We Can Cut Petrochemicals Use Today: Plastic Packaging

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About RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing.

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Executive Summary

- Plastic packaging and films are the most well-known petrochemicals end use, comprising almost half of commodity plastics demand (resin codes 1 to 6), at 151 million tons per year. Packaging accounts for over 17% of total petrochemicals intermediate product consumption, and most of this packaging is discarded after one use.

- About 1.5% of global greenhouse gas (GHG) **emissions from energy** systems can be **directly attributed** to plastic packaging and films. Yet the implications of packaging extend well beyond these direct impacts. The full packaging supply chain affects our consumption habits, land use, water resources, fossil fuel dependence, and global industrial climate decisions.

  - Plastic packaging has driven much of petrochemicals demand growth. Major packaging plastics grew over three times faster than **overall oil demand** from 2009 to 2019, per RMI analysis.
  - On current trends, petrochemicals feedstocks are poised to account for **40% of total oil demand growth in the next five years**.

- With the world's carbon budget nearing exhaustion, we need sizable emissions cuts in plastic packaging today. Reducing packaging demand is critical to halting investments in new supplies, curbing petrochemicals emissions, and reversing oil demand growth. Instead of maintaining plastic packaging's historical 4% growth rate,

  - Eliminating 1% of packaging demand per year after a 2026 peak could keep global petrochemicals demand on the **International Energy Agency's (IEA's) path to net-zero emissions**.
  - Reducing **about 5%** of new packaging demand per year over the medium term could stop the need for coal-based plastics in less than **three years**. Doing so by 2026 could avoid the need for new ethylene plant investments beyond what are **already planned**.

- Decision makers should prioritize the following actions.

  - **Eliminate packaging entirely** — not just plastic packaging — where possible.
  - **Switch to reusable and multiuse** packaging business models.
  - **Employ a systems approach to packaging**. New designs and behaviors can reduce the use of all packaging materials and their associated environmental impacts.
  - **Replace required food packaging** with other materials, including compostable materials, where possible. Composting infrastructure and behaviors must keep up with use of these new materials to avoid increases in methane emissions from landfills.

Role of Packaging

In today's world, packaging plays an important role in safely getting a particular product from the manufacturer to the consumer. This requires packaging to take many forms and functions using a range of materials. These varied roles can be broadly categorized into the following three groups.

Primary packaging has direct contact with the end product, providing containment and protection from the external environment. Primary packaging also contains products in individual portions and plays a leading role in communicating the product's brand and information for regulatory and marketing purposes.

- **Main functions:** Protection from contamination, branding, and convenience.
- **Common forms:** Bottles, food wrappers and containers, blister packs, bags, and boxes.

Secondary packaging contains a group of primary packages, providing a way to collect, display, and transport aggregated products. In addition to grouping products together, secondary packages such as e-commerce cardboard boxes and space-filling plastic bubbles also facilitate protective product handling and transportation.

- **Main functions:** Protection from handling and stacking, aggregation, storing, and transportation.
- **Common forms:** Cardboard boxes, paperboard cartons, and plastic crates, wraps, and films.

Tertiary packaging refers to materials used as bulk packaging, enabling safe and efficient transportation of aggregated secondary packages. Tertiary packaging can be used for transit along the supply chain as well as for storing bulk quantities of product at warehouses and distribution centers.

- **Main functions:** Stable storage and safe protection from movement and handling during transportation.
- **Common forms:** Wooden pallets, plastic pallet wrap, and wooden or plastic crates.

Packaging options frequently involve trade-offs between cost and one or more priorities of the functions outlined above. Primary packaging for foodstuffs, medical goods, and reactive chemicals prioritizes maintaining product integrity through special safety or oxygen barriers. Eye-catching packaging is one of the top 10 factors in the consumer selection process, so primary and secondary packaging of consumer goods often prioritizes branding and appearance for product differentiation. This desire to differentiate and customize drives the consumer packaged goods industry to use more plastic per dollar of sales than both the apparel and the construction industries, despite their smaller or similar market size. Relatively well-known polymers such as polyethylene and polypropylene dominate this market segment owing to their low corporate costs, high functionality for a wide array of packaging specifications, and longevity. However, many factors, including problematic design choices, inconsistent recycling programs, and waste management expenses, greatly inhibit these plastics' reusability. **The remainder of this brief focuses on plastics as a packaging material with both widespread utility and implications.**

Implications Beyond the Package

Plastic packaging affects us well before and after we come into contact with it as consumers. Before use, plastic packaging's upstream supply chain requires investments in fossil fuel supplies and chemicals plants, which have environmental and health implications for surrounding communities and climate consequences for the planet. After use, plastic packaging results in large quantities of waste that can contaminate the environment in myriad ways. Beyond the visible plastic waste issue, plastic packaging can have negative health effects and encourage overconsumption, further compounding human health impacts.

New plastic packaging is a key driver of oil supplies and petrochemicals growth

Packaging is the largest end use for plastics, and plastics are the largest application of petrochemicals. Rising demand for plastic packaging is a key driver of current petrochemicals capacity expansions, such as ethane steam cracking. Cutting plastic packaging consumption is thus a direct avenue to curbing oil demand and forgoing costly investments in petrochemicals infrastructure. Below are some particularly powerful data points on the potential impact of slashing plastic packaging demand.

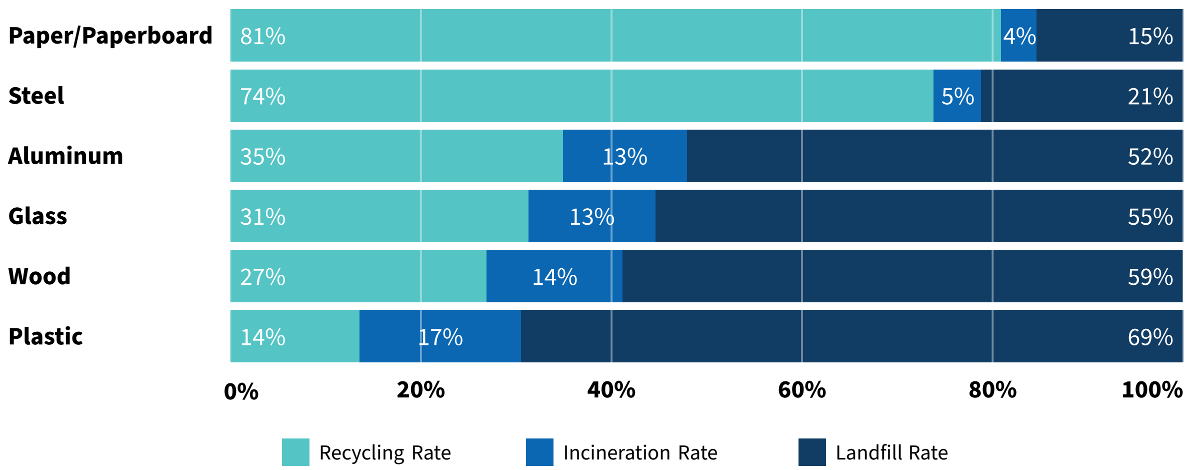
- Eliminating 1% of packaging demand per year after 2026 could keep global petrochemicals demand on the **IEA's path to net-zero emissions**.
- Reducing **about 5%** of packaging demand per year over the medium term could stop the need for coal-based plastics in less than **three years**. Doing so by 2026 could also avoid the need for new ethylene plant investments beyond what are **already planned**.
- Cutting one-quarter of packaging demand would be equal to eliminating **half of Japan's annual oil demand by volume**, or all of its combined annual petrochemicals liquid feedstock and gasoline demand. The **money saved** from sustaining this over 20 years would be enough to **decarbonize the rest** of the chemicals industry.
- China's incremental **plastic production** since 2015 required the energy equivalent of 11% of its **liquefied natural gas import growth** in the same time frame.

Single-use plastic packaging such as containers and films have high potential to form the bulk of these reductions. These plastics are the most visible and obvious petrochemicals uses in packaging, but they are by no means the only ones. Most laminate labels, inks, and adhesive tapes trace back to fossil feedstocks and have significant implications in packaging. For example, ink labels on food packaging in the United States **have no regulations** as they are not considered a food contact material, enabling 20% of additives, solvents, and plasticizers to be used. Some of these ink inputs can have even **higher carbon intensity** than the package itself.

Packaging waste is a financial, environmental justice, and health burden

After consumer use, plastic waste management is the predominant issue facing plastic packaging. According to the US Environmental Protection Agency, **nearly 30%** of US municipal solid waste comes from packaging. Although paper and cardboard contribute nearly three times more solid waste by weight than plastic, the end-of-life fates of these top two packaging materials are vastly different. As seen in Exhibit 1, every identified packaging material has a recycling rate above 25% in the United States except for plastic, which only reaches 14%. Globally, plastic's recycling rate is **below 10%**, with only one-fifth of that recycled material getting remanufactured into products with a similar value instead of being used in a lower-value application.

Exhibit 1 **US packaging waste management by material**



RMI Graphic

Source: *US Environmental Protection Agency*

Poor recycling and reuse rates create a plastic packaging waste burden that countries often shoulder unequally for socioeconomic and geopolitical reasons. Shipping plastic waste internationally enables an exporter to avoid high waste management costs and unprofitable recycling. Waste-importing countries often lack adequate waste management infrastructure and formal labor forces. This burden weighs heavily on these countries and local communities, with some jurisdictions allotting **19% of their municipal budget** to waste management, compared with 4% in high-income areas.

High volumes of plastic waste in locations not well equipped to process them can lead to unforeseen health problems, such as **clogging urban rivers and sewers**, creating breeding grounds for pests, and exacerbating the transmission of infectious disease. Mismanagement can also result in plastics being combusted at high rates, either informally or at incinerators. Incineration sites are sources of hazardous pollution in the end-of-life phase of plastic products, capable of emitting GHGs, volatile organic compounds, particulate matter, dioxins, and a mix of other pollutants into the air, as well as producing toxic by-products in ash and wastewater.

In the United States, these facilities **disproportionately affect already overburdened populations**, with 80% of incineration sites located in low-income communities and communities of color. The remainder of unmanaged plastic waste leaks into the environment, with an estimated **11 million tons a year** ultimately flowing into the ocean, impairing ecosystem services and affecting already vulnerable coastal and island communities.

Efforts to mitigate these harmful outcomes of plastic waste mismanagement are necessary, but the upstream origins of these problems will remain unabated unless focus shifts to eliminating avoidable and problematic plastic products. The **United Nations Plastics Treaty**, a binding agreement that is still being negotiated, aims to arrive at a comprehensive solution that mitigates the legacy impacts of plastic, turns off the tap of limitless plastic production, and lights the path for a more just and circular future.

Plastic packaging: a double-edged sword in the fight against food waste

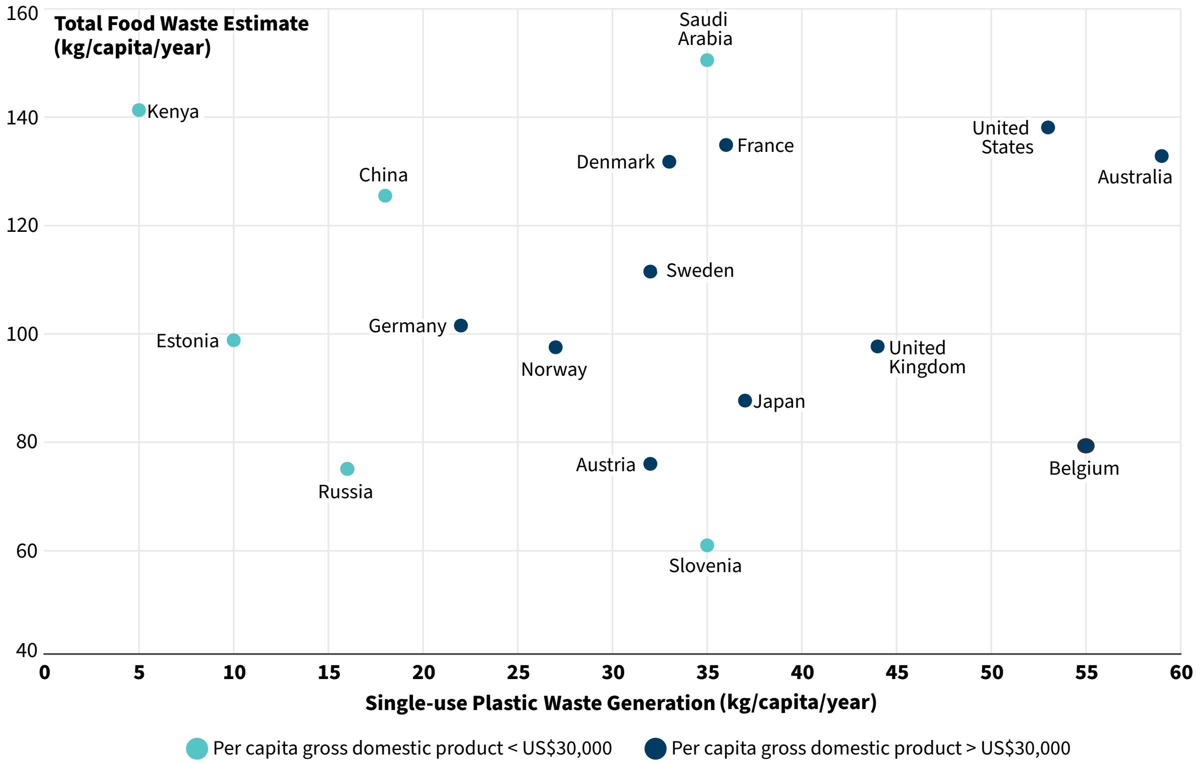
One of the hallmark claims of plastic packaging's advantages is the ability to extend the shelf life of perishable foods cost-effectively and conveniently. In fact, the origin of the modern age of plastic packaging can be largely attributed to the **mass appeal** of lightweight, airtight plastic containers in home kitchens across postwar America. Today the role of packaging in reducing food waste still includes preserving personal leftovers but has grown to encompass applications like portioning individual food products for microbial resistance or delaying the ripening of produce across thousands of miles of transit.

The conventional assumption that plastic packaging reduces food waste faces calls for further analysis. Around **38% of total energy used** in the global food system is attributed to producing food that is lost or wasted. Food waste accounts for an alarming **8%–10%** of global GHG emissions, including **methane releases at disposal sites** and excessive transport.

One way by which plastic packaging may in fact *increase* food waste is through encouraging overconsumption. Prevailing wisdom is that plastic packaging of perishable food improves stability and reduces susceptibility to spoilage. But this can result in people purchasing more food than they can consume before it spoils. Consumers view produce packaging as a protective layer, but often it is a low-barrier film that does not extend shelf life. The assumption that plastic packaging extends freshness can result in overpackaging of produce that already has a protective covering, such as oranges and bananas. Incorrect interpretation of expiration date labels on plastic packaging also contributes to increased food waste.

Exhibit 2 (next page) shows the lack of correlation between food waste and single-use plastic consumption on a per capita basis in nations where higher-quality data on food waste exists. Other factors such as consumption habits or food access may be stronger indicators of food waste levels, and thus better focus areas for food waste solutions than single-use plastic packaging.

Exhibit 2 **More single-use plastic is not a clear solution to food waste**



RMI Graphic

Sources: *Minderoo Plastic Waste Makers Index* and *Waste & Resources Action Programme Food Waste Index*

Business as usual is incompatible with climate-aligned constraints and priorities

Demand for plastic packaging, a product that is cheap to source and produce at scale, has grown rampantly for several decades. Its favorable economics are likely to change with the rise of extended producer responsibility (EPR) and multiprong efforts to put a price on carbon.

The US chemicals industry is expected to spend $16.3 billion each year to maintain the status quo, but **decarbonization of the system** could cost less. New market mechanisms that account for the external costs of carbon combined with growing difficulty to access capital for fossil fuel investments contribute to the high cost of maintaining the current system. **The United Nations Environment Programme assessed the total negative externalities of the plastic value chain to be between $293.5 billion and $459.5 billion annually**, covering exposure to hazardous chemicals, climate change, air pollution, marine ecosystem services, and ocean cleanup.

From a consumer's perspective, **perception of product quality and convenient access ranked higher than packaging as critical factors** in purchasing decisions. Nonetheless, consumers are increasingly aware of the environmental impact of products they buy and **value "green" characteristics**. More than 90% of US consumers say that for most major products, they are willing to pay more for sustainable packaging, with nearly half willing to spend **at least 4% more**. A **2022 global survey by Trivium Packaging** suggests that 68% of consumers had chosen a product in the previous six months based on its green credentials. Companies' **revenue growth** from environmental, social, and governance (ESG)-related products also reflect these preferences. Changing consumer behavior combined with the rising costs and risk exposure for the petrochemicals industry require a wholesale shift in how packaging is produced and used — from initial design through reuse or disposal.

Rethinking Packaging to Be Sustainable, Smart, and Circular

Plastic has become the material of choice for consumer packaging because it is seen as not only versatile and durable, but also cheap and profitable. Yet market prices for plastic packaging hardly reflect the true societal cost, or negative externality. Even worse, in many cases petrochemicals benefit from direct subsidies in support of fossil fuel production. And although plastic may be favored for its durability, the reality is that most packaging is used and disposed of in less than a year, with roughly 96% of plastic packaging **being discarded or incinerated and not recycled or reused**.

Evaluating the role of plastics in a circular economy requires reconciling their benefits as materials with the detrimental societal impacts incurred throughout their life cycle. Some packaging applications are well suited for plastics, whereas others warrant revisions to current materials and systems.

Many studies have attempted to quantify these costs and benefits through life-cycle assessments comparing the efficacy and impact of different packaging to fulfill the same purpose in select scenarios. The best option can vary based on which impact categories are prioritized, how recycling is modeled, and what transportation assumptions are used. **One study finds** that plastic packaging makes lower total GHG contributions than nonplastic alternatives in 9 out of 14 cases examined, such as milk cartons, meat packaging, cups, and bags. These results are not surprising since plastics have lower production emissions intensities and higher weight efficiencies than alternatives, so products used only once yield emissions savings with plastic.

“Although plastic may be favored for its durability, the reality is that most packaging is used and disposed of in less than a year, with roughly 96% of plastic packaging being discarded or incinerated and not recycled or reused.”

However, this type of analysis does not factor in the full life-cycle impact. For example, including the impact of plastic packaging’s low recycling rates illuminates how reuse can tip the scales toward nonplastic materials. We calculate the number of reuses needed to break even in favor of emissions savings in Exhibit 3 (next page).

Reuse capabilities and material trade-offs can be evaluated at a product level under sets of modeled assumptions, but advancing sustainable packaging will require system-level solutions tailored to specific locations and use cases that can be tracked to show their efficacy in minimizing emissions, waste, and cost. Leveraging the desirable properties of both plastic and nonplastic packaging requires innovation in product design, distribution models, collection logistics, and overall product-system compatibility, as well as changes in **public attitudes and habits**. The following section lays out three categories of solutions already in practice that can scale further to reduce plastic demand, catalyze circularity efficiencies, and improve human and planetary health outcomes.

Exhibit 3 Reuse can change packaging from a waste liability to a supply chain asset

Product	Corrugated cardboard	Polypropylene plastic crates	PET beverage cup	Aluminum beverage cup	PET water bottle	Steel water bottle	Polystyrene takeout container	Polypropylene takeout container
Product Volume	8,218.7 L	8,218.7 L	473 mL	473 mL	500 mL	500 mL	3.9 L	3.9 L
Product Weight (grams)	1,086	2,000	10	21	9	295	15	263
Material Production Emissions Intensity Range (g CO_2e/g material)	6,146	1,681	2,395	5,290	2,395	3,337	2,755	1,681
Percent Recycled/ Incinerated/ Landfilled	96 / 1 / 3	98 / 1 / 1	25 / 15 / 60	35 / 13 / 52	29 / 14 / 57	74 / 5 / 21	1 / 9 / 90	3 / 9 / 88
Life-cycle Emissions Intensity (g CO_2e)	3,056	1,676	30	38	26	435	44	474
Product Reuse Cycle Minimum*	-	1	-	2	-	17	-	11

Single-use product Reusable product

**Reuse cycle minimum refers to the number of times a reusable package will have to be used before the amortized emissions for the reusable package are equal to or lower than for a single-use package, calculated through the ratio between product life-cycle emissions intensities.*

RMI Graphic

Sources: ***https://www.osti.gov/pages/biblio/1866379, https://doi.org/10.1007/s11367-020-01813-w, https://doi.org/10.3390/polym13213793, https://storeimages.amercareroyal.com/TGCR48B_CW_Spec.pdf, https://nature.berkeley.edu/classes/es196/projects/2013final/HarnotoM_2013.pdf, https://www.epa.gov/warm, https://static1.squarespace.com/static/5f218f677f1fdb38f06cebcb/t/610aaa9a1f89ff0d02ef7d7d/1628089003873/Cup+LCA+Report_Final.pdf***

Package removal

Prevention is the most preferred and **popular** method of waste reduction, and this is especially true for packaging. From a demand standpoint, packaging operates as a service and a waste byproduct more so than a primary product. Therefore, eliminating the need for single-use packaging while preserving the underlying service is the most direct avenue to reducing demand. One way to accomplish this is via zero-packaging solutions where the function of a package is obsolete. The narrow use case of *truly* zero packaging arises in settings like farmers' markets, secondhand markets, and other small-scale transaction locales where products are not prepackaged.

More broadly applicable zero-packaging solutions remove the need for conventional single-use plastic packaging and maintain the original function through different materials and systems. For example, grocery stores that offer self-portioned bulk food items eliminate the need for a variety of plastic package types like flexible stand-up pouches and rigid clamshells. In another consumer goods example, liquid household products such as dish soap, detergent, and shampoo can be solidified into powders, sheets, or bars, removing the need for dilution with water and plastic bottles to contain the liquid products. Meeting European demand for low-packaging options could cut the continent's plastic packaging use **nearly in half** while increasing sales.

Overall, this suite of solutions requires adapting product purchasing, transportation, and use to methods that do not require single-use plastic packaging. These methods can target the single-use component (e.g., reusable bags and containers needed in a bulk grocer), the plastic component (e.g., paper packaging for concentrated cleaning goods), or a combination of both. Although the adoption of zero-packaging systems varies widely across geographies, new avenues are growing to eliminate packaging profitably.

Package reuse

Reuse refers to a product's ability to repeat its initial purpose with little to no degradation or additional requirements. In packaging, reuse solutions displace single-use packaging by changing either the packaging material or the delivery method of the packaged product. Material substitutes for single-use plastic packaging include replacing one plastic type with another type or with nonplastic materials. The environmental benefit of these swaps is the greatest in scenarios where the displaced material is both single use and difficult to recycle, such as polystyrene take-out containers, polyethylene films, and multi-material products like hot drink cups and aluminized plastic wrappers.

Companies or consumers can spur such substitutions. For example, **Just Salad's reusable bowl program** offers customers free salad toppings when they reuse the chain's $1 polypropylene bowl. Although this reuse model shifts responsibility to the consumer to clean and transport their own packaging, it is one of the simplest and most effective methods to reduce packaging consumption.

Reuse solutions implemented in local settings such as event venues and public spaces are another emerging method of displacing single-use plastic packaging. Examples include the **Ball Aluminum Cup** used to replace plastic cups in sports arenas in Denver and California since 2019, and **TURN Systems' modular system** of cups, washers, bins, and tracking software, which can be deployed at concerts, airports, and public events. This model of reuse complements existing trends of people bringing their own bottles and is collected more efficiently than traditional recycling because the products remain on-site and are not mixed with other waste streams.

Since purchase and disposal of packaging are only colocated in certain settings, other forms of reuse are needed to achieve circularity in more dispersed supply chains. This is where various solutions targeting the delivery and purchasing methods of products can be effective. An innovation in this space is the refill dispensing station, where consumers reuse existing durable bottles to refill soaps, detergents, and other liquid products. The refill station model has been adopted in commercial settings like airports, by established retail brands like **Dr. Bronner's** in supermarkets, and by startup companies such as **Chile-based Algramo**.

Another solution is "reverse logistics," whereby consumers and companies pair the refill of a product order with the return of previous packaging at the point of delivery. An early example of this was the self-sustaining 19th-century **Dabbawallah lunch box return system**. This model is still operating today, for example with the aptly named modern rendition, **Wally Shop**.

Efforts focusing on collection are also needed given the variety of materials that are traditionally difficult to recycle. A leader in this category is **TerraCycle**, a waste management company that offers product-specific recycling pickup programs for traditionally landfilled packages such as coffee capsules, medicine and contact lens packaging, beauty waste, toothpaste tubes, and water filters. Companies can also get creative with multiuse packaging systems, where the secondary use is entirely different than the original packaging use. For example, Samsung has redesigned its cardboard TV packaging for secondary use as furniture, storage, or cat houses. Packaging could become a complementary secondary product chosen by customers to increase sales and satisfaction while reducing emissions.

Package redesign

The last category of solutions deals with the inevitable disposal of packaging and the opportunities to transform the recycling industry into a leader in the drive toward decarbonization and circularity. Between material, shape, strength, flexibility, opaqueness, permeability, and dozens of other properties, a package's design features determine its suitability to fit the needs of a product, and usually indicate the end-of-life fate of the package as well.

There have been long-standing industry efforts to promote design changes that lessen the impact of packaging, such as lightweighting and compacting. These changes reduce the volume and weight of packaging but are mostly palliative measures that may make progress toward sustainability goals without addressing the root cause of unsustainability. In the case of plastics, the problem in question is persistent low-value solid waste generation, and this is the target of new design interventions. One such innovation is the mono-material trend, where plastic packaging previously containing multiple material types, such as a #2 high-density polyethylene (HDPE) rigid container with a metallized film layer, is redesigned to be completely #5 polypropylene (PP). Redesigning multi-material packaging into a single polymer type helps overcome obstacles throughout the recycling value chain, from the initial disposal to secondary sorting and reprocessing.

Another emerging trend is the creation of biodegradable polymers for compostable packaging. This expanding segment requires careful consideration owing to unintended consequences in land-use change as well as in disposal mismanagement, but the approach has the potential for emissions savings when deliberately implemented.

Compostable packaging such as polylactic acid (PLA) film derived from bio-based resources can be a strategic alternative to polyethylene films and **beverage concentrates** in food-grade applications. Matching compostable films to food applications effectively removes a sortation and separation step for scrap and expired food, simplifying diversion of methane-generating organic matter from landfills. An increased share of food-grade packaging coming from compostable films can also ease public concern over traditionally recycled plastic in food-handling applications. However, it is critical to establish adequate composting supply chains before implementing this substitution, since PLA is only compostable in industrial facilities, and municipalities may be forced to landfill these types of waste if they lack the requisite capacity. Other non-PLA compostable films are gaining traction even though current prices are four to five times higher than those of traditional plastics. Coated paper as well as **seaweed- and mushroom-based packaging** are nascent compostable options for special packaging applications where films are not an option.

The emerging trends of material homogenization and biodegradable polymers are promising but fall short of a comprehensive solution. A single attribute of a plastic package, such as the presence of an additive, may render the entire product incapable of being recycled or composted. This, in combination with the fact that recycling programs and facilities vary in their capacity to collect and process waste streams, points to a dire need for packaging design standardization. Implementation of a design standard can shift upstream primary plastic packaging production to align with an established set of best practices for different product types. A design standard can also inform the transformations needed in recycling supply chains so they are compatible with the packaging. The resulting waste streams would be lower in volume and less contaminated — and ultimately more manageable and sustainable (see Exhibit 4).

Exhibit 4 New modes of storefront and delivery options to reduce the need for packaging

	Current	Future
In store	Small, individual single-use containers	Portion control bulk fill and refill station
	Large, individual single-use containers	Returnable or resuable individual containers
	Multi-material, multilayer containers	Minimally printed primary packaging
	Unrecyclable secondary packaging	
	Labels inhibitting recyclability	Clear mono-material containers
Delivery	Individual, single-use primary packaging	Reusable, refillable, returnable subscription service
	Unrecyclable protective and space-filling secondary packaging	Secondary packaging with repurposability
	Single-use boxes	Reusable/refillable crates and boxes
	Truck last-mile delivery	Electric or micro-mobility last-mile delivery

RMI Graphic

Spurring Government and Corporate Action

Although many potential options to reduce packaging use and emissions exist, winning solutions must be deployed at scale. Leaders across governments, financial institutions, companies, and consumer coalitions are making progress in innovative ways. But they must go further faster using well-constructed policies and initiatives. The **public policy landscape for plastic waste reduction** has recently grown substantially, with more public policies signed in the past five years than in the prior two decades. In the past, policy measures favored regulatory instruments like prohibitions and requirements. New action can take an “all of government” approach, adopting a mix of instruments from economic incentives for reusable schemes to public outreach campaigns for maximum impact. Decision makers can start with some solutions listed in Exhibit 5.

Exhibit 5 **Key government and corporate levers available**

Driver	Key Measures
Government action	• Tax new fossil-based plastics and/or feedstocks. • Enact extended producer responsibility (EPR) laws that hold suppliers accountable for full packaging waste management costs. • Establish supply-side subsidies for reusable and compostable product handling systems, especially locally. • Ban nonmedical single-use and hard-to-recycle plastics that have viable alternatives. • Set standards on packaging formats that improve reuse, recycling, and composting rates. • Restrict commercial landfill waste bin sizes and pickup frequencies. • Require end-of-life tracking and data disclosures for all products sold to limit disposal knowledge gaps.
Corporate accountability	• Fund local reuse systems, prioritizing items with high reuse rates using short-distance, low-carbon transport. • Tie executives’ pay to reducing single-use packaging. • Fund education that improves reuse and composting rates. • Pass shareholder resolutions to reduce plastic packaging use at short-term annualized rates, especially for consumer packaged goods companies. • Require demonstrated reductions in plastic packaging use as a condition of contracts, investments, and insurability.

Government action

The most effective policy measures add targeted single-use and low-recyclability plastic bans to EPRs, setting an enforceable performance floor. Policy coordination across governments and geographical areas are preferred but are not required to make an impact. An effective waste management plan started in 2017 by Estonia's capital, Tallinn, **cut single-use plastics at public events** and applied lessons learned from other European municipalities. This plan, along with updates to a packaging excise duty law in 2017, reduced plastic packaging waste per capita by **over 13%** across the country from 2014 to 2019 despite a 16% increase in gross domestic product. Most EPR and plastic-ban laws target food and beverage plastic packaging, a subset of all packaging. Policies should cover as many packaging applications as practical, such as the recently passed **California Plastic Pollution Prevention and Packaging Producer Responsibility Act**.

Policy can also price plastic packaging to account for negative externalities through targeted taxation and content standards. Taxing fossil-based plastics can support financial incentives to reduce packaging use, especially when taxes target cheaper feedstocks linked to single-use plastics. For example, ethane is a heavy component of natural gas usually converted into polyethylene plastic packaging. Standards for food packaging's compostable content and nonfood packaging's recycled content can ramp up in scheduled and sensible ways to guide business decisions. Citizens and policymakers can support these initiatives with upcoming opportunities in the European Union's Packaging and Packaging Waste Regulation overhaul and development of the UN Plastics Treaty.

A good **waste management** policy also realigns costs away from frontline communities, taxpayers, and the environment toward the right producers. EPR laws can be simple, like "bottle bills" used in several US states, or elaborate systems that price packaging weights and material types differently, like in the European Union. Well-crafted EPR regulations can encourage use of packaging designs that minimize weight, waste, and GHG emissions. Incentivizing reduced environmental impacts like these is an EPR principle known as eco-modulation.

Policies that enable or encourage consumers to get what they want without packaging are a good first step, especially at the local level. Consider bottled water, the sales of which have surpassed soda's every year since 2016 and **continue to grow**. Water from public water fountains can cost **over 80%** less than bottled water. Schools and municipalities have been adding bottle-filling stations to fountains over the past 20 years to reduce demand for bottled water. Governments can also incentivize or add carbonation options to meet growing demand for sparkling water, as **Paris did**. Partnerships with drink companies could further catalyze the market for reduced packaging while reducing government waste management costs. Educating the public about these low-packaging options and benefits is an important but often overlooked action.

More broadly, adjusting trash pickup frequencies, waste bin sizes, and public education strategies can influence how citizens decide what to purchase. Improving composting access and infrastructure can reduce waste management costs and minimize landfill methane emissions as companies scale compostable food packaging. Good urban planning policies can also minimize the cost and emissions of reusable packaging models for communities. Similarly, well-planned supply chain incentives and land-use zoning policies can minimize the need for single-use secondary packaging to transport goods.

Corporate accountability

Financial institutions, third-party data providers, plastic packaging suppliers, and consumer coalitions are key stakeholders to consider in developing corporate accountability mechanisms that reduce plastic packaging use and emissions.

Banks, investors, and insurance companies can put financing pressures on companies to reduce packaging. Investors are leading the way, valuing chemicals companies aligned with circularity and sustainability priorities **more than five times higher** than companies focused on single-use plastics. VBDO, a Dutch association of investors for sustainable development, organized investors with $10 trillion in assets under management to **demand consumer goods companies to reduce plastic** packaging. Leading circularity investors can help low-packaging and reuse-enabling **businesses scale**, as Closed Loop Partners has already done with Algramo, Earthodic, and Loliware. Banks and insurance companies can join the movement while reducing their risk exposure to packaging-dependent models.

> **“Banks, investors, and insurance companies can put financing pressures on companies to reduce packaging. Investors are leading the way, valuing chemicals companies aligned with circularity and sustainability priorities more than five times higher than companies focused on single-use plastics.”**

Major companies can set a high expectation for waste management that can pull others along. Plastic credits allow firms to claim credit for funding the removal of ocean-bound plastic waste from the environment. They can serve as the voluntary bare-minimum expectation for companies to manage their waste in regions where EPR policy does not require it. In doing so, these credits can also provide more accurate estimates of waste management costs for other companies and governments to de-risk investments in proper waste handling facilities.

All companies in the packaging supply chain should take packaging reduction actions before regulatory and investor pressures require them to do so. Leading corporations have already cut packaging through internal decisions aligning with **global coalition commitments**. From 2018 to 2021, **Danone** cut its plastic packaging use by 60,000 tons while increasing the recycled content and circular-capable rating of its remaining packaging. **Asos**, a clothing company, cut 40% of its packaging in two years by eliminating oversized and excessive packaging, while requiring at least 80% recycled content. **Unilever** has cut the weight of its packaging by 20% over the past decade through better and lighter designs. More than **15 food and beverage companies globally** have implemented business models free of single-use plastic packaging.

Corporate reuse programs are another way to reduce packaging and increase sales and brand recognition. **Puma's** shoe packaging uses less plastic and 65% less cardboard through integrative design, while increasing reuse potential of a branded shopping bag. Hotel chains are changing from single-use packaging to refillable dispensers for customer bathroom products. Some innovative companies center their business models around managing difficult packaging. **CupClub**, a reusable cup subscription service, partners with coffee shops and other stores to reduce the billions of single-use cups used annually. This has recently scaled to a full reusable packaging service business called **ClubZero**. **Close the Loop** processes spent ink cartridges for direct reuse when possible, or downcycles them to create asphalt additives for improved performance when not. Companies can **follow guidance for reusable packaging** and **bag system innovation** to **design standard** systems that facilitate supportive customer behaviors.

Decision makers should think broadly about opportunities to reduce overall petrochemicals use. Even when options to eliminate packaging are limited, appropriate value should be given to safe reuse or recycling of packaging to different end uses like construction materials or textiles. We will explore this and other demand-reduction opportunities in upcoming reports on buildings and textiles.

Sasha Bylsma, Joseph Fallurin, TJ Conway, and Jikai Wang, *We Can Cut Petrochemicals Use Today: Plastic Packaging*, RMI, 2023, **https://rmi.org/insight/we-can-cut-petrochemical-use-today/**.

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