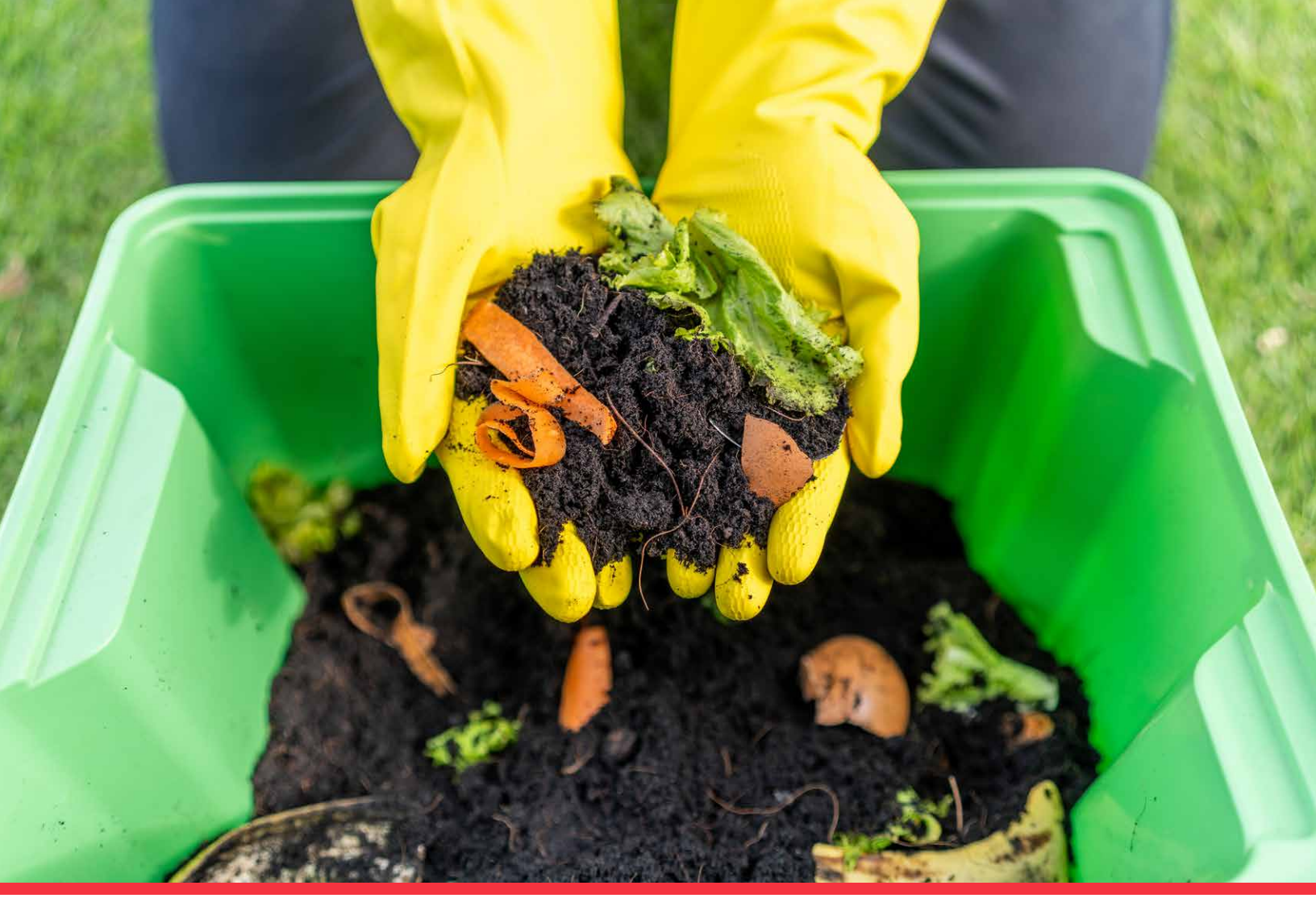

How to Reduce Food Waste in Massachusetts

KEEPING WASTED FOOD OUT OF OUR LANDFILLS AND USING IT TO FEED PEOPLE AND BUILD HEALTHY SOILS

MASSPIRG Education Fund
CLEAN WATER FUND
FRONTIER GROUP

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AUGUST 2024

ACKNOWLEDGMENTS

The authors sincerely thank Katherine Blauvelt, Circular Economy Campaign Director at Industrious Labs; Elizabeth Schroeder, Senior Communications Strategist, Circular Economy at Industrious Labs; and Heather Latino, Clinical Instructor at the Food Law and Policy Clinic at Harvard Law School for their review of this document, as well as their insights and suggestions. Thanks also to Frontier Group intern Ellen Gracia for her valuable research and editorial assistance; as well as Elizabeth Ridlington and James Horrox of Frontier Group, and intern Hailey Seo for their editorial support.

The authors thank Industrious Labs for making this report possible.

The authors bear responsibility for any factual errors. The recommendations are those of MASSPIRG Education Fund. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

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Executive summary

MASSACHUSETTS DISPOSES of nearly a million tons of wasted food every year,[1] most of it going to incinerators and landfills, where it produces greenhouse gases that worsen global warming. Much of that food is edible and could be used to feed people. The rest could be composted to help build the health of our soils.

States across the country have taken steps to reduce food waste, and Massachusetts is no exception. Massachusetts has banned the landfilling of food waste from large commercial food waste generators; more Massachusetts residents than ever are taking part in food scrap collection programs at home; and the commonwealth has built several new large-scale facilities to accept organic materials. We are keeping more organic material out of landfills and incinerators than ever, and our communities and environment are reaping the benefits.

Yet, despite that progress, Massachusetts continues to fall short of our food waste diversion goals and has fallen behind leading states that are taking even more ambitious steps to limit food waste.

Massachusetts must follow the example of leading jurisdictions and take an aggressive, coordinated, well-funded approach to reducing food waste. **Specifically, the commonwealth should invest in food waste prevention and food recovery, prioritize composting, and increase the amount of food waste diverted from landfills and incinerators, especially from residents.** Proven, common-sense strategies in each of these areas can position the commonwealth to build on its progress to date and achieve its goals.

Massachusetts produces nearly 1 million tons of food waste each year – worsening global warming and wasting resources and money.

- Food waste accounts for about one-fifth of Massachusetts' trash – approximately 930,000 tons sent each year to landfills and incinerators.[2] While Massachusetts is diverting more food waste from disposal than ever – thanks in part to the state's ban on most commercial disposal of food waste and expansion of residential food waste collection – the commonwealth has thus far failed to meet its food waste diversion goals.[3]
- Food waste is a significant source of global warming emissions. When buried in landfills, wasted food and other organic materials produce methane – a highly potent greenhouse gas. **The burning and burial of municipal solid waste (including food waste) was responsible for 1.5 million metric tons (CO_2-equivalent) of greenhouse gas emissions in Massachusetts in 2020, or about 2% of the state's total emissions.**[4]
- Solid waste disposal is increasingly costly – Massachusetts has the highest landfill tipping fees in the nation.[5] Collecting food waste for composting or anaerobic digestion can be far less expensive than landfilling or incinerating it. **The town**

of Hamilton, the first municipality in the state to ban all disposal of food waste in trash, found that disposing of separated food waste cost half as much as solid waste disposal.[6]

- Food waste is also a waste of resources. Growing, processing and transporting food consumes energy and nutrients and often inflicts harm on the environment. Wasting less food can reduce those impacts. Wasted food also costs households money – the average American family of four spends $1,500 per year on food that is not eaten.[7]

Massachusetts has made significant progress in reducing food waste, and communities are reaping the benefits.

- The total amount of food waste diverted from landfills and incinerators in the commonwealth nearly doubled between 2016 and 2022, increasing from 190,000 tons to 360,000 tons per year.[8]
- The commonwealth has dramatically expanded its capacity to process organic waste, with approximately 600,000 tons per year of anaerobic digestion capacity, along with additional capacity for food donation and composting.[9]
- As of 2023, 89 of Massachusetts' 351 cities and towns had some form of municipal food waste collection, up from just 24 municipalities in 2014.[10] More than 550,000 Massachusetts households had access to food waste collection programs as of 2023.[11]
- Despite this progress, Massachusetts fell 20% short of its 2020 goal of diverting 450,000 tons of food waste from disposal.[12] Nevertheless, the commonwealth has established an even more ambitious goal for 2030, aiming to reduce food waste disposal by 780,000 tons per year – more than doubling the amount of food waste diverted annually over the course of a decade.[13]

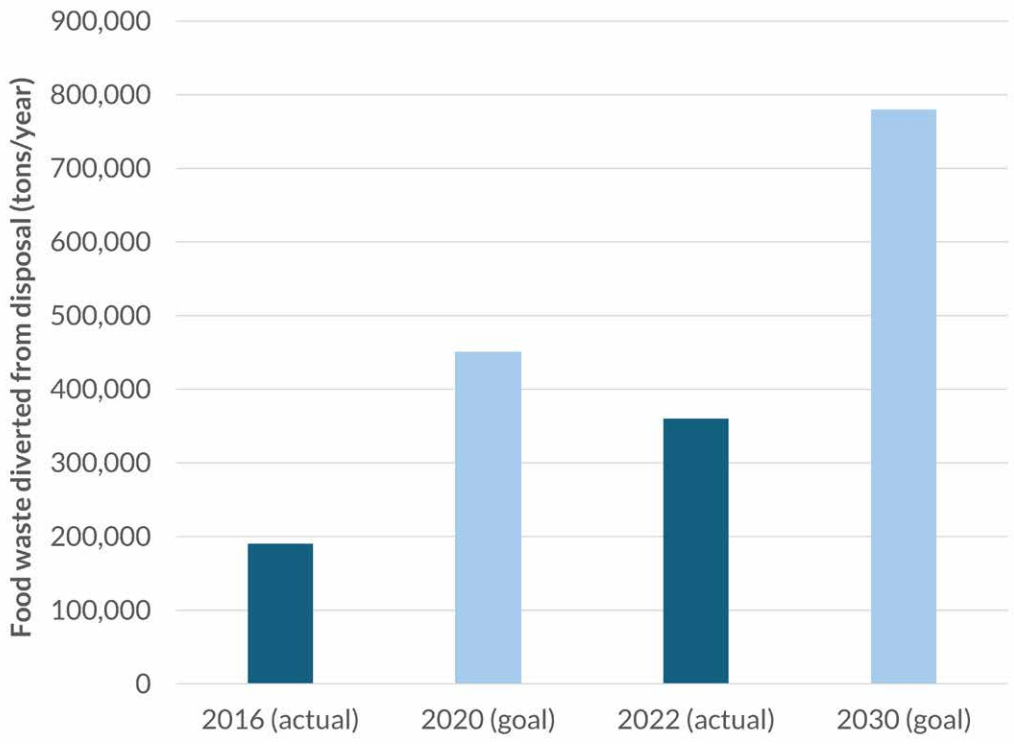


Figure ES-1. Massachusetts food waste diversion vs. goals[14]

There are many proven, readily available strategies that Massachusetts can use to reduce disposal of food waste, but Massachusetts' track record in implementing the most beneficial strategies is mixed.

The EPA's "Wasted Food Scale" highlights the most – and least – beneficial options for addressing food waste. These include:

- **Prevention** – The most beneficial strategy for reducing food waste is prevention – not buying more food than we need. Public education and social media campaigns – such as the "Save More than Food" campaign run by the Solid Waste Authority of Central Ohio – have made a measurable difference in the amount of food that households throw away.[16] While Massachusetts has plans to expand public education about food waste through the "Recycle Smart MA" program, that effort has yet to fully get off the ground.
- **Donating or "upcycling" edible food that can be used to feed others** – Produce, packaged foods and restaurant

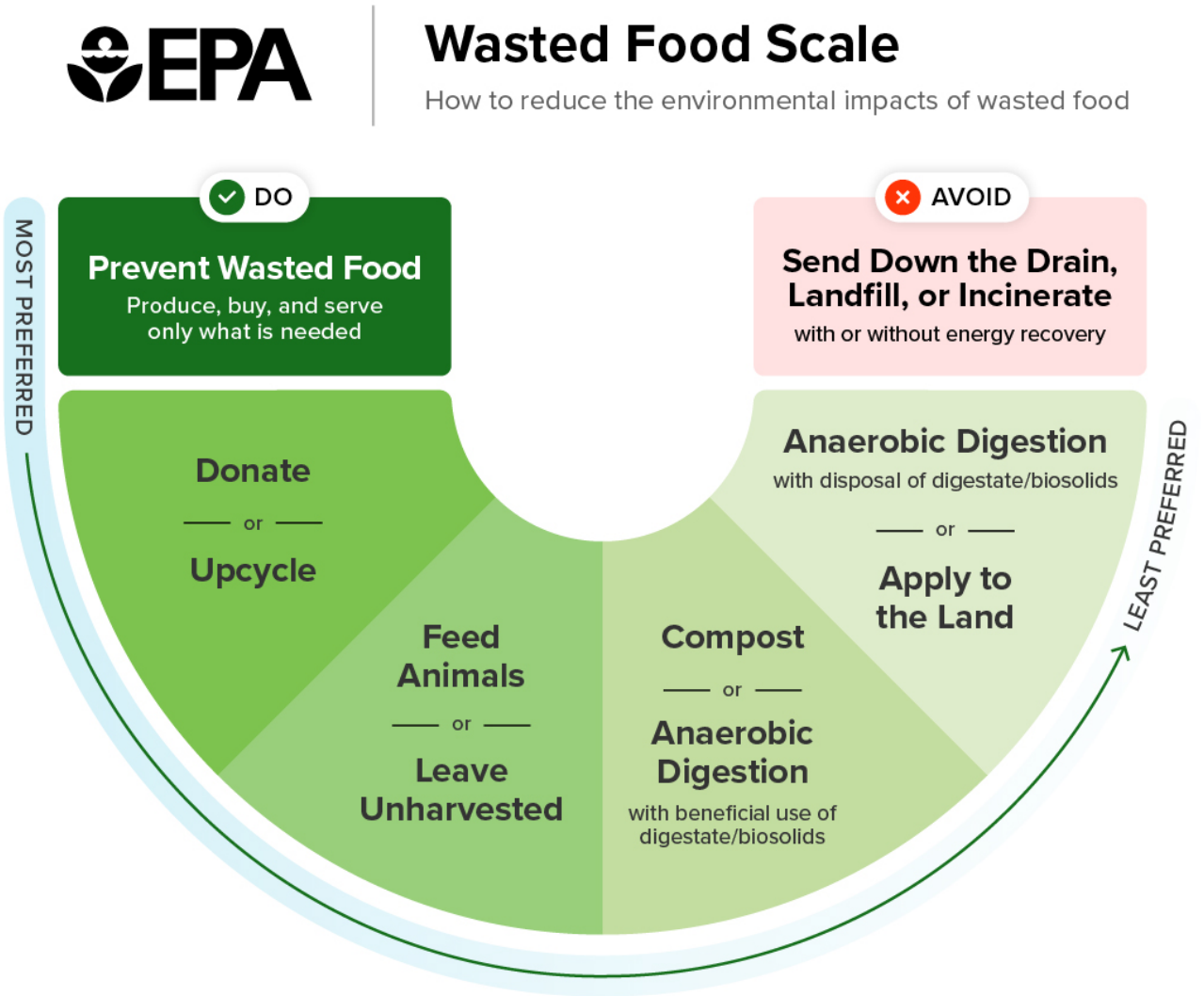


Figure ES-2: EPA's Wasted Food Scale[15]

meals that would otherwise be wasted can be repurposed to feed people in our communities. Massachusetts' commercial organic waste ban has created an incentive for companies to donate excess food, and a rich ecosystem of food recovery and rescue organizations has emerged to deliver that food to those who need it. But the commonwealth does not provide tax credits for food donations or provide other supports or incentives that could enable food donation to achieve even greater scale.

- **Feeding animals** – Food that cannot be rescued for human use can often be used to feed animals. Massachusetts increased the amount of food waste used to feed animals by 64% between 2016 and 2022.[17]
- **Composting food scraps** – Composting, the process of recycling organic matter through decomposition in the presence of oxygen, reduces greenhouse gas emissions from organic waste and produces valuable fertilizer to help build healthy soils. Massachusetts has numerous composting businesses and a long legacy of home composting, but the amount of food waste composted in the commonwealth has declined since 2016.[18] Composting has received less consistent financial support than anaerobic digestion, and Massachusetts composters have struggled to obtain the space and contamination-free streams of organic waste they need to grow.
- Sending food waste to **anaerobic digesters**, facilities that break down organic matter in the absence of oxygen, produces methane gas that can be burned for energy and residual material that can be composted or applied to crops. The amount of food waste processed at anaerobic digesters in Massachusetts increased more than four-fold between 2016 and 2022, the result of aggressive state financial support, including through the commonwealth's clean energy programs.[19] But the practice of sending food waste to wastewater treatment plants for anaerobic digestion poses serious concerns that the resulting "biosolids" may be contaminated with chemicals including per- and polyfluoroalkyl substances (PFAS), also known as "forever chemicals." These concerns led to a ban on land application of biosolids in Maine.[20]

To meet the commonwealth's food waste reduction goals, slow global warming, and repurpose excess food to successfully feed hungry people and build healthy soils, Massachusetts should follow the example of leading states and take the following steps:

- **Set ambitious goals and follow through.** Massachusetts' food waste reduction targets once led the nation, but we have since fallen behind. California and Vermont, for example, require diversion of all food waste from landfills and have taken other important steps to ensure that excess food is used first to keep people and soils healthy. Those ambitious targets – while challenging to meet – have forced those states to rethink the waste system from top to bottom. To build on the commonwealth's successes to date, Massachusetts should commit to diverting all food scraps from disposal as soon as possible and invest in the infrastructure needed to support that policy. Massachusetts should also pursue an ambitious program of preventing food waste.
- **Target the "top" of the wasted food scale.** Massachusetts successfully scaled up anaerobic digester capacity in the 2010s, showing that a coherent strategy to address disposal of food waste, backed by significant financial resources, can bring about rapid change. Massachusetts

should apply a similar approach – and make a similar investment – in efforts to prevent food waste at the source and ensure that healthy, edible food that would otherwise be wasted is provided to people who need it.

- **Focus on composting.** Composting is a vital tool to reduce greenhouse gas emissions and restore the health of our soils. Over the past decade, however, composting has been supplanted by anaerobic digestion as the primary destination of separated organic waste. To revitalize composting, the commonwealth should provide consistent financial support for capital investments in composting facilities, provide ongoing financial support similar to that provided to anaerobic digestion facilities, and take steps to expand composting infrastructure, including the siting of new facilities in proximity to sources of food waste.

- **Keep toxics out of the food waste stream.** Anaerobic digesters at sewage treatment plants produce "biosolids" that are sold as fertilizer. In recent years, some Massachusetts cities and towns have sent their food waste to be digested at these sewage treatment plants, potentially contaminating what would otherwise be a relatively "clean" feedstock. Massachusetts should reduce the diversion of food waste to sewage treatment plants, take clear steps to ensure the purity of food waste sent to composting operations, and adopt clear standards for PFAS and other potential worrisome contaminants in biosolids.

- **Expand food waste collection.** Massachusetts has more capacity for organic waste processing than it currently uses, and the state will not meet its ambitious food waste diversion goals without a massive increase in food scrap collection. The commonwealth should provide additional resources to help cities and towns launch food scrap collection programs, improve participation in existing programs through consistent statewide public education efforts, and consider banning *all* food waste from disposal – including residential food waste – and support infrastructure and policies to implement the ban.

- **Provide adequate funding.** Achieving Massachusetts' food waste reduction goals will require significant, ongoing investment. Massachusetts should identify consistent, reliable, dedicated sources of funding to support the transition to zero food waste.

Introduction

EVERYONE KNOWS that a balanced diet is a key to good health.

The same can be said for a healthy approach to reducing food waste.

There are many ways to reduce the amount of food scraps, unsold produce and uneaten restaurant meals that are clogging Massachusetts' landfills and incinerators, wasting valuable resources, and contributing to climate change. Those approaches can range from small in scale – encouraging Massachusetts residents to carefully store vegetables so that they last longer, or to take leftovers to work for lunch – to industrial-size, such as building large-scale facilities that convert tens of thousands of tons of food waste each year into compost or energy.

Massachusetts has finally committed to significantly reducing the amount of food waste it sends to landfills and incinerators – by 2030, the commonwealth aims to reduce the amount of food waste that is disposed of in Massachusetts by an additional 500,000 tons per year, for a total of 780,000 tons annually.[21]

The commonwealth has thus far achieved some important successes: increasing the amount of food waste that is diverted from landfills and incinerators; boosting Massachusetts' organic waste processing capacity; banning most commercial food waste from disposal; and steadily increasing the number of households with access to food waste collection services.

Unfortunately, despite that progress, Massachusetts has failed to meet its food waste reduction goals. The reason is simple: The commonwealth has not done enough to create a vibrant zero-waste food ecosystem – one in which residents, businesses, nonprofits, municipalities, farmers, waste haulers, composters and waste management firms are incentivized to work together to reduce the amount of food waste we produce and use the excess food we do create to feed people, build healthy soils and reduce pollution of our environment.

Instead of a "balanced diet" of investments, Massachusetts has focused the bulk of its resources on just one solution – anaerobic digestion – even as other food waste reduction efforts have struggled.

To build an effective, maximally beneficial and environmentally sound strategy to deal with food waste, Massachusetts needs a balanced plan that puts food waste prevention, donations and composting first; prioritizes investments in the food waste reduction strategies with the biggest benefits; and lays the groundwork for a large-scale expansion in food scrap collection and composting.

This paper reviews the current state of food waste in Massachusetts, as well as the challenges and opportunities ahead, and highlights examples of cities and states around the country that are taking novel and effective approaches to food waste.

Over the last decade, Massachusetts has shown that a combination of mandates, technical assistance, and steady, reliable financial support can result in big reductions in disposal of food waste. Now it is time for Massachusetts to apply those same approaches to the wide variety of strategies that we will need to succeed to meet the next wave of food waste reduction goals.

Food waste in Massachusetts is a big problem

FOOD WASTE CONTRIBUTES to numerous problems in Massachusetts. At a time of growing concern about the effects of climate change, food waste disposed of in landfills produces climate-warming methane – a greenhouse gas that is more than 80 times as potent as carbon dioxide over a 20-year period.[22] At a time when many Massachusetts residents face food insecurity or grapple with the rising cost of groceries, wasting edible food is a tragedy and a waste of money. And at a time when many Massachusetts municipalities are buckling under the high cost of solid waste disposal, food waste leaves cities and towns paying to dispose of material that should be considered an asset.

How much food waste does Massachusetts produce?

Massachusetts alone disposes of nearly 1 million tons of food waste each year, with wasted food making up about one-fifth of all our trash.[25] That food waste comes from a variety of sources – homes, restaurants, institutional food service facilities, grocery stores, wholesale food distributors, farms and more.

According to estimates from the national organization ReFED, over two-thirds of Massachusetts' food waste comes from the residential sector.[26] Commercial food waste generators – food service facilities, grocery retailers, farms and food manufacturers – account for the rest. Data produced in the early 2000s and updated in 2011 for the Massachusetts Department of Environmental Protection (MassDEP) identified food and beverage manufacturers and processors as the largest commercial source of food waste, followed by restaurants and supermarkets and grocery stores.[27]

The same MassDEP analysis estimates that the top 13% of commercial food waste generators are responsible for 59% of all commercial and industrial food waste, and that 97% of all commercial and industrial food waste comes from facilities that produce more than 25 tons of food waste per year.[28] As a result, Massachusetts has adopted a strategy aimed primarily at diverting food waste from a small number of large facilities – a strategy that can make a big impact on the problem, but that risks overlooking other important sources of food waste.

When food is thrown away, all of the energy and resources used to produce, transport and prepare it are also wasted. Additionally, there are many harmful environmental and climate effects that result from disposing of food waste, as well as impacts on household and municipal budgets. To reduce climate change and environmental degradation, Massachusetts must adopt more sustainable ways of addressing food waste.

A food waste glossary

Conversations around food waste often include a dizzying array of terms, often with unclear definitions. As used in this report, these terms are defined as follows:

Food waste – Food that is fit for human consumption but is discarded at any point in production, processing, transportation, sale or end use.

Food scraps – Waste from the conversion of raw food into prepared products or meals (e.g. potato peels).

Food waste diversion – The repurposing of food that would otherwise be wasted to other uses (e.g. donation, "upcycling", animal feed, composting, anaerobic digestion).

Food loss – The decrease in the quality or quantity of edible food resulting from decisions made "upstream" in the supply chain (i.e., before food products reach retailers or food service businesses).[23] For example, improper storage that causes food to become inedible.

Food recovery/food rescue – The recovery of edible food that would otherwise be wasted to feed people.

Upcycling – The repurposing of food that otherwise would not have been consumed by humans for value-added products for human consumption (e.g., the conversion of raw produce into processed foods) with an auditable supply chain.[24]

Composting – The conversion of organic material in food (and other) waste into a nutrient-rich soil amendment, by allowing organic waste to decompose in the presence of oxygen (aerobic decomposition).

Anaerobic digestion – The conversion of organic material into methane for energy and a nutrient-rich soil amendment. Anaerobic digesters can source organic material from food waste, agricultural byproducts, and/or sewage sludge. Sewage sludge can be contaminated with toxics.

Food waste disposal worsens climate change

Landfilling food waste worsens global warming. In large part due to organic waste, landfills are the nation's third-largest source of emissions of methane – a potent greenhouse gas – from human activities.[29]

In a natural environment, microorganisms help decompose food in the presence of oxygen, releasing the nutrients contained in the food back into the earth. Landfills, however, are not natural environments – they lack the light, air and water necessary for these microorganisms to thrive. Without the ability to decompose naturally, broken-down food instead emits methane, a potent greenhouse gas that is especially damaging over the next few decades when it is critical to restore balance to the climate system.[30] The U.S. Environmental Protection Agency (EPA) finds that wasting food has as big an impact on the climate as travel by 50 million cars each year, nationally.[31]

Landfilling is not the only way that food waste disposal contributes to global warming. Much of the municipal solid waste disposed of in Massachusetts is burned, rather than buried.[32] Burning food waste creates carbon dioxide, another global warming pollutant, as well as air pollution emissions that can harm human health.[33] Altogether, the burning and burial of municipal solid waste (including food waste) was responsible for 1.5 million metric tons (CO_2-equivalent) of greenhouse gas emissions in Massachusetts in 2020, or about 2% of the state's total emissions.[34]

In addition to burying and burning trash within the state, Massachusetts sent nearly 1.4 million tons of municipal solid waste out of state in 2022, with destinations as far away as Alabama.[35] This is an increase from 824,000 tons in 2017.[36] Transporting waste out of state also consumes significant amounts of energy and produces greenhouse gases and harmful air pollutant emissions.

Loss of valuable food and organic material

Disposal treats the valuable nutrients in leftover food as a waste product, rather than as a resource that can be used to keep people and soils healthy.

Our current, one-way food system often involves the manufacture and application of chemical fertilizers to grow food, with the nutrients in wasted food being lost through landfilling or incineration, requiring the manufacture of even more fertilizer to grow the next set of crops. This one-way system does serious damage to the environment – nutrient runoff can wreak havoc on aquatic ecosystems, fueling harmful algal blooms and depriving waterways of the oxygen needed to sustain healthy populations of fish and other organisms.[37] Our one-way agricultural system also damages the soil itself.[38]

There are a wide variety of strategies that can be used to keep nutrients on farms or return them to soils. Leaving unharvested crop material in fields, feeding food waste to animals,[39] and applying compost to fields can all help close the loop, reducing the amount of chemical and other inputs needed to grow food while reducing environmental pollution. Some of these strategies can even help to sequester carbon in soils – further reducing the impact of agriculture on global warming.[40]

At a more basic level, wasting food is simply a waste. Nationally, an estimated $408 billion worth of food is thrown away each year.[41] Minimizing food waste can allow for healthy, nutritious food to be shared with people who may need it or can simply reduce the amount of food that people buy in the first place. At a time of escalating grocery prices, reducing food waste in the home can generate big savings.

Rising costs of waste disposal

We have known for decades that an economy in which materials are produced, used only briefly or wasted, and then sent to landfills or incinerators is unsustainable environmentally *and* economically. Yet, instead of investing adequate resources in waste prevention, reuse and recycling, Massachusetts has continued to act as though we can send our trash "away."

The costs of that one-way system are escalating, lending greater urgency to efforts to reduce the disposal of valuable organic material.

Massachusetts' solid waste tipping fees are the highest in the nation,[42] and solid waste disposal capacity in the commonwealth is shrinking. Four active landfills, with a combined permitted capacity of more than 739,000 tons per year, are due to reach the

end of their lives by 2031.[43] The Saugus ash landfill, which accepts ash from the adjacent WIN Waste Innovations incinerator, is projected to close in 2026.[44] Massachusetts' 2030 Solid Waste Master Plan forecasts that, even if the commonwealth's waste reduction goals are met, Massachusetts will still be producing 700,000 more tons of waste each year by 2030 than it can dispose of in-state.[45] Failing to meet those waste reduction goals, which include a dramatic increase in the amount of food waste diverted from disposal, will lead to even greater costs and potentially reliance on out-of-state disposal options.

Collecting food waste for composting or anaerobic digestion can be far less expensive than landfilling or incinerating it. **The town of Hamilton, the first municipality in the state to ban all disposal of food waste in trash, found that disposing of separated food waste cost half as much as solid waste disposal.**[47]

TABLE 1. ACTIVE MASSACHUSETTS LANDFILLS AND THEIR PROJECTED CLOSING DATES[46]

Municipality	Permitted capacity (tons/year)	End of current permitted capacity	Lifetime of landfill
Dartmouth	115,000	2024	2026
Nantucket	26,000	2029	2029
Westminster	538,200	2030	2030
Middleboro	60,000	2031	2031
Bourne	30,000	2024	2040

Reducing food waste in Massachusetts: Solutions at the ready

THERE IS NO SHORTAGE of tools Massachusetts can use to reduce the amount of wasted food clogging our landfills and fueling climate change. Massachusetts has used many of these tools to reduce the amount of food waste we send to landfills and incinerators, but the commonwealth still has far to go to meet its waste reduction goals.

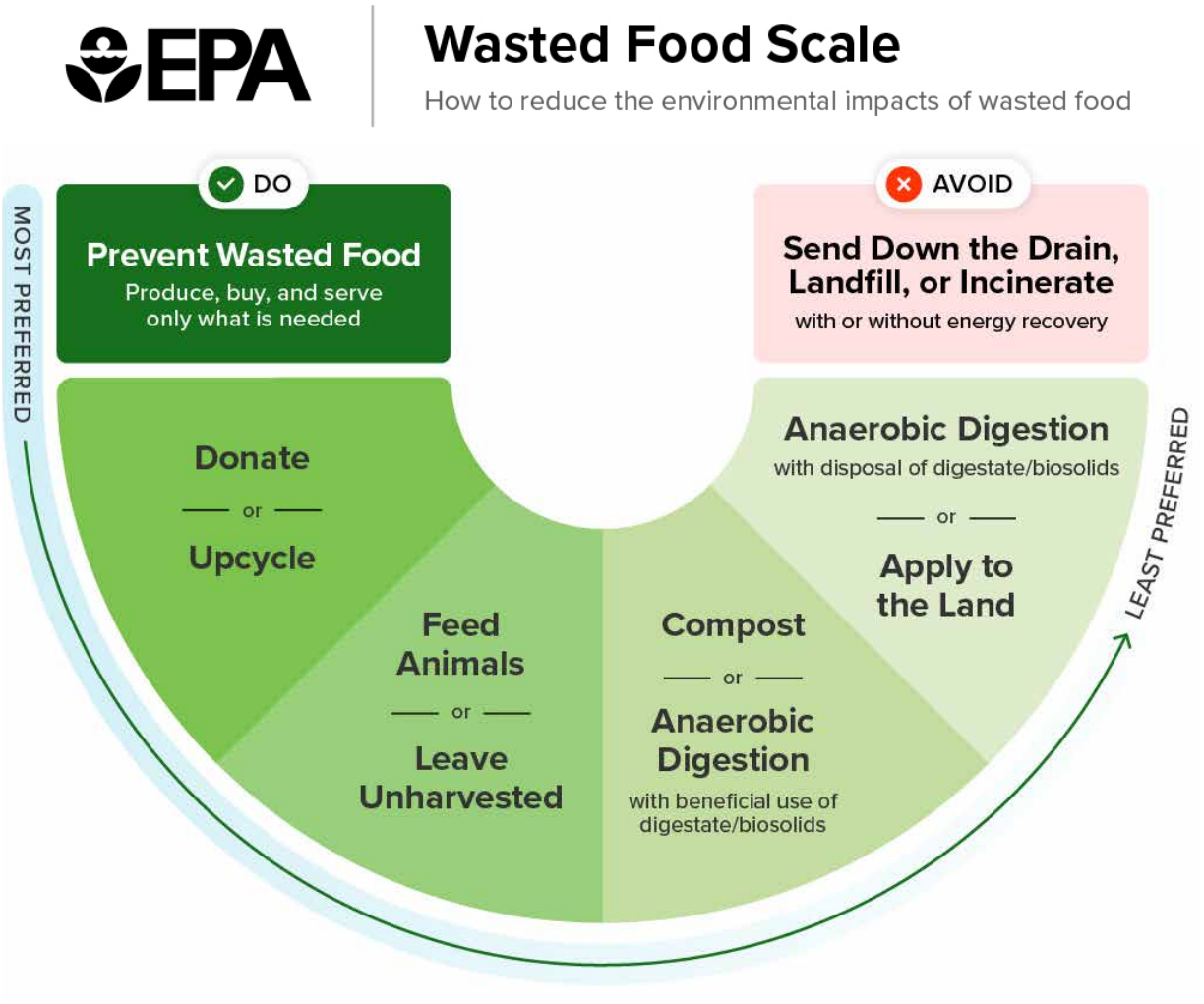


Figure 1. The EPA Wasted Food Scale[48]

How should Massachusetts deal with food waste? Not every step that keeps food waste out of landfills or incinerators is equally beneficial.

The U.S. EPA's Wasted Food Scale prioritizes strategies to reduce food waste based on their benefits to the environment and public health.

Food waste prevention and donating excess food: Saving money, conserving resources and feeding people

The most beneficial methods of reducing food waste involve **avoiding waste** in the first place, either by buying less food, consuming more of the food we do buy, or ensuring that edible food finds its way to people who can use it through **donation** programs or "**upcycling**."

Buying and serving only the amount of food that is needed, making use of leftovers, and storing food properly so as to extend its lifespan can all reduce food waste (and save households money). Purchasing less food requires less food to be grown, reducing the large impacts that agriculture inflicts on the environment and the climate. The EPA estimates that reducing food waste at the source produces "order-of-magnitude greater [climate] benefits than any other pathway" for addressing food waste.[49] And unlike other methods of food waste reduction that cost money or require the development of new infrastructure, buying less food requires only limited effort and actually *saves* households and businesses money. The U.S. Department of Agriculture estimates that the average household can save $370 per person per year by reducing food waste, with big savings also possible for food service facilities and other businesses.[50]

Unfortunately, governments and food manufacturers make it more difficult for households to reduce food waste when they employ confusing guidelines for date labels on food. Consumers often throw away edible, nutritious food because they mistake "best by" dates intended to indicate when a food item remains top-quality with "use by" dates that indicate it is no longer safe to eat.[51] Applying clear, consistent standards for date labeling – and educating consumers on how to interpret date labels properly – is a simple step that can make a big difference in preventing food waste.

Donating edible food or "upcycling" it (e.g., making prepared or packaged foods from materials unlikely to be sold) can also reduce waste. Food rescue organizations recover produce, packaged foods or prepared meals from wholesalers, retailers or food service businesses and

Food rescue organizations distribute wholesale produce that is unlikely to be sold for use by the community.

distribute them directly to individuals or to organizations that provide food assistance. "Upcyclers" convert raw food products into prepared meals that are either sold at retail or distributed by community service organizations. Food donation and upcycling can provide nutritious food to people who need it and save money for organizations that provide food to the public.

Feeding animals and leaving crops unharvested: Keeping nutrients on the farm

In the middle of the Food Waste Scale are solutions that derive benefits from food waste, or that alleviate some of the damages caused by food waste disposal, but that don't directly recover food for human consumption. **Feeding food waste to animals** can provide a good source of nutrition to farm animals, keeping food that would otherwise be wasted in the human supply chain, while reducing the need for other animal feeds and saving money for farmers.[52] Depending on the type and source of food used, it may require treatment before being fed to animals.

Leaving crops unharvested can allow them to be used for grazing or to be plowed back into the soil to add organic matter and improve soil health – again, indirectly supporting the food supply chain for humans. Leaving food that is unlikely to be eaten by people in fields can eliminate the cost and greenhouse gas emissions associated with moving crops through the supply chain, and reduce the need for artificial fertilizers.[53]

Composting: Building healthy soils and reducing greenhouse gas emissions

Composting enables food scraps and otherwise wasted food to be transformed into a valuable soil amendment while eliminating climate-warming methane emissions that result from disposing of food waste in landfills. Composting allows organic material such as food waste to decay in the presence of oxygen, as opposed to the anaerobic (oxygen-free) environment in landfills.

Compost helps to build healthy soils in several ways. The nutrients in compost fertilize crops, reducing the need for chemical fertilizers derived from fossil fuels that can pollute waterways and contribute to climate change.[54] Compost also helps retain water in soils and prevent soil loss.[55] Finally, compost sequesters carbon in soils, helping to reduce climate change emissions.[56]

Anaerobic digestion: Energy and fertilizer from food waste

Anaerobic digesters are designed to create methane gas (the same gas produced when food waste is disposed of in landfills), capturing and burning the gas to produce energy that can be a substitute for fossil fuels. Digesters also produce residual organic matter – called digestate or, when produced from digesters at wastewater treatment plants, "biosolids" – that also can be used as a fertilizer.

Not all anaerobic digestion delivers the same benefits. As the EPA Wasted Food Scale recognizes, the greatest benefits result from using digestate or biosolids as a soil amendment that can replace chemical fertilizers. Anaerobic digesters that dispose of the residual organic material in landfills or incinerators occupy a lower (less beneficial) rung on the EPA's Wasted Food Scale. [57]

Anaerobic digestion of food waste can occur at standalone facilities, facilities located on farms that accept manure and other farm-generated wastes, or wastewater treatment plants that use anaerobic digestion to

produce energy from sewage sludge. The commingling of food waste with municipal sewage creates residual biosolids that can contain toxic leftovers from the sewage treatment process, raising concerns about potential contamination with pollutants such as PFAS "forever chemicals." [58]

In 2022, the state of Maine banned the land application of biosolids after testing uncovered high levels of PFAS contamination on farms that had used biosolids residuals.[59] Numerous Maine farms shut down temporarily or permanently due to the contamination.[60] Sending food waste to wastewater treatment plants raises the possibility that food waste that could otherwise be used to produce "clean" fertilizer is instead lost or mixed in with pollutants that can contaminate farm fields.

Meeting Massachusetts' food waste reduction goals: Challenges and opportunities

MASSACHUSETTS HAS MADE significant progress in reducing disposal of food waste in landfills and incinerators. But the commonwealth has failed to meet its own food waste diversion goals, and Massachusetts' approach to food waste has been overly focused on measures at the less-beneficial end of the EPA's Wasted Food Scale, particularly anaerobic digestion.

The good news is that Massachusetts can further reduce the amount of wasted food we discard – and deliver greater benefits for the climate, our environment, our soils and our people – by redoubling its efforts to reduce food waste. To achieve that goal, the commonwealth will need to overcome a few significant challenges.

Where does Massachusetts' food waste go?

Massachusetts disposes of nearly a million tons of food waste every year, with food waste accounting for about one-fifth of Massachusetts' trash.[61]

In 2022, the commonwealth diverted 360,000 tons of food waste from landfills and incinerators, up from just 190,000 tons in 2016.[62] While Massachusetts has been successful in increasing its diversion

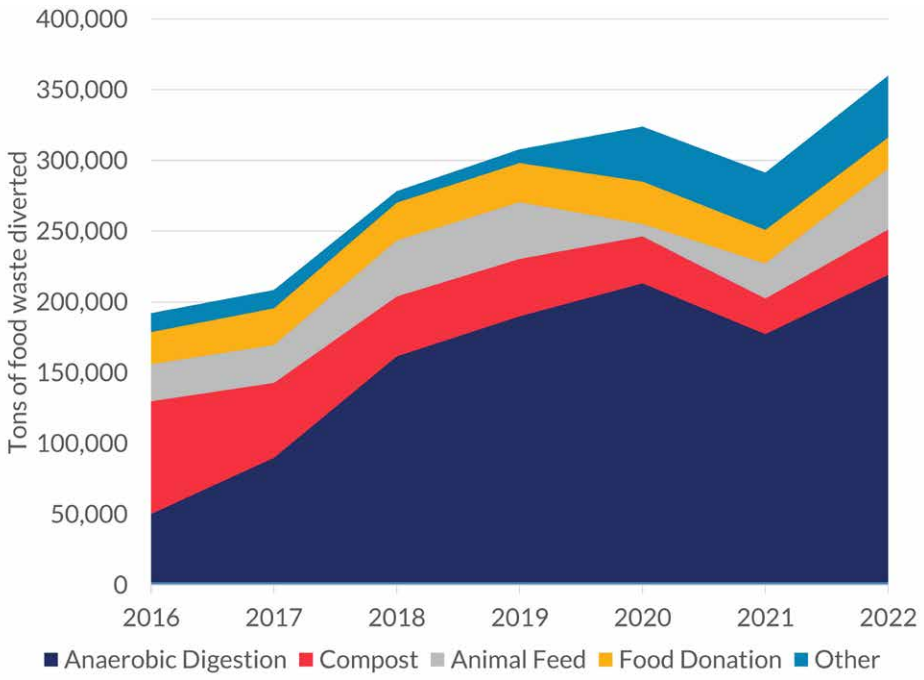


Figure 2. Food waste diversion in Massachusetts[63]

of food waste, it has fallen short of its diversion goals, and is pursuing strategies that are lower on the Wasted Food Scale – and therefore less beneficial – than the superior approaches at the top of the scale.

The amount of food waste sent to anaerobic digesters in the commonwealth has increased more than four-fold since 2016, from just over 48,000 tons to over 217,000 tons in 2022.[64] Massachusetts also diverted about two-thirds more food waste to animal feed in 2022 (43,000 tons) than it did in 2016 (26,000 tons).

However, food donations, which accounted for roughly 12% of all diverted food in 2016, represented only about 6% of diverted food in 2022, with the amount of food that was donated remaining roughly the same. Massachusetts actually reported composting less than half as much food waste in 2022 (32,000 tons) as it did in 2016 (nearly 80,000 tons).

Meanwhile, Massachusetts remains off target to reach its overall food waste diversion goals. The commonwealth had adopted a 2020 goal of diverting 450,000 tons of food waste from landfills and incinerators; in 2022, Massachusetts diverted only 360,000 tons of food waste from disposal, falling 20% short of the 2020 goal.[66] The commonwealth's most recently adopted 2020-2030 Solid Waste Master Plan calls for the diversion of 780,000 tons of food waste per year by 2030.[67] **Achieving that goal would require Massachusetts to more than double the amount of food waste diverted over an eight-year span from 2022 to 2030.**

Massachusetts' approach to food waste: Progress, challenges and opportunities

The commonwealth has made progress in some food waste prevention and diversion strategies, lagged in others, and has not yet invested the resources or attention needed to position itself for success in the long run.

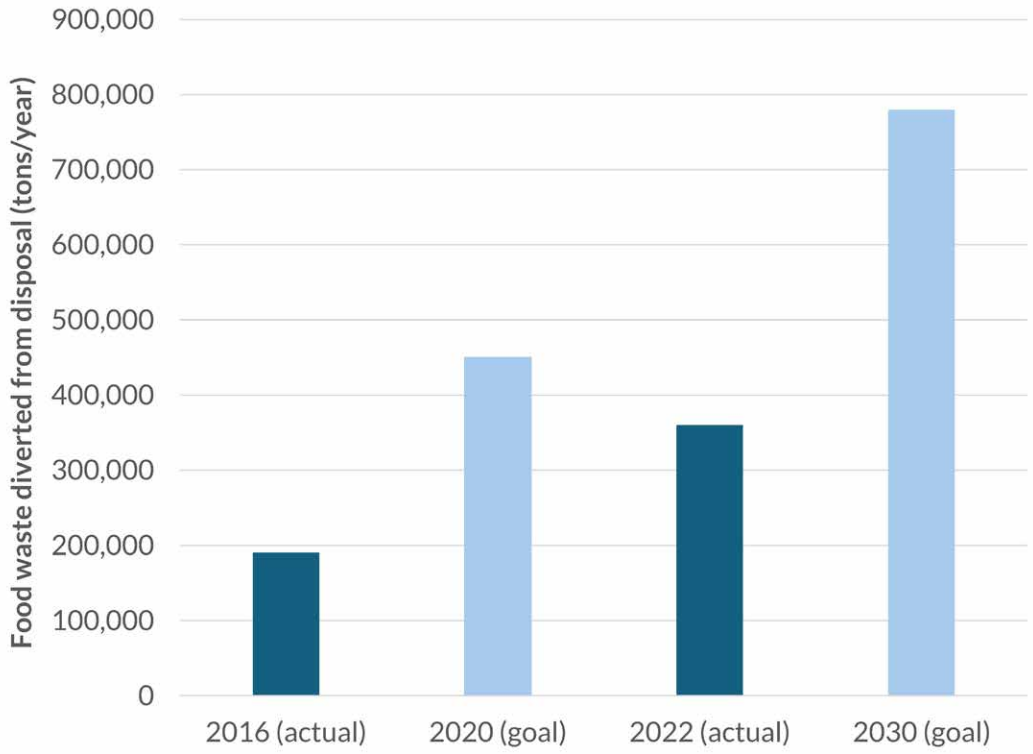


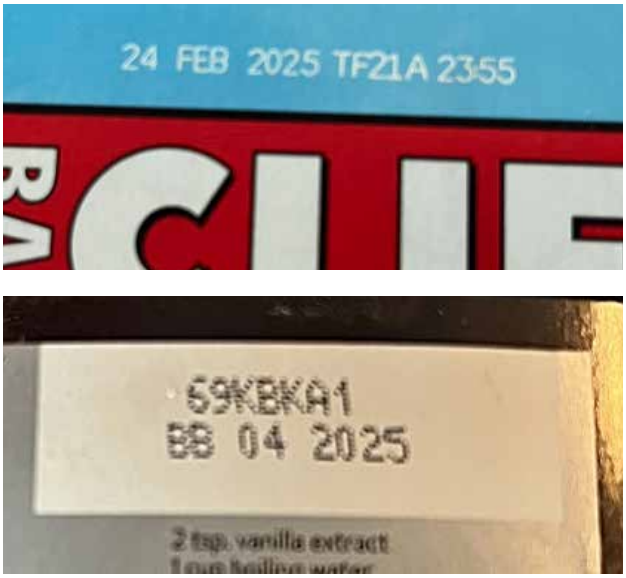
Figure 3. Massachusetts food waste diversion vs. goals[65]

Food waste prevention: An important strategy with room to grow

Preventing food waste at the source can deliver tremendous benefits for Massachusetts households and the environment. It is, however, difficult to measure, and Massachusetts' food waste *diversion* goal is not matched with a parallel target for food waste *prevention*. The commonwealth has much room for improvement in its efforts to prevent food waste at the source.

Food labeling

Confusing or misleading date labeling on food items can discourage donations and lead to individuals and businesses throwing away perfectly wholesome and healthy food. Many consumers erroneously believe that eating food that has passed its "best if used by" date, meant to convey when the item is at its peak quality, can harm their health.[68] This confusion is estimated to contribute to about 7% of consumer food waste.[69]



Inconsistent and unclear date labels on food can lead consumers to discard wholesome, nutritious food unnecessarily.

Massachusetts requires that foods past their label date be separated from others and clearly marked as past date before they can be sold.[70] The advocacy group ReFED rates Massachusetts' date labeling policy as a "negative policy" from the perspective of preventing food waste.[71] Bills have been introduced in the past several legislative sessions (for 2023-24, H. 2205[72] and S. 1390[73]) that would standardize date labeling for food items to make a clearer distinction between dates that indicate the quality of a food item and those intended to signal to the consumer that food is safe to eat. In addition to standardizing date labels, the bills would address other important barriers to reducing disposal of safe, edible food, including making food quality dates optional, eliminating restrictions on the sale or donation of food after the voluntary quality date, and providing public education about the meaning of quality and safety labels.[74]

Public education

Public education is critical to inform Massachusetts residents about why and how to reduce food waste, engage in backyard composting, participate in local organics waste pickup and drop-off programs, and more. The Massachusetts Organics Master Plan calls for public education through Recycle Smart MA – a website that provides educational resources on recycling for Massachusetts residents – and partnerships with municipalities to share other educational materials.[75] Food waste prevention is also part of the Massachusetts Green Team environmental education and sustainability program for schools.[76]

Still, much of Massachusetts' efforts at public education are locally driven and underresourced. While local efforts are important, food waste prevention experts urge coordinated campaigns aimed at educating and mobilizing the public to reduce food waste.[77] At the time of this writing (July

2024), information on food waste has yet to be integrated into the Recycle Smart MA website.[78]

The past decade has seen growing food waste awareness in Massachusetts. Additional resources and greater coordination can help Massachusetts build on that awareness in the years to come.

Food donation and rescue: A growing movement with even greater potential

Massachusetts' ban on the commercial disposal of food waste – initially adopted in 2014 and expanded in 2022 to cover commercial facilities generating a half-ton or more of food waste per week – has played an important role in encouraging donations of food rather than disposal. Food rescue organizations report that the 2014 commercial disposal ban led to a surge of interest by covered businesses in developing partnerships with organizations that distribute food to the community.[79]

Massachusetts has also adopted legislation and created grant programs to support food donation and rescue. Massachusetts' Bill Emerson Good Samaritan Food Donation Act provides liability protections for businesses and nonprofits that donate or receive food.[80] Meanwhile, a variety of state grant programs, including the Recycling and Reuse Business Development Grant (RRBDG) program[81] and the Reduce, Reuse, Repair microgrant program[82] can be used to support food recovery activities. RRBDG grants have funded the purchase of software and trucks to support the collection of food for donation.[83] A little over $100,000 in grants have been dispensed to support food donations through the program – or about 7% of the funding provided for food waste-related projects through the program as of the end of 2023.[84]

Local governments have also made key investments. In 2024, the city of Boston invested $2.5 million in federal funds to secure cold storage space for use by local food pantries and food rescue agencies.[85] The move will make it easier for organizations to receive and store donations of perishable food.

These policy changes and investments have helped create a rich ecosystem for food donation and recovery. Numerous organizations now exist across the commonwealth to collect and redistribute food from wholesalers, retailers and food service businesses that would otherwise be wasted.[86] Upcycling has also taken root. The nonprofit grocer, Daily Table, founded in 2015, uses surplus food to produce affordable, nutritious prepared meals.[87] Organizations such as Boston's Community Servings, which provides medically tailored meals to people facing chronic or critical illness, receive donated food from local farms and food rescue agencies, enabling them to provide a vital community service at lower cost.[88]

Yet, despite the many benefits of food donation and rescue, the amount that Massachusetts has invested in those solutions pales in comparison with the investments made over the past decade in organic waste collection and processing. A 2016 survey by ICF International found that capital investment by organic waste processors and haulers dwarfed that of food rescue organizations.[89] Organics processors also added jobs at a more rapid rate than food rescue organizations. The ICF study noted that commercial food establishments find composting/anaerobic digestion easier to manage than food rescue, indicating that unlocking the full promise of food rescue will require relatively greater investment from the state.

Other states have taken more aggressive steps to encourage and support food donation. Numerous states provide tax incentives for food donations, which Massachusetts currently does not.[90] California actually requires certain food businesses to donate edible food items to food recovery organizations.[91] A variety of commercial food system entities in California – large grocery stores, food wholesalers, institutional food service providers and others – are required to donate as much of their edible food as possible (as opposed to composting it or sending it to anaerobic digesters) and establish contracts or agreements with food recovery organizations.[92] All in all, California has established a goal of recovering 20% of the edible food that would otherwise be thrown away for human consumption by 2025, though there are questions about whether this ambitious goal can be met.[93] (See California case study, page 33.)

Commercial organics waste ban: A cornerstone policy, if enforced

Massachusetts' ban on disposal of food waste from commercial establishments is a linchpin in the effort to reduce food waste. The ban has encouraged donations to food rescue organizations (see above) and provided a steady flow of organic material to take advantage of the commonwealth's investments in anaerobic digestion and composting. But a lack of aggressive enforcement means the ban may not be delivering the results it could.

In 2014, Massachusetts banned the disposal of food and other organic waste from businesses and institutions producing more than 1 ton of such waste per week. In 2022, the ban was extended to businesses producing a half-ton of organic waste or more per week.[94] Full enforcement of the ban would keep roughly 400,000 tons of food out of landfills and incinerators per year.[95]

The ban has helped to transform the way businesses in Massachusetts handle their food waste. According to MassDEP, more than 3,500 businesses in the commonwealth are currently participating in a food waste collection program (compared with the roughly 6,900 food waste-generating businesses that existed in Massachusetts in 2011).[96] The average amount of food waste received by organic waste haulers increased by more than a factor of eight between 2010 and 2016, after the initial ban went into effect.[97]

While the commercial organic waste ban has fueled the growth of businesses that process food waste, it is unclear how much food waste is continuing to escape the ban. MassDEP conducts inspections at solid waste facilities to identify loads of trash with "significant amounts of a banned material" and works from there to identify the entity responsible.[98] Between November 2022 and March 2024, inspectors reviewed more than 4,400 loads of trash. In 2023, the first full year of the expanded commercial organics ban, according to MassDEP enforcement records, there were a total of just 11 enforcement actions for commercial organic material statewide, with one consent order carrying an $860 penalty.[99] In addition to formal enforcement actions, MassDEP also sends warning letters when there is evidence of possible violation of the ban.

An enforcement system that identifies approximately a dozen violators annually and issued just one fine in the past year is evidence either of near-universal compliance with the law or – more likely – the continued disposal of some unknown amount of food waste with commercial trash. In the absence of more detailed tracking of the effectiveness of the commercial organics waste ban, it is impossible to know which is the case. Given the importance that Massachusetts has placed on the commercial organic waste ban in its overall food waste reduction strategy, this lack of transparency is a major problem.

Massachusetts' commercial organics waste ban has clearly reduced the amount of food waste headed to landfills. Stronger enforcement and better transparency regarding compliance – made possible by increasing staffing and resources at MassDEP – could help the commonwealth meet its food waste diversion goals and inform the development of the systems and infrastructure needed to repurpose surplus food for the benefit of Massachusetts residents and our environment.

Anaerobic digestion: A fast-growing industry with environmental impacts

The growth of anaerobic digestion in Massachusetts is the biggest change to the commonwealth's approach to food waste management over the last decade. The rapid growth of anaerobic digestion is proof that a coordinated strategy to reduce food waste disposal, backed with sufficient, stable state financial support, can make a big impact – and do it quickly.

However, some forms of anaerobic digestion pose risks to the environment and public health, and the growth of anaerobic digestion has been driven more by energy policy than by Massachusetts' strategy to reduce food waste, skewing investment and public policy away from approaches that would generate greater overall benefits.

There are, generally speaking, three types of anaerobic digesters capable of receiving food waste:

- Stand-alone facilities that only accept food waste.
- On-farm facilities that combine food waste with animal waste (largely manure from dairy cows).
- Digesters at wastewater treatment plants that mix food waste with sewage sludge. Massachusetts first allowed food waste to be sent to digesters at wastewater treatment plants in 2012.[100]

Often, food waste must be processed before being used in these facilities. Waste Management, for example, operates a facility in Charlestown that converts organic waste into a "bioslurry" that is then trucked to wastewater treatment plants for digestion.[101] In recent years, Massachusetts has seen an expansion of "depackaging" capacity to recover organic material from packaged foods.

Massachusetts has invested heavily in the expansion of anaerobic digesters, with the Massachusetts Clean Energy Center providing $6.5 million in funding for anaerobic digestion and composting-with-heat-recovery projects through its Commonwealth Organics-to-Energy program, which ran from 2012 to 2020.[102] The program claimed to support the addition of 500,000 tons of organics processing capacity by assisting with the construction or upgrade of 12 anaerobic digestion facilities and two composting projects.

Photo: U.S. Department of Agriculture

Anaerobic digester at Jordan Dairy Farm in Rutland, Mass.

The commonwealth has also expanded its capacity for accepting organic waste at sewage treatment plants. As of 2022, the Greater Lawrence Sanitary District (GLSD) treatment facility in North Andover had received more than 200,000 tons of food waste.[103] To accommodate food waste, GLSD added a fourth digester to its system and made a series of other upgrades.[104] Of the nearly $28 million in project costs, roughly $7.5 million came in the form of grants or incentives from state agencies.[105]

Anaerobic digestion has benefited from aggressive state support

Why has anaerobic digestion capacity grown quickly in Massachusetts while other organic waste processing options have stalled? In large part, it is the result of coordinated state strategy, coupled with the availability of generous streams of funding related to the ability of digesters to produce "clean" energy.

Massachusetts' clean energy strategy is largely driven by the commonwealth's need to reduce greenhouse gas emissions to meet the state's legally binding goal of achieving net zero greenhouse gas emissions by 2050.[106] Fossil fuel combustion is by far the largest source of greenhouse gas emissions in Massachusetts, accounting for 92% of the state's emissions in 2020.[107] As a result, state policy has been focused on replacing high-emitting sources of energy with lower-emission and renewable forms of energy, including methane gas from biogenic sources such as anaerobic digestion.

While anaerobic digestion can be far better for the climate than disposing of organic waste in landfills, other approaches to addressing food waste do a superior job of reducing greenhouse gas emissions, according to the U.S. EPA.[108] (See Figure 4, below.) The estimated greenhouse gas benefits of anaerobic digestion rely on the

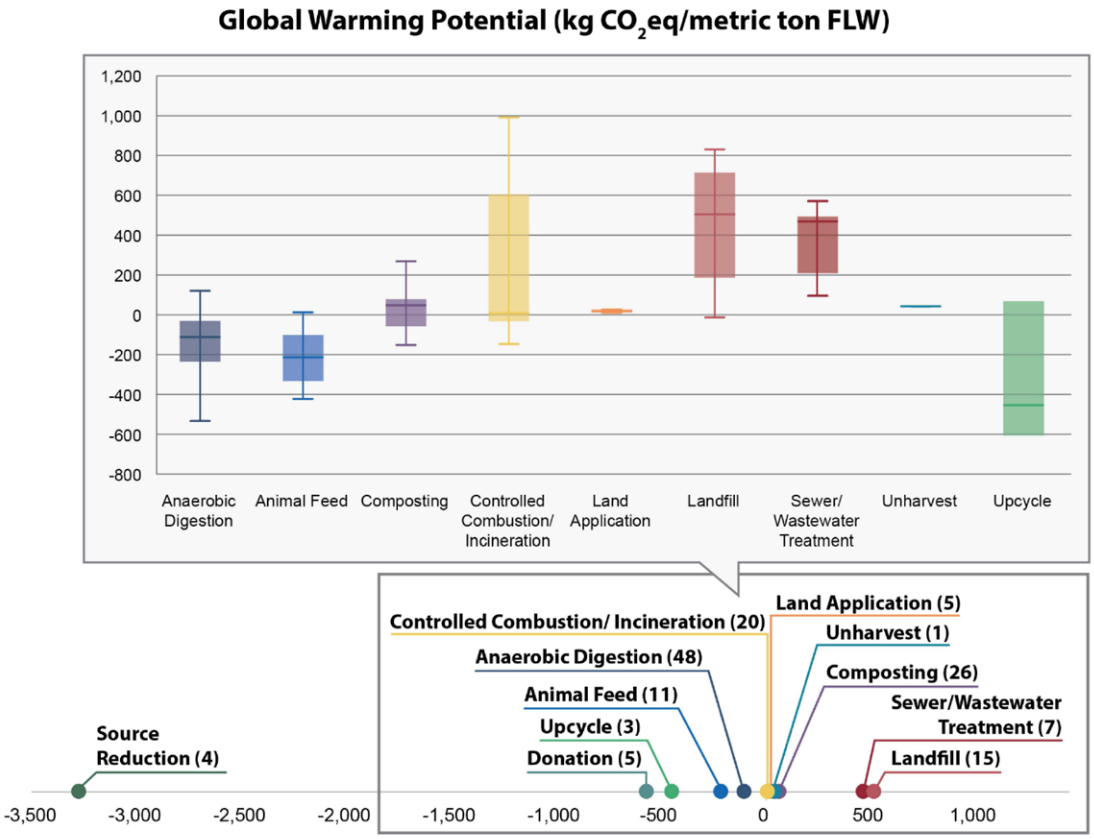


Figure 4. Greenhouse gas emission impacts of various approaches to food waste (FLW = food loss and waste)[110]

assumption of "high biogas capture and displacement of carbon-intensive energy" as well as the application of resulting biosolids in place of manufactured fertilizer.[109] Failing to use biosolids as fertilizer, or losing a significant amount of methane gas through leakage, reduces the greenhouse gas benefits of anaerobic digestion.

Despite the superiority of other strategies, anaerobic digestion – unlike food waste prevention, donation or composting – produces energy within Massachusetts. As a result, it has been eligible for financial assistance under a variety of programs aimed to increase clean energy production. These include:

- Funding from the Massachusetts Clean Energy Center, which operated the "Commonwealth Organics-to-Energy" grant program from 2012 to 2020.[111] The program provided $6.5 million grant funding for a variety of projects, most relating to anaerobic digestion.
- Electricity produced from anaerobic digestion is eligible for credit as a Class I renewable resource under Massachusetts Renewable Portfolio Standard, which sets a steadily increasing minimum percentage of renewable energy that must be provided by electric utilities.[112] Facilities that supply clean power can sell credits to utilities to ensure their compliance, or to other entities to meet voluntary renewable energy purchase goals. In 2021, anaerobic digesters that generate electricity from biogas accounted for 1.8% of all credits from Massachusetts facilities used to comply with the standards.[113] At a credit value of $30 to $50 per credit, this would have represented an annual revenue stream of approximately $1.9 million to $3.2 million in 2021 alone to Massachusetts anaerobic digestion facilities.[114]
- Combustion of biogas from anaerobic digesters is also eligible for credit under Massachusetts' Clean Peak Energy Standard, which provides credit to clean energy sources that can offset seasonal peaks in demand. Biogas facilities, including but not limited to anaerobic digesters, claimed 27% of the credits under the standard in 2021.[115] At a credit value of $40 to $45 per credit, this would have represented a revenue stream of $640,000 to $720,000 for biogas producers.[116]
- Anaerobic digestion facilities that generate electricity can, in some cases, participate in Massachusetts' net energy metering program, which allows those facilities to use credits gained from selling clean power to the grid to offset their site electricity bills.[117]

Anaerobic digestion facilities have also been eligible for a variety of other types of state financial and technical assistance.

Massachusetts' progress in boosting anaerobic digestion shows that it is possible for Massachusetts to achieve success in reducing the amount of food waste headed to landfills – and do it quickly. Massachusetts should look to the lessons of its experience with anaerobic digestion in developing strategies to accelerate progress at the more beneficial end of the Wasted Food Scale.

Environmental concerns with anaerobic digestion

While anaerobic digestion is generally superior to landfilling or incinerating food waste, and is likely to be an important part of any strategy to dramatically reduce organic waste disposal, it can come with significant environmental downsides.

- Combustion of biogas from anaerobic digestion produces air pollution

similar to that from burning methane gas from fossil sources.[118] Equally concerning, any facility that creates, stores, transports, processes or uses methane can experience methane leakage. Methane is a greenhouse gas 80 times as powerful than carbon dioxide over a 20-year period.[119] A 2023 study found that methane emissions from wastewater treatment plants were higher than estimated by the EPA, and that emissions from plants with anaerobic digesters were higher than those from plants without them.[120] While methane leakage to the atmosphere is a problem for many approaches to food waste (including those designed to minimize it, such as composting), the fact that anaerobic digesters create methane *intentionally* creates additional reason for concern.

- Biosolids produced from anaerobic digesters at wastewater treatment plants can contain harmful chemicals such as PFAS "forever chemicals" and other potential contaminants. More than 700 chemicals have been identified at one point or another in biosolids in the U.S.,[121] but perhaps the most urgent concern is with PFAS, which are chemicals that have been linked to an array of serious health effects, from cancer to reproductive harm to damage to the immune system.[122] When applied as fertilizer, biosolids contaminated with PFAS pose the risk that PFAS will be absorbed into plants, consumed by livestock, and/or migrate into drinking water supplies.[123] Concerns about PFAS in biosolids led public officials in Maine – which has a long history of using biosolids on farmland – to ban the land application of biosolids in 2022.[124]

  Mixing food waste with sewage that is contaminated with a range of household and industrial chemicals increases the risk that the end product will become too contaminated to use in land application – thus reducing the greenhouse gas and other benefits of anaerobic digestion. While data are limited, a 2021 EPA review concluded that "composts produced from sewage sludge generally had higher concentrations of contaminants when compared with composts produced from food waste."[125]

- Inappropriate incentives for energy produced from on-farm anaerobic digesters (most of which are located on dairy farms) can encourage environmentally unsustainable factory farming practices. In other states, specifically California, poorly designed subsidies have caused an explosion in the number of anaerobic digesters on dairy farms and demand for manure.[126] According to one analysis, the value of state and federal subsidies for one cow's manure amount to about half the value of the milk that cow produces – creating the potential for perverse consequences such as an accelerated shift toward factory farms, where manure can be collected and digested, versus traditional farms, where manure might be left in pastures to fertilize the soil.[127] Encouraging the development of on-farm digesters to accept general food waste could exacerbate those problems.

While anaerobic digestion is a valuable part of the commonwealth's strategy to reduce food waste disposal, it must be undertaken with care.

Composting: Important progress, but government must do more to restore momentum

Composting – both at the industrial scale and at a smaller scale in backyards and at farms – is a tried-and-true way to turn food waste into treasure. But while anaerobic digestion has boomed in the commonwealth in recent years, momentum on composting

has lagged. According to data from MassDEP, Massachusetts composted less than half as much food waste in 2022 as it did in 2016 (though MassDEP's figures do not include residential "backyard" composting or on-site agricultural composting).[128]

Unlike anaerobic digestion, which has received both significant upfront capital assistance and a consistent stream of clean energy-related subsidies, composting has not been provided with similar incentives. The lack of composting capacity acts as a constraint on municipal food waste collection programs such as Boston's, which are seeking places to compost.[129]

Expanding Massachusetts' composting capacity relies on the ability to find sites for composting facilities close to the places where food waste is generated. Transportation of heavy food waste over long distances can reduce the environmental and financial benefits of composting (and anaerobic digestion), meaning that siting composting facilities near populated areas is essential for success.[130] However, composters can sometimes struggle to find affordable land and assuage concerns of nearby residents about pests and odors.

Composters also face significant challenges in finding uncontaminated supplies of food waste. This is particularly important given recent concerns about chemical contaminants such as PFAS. The abrupt closure of one of the region's first composting facilities – Mass Natural Fertilizer in Westminster – in 2022 following the discovery of PFAS contamination (possibly due to the long-ago composting of paper waste at the site)[131] spotlighted the importance of keeping contaminants out of composting facilities. Potential contamination in food waste sent for composting can also drive up costs for composting facilities, as they are required to expend more time and effort removing contaminants from the waste stream.[132]

Massachusetts included a variety of steps to improve composting in its Priority Climate Action Plan issued in March 2024. Specifically, the plan calls for expanding existing composting sites and establishing new regional sites that can provide composting for institutional and municipal purposes. The plan also seeks to encourage municipal collaboration on composting initiatives and to encourage partnerships with nonprofit organizations, schools, libraries and other institutions.[133]

In addition to large-scale composting, backyard and community composting can reduce the amount of food waste sent to landfills and incinerators. As of early 2024, 163 Massachusetts cities and towns sell backyard composting equipment (often at a discount) to residents.[134] As discussed later in this report (page 32), backyard and neighborhood composting has been an important strategy Vermont has used to divert food waste from landfills.

Residential food waste collection: High demand, but growth is falling short of state goals

The residential sector is the biggest producer of food waste in Massachusetts.[135] There is no way that Massachusetts can meet its expanded food waste diversion goals without stepped-up efforts by governments to collect food scraps from residents.

Fortunately, Massachusetts residents have been eager to do their part – enthusiastically participating in municipal food waste programs and even, in some cases, paying extra to have their food scraps collected for composting. But most Massachusetts residents still do not have access to food waste

collection, and municipal programs are not growing quickly enough to meet the commonwealth's food waste diversion goals.

As of 2023, only about 1 in 4 Massachusetts municipalities (89 cities and towns) offered any kind of source-separated food waste disposal service to their residents.[136] Of those municipalities, 72 offered drop-off food waste service, 12 had curbside pickup and five offered both. For residents without curbside or drop-off options, the only alternatives are to either contract for their own organic waste pickup or, more likely, compost their food waste at home or dispose of their food waste in the trash.

Municipal food waste collection programs, such as the voluntary program launched by the city of Boston in 2022, are growing rapidly, but still only reach a fraction of the commonwealth's residents.

The 89 communities with some form of municipal food waste collection is significantly higher than the 24 cities and towns with collection in 2014, suggesting that Massachusetts is making slow but real progress in expanding access to food waste disposal service.[137] In addition, the commonwealth's largest city, Boston, now offers food waste pickup on a voluntary basis, having launched the service with capacity to serve 10,000 households in August 2022 and expanded it to serve 30,000 households in 2023.[138] In 2023, the city reported collecting more than 1,900 tons of food waste through the program, with Boston ranking third in Massachusetts behind Nantucket (see page 31) and Cambridge for volume of food waste collected.[139]

Across the commonwealth, cities and towns reported collecting more than 20,000 tons of food waste through municipal programs in 2023. About 40% of that was on Nantucket, which has provided composting for decades to reduce the high cost of sending waste off-island.[140] (See page 31.) In addition to municipally run curbside and drop-off food waste programs, some municipalities offer discounts or incentives for residents who have their food waste picked up by private firms.

The growth of municipal food waste collection programs across the commonwealth is promising, but one Massachusetts community shows the potential of going even farther: In 2021, the town of Hamilton became the first municipality in Massachusetts to ban the disposal of food waste in residential trash.[141] The town of 7,561 residents collected 433 tons of organic waste in 2023, up from 273 tons during a previous voluntary program in 2019.[142] With only 0.1% of Massachusetts residents, Hamilton was responsible for 2% of all

the food waste collected through municipal programs across the commonwealth in 2023.[143]

Expanding municipal food waste collection is essential for meeting Massachusetts' waste diversion goals. The commonwealth has provided some support to municipalities to improve their programs, such as grants to municipalities for the purchase of food waste carts.[144] But much more will need to be done to make the economics and logistics of municipal food waste pickup achieve the necessary scale.

Models for success: Examples of successful efforts to reduce food waste

MASSACHUSETTS HAS MANY TOOLS available to reduce or eliminate the disposal of food waste. Cities, states and countries around the world have demonstrated that it is possible to make progress at every step in the Wasted Food Scale – from reducing the amount of food waste that is generated by households and businesses to ensuring that the food waste we do produce is handled in the best possible way.

The following are positive examples that the commonwealth and Massachusetts communities can learn from as they ramp up their food waste reduction and diversion efforts.

Reducing food waste from the start: Columbus, Ohio

In central Ohio's Franklin County, home to the city of Columbus, almost a million pounds of food waste is landfilled every day.[145] To reduce this waste, and the resulting greenhouse gas emissions, the Solid Waste Authority of Central Ohio (SWACO) has prioritized food waste management and diversion, focusing on changing what is happening in consumers' kitchens and fridges with an innovative public education campaign that has achieved measurable results.

The Save More than Food campaign provides standardized advertising and educational materials to Central Ohio communities that they can use in educating their residents about food waste and changing household practices and habits.[146] SWACO provided a toolkit for a six-week-long social marketing campaign including:

- Content for websites and e-mail blasts to residents;
- A postcard mailer and suggested social media content; and
- Signage for food waste drop-off locations to indicate what materials are accepted.[147]

The campaign also included a website with resources for people throughout the region to learn more about the food waste problem and how they could take part in solving it.

The program had its origins in 2018, when SWACO convened the Central Ohio Food Waste Initiative, bringing together a wide variety of organizations to develop a coordinated approach to addressing food waste at every step of the scale.[148] Food waste prevention was a priority from the start, with consumer education a key part of the strategy.[149] The Save More than Food campaign was the result.

In 2021, the campaign was used in the town of Upper Arlington. Residents received educational materials through the mail, with additional outreach via social media, a newsletter and paid advertising.[150] Some residents received additional educational materials and were offered free "Bluapple" pods that keep produce stored in refrigerators fresher longer. An evaluation of the campaign found that residents reduced their food waste by 21% between the spring and summer of 2021.[151] Households

that received additional educational materials about food waste prevention and composting had a 53% reduction in wasted edible food between the spring and the summer.[152] As part of the evaluation of the program, residents were asked what interventions would help them compost more – provision of curbside compost pickup and kitchen compost collection containers were the most popular measures.

The Columbus-area program is not the only example of a successful community-wide educational and awareness effort. Campaigns in Canada and Europe have achieved similar results.[153] The U.S. EPA hosts a website with downloadable, customizable media materials from social media campaigns around the country, including SWACO's Save More than Food campaign, the Natural Resources Defense Council's "Save the Food" campaign, and others from Ohio, Oregon and California.[154]

SWACO's efforts to help residents reduce food waste have continued in recent years, expanding to measures such as educating shoppers at local grocery stores on how to properly store food to reduce spoilage.[155]

The Save More than Food campaign shows the potential of well-designed, well-resourced, consistent messaging and public education efforts to change how residents view food waste, help them reduce the amount of food waste they create, and increase the share of food scraps that are composted. While Massachusetts has created resources for statewide public education around recycling through the Recycle Smart MA program, launched in 2018, food waste prevention has not yet been integrated into the program, though that step is listed as "planned" in the commonwealth's 2023 Organics Action Plan.[156] The SWACO campaign shows that intensive outreach to communities across the commonwealth can have results.

Eliminating "trash" from the waste vocabulary: Nantucket, Mass.

Nantucket has long been a leader in keeping organic waste out of landfills – by necessity. As an island town, the cost of managing solid waste is high – only about 10% of the island's waste (consisting entirely of processed wastewater sludge and residual, non-organic material sent to the island's composter) is disposed of in Nantucket's sole landfill, with the vast majority being sent off-island for recycling or disposal.[157]

Photo: Polina Tankilevitch, Pexels.com

Preventing food waste at the source provides greater environmental benefits and household financial savings than any other strategy to address food waste.

As of 2023, Nantucket's landfill tipping fee was among highest in the commonwealth.[158] As a result, Nantucket has had ample incentive to reduce the disposal of compostable materials in household trash – and to minimize the amount of contamination present in organic waste sent for composting.

As of 2022, Nantucket far and away led the commonwealth in the volume of food waste diverted from landfills.[159] To educate the public about how to separate items for disposal, the town introduced new guidelines for household waste management in 2019 that changed the default assumption that most household waste would be disposed of as "trash."[160] The new guidelines established three categories of waste – recyclable waste, compostable waste, and "non-recyclable/non-compostable waste" or NRNC. The assumption is that *all* compostable waste will be sent to the compostable waste stream. Rather than a trash category that includes "everything else," the new communications define the types of materials that qualify as NRNC in the same way the other categories define what is included.

Setting priorities and addressing emerging problems: Vermont

In 2012, Vermont adopted the state's Universal Recycling Law.[161] Phased in over the course of the next eight years, the law banned the disposal of food scraps in stages, leading up to a full ban including both residents and businesses in 2020.[162] Its implementation shows the potential for environmental benefits from similar laws and highlights some of the challenges of implementation.

The ban on disposal of food scraps in trash is part of Vermont's overall strategy to increase the diversion of recyclable materials from the waste stream to 50% from the 34% to 36% rates the state had achieved between 2015 and 2021.[163] As of 2021, the year after implementation of the total ban, the state reported that "the annual tons of material recycled/composted has risen slightly, but neither disposal nor overall waste generation have consistently decreased."[164]

More recent data, however, shows that progress is being made. In a 2023 survey, Vermonters reported separating 71% of their food waste from household trash.[165] In 2022, the total amount of municipal solid waste disposed of in Chittenden County, the state's most populous, decreased by 2.5% and the total amount of waste diverted increased by 2.6% to the highest level on record.[166] The Chittenden Solid Waste District reported a 40% year-over-year increase in diversion of waste from food residuals and non-recyclable paper, including increases in diversion of edible food to food rescue organizations and in farm gleaning for the Vermont Foodbank.[167]

Vermont's approach to reducing food waste has been shaped by its status as a primarily rural state. Wastage of edible food on farms is reduced by gleaning efforts such as those organized by the Vermont Foodbank. Hundreds of volunteers each year remove excess edible produce from farm fields, gathering nearly a half-million pounds of produce provided to institutions and individuals throughout Vermont.[168]

Vermont has also succeeded in reducing disposal of food waste by encouraging backyard composting. A 2023 survey conducted by researchers from the University of Vermont found that composting at home, or donating compostable organic waste to neighbors who compost, was the most common strategy Vermont residents used to dispose of food waste.[169]

Vermont's ambitious approach to diverting food waste from landfills has led to significant challenges. An estimated 38% of food waste in Vermont is packaged,[170] raising the problem of how to safely remove food from packaging without creating additional environmental harm. In recent years, organics processors have built "depackaging" facilities, but the ubiquity of plastic packaging has led to concerns that these facilities might taint the resulting compost or digestate with microplastics or with PFAS "forever chemicals." In 2022, Vermont adopted an effective moratorium on the construction of new depackaging facilities until the Agency for Natural Resources (ANR) could study the issue and make recommendations.[171]

The recommendations of the stakeholder group, issued in January 2023, reinforced the importance of prioritizing reduction of food waste, food donations and other more beneficial solutions in the Wasted Food Scale over waste processing; avoiding commingling of packaged and source-separated organic material; and continuing to work with food waste generators and haulers to identify best practices for depackaging and ensure that they are followed.[172] A subsequent 2024 report to the legislature identified microplastics in both depackaged and source-separated food waste, but all finished composts and digestates analyzed met the most stringent domestic and international standards for presence of plastic.[173]

Vermont has also had to deal with the vexing issue of compostable foodware. Concern about plastic waste has led to the increasing use of biologically based plastics and other forms of disposable containers that are branded as "compostable" (as well as containers marketed as "biodegradable" or "made from plants" that might lead consumers to believe that they can be composted).

These containers, however, can pose numerous problems – some contain toxic PFAS,[174] some do not break down easily in industrial composters, and it can be difficult or impossible to distinguish them from non-compostable plastics in the waste stream.[175] These and other concerns have led some Vermont composting facilities to stop accepting compostable foodware, while the state is continuing to investigate what role compostable packaging might play in the contamination of finished compost and digestate.[176] Other states, such as Washington, have established stringent standards for what products can be labeled as "compostable" and require clear labeling to ensure that consumers and waste processors are readily able to distinguish certified compostable packaging that meets those standards.[177]

Vermont is not only a national leader as the first state to fully ban the disposal of food waste in trash, but it is also working through many of the issues and challenges that face food waste reduction efforts. The state has placed its focus on the most-beneficial steps of the Wasted Food Scale – food waste reduction and donations – ensuring that any would-be wasted food is used to feed Vermonters first. The state has avoided being overwhelmed by a tidal wave of food waste following the adoption of its waste ban by encouraging backyard composting on a wide scale, and Vermonters have responded. The state has also taken a thoughtful approach to emerging issues, particularly the importance of keeping compost and anaerobic digestate "clean" and free from contamination.

Big state, ambitious goals: California

In 1996, San Francisco became the first city in the U.S. with a large-scale food waste collection and composting program.[178] In 2009, San Francisco made composting mandatory for its residents, developing a "three-stream" system for collecting

residential waste: recycling, composting and trash.[179] To date, the system has kept an estimated 2.5 million tons of organic material out of landfills.[180]

Over time, other California municipalities followed San Francisco's lead. Like Massachusetts, California moved, starting with the passage of legislation in 2014, to require commercial generators of organic waste to contract for organic waste pickup.[181] And in 2016, the California Legislature adopted SB 1383, legislation focused on reducing emissions of short-lived climate pollutants such as the methane emitted from decomposition of organic matter in landfills. SB 1383 took the waste separation system pioneered by San Francisco statewide, requiring municipalities to provide organic waste collection services to residents by no later than January 1, 2022.[182]

The impact of the law, however, extends far beyond food waste collection. SB 1383 required municipalities to procure compost, mulch and/or renewable energy from organic waste, helping to guarantee a market for the compost and other products produced as a result of organics waste collection.[183] The law also required jurisdictions to establish systems for food donation and recovery, and required a wide variety of establishments – from institutions to hotels to grocery stores – to donate edible food to food banks and other organizations that can distribute it to people in need, with a goal of recovering at least 20% of the edible food that would otherwise be sent to landfills by 2025.[184] SB 1383 also directed counties to take the lead in planning for new organic waste processing facilities capable of handling the 20 million to 25 million tons of additional organic waste to be collected under the law.[185]

SB 1383 set the ambitious goal of diverting 75% of the state's organic waste (compared with 2014 levels) by 2025.[186] California is likely to fall short of that goal but has still made impressive progress.

Three out of every four California communities now have residential organic waste collection in place.[187] (Some communities were able to apply for more time to comply as a result of delays caused by the COVID pandemic).[188] The amount of organic waste diverted from the waste stream increased by 13% between 2021 and 2022.[189] Jurisdictions around California rescued about 200,000 tons of unsold edible food in 2022.[190] The rapid build-out of organic waste processing capacity – both composting and anaerobic digestion – continues, with a target of bringing between 80 and 90 new organic waste recycling facilities on-line by 2025.[191]

California has made this progress by making significant investments. CalRecycle, the state agency spearheading implementation of the law, has invested nearly a half-billion dollars in the expansion of the state's organics processing infrastructure.[192] But the state's investments have not been limited to the end of the waste stream – in fiscal year 2021-2022, CalRecycle made available $2.85 million in grants to support food recovery and food waste prevention programs.[193] The state estimates that more than 224 million meals have been recovered so far through programs funded by CalRecycle.[194] The program was funded by proceeds from California's cap-and-trade system for greenhouse gas emissions.[195]

While California has made great progress, the state's food waste prevention and diversion efforts have run into obstacles. The Little Hoover Commission, an independent state government oversight agency, identified a number of challenges in a 2023 report, including difficulties in coordination across state agencies, failure to resolve competing priorities, and concerns about whether the

staffing and financial resources provided for the effort were adequate.[196]

California's progress with implementation of SB 1383 shows that achieving a sea change in how the nation's most populous state deals with its wasted food is no simple matter. But by setting ambitious goals and clear expectations that extend up and down the Wasted Food Scale, California is moving quickly toward a system that throws far less organic waste into landfills … and gets results.

Putting food waste at the center of climate action planning: South Carolina, New Jersey and Oregon

The federal Inflation Reduction Act, passed by Congress in 2022, includes $5 billion in funding for states, local governments, territories and tribes to develop and implement plans to reduce greenhouse gas emissions.[197] For state governments dealing with tight budgets and numerous competing priorities, the Climate Pollution Reduction Grants (CPRG) provided a unique opportunity to advance strategies to reduce greenhouse gas emissions that might otherwise go unfunded.

The first phase of the program provided funding for jurisdictions to develop Priority Climate Action Plans. Projects identified in those initial plans were eligible for funding via the larger pool of competitive implementation grants – $4.6 billion – made available under the program.[198] The recipients of $4.3 billion of the grants were announced on July 24, 2024.[214]

While most CPRG funding has been allocated, several states – specifically South Carolina, New Jersey and Oregon – used the Priority Climate Action Plan process to delineate specific strategies to address and reduce food waste:

South Carolina – Produced by the Palmetto Clean Air Collaborative – a grouping led by two state agencies – South Carolina's plan proposed to expand its "Don't Waste Food SC" program, which promotes food waste prevention and food donations, and develop a "hub and spokes" food waste management network with expanded capacity for composting. The proposed network would enable smaller communities to share resources with others to achieve the necessary economies of scale to support the operation of organic waste management facilities.[199] The food waste reduction priorities laid out in the state's plan would enable South Carolina to address two pressing problems: food insecurity and lack of space in existing landfills. South Carolina's Priority Climate Action Plan identified the key agencies that would be responsible for leading the effort, and states that implementation of the plan would begin within one year after funding is received.[200]

Oregon – In 2015, the Oregon Legislature established the goal of recovering 25% of food waste for composting, anaerobic digestion or other useful purposes by 2020. The state has fallen far short of that goal, recovering only 10% of its food waste in 2020.[201] Oregon has identified a lack of organics processing capacity as a significant obstacle to meeting those goals, and the state's Priority Climate Action Plan included steps that would meaningfully close the gap. Oregon proposed to use grant funding to support the adoption of equipment to improve anaerobic digestion and composting – such as more efficient materials handling, odor control and electricity generating equipment. Funding would also be made available to support the construction of new composting and anaerobic digestion facilities. The state also planned to encourage smaller-scale

"community composting" of food waste to produce compost for community gardens. Oregon was awarded a $191 million Climate Pollution Reduction Grant to support its Climate Equity and Resilience Through Action (CERTA) grant program, which will support a range of climate investments including infrastructure for composting and food recovery.[202]

New Jersey – Food waste is one of six focus areas identified in New Jersey's Priority Climate Action Plan.[203] New Jersey is already a leader in preventing food waste – in 2020, the state banned commercial disposal of food waste for facilities producing more than 52 tons of food waste per year that were located within 25 miles of a food waste recycling facility. And in 2023, the state issued its Food Waste Reduction Plan, a step required by a 2017 law that established the goal of achieving a 50% reduction in food waste statewide by 2030.[204] New Jersey's Priority Climate Action Plan included a wide array of steps designed to expand food waste prevention and recovery in the state, including the development of tools to help local governments implement food waste prevention programs; the creation of tools to link potential donors of edible food with recipients; and the development of local and regional composting capacity.[205]

The South Carolina, Oregon and New Jersey Priority Climate Action Plans are good models for several reasons. First, they incorporate and reflect the existence of food waste strategies that are targeted toward each state's specific needs. In the case of South Carolina and Oregon, the plans envisioned the implementation of specific programs, identified the agencies in charge of carrying them out, and proposed specific timelines for accomplishing them. By contrast, while reducing food waste was part of Massachusetts' plan, the plan included only three general "implementation concepts" disconnected from any larger sense of the commonwealth's food waste reduction strategy.[206]

Even states that did not receive funding for food waste reduction efforts through the CPRG program benefited from the process of identifying opportunities for food waste reduction, making it easier to implement those programs when funding becomes available.

In addition to states, local governments were also eligible for Climate Pollution Reduction Grants, with their actions guided by regional level plans. The Greater Worcester regional Priority Climate Action Plan, for example, was more focused and specific than the Massachusetts state plan, identifying the creation of a region-wide "waste management entity" as a key priority to achieve economies of scale and coordinate efforts toward food waste reduction, and seeking to ensure that anaerobic digesters and composting facilities in the region benefit from a steady flow of organics. The region also sought to boost composting programs and expand anaerobic digester capacity.[207]

Recommendations: A roadmap to address food waste in Massachusetts

MASSACHUSETTS HAS MADE progress in the effort to reduce disposal of food waste. The state is diverting vastly more food waste than a decade ago, a result in large part of the state's commercial food waste disposal bans. Food recovery and rescue infrastructure is stronger than it was a decade ago. The state's investments in, and planning for, the expansion of anaerobic digester capacity have met with results. And more Massachusetts residents are taking part in food scrap collection than ever before.

But Massachusetts – once a leader in addressing food waste – is falling down the leaderboard as states such as Vermont and California embrace bold goals and commit new resources and energy to food waste prevention and organics waste management. For example, Massachusetts ranks 10th among the states for the number of residents with access to food waste collection.[208]

To reestablish Massachusetts' leadership, take advantage of the potential to repurpose food waste for the health of our people and our soils, and minimize the environmental and public health damage caused by waste disposal, Massachusetts should take the following steps:

Set ambitious goals and follow through

Massachusetts has set an ambitious goal for food waste diversion for 2030. But the commonwealth has a track record of failing to meet previous goals, and key steps identified in previous planning efforts have yet to be implemented.

To address this, Massachusetts should:

- **Implement previous state and collaborative food waste reduction plans.** Massachusetts' Solid Waste Action Plan and Organics Action Plan include a variety of specific actions to guide the commonwealth's food waste strategy. Implementing those steps is necessary, but so is implementing other strategies that have been identified in previous planning efforts by state and local governments and nonprofit collaboratives. The Massachusetts Local Food Action Plan, for example, produced in 2015 for the Massachusetts Food Policy Council, called for a statewide public education plan about food waste; clarification of sell by/expiration dates; creating a state tax credit for donation of surplus food; and several steps to encourage food donation and support the activities of food rescue organizations.[209] Nine years later, many of those common-sense recommendations have yet to be carried out.
- **Ensure that the commonwealth's action plans are adequate to meet its food waste goals.** Neither the Organics Action Plan nor the Solid Waste Master Plan contain enough specifics to demonstrate that the overall food waste reduction goal set out in those documents will be met. The plans provide few specifics on strategies for addressing the largest

remaining source of food waste: the residential sector. Similarly, the commonwealth's Priority Climate Action Plan is light on specifics for how it will address food waste. Rigorous analysis and planning are necessary to ensure that Massachusetts invests the appropriate resources in the right solutions.

- **Measure food waste prevention, not just diversion.** Keeping food waste out of landfills and incinerators can be achieved in two ways: separating food waste from trash and preventing the creation of food waste from the start. Currently, Massachusetts only has a goal for, and measures, the former. This creates the potential for skewed priorities, with programs that divert food waste receiving more resources and attention than programs that prevent it. Food waste prevention is far and away the most powerful and beneficial step Massachusetts can take to reduce greenhouse gas emissions. The commonwealth must set an explicit goal for prevention and evaluate (to the extent possible) whether it is being achieved.
- **Set a timeline for banning all food waste in trash.** The majority of food waste produced in Massachusetts comes from homes, and there is no solution to the commonwealth's food waste problem that does not involve diverting food waste from residential trash. Massachusetts should follow the lead of Vermont and California in requiring residential food waste diversion, establishing a timeline for implementing the ban and providing the resources necessary to implement it.

Emphasize food waste prevention and donation

Massachusetts successfully scaled up anaerobic digester capacity in the 2010s, showing that a coherent strategy, backed by significant financial resources, can bring about rapid change. Massachusetts should apply a similar approach – and make a similar investment – in efforts to prevent food waste at the source and ensure that healthy, edible food is provided to people who need it.

Massachusetts should:

- **Coordinate with municipalities on public education and social marketing campaigns to help Massachusetts residents reduce food waste.** Integrating food waste educational materials into the Recycle Smart MA website is a start, but the proven success of social marketing campaigns elsewhere in the United States shows that a coordinated, sustained effort can yield changes in habits and attitudes with the potential to last.
- **Standardize date labeling for food items** to make a clear distinction between dates that indicate that a food item is still of high quality and those that indicate that it remains safe to eat. Research shows that many people throw out edible food due to confusion about sell-by and use-by dates. Product labeling reform should be accompanied by a public education campaign to help residents understand and interpret the new labels.
- **Implement a tax credit for food donations.** At least 11 states and the District of Columbia provide a partial or full tax credit on the value of food donated by farmers or others to food banks, pantries or other nonprofit organizations.[210] Adopting a similar tax credit in Massachusetts would incentivize the donation of edible food to those who need it. Tax credits are particularly beneficial to small- and mid-size food businesses that may operate with small profit margins and are less able to take advantage of other types of tax incentives.[211]

- **Expand efforts to reduce food waste at schools and other public institutions.**
- **Provide capital and operating support to food rescue agencies.** Food rescue agencies require equipment, warehouse space and cold storage capability to accept and distribute perishable items at a scale sufficient to meaningfully reduce food waste. State and local financial support can make a big difference.
- **Consider a policy that encourages or requires the donation of edible food to food rescue agencies by commercial establishments.** The commonwealth should study the implementation of California's food donation policy and allow time for phase-in before imposing such a requirement.

Focus on composting

Composting is a vital tool to reduce greenhouse gas emissions and restore the health of our soils. Over the past decade, however, composting has been supplanted by anaerobic digestion as the primary destination of separated organic waste.

To revitalize composting, the commonwealth should:

- **Working with municipalities, help composters identify new locations for composting facilities in locations near population centers.** Regionalization of waste planning and collection – as proposed in the Greater Worcester Priority Climate Action Plan – could help with this effort.
- **Provide consistent capital and operating financial support for composting facilities and compost collection.** The commonwealth should model its efforts on the successful effort to encourage anaerobic digestion in the 2010s, which was aided by generous capital funding and (in the case of digesters that sell energy back to the grid) ongoing support through the commonwealth's clean energy programs.
- **Expand markets for compost.** The long-term success of the composting industry depends on the development of sustainable markets for the finished product. Massachusetts can provide financial incentives for the application of compost to farmland, commit to purchases of compost for use on state property, and encourage the provision of compost to community gardens and nonprofits. Policies adopted elsewhere in the U.S. specifically encourage the use of local compost made with food scraps and set standards for compost quality.[212]
- **Apply for, and help local organizations to receive, federal funding.** The commonwealth should seek out opportunities for federal funding to support composting, including funding opportunities available through the U.S. Department of Agriculture and U.S. EPA.
- **Enhance backyard composting.** Massachusetts cities and towns have long supported backyard composting with discounted composting systems. Massachusetts should continue and expand those efforts, and investigate the current prevalence of backyard composting in the commonwealth, opportunities for growth, and the obstacles standing in the way of expansion of backyard composting.

Keep toxics out of the food waste stream

The beneficial reuse of compost and digestate is essential to obtain the full benefits of food waste diversion for greenhouse gas emission reduction and soil health. The practice of sending food waste to be digested at sewage treatment plants runs the risk of contaminating a relatively "clean" feedstock with hazardous

chemicals. Moreover, the presence of non-organic items in food waste sent for composting increases costs for composters and potentially reduces the desirability of the finished product.

To keep contaminants out of the food waste stream, Massachusetts should:

- **Not rely on increases in anaerobic digestion at wastewater treatment plants to meet food waste diversion goals**.
- **Ban PFAS "forever chemicals" from consumer products,** which pose a risk of soil and water contamination if they find their way into compost or digestate applied to agricultural lands.
- **Set clear, health protective standards for PFAS and other contaminants of concern in biosolids applied to farmland**.
- **Reduce single-use plastic packaging** throughout Massachusetts by encouraging the use of refilling stations and the use of durable, reusable and non-toxic materials in packaging. Arlington, for example, has banned the retail sale of small plastic water bottles, while installing water refilling stations at facilities throughout the town.[213]
- **Consider policies that give preference to separation of organic materials from packaging at the source.** Research into the possibility of microplastic contamination from mechanical depackaging continues and should be monitored as Massachusetts sets policy in this area.
- **Adopt and enforce clear standards for the sale of "compostable" packaging, including requiring such packaging to be certified and be marked in ways that enable consumers and composters to identify it quickly and easily.** Massachusetts should also regulate the use of other product claims – such as "biodegradable" and "plant-based" – that may confuse consumers and lead to more contaminants in the food waste stream.

Expand food waste collection

Massachusetts will not meet its ambitious food waste diversion goals without a massive increase in food waste collection, particularly from the largest source of food waste: the residential sector. To meet its food waste diversion goals, the commonwealth should:

- **Strengthen enforcement of the current ban on disposal of food waste by large and medium-sized food waste generators.** The commonwealth should hire additional inspectors, ramp up penalties for violators, conduct a thorough evaluation of compliance with the ban, and continue to provide education and support to commercial establishments to help them comply.
- **Commit to an eventual ban on all food waste disposal.** Massachusetts must eventually eliminate all food waste from disposal in household and commercial trash. Making such a ban work will require the construction of new organic waste management infrastructure, close coordination with the commonwealth's cities and towns, and aggressive public education. Not all of that will happen overnight, but making sure that it happens at all will require Massachusetts to put a date on the calendar by which all food waste will be diverted. The sooner we establish the date, the sooner we can begin building the zero-waste system of the future.
- **Provide resources to cities and towns to continue to expand their food waste collection programs.** State and federal funds have played a key role in helping

cities and towns get food scrap collection programs up and running. Continued support will be necessary to help them grow.

- **Deploy proven tools to reduce residential disposal of food waste.** Cities and towns have adopted a wide variety of proven tools to reduce the disposal of recyclable materials in trash. Many of those same approaches can be used to reduce disposal of food waste in household trash. These tools include: requiring the use of clear plastic trash bags; providing smaller containers for non-recyclable, non-compostable trash; and establishing pay-as-you-throw pricing with higher prices for trash, and discounted or free pickup for separated food waste. Such tools can make households more conscious of what they are putting in the trash and increase the diversion of food waste.

Provide adequate funding

Ending food waste can bring enormous benefits to Massachusetts – less pollution, healthier people, monetary savings for households and businesses, and healthier soils. Yet, transitioning from our current, one-way waste system to a circular, zero-waste economy will require significant upfront investment and ongoing financial support.

The commonwealth's experience with anaerobic digestion shows the importance of steady, reliable financial support derived from dedicated sources of funding. In order to meet its food waste reduction goals, Massachusetts should identify ongoing, reliable, dedicated streams of funding – similar to the consistent funding provided for clean energy projects – that can deliver the scale of investment necessary to meet Massachusetts' food waste reduction goals.

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