MassRecycle White Paper

A Call to Action on Materials Management & Climate Change

Approved by the MassRecycle Board of Directors

February 4, 2025

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EXECUTIVE SUMMARY

Greenhouse gas (GHG) emissions, no matter where they occur, are a driver of global climate change. Emissions associated with producing the goods consumed within Massachusetts are not quantified or targeted in the state's traditional GHG inventories, if they occur outside its borders. As a result, Massachusetts is missing significant opportunities to reduce GHG emissions related to the goods that residents, businesses, institutions, and governments consume. For most products, the greatest contributions to GHG emissions occur during their production, before they reach the consumer. Significant life cycle energy is invested to extract and process the raw materials used to produce and transport consumer and commercial products. For most products that are sold in Massachusetts, those activities occur outside of the state. The impacts on the global climate – including those in Massachusetts – are the same. Even if the emissions occur in other states or nations, a broad suite of approaches is emerging that allows residents, businesses, institutions, and policy makers in Massachusetts to achieve reductions in those emissions.

MassRecycle believes that it is critical for the Commonwealth to develop a deeper understanding of the full life-cycle GHG impacts associated with the consumption of goods so that those sources can be more strategically targeted for reductions. This MassRecycle White Paper highlights a number of strategies that Massachusetts could pursue to mitigate GHG sources related to materials and products:

- Focus the state's solid waste and climate planning on actions that help measure and reduce life cycle GHG impacts.
- Accelerate source reduction, embodied carbon, producer responsibility, reuse, and recycling initiatives through state and local climate and solid waste plans, and integrate GHG impact measures and tracking.
- Further expand the state's wasted food prevention program, aiming to significantly prevent wasted food generation through new policies and technical assistance and education programs.
- Collaborate with other jurisdictions to establish clear and understandable date labeling on foods and expand educational efforts targeting Massachusetts residents, businesses, and institutions to help them better interpret food date labels and prevent wasted food.
- Provide widespread multilingual educational opportunities for prevention and reuse of all used materials and products.
- Grow free and confidential technical assistance to businesses and institutions to help them reduce consumption and achieve zero waste to eliminate wasted materials and waste-related sources of GHGs.
- Adopt extended producer responsibility (EPR) laws covering batteries, solar panels, and wind turbines so that every resident, business, and institution has access to convenient, safe collection and recovery of the materials in these products.
- Investigate improved ways to expand use of mixed material recycling facility (MRF) glass as a pozzolan material, increase glass reuse options, attract a state-based glass recycler, and enact post-consumer recycled content mandate policies for glass products.
- Advocate for legislative changes to prevent municipal solid waste generation and increase reuse and recycling and recycling access, including modernizing the state's bottle bill and instituting an EPR law for packaging and paper products.
- Enact post-consumer recycled content legislation covering plastic containers.
- Adopt a statewide ban on single use take-out bags, polystyrene, and other unnecessary and high GHG-contributing nondurable products. Study and promote reuse options for take-out bags that are made from low-carbon materials.

- Explore truth-in-labeling policies that other states have adopted to ensure that only plastic products that can be widely collected for recycling have recycling labels.
- Pursue development of environmentally preferable purchasing standards for construction projects that reduce embodied carbon, maximize energy efficiency during materials use, and promote reuse and recyclability at end of life.
- Implement measures to promote low GHG impact coolants, where feasible, and ensure recovery of all appliances for refrigerant and metal recycling.
- Advance net zero programs at waste service providers and institutions.

MassRecycle is committed to pursuing these and other strategies and helping to advance ways to measure their GHG impacts.

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Background

With the publication of this Call to Action, MassRecycle joins the Solid Waste Association of North America (SWANA) and other materials management organizations to call for more strategic measures to address climate impacts of consumption and materials management. In recent years, there has been a growing recognition and a body of international research documenting the relationship between sustainable materials management (SMM) and climate change mitigation and adaptation. This Paper outlines a set of strategic actions that the organization proposes for Massachusetts to mitigate consumption-based GHG impacts and to improve climate resilience in the recycling and waste sector.

The adverse impacts of rapid, anthropocentric climate change on human health, the environment, and the economy, both worldwide and in Massachusetts, are well documented. According to the 2022 Massachusetts Climate Change Assessment, "Key climate hazards include warmer temperatures and more heat waves… that are connected to human health, droughts, agriculture yields, and a need for infrastructure repairs. Other projected changes include more frequent seasonal droughts affecting water supplies and agriculture; more intense days of high rainfall, increased flooding; more intense and frequent coastal storms that cause power outages, injuries and deaths, and damaged infrastructure; and gradual sea level rise, which changes ecosystems and the coastal built environment." These impacts affect everyone, but disproportionately harm low-income and marginalized communities, which often bear the brunt of extreme weather, pollution exposure, and limited access to resilient infrastructure.

According to the World Resources Institute, Americans consume more than 23.6 tons of material per person per year. This includes food, clothing, building materials, household items, phones, electronics, toys, furniture, cars, recreational equipment, and much more. Significant upstream energy is invested to extract and process the raw materials used to produce and transport these consumer and commercial products, and their GHG impacts are increased by the carbon emissions associated with their use and disposal.

Consumption-Based Climate Impacts in Massachusetts

For most products, the greatest contributions to greenhouse gas emissions occur during production, which includes the extraction, manufacturing, and transportation of materials. These emissions, often called "embodied carbon," are generated before a product is sold or delivered to a home or business, becoming part of its lifecycle emissions even as it is used, disposed of, or recycled in Massachusetts. To understand these impacts, the Environmental Protection Agency (EPA) published a consumption-based emissions inventory (CBEI) for the northeastern U.S., including Massachusetts, in November 2024. According to the Report, "Many U.S. states compile regular annual greenhouse gas inventories (GHGIs) that are used as a benchmark in measuring progress toward greenhouse gas (GHG) emissions reduction

goals… These territorial (also called sector-based) inventories typically cover GHG emissions occurring within the state's borders. They commonly include emissions associated with transportation, electricity production, industry, land use and forestry, commercial and residential buildings, and waste disposal. Many states already have initiatives to reduce sources of these territorial emissions. But GHG emissions are a driver of climate change, which is a global environmental issue. Emissions occurring out-of-state might also be associated with activities that are supporting a state, especially when a state is a consumer of a good that is produced or uses source materials or energy from another state or country. From a consumer perspective, states can therefore also reduce emissions related to the goods and services that their residents, businesses, and government consume, even when those emissions occur outside the state. However, emissions associated with producing the goods and services consumed within a state are not traditionally quantified if they occur outside its territorial borders. A consumption-based emissions inventory (CBEI) is an accounting method that can be applied to a region, including a state, that quantifies emissions associated with all goods and services consumed by a state, regardless of their origin. This approach allows these regions to more comprehensively account for emissions that their activities are directly and indirectly driving. A CBEI is commonly referred to by other names, such as a 'GHG footprint.' Key findings from this study include:

- Consumption-based GHG emissions from northeastern states are 40–60 percent greater than territorial emissions.
- Manufactured goods are the largest category contributing to the states' consumption-based emissions (CBEs), and the emissions from this category are largely from commodities made out of state."

The study conducted a more in-depth analysis of sources of consumption-based emissions for the state of Maine and found that:

- "Consumption from households steadily increased from 2015 to 2020, outpacing government expenditures or investment. Over approximately the same period, the embodied carbon consumption intensity in Maine decreased by about 13 percent. This decrease in intensity neutralized the emission effects of increases in real consumption.
- In Maine, the purchase of manufactured goods, personal transportation, and residential heating and cooking are the largest contributors to consumption-based emissions. The largest contributors among manufactured goods are food, petroleum products (mainly gasoline and diesel), chemicals, and vehicles.
- Most emissions for categories including clothing, computers, and furniture, are associated with imported goods. Imported clothing and leather goods have an emissions intensity five times higher than those domestically produced. Similarly, the emissions intensity of imported furniture is four times greater than domestic furniture."

A much earlier CBEI study by the U.S. Environmental Protection Agency (EPA) found that about 42 percent of all U.S. GHG emissions are associated with the raw materials extraction, production, transportation, and disposal of materials and products. A CBEI conducted by the Oregon Department of Environmental Quality for 2021, found that materials and products account for 48 percent of GHGs, and that number has increased in both absolute and relative terms, even as emissions from consumption of fuels and electricity - the traditional focus of state climate policy – has declined. Oregon's consumption-based GHG emissions inventories have helped to inform their climate mitigation and sustainable materials management programs to achieve the greatest benefits.

The EPA defines Scope 1 GHG emissions as those that occur directly from production, for example at a manufacturing facility or company, or from fleet fuel consumption. Scope 2 emissions are associated

with electricity consumption, heat generation, or steam purchases. Scope 3 emissions are associated with other inputs, including transportation, distribution, and waste disposal or treatment. The wide range of Scope 3 emissions makes this category more difficult to quantify but vital to consider. Consumption-based GHG inventories include Scope 3 emissions and, therefore, are able to assess the wider reaching effects of raw materials extraction, travel, and end-of-life management for products.

The Massachusetts DEP 2030 Solid Waste Master Plan set a statewide "waste reduction goal for 2030... to reduce disposal by 1.7 million tons annually from a 2018 baseline of 5.7 million tons to 4 million tons by 2030, a 30 percent reduction in tons disposed." This goal would place the state on track to achieve a 2050 goal of 90 percent reduction, using 2018 as the baseline. The Master Plan states that waste reduction can lead to significant GHG emissions reductions, particularly when evaluated from a lifecycle or consumption-based perspective. The Solid Waste Master Plan estimates, based on EPA's Waste Reduction Model (WARM), that if Massachusetts achieves its 2030 waste reduction goals, it could prevent over 1,700,000 metric tons of carbon dioxide (CO_2) equivalents from entering the atmosphere. This reduction is equivalent to removing annual emissions from over 370,000 passenger vehicles or conserving nearly 200 million gallons of gasoline.

Preventing, reducing, repurposing, refurbishing, and reusing materials have the most significant GHG benefits of all of the sustainable materials management strategies when considered from a life cycle perspective because, as noted above, the majority of the GHG impacts occur during the material extraction and production life cycle phases. The 2030 Solid Waste Master Plan made a concerted effort to help policy makers and the citizenry understand the connection between consumption and climate change and the GHG reduction potential of engaging in more waste reduction, reuse, recycling, and organics diversion. **It is critical to follow up on the actions described in MassDEP's Master Plan and focus the state's solid waste and climate action planning on regulatory, technical, and financial assistance, and other actions to measure and reduce life cycle GHG impacts related to materials and products, as other states, such as Oregon, have done.**

This paper outlines a number of sustainable materials management (SMM) strategies for Massachusetts that MassRecycle believes would help advance the state toward its climate mitigation, resilience, and solid waste goals. Quantifying the potential impacts of these strategies was beyond the scope of this paper, however MassRecycle recognizes the importance of accelerating efforts to study and estimate the GHG impacts of SMM approaches, and urges all materials management stakeholders to do more to facilitate those efforts. A recently published report by Oregon Department of Environmental Quality and the Stockholm Environment Institute provides an example of the kind of study that could be undertaken for Massachusetts to assess opportunities and policy approaches for reducing GHG emissions associated with consumption.

MassRecycle is also concerned about other important impacts of solid waste management on the environment and public health, including the presence of chemicals of concern in various products that become waste and then adversely affect the materials management system, other potential hazards (for example improper storage of lithium batteries, which can cause fires), and impacts on water systems, but those topics are outside of the scope of this paper.

The organization recognizes that not every ton of material reused or recovered for recycling has equal value in terms of relieving the climate impacts of raw material extraction, but nevertheless it has identified a set of actions that it believes would help reduce consumption-based GHGs. The listing of the strategies below does not imply any order in terms of quantifiable impact or preference.

Climate Actions for Massachusetts to Reduce Consumption-based GHGs

MassRecycle is a pragmatic, statewide, non-profit, non-partisan coalition dedicated to improving sustainable materials management, recycling, and organics reduction and diversion to benefit the climate, economy, communities, and the environment.

MassRecycle engages individuals, municipalities, institutions, waste service providers, non-governmental organizations, vendors, consultants, and others. The organization builds capacity for collaboration to connect, educate, and advocate for sustainable materials management policies and programs.

MassRecycle believes that all state and local climate mitigation and adaptation plans should address consumption-based GHG sources, including advancing prevention, reuse, organics diversion, and recycling, wherever possible, and considering adopting at least some of the strategies outlined in this paper. State Solid Waste Plans should integrate GHG impact measures and tracking where feasible, so that all stakeholders can understand where the greatest climate mitigation impacts are occurring and where there are lessons to be learned and new opportunities to reduce GHGs. The organization is dedicated to advancing action to reduce climate change impacts and improve resiliency in the recycling sector and offers the following strategies. The strategies are summarized in the bolded statements throughout the paper.

Expand Wasted Food Prevention and Diversion

Project Drawdown (a non-profit organization dedicated to researching and promoting solutions aimed at achieving the "drawdown" toward decline of greenhouse gas levels in the atmosphere) lists food waste prevention as one of the most effective GHG mitigation strategies. Wasted food prevention includes such options as improved food storage and meal preparation practices at businesses and institutions, gleaning at farms, better advanced meal planning and shopping, understanding date labeling to help avoid throwing out edible food, and redirecting surplus food to feed people. Wasted food is a significant portion of the solid waste stream in Massachusetts, making up to 22 percent of the trash.

Diverting wasted food to composting or conversion to energy through anaerobic digestion (AD) also reduces GHGs when compared with landfilling. Wasted food is a potent source of methane gas when disposed of in landfills. According to the EPA, methane is more than 28 times as potent as carbon dioxide at trapping heat in the atmosphere. The EPA has reported that landfills are the third largest source of anthropogenic methane in the United States, and these releases are associated with food and other organic waste.

MassDEP has underscored the importance of preventing and diverting wasted food by implementing the 2022 tightening of its commercial organics disposal ban from one down to a half ton of wasted food per producer per week. **MassRecycle urges the Commonwealth to further expand its wasted food prevention program, aiming to significantly prevent wasted food generation through new policies and technical assistance and education programs.**

Food manufacturers and stores use a variety of date definitions on their products. The dates are often not related to food safety, but many people think they are and throw out edible food. “Best before”, “use by,” “best by,” “best if used by,” “enjoy by,” and similar dates have no standard definition and are

merely suggestions related to quality. The food is usually still safe to eat after the date and probably even still at its best quality. For the most part, consumers can trust their senses to know when food has gone bad. For example, milk, yogurt, juice, sauces, and many other items are well suited to the "look" and "smell" tests. "Sell by" dates are meant for the store staff so that they can manage inventory. If the food is sold or donated by that date, it will still have top-quality shelf life for some time afterward. Consumer, institutional, and business confusion about these dates can contribute to unnecessary wasting of edible food. California recently passed a ground breaking date-labeling law that could be a model for Massachusetts. **MassRecycle encourages Massachusetts environmental and public health agencies to collaborate with other jurisdictions to establish clear and understandable food date labeling. Additionally, we urge these agencies to expand educational efforts targeting Massachusetts residents, businesses, and institutions, helping them better interpret food date labels and prevent wasted food.**

Increase Collection, Recycling, and Reuse of Lithium Batteries, Solar Panels, and Wind Turbines

As the Commonwealth moves toward electrification through renewable energy, which is critical to reaching its GHG reduction goals, the use of solar panels, wind turbines, and lithium and other rechargeable batteries will grow. These products will eventually reach their end-of-life. It is imperative that the state create a safe and convenient material reuse (where appropriate) and recovery system for lithium and other batteries, solar panels, and wind turbines to offset the need for mining of virgin materials, prevent environmental exposure or pollution, and protect people and property.

What is Product Stewardship and Extended Producer Responsibility?

The Product Stewardship Institute defines product stewardship as "the act of minimizing the health, safety, environmental, and social impacts of a product and its packaging throughout all lifecycle stages, while also maximizing economic benefits. The manufacturer, or producer, of the product has the greatest ability to minimize adverse impacts, but other stakeholders, such as suppliers, retailers, and consumers, also play a role. Stewardship can be either voluntary or required by law."

Extended producer responsibility (EPR) is defined as "a mandatory type of product stewardship required by law. It includes, at a minimum, the requirement that the manufacturer's responsibility for its product extends to post-consumer management of that product and its packaging. There are two related features of EPR policy: (1) shifting financial and management responsibility, with government oversight, upstream to the manufacturer and away from the public sector; and (2) providing incentives to manufacturers to incorporate environmental considerations into the design of their products and packaging. EPR levels the playing field among competitors and incentivizes environmentally conscious design."

The West Coast Forum on Climate and Materials Management has posted a paper that prioritizes climate mitigation in the context for EPR for packaging.

Safely recycling lithium and other batteries at the end of their useful life conserves the critical minerals and other valuable materials that are used in the batteries, reduces the GHG impacts associated with the raw materials extraction, production, and transportation, and is overall a more sustainable approach than disposal. When lithium batteries are improperly disposed of in the trash or other waste management facilities, they are likely to be punctured and start a fire. The National Waste and Recycling Association estimates that improperly disposed of lithium batteries cause more than 5,000 fires annually at recycling facilities in the U.S.

States such as Vermont, Illinois, New Jersey, and California and the District of Columbia have passed extended producer responsibility (EPR) laws covering portable primary and rechargeable batteries, which obligate battery manufacturers or importers to develop, implement, coordinate, and pay for a battery collection and recycling system. These systems are already in place in other countries, including Canada and European nations. There is a growing lithium battery recycling industry in the U.S. **MassRecycle actively champions policies and programs to facilitate the proper collection and recycling of batteries where feasible, particularly through EPR programs, so that Massachusetts residents, businesses, and institutions have access to convenient and safe collection and recycling of batteries, starting with the smaller portable batteries.**

Some solar panel recycling companies have started to recover the glass, aluminum, copper, and semiconductor material found in the photovoltaic (PV) panels. Expanding these programs would have many benefits, including providing raw materials for production of new panels or other products and, thereby, reducing GHG impacts of producing new PVs. MassRecycle believes that an EPR program for solar panels, perhaps modeled on the law that Washington State has enacted, would achieve this impact and obligate solar panel manufacturers or importers to develop, implement, coordinate, and pay for a solar panel recycling system. In Europe, solar panel EPR is mandated under the Waste Electrical and Electronic Equipment Directive. PV manufacturers and recyclers have been following those regulations since 2013, which includes requirements for tracking how many panels are collected and the amount of material recycled from the panels. **MassRecycle supports adoption of an EPR law, like that of Washington State, covering solar panels so that every resident, business, and institution has access to easily accessible safe PV collection and recycling.**

To date, there are no states that have adopted EPR programs for wind turbines, but with the rapid expansion of wind power in Massachusetts, **MassRecycle believes that the Commonwealth should begin now to prepare for proper collection and recycling, where feasible, of the materials used in wind turbines. EPR programs should be considered as one of the key strategies for managing them at end-of-life.**

Promote Expansion of Waste Reduction, Reuse, and Recycling Programs

In Massachusetts, disposal capacity is rapidly declining, and the waste infrastructure is aging. MassDEP has concluded that insufficient disposal capacity, including dwindling landfill capacity and the aging waste-to-energy infrastructure, has weakened the resilience of the Commonwealth's waste disposal system and may lead to lack of adequate local options (2030 Solid Waste Master Plan). This situation puts the state's solid waste disposal system at risk for failure. It also leads to greater carbon emissions because as Massachusetts' waste disposal capacity shrinks, the distance traveled for disposal increases. Massachusetts currently exports trash to places as far away as Alabama, greatly increasing the GHG emissions associated with material disposal.

Shipping trash ever-increasing distances is at odds with the climate goals of Massachusetts. Relying upon other states to take its waste leaves Massachusetts in a precarious position and adds to the cost that municipalities, businesses, and institutions bear for their waste management services. This trend underscores the urgent need for Massachusetts to develop sustainable, in-state materials management solutions to reduce dependency on out-of-state destinations and reduce GHG impacts from shipping waste long distances. Exporting waste also comes with serious environmental justice ramifications. For example, Alabama, an end site for some of Massachusetts' solid waste, has long been the site of contentious battles between residents and privately-owned landfills that accept waste from other states. Claims of "environmental racism" have been put forth by residents of low-income, largely African-American communities that live in close proximity to landfills accepting out-of-state waste. Massachusetts must confront the environmental and social costs of exporting its waste by investing in equitable, local sustainable materials management solutions that respect both environmental justice and regional independence.

The 2030 Massachusetts Solid Waste Master Plan establishes aggressive waste reduction goals to guide the state toward a zero-waste future. The Plan proposes development of Action Plans for key waste reduction areas, including advancing reduction and reuse. MassDEP's Reduce and Reuse Action Plan articulates a vision and strategies that focus on reducing upstream waste generation. The development of this Plan was supported through MassDEP's multi-stakeholder Reduce and Reuse Working Group. The Reduce and Reuse Action Plan provides background and explains the importance of these strategies to reduce waste and to reuse materials. The plan summarizes the plan development process, identifies barriers to progress, and defines progress measures. The plan then establishes short-, medium-, and long-term priority zero-waste strategies across seven categories, including:

- Education and Behavior Change
- Tools, Resources, and Technical Assistance
- Grants and Financial Incentives
- Job Training and Workforce Development
- Networking
- Legislation
- Procurement

MassRecycle urges rapid investment in and implementation of the priority strategies that are included in the state's Reduce and Reuse Action Plan, which would result in reduced GHG emissions, and reporting on the results both in terms of waste prevention/diversion and GHG savings. The organization also urges MassDEP to work with local communities to integrate GHG-impactful sustainable materials management strategies into their climate action plans and to begin to quantify their impacts.

The state needs to continue to expand its efforts to reach the public about preventing, reusing, and properly recycling various components of municipal solid waste. Packaging and nondurable products are constantly changing, and keeping up with that evolution and its impact on the reuse opportunities and recycling stream is critically important. Some of the newer composite materials are lightweight and have climate advantages because they lower the GHG impacts of production and transportation, but are not currently reusable or recyclable, and many people are confused by that. Programs like RecycleSmart MA are critically important to helping the public, businesses, and institutions understand the opportunities available to properly recycle various materials. **MassRecycle urges the Commonwealth to build upon the success of the Recycle Smart MA public education campaign and provide even more widespread education on opportunities for prevention and reuse.**

There are examples of successful educational programs that are helping to educate Massachusetts businesses and institutions about opportunities to reduce and reuse waste and properly recycle (for example see Bio-Medical Plastic Waste webinars and handouts for the public). **The MassDEP funds the Center for EcoTechnology to administer RecyclingWorks in Massachusetts. RecyclingWorks provides free technical assistance to businesses to help develop reuse, recycling, and food recovery programs. MassDEP should continue to grow and expand its reach and scope.**

Increase Reuse and Recycling of Metals

A 2022 study showed that the GHG emissions from recycling metals were approximately one third that of virgin production. The extraction of metals from virgin feedstocks is a significant contributor to global GHG emissions. Aluminum is the most abundant metal found in residential recycling and is one of the most commonly mined metals globally. Aluminum extraction utilizes highly destructive strip mining, which is GHG-emissions intensive with respect to fuel consumption, but that also releases mineralized carbon from soil through oxidation. Metals are, however, highly recyclable and valued by the recycling industry. The Recycled Materials Association underscores the value of aluminum, reporting that "Recycled nonferrous metals only account for around 10 percent of the volume of all recyclables in the United States but generate about half of the value in dollar terms due to their high per-unit prices." **These factors make continuing to grow diversion of metal wastes from disposal an important strategy to reduce GHGs and the waste stream.**

Expand Paper Recycling

Paper mills are large GHG industrial emitters. Paper production emits GHG through extraction of materials, production, and treatment of the heavily-polluted wastewater that results from the manufacturing process. Life cycle assessment of paper manufacturing using virgin pulp versus recycled waste paper found that GHG emissions were three times higher for production using virgin materials. Cardboard is a material that has become increasingly common in the waste stream due to the rise of e-commerce. Cardboard recycling is a priority material in the MassDEP 2030 Solid Waste Master Plan, which includes an ambitious goal to reduce its disposal. To achieve this, MassDEP has implemented a ban on disposal of cardboard. The recycling of paper and cardboard not only reduces the GHG and other pollution associated with its production, but preserves the forests that sequester carbon. **Increasing cardboard and paper recycling is a critical step in reducing GHG emissions, conserving resources, and protecting forests.**

Improve End-of-Life Options for Used Glass

Used glass may be recycled into pozzolans or reused in its original form (i.e. refilling bottles) to reduce life cycle GHG impacts. Pozzolan can be made from recycled post-consumer ground glass. It is a safe, sustainable, and high-performing material that can replace the cement and dramatically reduce the embodied carbon in concrete. Traditional cement-based concrete is an abundantly used construction material that has substantial GHG impacts primarily from its production.

The last glass recycling processor in Massachusetts closed in 2018, leaving a dearth of options for glass recycling. This has resulted in mixed glass generated by material recovery facilities (MRF) being used as daily cover for landfills, which is a beneficial use, but it is not recycling and has low climate benefits.

Recycled content mandates require that products sold in a jurisdiction have a certain percentage of content from post-consumer recycled material. These mandates help to increase the demand for clean

recycled material, thereby stimulating the market and collection programs for recyclables. The Northeast Recycling Council (NERC) has developed model legislation for increasing recycled content in glass containers and other uses.

Massachusetts should investigate improved ways to expand use of mixed MRF glass as a pozzolan material, increase glass reuse options, attract a state-based glass recycler, and enact post-consumer recycled content mandate policies for glass products.

Expand Access to Collection for Recycling at Multi-Family Housing

Any discussion of recycling must consider access among other factors. In Massachusetts, many residents of multifamily buildings lack access to recycling, creating a significant environmental justice challenge and a great deal of recyclables being trashed. While single-family homes and smaller residences often have curbside collection for recycling, larger multifamily complexes frequently go without due to logistical challenges, inadequate support from property managers, and the structure of municipal bylaws or ordinances. This disparity places barriers to recycling for residents in densely populated urban areas—often lower-income communities and communities of color. **Addressing the gap in recycling access is essential for creating a more equitable and sustainable materials management system across the state.**

Adopt EPR for Packaging and Paper Products

Most of Massachusetts' solid waste laws were enacted more than 30 years ago, when recycling services were not available in most locations, and have not been significantly modernized since then. They are, therefore, out-of-date and do not address opportunities to take action on climate change through sustainable materials management strategies. **MassRecycle has been advocating for several important legislative changes that would help reduce waste and increase recycling and recycling access in the state, thereby reducing GHGs and increasing recycling.**

EPR laws covering packaging and paper products have been enacted in Maine, Oregon, Colorado, California, and Minnesota, as well as most Canadian provinces, Brazil, South Africa, India, and other countries, including much of Europe. The programs in Canada and Europe have achieved some of the highest recycling rates in the world. The U.S. states with these laws are actively implementing them now, and they should start to demonstrate results within the next five years. MassRecycle's Product Stewardship Council (MassPSC) has introduced EPR for packaging and paper products bills for the past few years. Covered materials in these proposed bills include 37.5 percent of currently disposed of materials, and are the main targets for reduction in the MassDEP 2030 Solid Waste Master Plan. EPR for packaging and paper products policies should integrate prevention approaches, and provide incentives to simplify and streamline packaging as much as possible to maximize reductions in life cycle GHGs. **MassRecycle has proposed and advocated for an EPR bill covering packaging and paper products and will continue to do so as it learns from the experiences with these laws in other states.**

Modernize the Bottle Bill Program

The Massachusetts Bottle Bill is a Deposit Return System (DRS) that places a small deposit on a container that is refunded upon return by the consumer. DRS strategies are currently utilized in over 40 countries or regions, including 10 U.S. states and 8 Canadian Provinces. These systems have been shown to incentivize recycling (with its associated GHG benefits), result in clean materials for downstream processes, and reduce litter. The 1983 Massachusetts Bottle Bill was one of the first container deposit

systems in the nation. Unfortunately, the initial $0.05 deposit has not been increased (even to adjust for the impact of inflation) and does not compare to more successful deposit systems in the nation that offer $0.10-$0.15. Redemption rates in Massachusetts have fallen from 81 percent in 1989-1997, to 38 percent in 2022. Modernizing and expanding the types of containers covered by the state's bottle bill would expand collection and recycling of these valuable materials, and thereby reduce GHGs.

States like Oregon, Maine, and California demonstrate that EPR and bottle bill systems can co-exist. **MassRecycle supports the modernization of the state's Bottle Bill program, particularly one with an approach that incentivizes consumer participation, increases scope, applies non-refunded deposits to a recycling fund, and works with the current Massachusetts recycling infrastructure.**

Reduce, Reuse, and Recycle Plastics Waste

According to Project Drawdown, "Global plastic production has increased astronomically over the past few decades, reaching 368 million metric tons in 2019. Not only are plastics petroleum-based, consuming approximately 6 percent of global oil today as a raw material, but their production is energy intensive, releasing more than 390 million metric tons of carbon dioxide equivalent—4 percent of global GHG emissions—in 2015." A recent study from the U.S. government's Lawrence Berkeley National Laboratory reported that, under certain conditions, GHG emissions from primary plastic production could triple by mid-century, accounting for 20 percent of the remaining carbon budget.

Project Drawdown has stated that, "Application of plastic spans all areas of life and society. More than 60 percent of all use is for short-term applications such as packaging and household goods. These applications produce prolific plastic waste that, when released into the environment, can harm wildlife, society, and our economy. According to some reports, between 30 to 60 percent of plastics in packaging can be reduced." "Nondurable plastic represents around 64 percent of all plastic produced. It includes packaging and household goods with an average lifespan of three years."

About 162 municipalities (covering around 70 percent of the population) in Massachusetts have adopted bans on retailers and other businesses giving out single use plastic bags as of May 2023. It's past time for enactment of a state-wide ban in Massachusetts. **MassRecycle recognizes the climate and litter reduction benefits of a number of policy initiatives that have been proposed in Massachusetts, including a statewide ban on single use take-out bags, polystyrene, and other unnecessary and high GHG-contributing nondurable plastic products. The state should also study and promote reuse options for take-out bags that are made from low-carbon materials.**

According to Project Drawdown, "As consumption of commodities and resources increases, so does the environmental footprint of extraction of raw materials. Recycled plastics have a significantly lower carbon footprint than virgin plastics, so increasing the amount of plastics produced from recycled feedstocks by increasing collection, reducing yield losses, and incentivizing or switching feedstocks from virgin to recycled, could have a large impact on the global carbon budget of materials." The Association of Plastic Recyclers (APR) has stated that, "replacing new plastic with recycled plastic can reduce GHG emissions by 70 percent."

Project Drawdown focuses its recycled plastics solutions on the production of plastic nondurable goods from recycled feedstocks. This replaces the conventional approach of producing plastic nondurable goods from virgin, petroleum-based plastics. Production from recycled feedstocks results in reductions of waste in landfills and dumps, environmental pollution, and extraction of oil, and it requires less energy than conventional plastics production. It is limited to short-term-use plastics, such as packaging, and does not include durable goods in buildings, construction, and vehicles.

Some states, including California, New Jersey, and Washington, have enacted recycled content mandates for targeted plastic products, including packaging. The Northeast Waste Management Officials' Association (NEWMOA) and the Northeast Recycling Council (NERC) have developed model recycled content legislation for certain plastic products and packaging. **MassRecycle supports this effort and urges the state legislature to consider this approach as a complement to EPR for packaging and a modernized and expanded bottle bill program.**

For the past few years, MassRecycle has been educating its members and the public on the benefits of reducing, reusing, and recycling plastic waste through podcasts, tours, sessions at its conferences, conversations with reporters, and other activities. It is dedicated to ensuring that accurate information about opportunities for increasing reuse and recycling of plastic waste are reaching the public and decision makers. **The organization will continue to seek opportunities to educate stakeholders and the public about the climate benefits of reducing plastic use and reusing plastic when possible. It is critical to MassRecycle's efforts to improve accuracy in public information on the value of recycling acceptable non-durable plastics and to make the public aware that recycling plastics has climate and other benefits.**

The recycling staff who work for municipal and waste services providers constantly face public confusion about the different types of plastics and their recyclability. The existing system for labeling plastics with the "chasing arrows" triangle is not helpful and exacerbates this confusion. Many products that display the logo are not recyclable in communities in the state. Laws passed in Oregon and California aim to address labeling confusion on plastics packaging. When these laws are implemented, they are likely to have a national impact on improving collection of recyclables and reducing the energy, GHG impacts, and cost needed to process those materials. **MassRecycle urges Massachusetts policy makers and regulatory staff to explore truth in labeling policies and programs that other states have adopted to ensure that only plastic products that can be widely collected for recycling have recycling labels.**

Reduce GHG Impacts of Construction and Demolition Materials

According to Project Drawdown, buildings are a major driver of GHG emissions. "Some stem from the materials that comprise buildings and the process of construction, renovation, or demolition—what's known as 'embodied carbon.' Many more are the result of ongoing use."

According to the MassDEP, in 2023 (the latest year for which data is available), nearly 2.5 million tons of construction and demolition (C&D) waste were generated in the state, of which about 17.4 percent was recycled. The Massachusetts 2030 Solid Waste Master Plan sets a goal to reduce disposal of C&D materials by 260,000 tons by 2030, as compared to the calendar year 2018 baseline. Priority materials include wood, cardboard, gypsum, and carpet. **MassRecycle supports the strategies described in the state's Master Plan, including waste ban regulatory developments and enforcement, technical and financial assistance, and expanded reporting for these construction materials.**

In addition to increasing C&D materials recycling, prioritizing building and material reuse is another way to reduce waste and GHG impacts from construction activities. Deconstruction is a sustainable alternative to traditional demolition, emphasizing the careful dismantling of buildings to maximize the recovery and reuse of materials. Deconstruction offers a critical opportunity to lower GHG emissions, reduce disposal, and conserve natural resources. By addressing the emissions associated with the extraction, manufacturing, and transportation of building materials, the state can address a key contributor to climate change. **Massachusetts can implement statewide or incentivize municipal level policies to require deconstruction, building material reuse, and C&D materials recycling.** This would

support the state's climate goals and foster green jobs, preserve historic structures, stimulate local markets for salvaged materials, and reduce the environmental footprint of the built environment.

MassRecycle advocates for the Commonwealth to pursue development of environmentally preferable purchasing (EPP) standards for materials used in state government and private sector construction projects that minimize embodied carbon, maximize energy efficiency during use, and improve reuse and recyclability at end of life, thereby reducing GHG impacts. In particular, this could include:

- Evaluating the expansion of the use of energy efficient pozzolan materials that utilize recycled glass from single stream recycling operators in state buildings (see above section on glass)
- Developing low carbon materials standards for all state facilities that also consider end-of-life processing, reuse, and recycling, starting with a focus on concrete
- Measuring the GHG and other impacts of adopting these standards in state government construction projects
- Identifying opportunities for mandates for the private sector construction industry for adopting EPP standards in construction projects to minimize embodied carbon while maximizing energy efficiency and incentivizing reuse and recyclability at end-of-life
- Using EPP standards that the state has developed, evaluate the adoption by private developers throughout the state and measure the GHG and other impacts of adoption of these standards by private developers and public entities

Reduce Use of and Recycle High Global Warming Refrigerants

Proper use and management of used refrigerant is another opportunity for significantly reducing GHG releases. According to Project Drawdown, replacing and recycling the refrigerants in cooling appliances has a powerful effect in cutting carbon in the atmosphere. When chlorofluorocarbons are released from old appliances, they are up to 9,000 times more potent than carbon dioxide in trapping carbon. Even the more modern Hydrochlorofluorocarbons (HCFCs) have this effect. With the expanding use of heat pumps and other cooling appliances worldwide, capturing these substances for recycling has become more urgent. Fortunately, there are markets for recovered and purified refrigerants for appliances of all vintages. **Every state and local Climate Action Plan should include measures to promote less impactful non-HCFC coolants, where feasible, and to ensure recovery of all appliances for refrigerant and metal recycling.**

Advance Net Zero Programs at Waste Service Providers and Institutions

Companies that provide waste services, such as haulers, MRF operators, recyclers, composters, and AD facility operators, all use fossil fuels to power their vehicles and equipment, and to heat and cool their buildings. Many of these firms have made commitments to achieving net zero status in their operations as a key to their efforts to mitigate climate change. According to the United Nations, net zero "means cutting carbon emissions to a small amount of residual emissions that can be absorbed and durably stored by nature and other carbon dioxide removal measures, leaving zero in the atmosphere." Companies that operate in Massachusetts, such as Republic Services, Casella, Waste Management, WIN Waste Innovations, and others are making strides toward their net zero and sustainability goals. The waste services companies and programs, including recycling, in Massachusetts and elsewhere are increasingly committed to achieving net zero GHGs associated with their operations. These programs target scope 1 and 2 emissions and, where possible, scope 3 impacts as well.

Colleges and universities and other institutions are also innovating to reduce the climate impacts of their materials management and recycling operations and moving toward net zero impacts and zero waste.

For example, Boston University has incorporated zero waste strategies into its climate action planning and has developed a number of innovative strategies to achieve their goals. Brandeis University, Harvard University, and Williams College have signed the Coolfood Pledge, pledging to cut food-related GHG emissions by 25 percent by 2030. The University of Massachusetts System's Unified Procurement Service Team has built sustainability measures into contracts with food and materials vendors. MassRecycle's Campus Collaborative program is supporting and coordinating these and other academic institutions around the state in adopting expanded SMM programs and helping to connect SMM with their climate action activities.

MassRecycle supports corporate and institutional net zero trends and believes they should be embraced more widely in the waste services industry, government programs, and institutions for all of their operations.

Climate Resilience and Adaptation Measures for Materials Management

In Massachusetts, ensuring the resiliency of the waste services infrastructure at all levels, including municipalities, is essential in climate resiliency planning. As noted above, the state is facing a future with increased potential for severe storms and sea level rise that bring extensive flooding and infrastructure damage. Effective recovery from these events depends on the waste infrastructure to remain intact and prepared for the significant influx of materials for processing during a disaster event.

Plan for Effective State and Local Disaster Debris Events

Effective state and local disaster debris planning is critical to disaster recovery efforts. At the municipal level, disaster preparedness should include a comprehensive disaster debris plan that identifies temporary debris management areas and contractual arrangements for needed services. **MassRecycle calls on all municipalities to take advantage of available support and assistance from MassDEP and the Massachusetts Emergency Management Agency (MEMA) to develop or update their disaster debris management plans. In particular, these plans should help ensure that they are able to segregate recyclables to maximize recycling of appropriate materials and, thereby, reduce GHG impacts and to minimize the need for disposal.**

Ensure That the Commonwealth's Waste Services Infrastructure is Climate Resilient

Identifying vulnerable solid waste and recycling facilities and increasing their resiliency strategies is of the utmost importance to maintain and secure existing waste processing and recycling operations now and in the future. **Identifying at-risk solid waste facilities, including transfer stations, MRFs, landfills, waste-to-energy, recycling, composting, AD, and others, and working with them to adopt adaptation and resiliency measures for anticipated disaster events is now more important than ever.**

Conclusion

We are facing a climate crisis that is having profound impacts on public health and the environment. Massachusetts has been a national leader in adopting policies and programs to address the greenhouse gas (GHG) impacts of transportation, the energy sector, and energy use in the built environment. However, the Commonwealth is significantly behind other jurisdictions in adopting twenty-first century approaches to reducing the climate impacts of consumption. This is in part because the GHG inventory model that the state relies on does not account for life cycle impacts. A recently published EPA consumption-based GHG emissions inventory has found consumption-based GHG emissions from northeastern states, including Massachusetts, are 40–60 percent greater than within-state emissions that do not account for life cycle impacts. Other states have found that even as GHG releases associated with transportation and energy production are declining, GHG impacts from consumption are increasing. By not actively including a focus on consumption-based GHGs in its climate change strategies, Massachusetts is missing an increasingly important source that will make achieving its climate mitigation goals unnecessarily challenging.

Massachusetts has not significantly updated its solid waste policies in more than 30 years, as others, particularly neighboring jurisdictions have done. Through this Call to Action, MassRecycle calls upon the Commonwealth to urgently address this deficit. MassRecycle proposes that the state center its sustainable materials management policies and programs around quantifying and reducing climate impacts of consumption and educating policy makers, businesses, institutions, and the public about what actions they can take. The organization endorses a slate of policy changes that would re-establish Massachusetts as a leader in waste prevention, reduction, reuse, and recycling, including:

- Focus the state's solid waste and climate action planning on actions that help measure and reduce life cycle GHG impacts.
- Accelerate prevention, embodied carbon, producer responsibility, reuse, and recycling initiatives through state and local climate and solid waste plans and integrate GHG impact measures and tracking.
- Further expand the state's wasted food prevention program, aiming to significantly prevent wasted food generation through new policies and technical assistance and education programs.
- Collaborate with other jurisdictions to establish clear and understandable food date labeling and expand educational efforts targeting Massachusetts residents, businesses, and institutions to help them better interpret food date labels and prevent wasted food.
- Adopt extended producer responsibility (EPR) laws covering batteries, solar panels, and wind turbines so that every resident, business, and institution has access to convenient safe collection and recovery of the materials in these products.
- Investigate improved programs to expand use of mixed MRF glass as a pozzolan material, increase glass reuse options, and consider enactment of post-consumer recycled content mandate policies for glass.
- Advocate for legislative changes to curtail municipal solid waste generation and increase reuse and recycling and recycling access, including modernizing the state's bottle bill and an EPR law for packaging and paper products.
- Enact post-consumer recycled content legislation covering plastic containers.
- Adopt a statewide ban on single use take-out bags, polystyrene, and other unnecessary and high GHG-contributing nondurable products. Study and promote reuse options for take-out bags that are made from low-carbon materials.
- Explore truth in labeling policies that other states have adopted to ensure that only plastic products that can be widely collected for recycling have recycling labels.

- Pursue development of environmentally preferable purchasing standards for construction projects that reduce embodied carbon, maximize energy efficiency during materials use, and promote reuse and recyclability at end of life.
- Implement measures to promote low GHG impact coolants, where feasible, and ensure recovery of all appliances for refrigerant and metal recycling.

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About MassRecycle

MassRecycle is a pragmatic, statewide, non-profit, non-partisan coalition dedicated to improving sustainable materials management, recycling, and organics reduction and diversion to benefit the climate, economy, communities, and the environment.

MassRecycle engages individuals, municipalities, institutions, waste service providers, non-governmental organizations, vendors, consultants, and others. We build capacity for collaboration to connect, educate, and advocate for sustainable materials management policies and programs.

For more information visit: https://massrecycle.org/.

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