However, while eco-design promotes circular design and recyclability, it does not inherently promote reduction of waste. Incentive mechanisms and fees must be implemented to promote a shift in the reuse and reduction of products.

*iv. Targets for collection, recovery, and recycling of plastic waste should be ambitious and adapted when goals are achieved.*

Targets provide a guideline for companies to improve collection and sorting of their products. Recycling targets in the EU are currently around 30%, with 15 countries surpassing 40%. In California, current targets are to achieve 55% recycling of plastic packaging products by 2030 (Watkins et al. 2017; Producer and Act 2022). Current targets in Minnesota's proposed 2024 Packaging Waste and Cost Reduction Act list recycling and composting targets at 65%, with 10% of packaging products sent to reuse facilities, and 10% minimum of post-consumer recycled content for all covered materials by 2033. Provisions to the bill can also include adapting performance targets based on a needs assessment evaluation.

*v. States should create a platform to share implementation of successful EPR schemes and encourage public education on recycled plastics.*

Increased public awareness of EPR strategies and recycling practices improves collection and sorting. Measures can include imposing information requirements on producers such as reporting requirements, labeling of products and components, communicating to consumers about producer responsibility and waste separation, and informing recyclers about the materials used in products. This can also include increasing recycling to communities lacking access, most notably multi-family homes. California SB 54 has established a working group for collaboration across states to ensure that EPR efforts are successful across the country. While there are benefits to sharing successes, such successes may be region or nation specific. Additionally, each EPR policy must have an understanding of local infrastructure which varies drastically from region to region.

## VI. EPR Policy Options

### *i. Policy Option 1: Municipalities continue managing plastic waste systems*

The current model struggles with efficiency and cost for municipalities. Fees are collected as taxes from residential homes and businesses for waste management.

#### *Advantages*

- Local governments have a better understanding of municipal waste streams and infrastructure already present through curbside recycling programs.

#### *Challenges*

- Consumers pay for the end-of-life management of plastic products.
- There are currently no incentives for producers to internalize waste-management costs of their products and promote sustainable design.
- It is a burden for municipal waste systems to collect and successfully recycle post-consumer plastics. In 2018, of the 290 million metric tons (MT) of waste generated in the US, 39 (MT) were plastics and only 8.5% were recycled (EPA 2023).

### *ii. Policy Option 2: States adopt an Individual Producer Responsibility system*

This makes each producer individually responsible for the lifecycle of their product, requiring each producer to manage the collection of their waste and how much is recyclable (Dempsey and McIntyre 2009). This option allows direct communication between recycling plants and manufacturers about ways to improve the design of recycled products.

#### *Advantages*

- Promotion of circular design can provide more incentive for improving sustainability standards of plastic packaging. Because each producer is responsible for financing the end-of-life costs of their products, there is more incentive for sustainable design.
- Waste streams are cleaner due to product-specific collection points.

#### *Challenges*

- IPR places more financial responsibility on each producer to separate and collect their

waste appropriately from household waste streams, which typically contain many kinds of packaging. Sorting of waste by brand can also significantly increase the operating costs of the producer.

- Decentralized systems lead to an increased cost of enforcement of policies.
- Fees for collection and recycling risk falling on consumers.
- Focusing on individual producers may limit the scope and systemic challenges with a variety of producers contributing to plastic waste.

### *iii. Policy Option 3: States adopt a Collective Producer Responsibility system where responsibility is allocated through market share of producers*

Producers are required to register and pay fees to a Producer Responsibility Organization (PRO) which will be responsible for waste-management activities. These fees will cover proper collection, sorting, and disposal of plastic waste.

#### *Advantages*

- Costs of end-of-life management are borne on producers rather than customers. This is the more cost-effective option for producers due to a shared responsibility of products in the market.
- A centralized system under a PRO makes management and enforcement simpler for producers. Costs are distributed collectively based on the producer's share of the product.
- Internalized costs incentivize greener and more sustainable packaging through directed fee-modulation.
- Direct avenues exist for producers to establish collaborative research and development for more sustainable packaging and strategies to minimize waste.
- Recycling rates are improved, and waste sent to landfills is reduced, as evidenced by successes in the EU (Tumu, Vorst, and Curtzwiler 2023).

#### *Challenges*

- EPR cost-effectiveness is generally assessed by looking at the weight reduction of plastics put into the market; this may be made more challenging with many producers under one PRO.

- Collective schemes may not lead to eco-design of products because the responsibility is shared and thus, the impact on individual producers is limited (Pouikli 2020; Watkins et al. 2017). Even with fee-modulation, products that are more profitable to be recycled will be recycled at higher rates while less profitable items are not recycled as much.
- Increased risk in difficulties of assessing non-compliance of certain producers since all materials are collected and sorted together. This can lead to freeriding in which certain producers may benefit from the initiative other producers take to improve product sustainability without improving their own products or paying shared costs (Agrawala and Borkey 2018).

## VII. Policy recommendation and implementation

The policy options listed above are approaches applicable to various waste systems. However, a Collective Producer Responsibility stewardship plan is the best policy option for plastic packaging products. States including Minnesota seeking to pass legislation on packaging products should follow a collective responsibility plan with a focus on promoting a circular economy for plastic packaging that holds producers responsible for the post-consumer stage of their products. A collective scheme is the most cost-effective and resource efficient option for organizing a multitude of

producers while having a greater impact on the overall reduction of non-recyclable plastic packaging waste. Legislators and coalition groups can incorporate language in these bills that includes targeted fee-modulation, statewide recycling and waste reduction targets driven by an understanding of local infrastructure, eco-design initiatives, and platforms to share EPR successes and challenges. These policy tools can incentivize producers to decrease production of waste materials and design their materials more sustainably.

Though there exist some challenges with successful implementation of EPR, coordinated efforts with external agencies, like the Minnesota Pollution Control Agency, for oversight and regulation could lead to more transparent monitoring and reporting from PROs. Municipal recovery facilities can provide data on the quantity and types of packaging waste materials introduced by producers which will guide improvements for recycling targets. Direct communication channels between PROs, local governments, producers, and the public can lead to increased awareness of plastic waste and help producers shift toward more environmentally and economically sustainable materials. When combined with other policy tools to curb plastic production, improve collection and disposal of waste, and promote eco-design initiatives for new products, EPR can ensure that producers of plastic packaging materials invest in systemic changes to achieve a circular economy.

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