
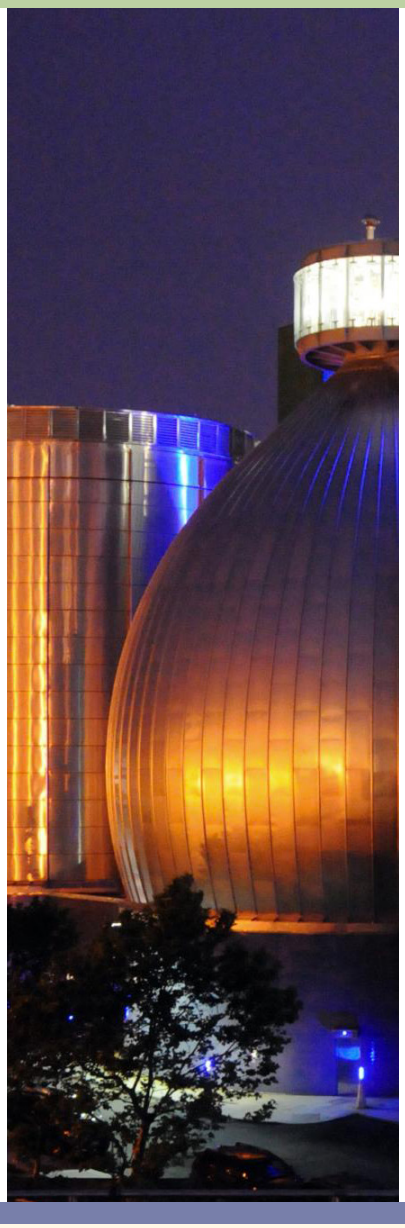

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GOVERNMENTAL PLANS TO ADDRESS WASTE OF FOOD

2017

JOHNS HOPKINS
CENTER *for* A LIVABLE FUTURE

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Environmental Health & Engineering

Contents

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Carrie Burns

Executive Summary

In the US, the amount of food that is wasted post-harvest has increased by about 50% from 1974, and now comprises up to 40% of the total produced.[1] As recognition grows regarding the magnitude of wasted food generated by households and businesses and its impacts, along with the great potential that exists to recover that food for those in need, interventions are proliferating. This report provides synthesized information about existing approaches in governmental plans to address wasted food, and shares recommendations to guide future efforts. It is based on analysis of 93 governmental plans aimed at addressing waste of food and interviews with 17 local, state, and national government staff about their plans. For this report, we define wasted food as food that could have been edible but was landfilled or incinerated.

Key Themes Across Plans. Ninety-three plans with content on wasted food (36 municipal level, mostly from the US; 18 US county level; 20 US state level; and 19 country-level plans including 12 from Europe and five from Asia, plus Australia and South Africa). We found that: (1) the number of new plans each year has dramatically increased since 2000; (2) objectives for addressing wasted food are included in multiple types of governmental plans, most commonly in solid waste management plans and least commonly in climate plans; and (3) 22 of the plans set numeric targets for minimizing the amount of food that is wasted by a specific year. The US Environmental Protection Agency (EPA) food recovery hierarchy emphasizes that the top goal should be prevention, i.e., reducing the quantity of excess food produced, purchased or served. We found that while some governmental plans stated a commitment to prevention, the plan activities commonly did not directly connect to it.

Tackling Barriers. Interviewees described approaches to addressing barriers to progress. These barriers included political challenges, disincentives to moving up the EPA food recovery hierarchy, lack of funding, low prioritization, setting non-evidence-based goals, contamination of the compost stream, negative perception of composting due to history of failure, data collection issues, waste management crossing jurisdictional borders, and lack of scale.

Words of Wisdom. Strategies recommended by interviewees include clearly linking wasted food targets with other existing goals; economically incentivizing wasted food strategies through tax credits and other policies; setting evidence-based targets; planning educational campaigns in conjunction with other strategies; gaining public support with pilot projects; forming strategic partnerships with local organizations, including businesses, that share common goals; keeping in mind the local context; making a plan for evaluation; clearly specifying roles, action steps, deadlines, and measures of enforceability in the plan; enabling community input; checking out source reduction strategies first if you have no organics collection program yet; sharing stories of success and failure to help other jurisdictions; and building on past efforts. A list of helpful resources is included.

This report provides jurisdictions with a summary of how other jurisdictions are using planning to address wasted food, and shares links to existing plans and collected wisdom from those engaged in these processes. While this report can guide discussions on creating and improving plans to address waste of food, there is no silver bullet. Each jurisdiction has distinct resources, challenges and opportunities. New opportunities could be created if jurisdictions had more diverse portfolios of transformational and incremental strategies that enable action across the entire food waste recovery hierarchy and not only at the end-of-life stage.

Introduction

In the US, the amount of food wasted post-harvest has increased by about 50% from 1974, now comprising up to 40% of the total produced.[1]

This preventable loss has profound effects on the environment, food security, and economics. In North America, we essentially "discard" about 35% of freshwater, 31% of cropland, and 30% of fertilizers by letting food that could have been eaten spoil in landfills and compost piles.[2] Beyond unnecessary resource use, wasting food also means that the environmental impacts associated with producing the food, such as water, air and soil contamination, were also unnecessary. A recent analysis ranked addressing waste of food, mostly through prevention, as #3 of 100 solutions to draw down irreversible climate change, since as organic matter degrades in landfills, it contributes 17.6% of U.S. emissions of methane, a powerful greenhouse gas that accounts for 10% of all GHGs.[3,4] Organic matter, which in addition to wasted food includes yard waste, paper, and other de-compostable materials, is the single largest and least recovered portion of the waste stream, leaving plenty of opportunity to make better use of surplus food and identify beneficial uses for unavoidable wasted food.[5] In 2015, 12.7 percent of American households were food insecure at least some time during the year.[6] While surplus food recovery cannot address the root causes of food insecurity, it can bring good food to those who need it.

As recognition grows regarding the magnitude of wasted food coming from homes and supply chains, and regarding the impacts of that waste, interventions are proliferating.

Many local, state, and national governments/organizations have developed plans that address wasted food. Some plans focus on wasted food specifically, but most include it as one component of a broader plan focused on a topic such as solid waste management or sustainability. Some plans set quantified targets for organics diversion*, including minimizing the amount of food wasted. In 2016, the United States announced plans to seek a 50% reduction in waste of food by 2030. US state and municipal targets range broadly. For example, Massachusetts aims to divert 35% of food from landfills by 2020, while Austin aims to divert 90% of overall solid waste from landfills and incinerators by

For this report, we define **wasted food** as food that could have been edible but was landfilled or incinerated. We prefer the term "wasted food" to "food waste" because it emphasizes that this is food, not waste, a distinction that is particularly important in context of food recovery programs. (No one wants to eat waste!)

*Note: *after a term indicates it is defined in Appendix A*

2040. Many locales embrace a zero waste* goal (i.e. designing and managing products to avoid sending any waste to a landfill or incinerator); while it may be technically impractical, it often sets the stage for ambitious action in recycling and recovering food for people. With that said, zero waste goals in the US often place low priority on source reduction*.

PURPOSE OF REPORT

This report compiles and analyzes governmental plans aimed at addressing waste of food.

Approaches in these plans include reducing the amount of unconsumed food that is discarded, recovering surplus food for human consumption, and using processes including composting* and anaerobic digestion* to recycle food that would otherwise go to landfills. Setting targets for addressing waste of food may create an impetus for aggressive action and can drive strategic priorities. Well-designed plans to address waste can define a government's priority actions, shape the effectiveness with which governments pursue them, and help guide allocation of personnel and other resources. Plans are different from policies and regulations, in that plans describe what a government wants to achieve over a specified time period and how but generally do not legally hold them to these goals; a plan could include goals to pass certain policies and regulations during the time period. For more information on wasted-food-related policies that U.S. states and the federal government have adopted, see ReFED's online database, Food Waste Policy Finder.[7]

To date, no study or report has systematically compiled, described, and compared governmental targets and plans. This report seeks to fill this gap by:

- Providing synthesized information about existing targets and plans based on a review of 93 identified plans that include actionable strategies or targets, from 36 municipal, 18 county, 20 state, and 19 national governments; and
- Sharing pragmatic recommendations to guide future efforts based on interviews with 17 local, state, and national government staff about targets and plans.

Wasted food can also be referred to as "food waste," "food scraps," or "surplus food," but in this report, we will use "wasted food" to be clear that we are referring to food that could have gone to good use but is wasted and ends up in a landfill or incinerator. All plans reviewed are included in Appendix B. Appendix C describes the search strategy to identify plans and other methods used in this report.

SETTING THE SCENE

The EPA Food Recovery Hierarchy (Figure 1) provides a framework for prioritizing interventions that reduce waste of food, based on the potential for environmental benefits and obtaining the greatest value from the resources that have gone into producing, processing, distributing, cooling or heating and preparing food.[8] The pyramid prioritizes prevention/source reduction* followed by recovery* of surplus food for humans, recovery for animals, industrial uses (i.e., processing waste oils and food scraps into industrial products) and composting* or anaerobic digestion*, with incineration or landfilling as the least preferred option.

Figure 1: EPA Food Recovery Hierarchy.[8]

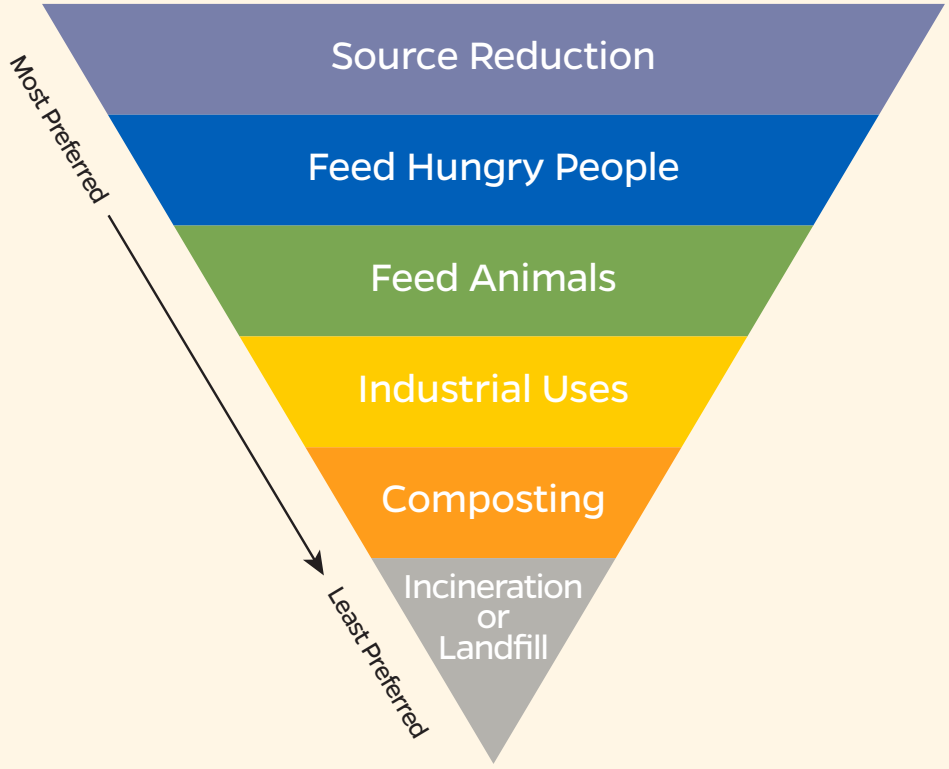


Photo credit: Treasure trove of wasted food, Foerster, Wikipedia Commons-CC0 1.0

Key Themes Across Plans

TARGETS AND TRENDS

Among the 93 plans reviewed with content on wasted food, we see that:

- The **number of new plans in a year has dramatically increased** since 2000 (Figure 2).

Objectives for addressing wasted food are included in **multiple types of governmental plans—**most commonly **waste management plans** (Figure 3). Note that waste management plans are not necessarily designed to include prevention and recovery, so plans in this category often address wasted food through composting, or just sending food to the landfill along with the rest of solid waste. It is also important to note that few climate plans addressed this topic, despite the extensive greenhouse gas emissions embodied in wasted food.

Many plans set numeric targets for addressing wasted food—often nested within broader goals (Figure 4). There was large variation in the types of targets (e.g. diverting food from a landfill vs. increasing the overall recycling rate vs. setting multiple targets), the numeric targets set, and the timelines for achieving them, with five plans not specifying any deadline.

Year for target achievement, among plans setting targets:

- 2011-2015: 5
- 2017-2020: 16
- 2022+: 8
- Year not specified: 5

Few plans included an evaluation component (32.9%). Of those that did, few were robustly described. Most plans (86.8%) included baseline data gathered via prior waste stream analysis or surveillance data. The robustness of this information varied by locality. Few plans included economic (40.8%), environmental (26.3%), or health impact (2.6%) data; and few have data on the types, quantities, and sources of "wasted food."

Figure 2. Year of plan publication.

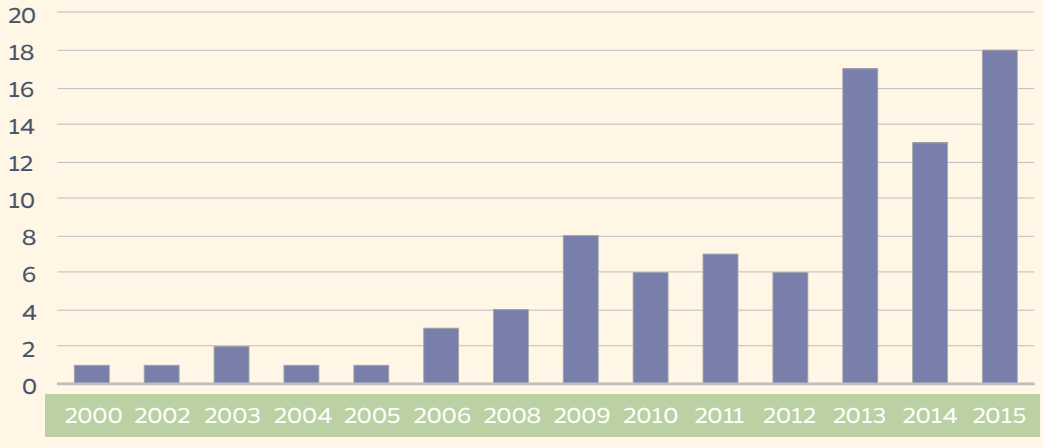


Figure 3. Plan type

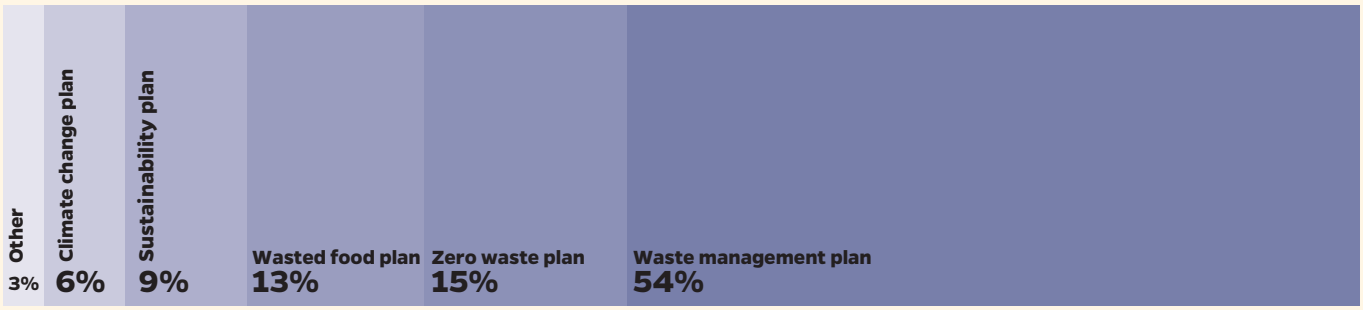
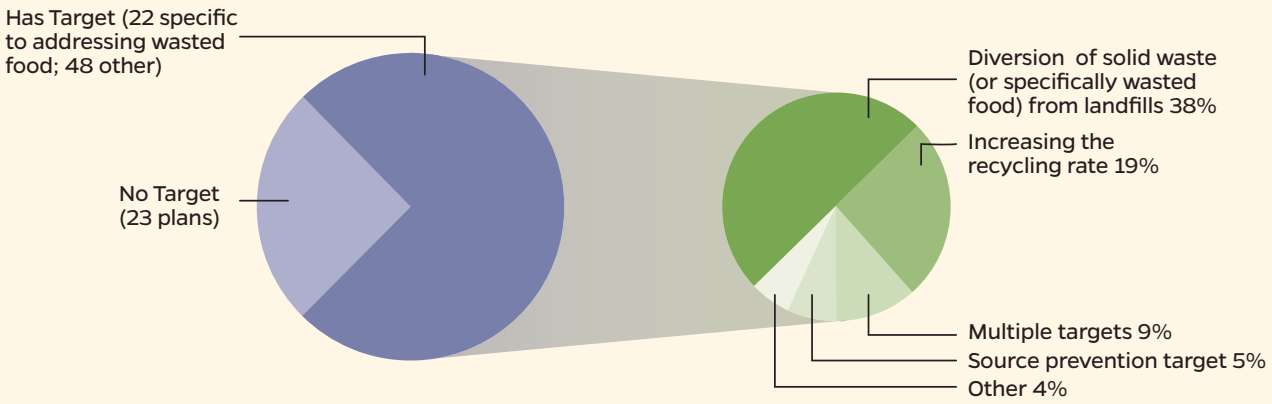


Figure 4. Types of targets in plans



APPROACHES

The list below shows approaches included in wasted food plans and their frequency. The list has been adopted from the landmark report, A Roadmap to Reduce U.S. Food Waste by 20 Percent.[9] This report was the result of a collaborative stakeholder process, including input and support from over 80 industry experts plus members of ReFED (a collaboration of business, nonprofit, foundation, and government leaders committed to reducing wasted food in the U.S.). The approaches are listed starting from prevention and then moving down the EPA food recovery hierarchy. Some strategies listed in the plans could not be categorized into a level of the hierarchy due to lack of specificity (e.g. they mentioned an educational campaign but did not specify what it would cover.) See Appendix A* for definitions of each of these approaches.

	# of plans
PREVENTION	
▪ Packaging	
▫ Standardized Date Labels	2
▫ Packaging Improvements	3
▪ Operational and Supply Chain	
▫ Waste Tracking and Analytics	3
▫ Supply Chain Management	4
▫ Food Retail Infrastructure	2
▫ Produce Specifications	1
▫ Equipment and Building Specifications	1
▫ Food Safety Regulations	3
RECYCLING	
▪ Anaerobic Digestion	24
▪ Residential Composting	62
▪ Commercial Composting	63
▪ Community Composting	28
▪ Bins for Composting	12
▪ Commercial Greywater	5
▪ Animal Feed	1
▪ Landfill Fees	13
▪ Landfill Bans	15
▪ Markets for Compost	15
▪ Government purchasing of compost	11
▪ Compost-related Infrastructure	9

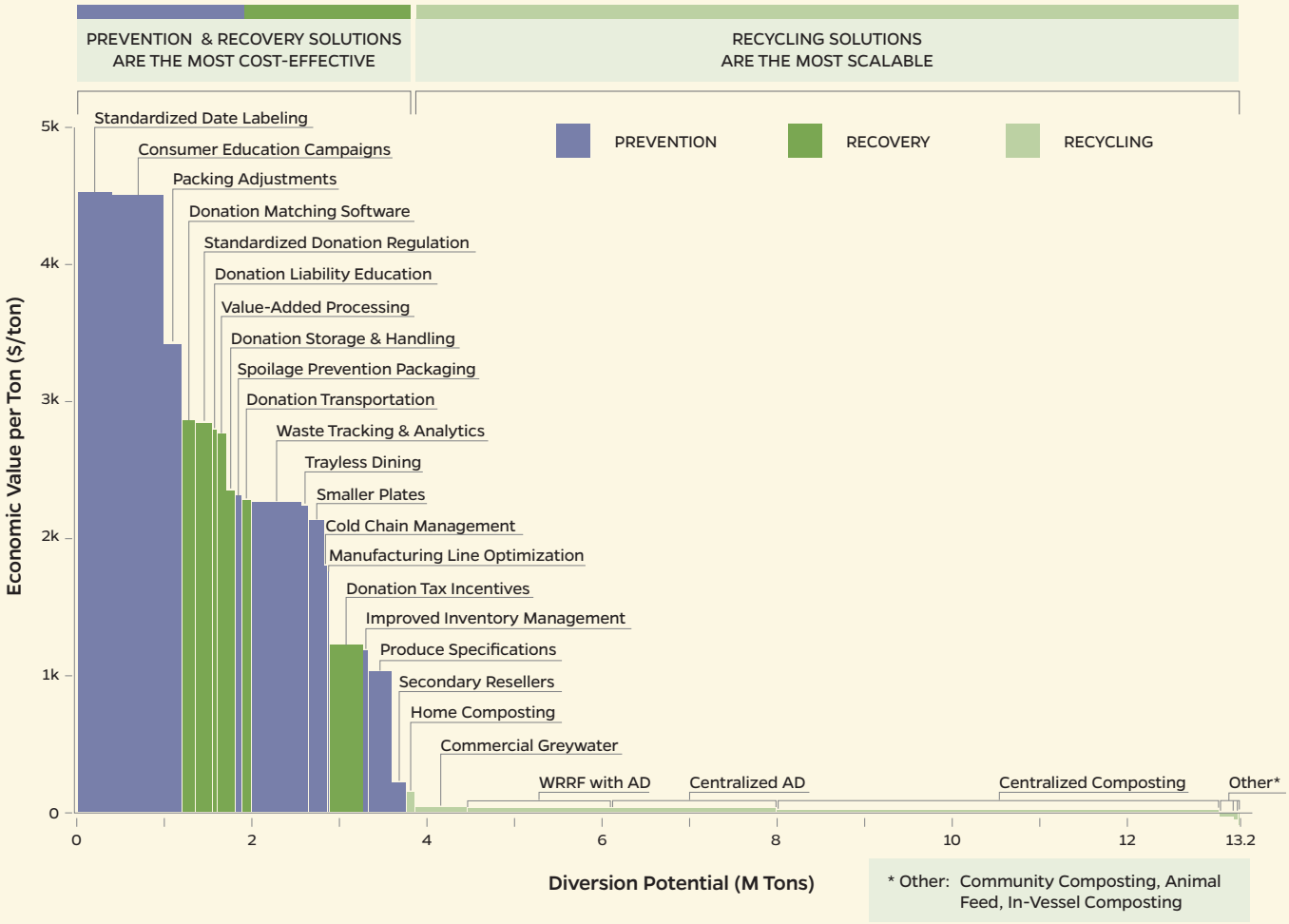
	# of plans
RECOVERY	
▪ Donation Logistics/Infrastructure	13
▪ Value-added Processing	1
▪ Standardized Donation Regulations	2
▪ Donation Incentives	3
▪ Donation Requirements for Governments	3
▪ Business Partnerships for Donations	6
CROSS-CUTTING APPROACHES	
▪ Research and Surveillance	
▫ Surveillance	22
▫ Waste Stream Analysis	13
▫ Grants and Research	11
▫ Feasibility Studies	29
▫ Program Evaluation	8
▫ Formation of Advisory Groups	7
▪ Education, Training, and Jobs	
▫ Consumer Education	55
▫ Commercial Education	51
▫ Education in Schools	19
▫ Training for Professionals	12
▫ Job Training in Waste Management	5
▫ Zero Waste Certification	3
▫ Master Composter Training	2

It is clear from this summary that a large majority of plans focus on strategies for recycling wasted food—including plans to collect wasted food for composting from residential bins and/or commercial locations, supporting community-based garden and/or backyard bin composting, and directing wasted food to anaerobic digester(s). We note that many plans include a stated commitment to prevention, but did not include activities, funding, or dedicated staff time directly supporting this goal. This remains an important area for future exploration. Some governments do address prevention through strategies not covered in the plans, particularly legislative and regulatory policies. These include regulations against discarding food, efforts to reduce recalls, reforming date labeling, and changing regulations on packing. For more information, please see the Harvard Food Law and Policy Clinic's 2016 report: Keeping Food Out of the Landfill: Policy Ideas for States and Localities.[10]

We would not expect to find all approaches listed in ReFED's report within governmental plans, because some fall within the domains of the private or nonprofit sector (e.g., selling "ugly produce" or using smaller plates at restaurants). That said, there are ways for governments to support and promote all of these activities, including by convening stakeholders or providing incentives such as grants or recognition. All could be considered for inclusion in future plans.

ReFED analyzed these interventions in terms of cost-effectiveness and amount of waste diverted. They found that the most cost-effective interventions were at the top of the EPA food recovery hierarchy: standardizing date labeling, education and changes to packaging. The interventions that would divert the most food from the landfill were toward the bottom of the hierarchy: wastewater recovery, centralized anaerobic digestion, and centralized composting. ReFED's figure below shows the results of their analysis (Figure 5).[9]

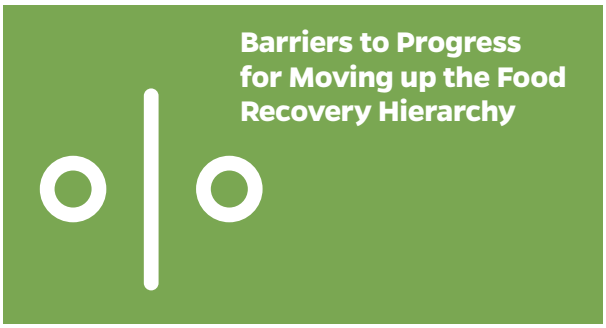
Figure 5: Economic value per ton and diversion potential of 27 interventions to address wasted food.[9]
Reproduced with permission from ReFED.

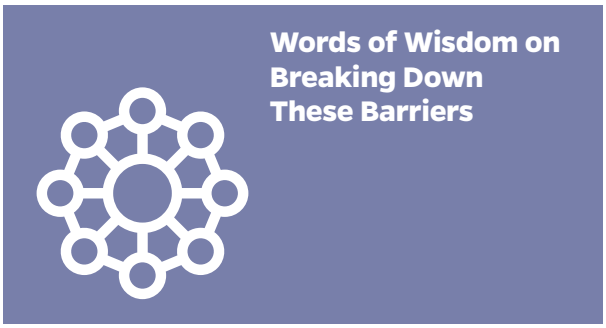


Notes from the Field

To gain further insights on these plans, the research team interviewed 17 developers and implementers of plans across the US, asking questions about the target setting process, important stakeholders, challenges, lessons learned, evaluation methods, plans for the future, research needs, and more. Eight telephone interviews were conducted with state employees and nine with municipal employees. Rather than focusing only on areas with "model plans" we aimed for a diversity of participants. Different types of insights can be gained from individuals engaged in plans that address wasted food extensively versus those with plans that only touch on the issue; and from those working across diverse geographic settings. We thus performed a random selection from the US-based plans and reached out to associated individuals. Further details about methods, and the question list, are included in Appendix C.

There was great diversity among those interviewed—some had strong support from the public and their legislators in addressing wasted food and were able to take large actions, while others faced low support and were just trying to include any content on the issue at all. Some were implementing plans from a decade ago while others were working from plans updated annually. All were generally aware of the EPA food recovery hierarchy and wanted to move their jurisdictions' actions towards prevention, with varying levels of political and financial feasibility, data to support preventing wasted food, and policies that prioritize investment in prevention. The next sections provide an overview of the interview findings, including barriers to progress (green headings) along with corresponding words of wisdom to break down these barriers (purple headings), case studies, and keys for success.





Politics/lack of funding. All jurisdictions interviewed cited lack of funding as a barrier to including wasted food activities in their plans and to taking effective action on items that were included. Key areas of concern ranged from funds for staff and educational campaigns to composting facilities and anaerobic digesters. Legislators often control the funding to reduce, reuse, and recycle food loss and waste, and a shift in focus due to elections or other emergent priorities and could defund a program at any time. It is also harder to educate legislators on interventions going beyond landfill diversion and feeding hungry people, so many jurisdictions end up focusing on what is easier to do and understand instead of taking a broader, long term strategic approach to the problem. Interviewees indicated that there is rarely actual opposition to addressing wasted food, however, there may be less political will to do so when other priorities command public attention. Wasted food activities must compete with other environmental (and governmental)

priorities for limited available budgetary funds. Further, the frequency of full-length legislative sessions varies by state; in some these occur as rarely as every two years, which can delay passing helpful bills and/or securing necessary funds.

- **Clearly link wasted food targets with other existing goals.** The political framing of waste issues can drive public opinion. (For example, is addressing wasted food the primary responsibility of individuals or society?) So too can the cost involved in waste collection and development of infrastructure. In certain circumstances, support can be gained by aligning wasted food targets to those already in place, such as those for methane mitigation or increasing the landfill diversion rate. Further, addressing wasted food can sometimes move up a jurisdiction's priority list when it is clearly linked with priorities such as job creation (in composting and value-added food processing), return on investment from prevention, and/or climate mitigation potential and other co-benefits (e.g., conservation of fresh water and agricultural land).

- **Form strategic partnerships with local organizations that share common goals.** Although your budget may be small, utilizing partnerships with other governmental agencies and departments (e.g., agencies that have common goals and complimentary authoring environments including the public health department and social services), as well as with nonprofits and businesses (e.g., "ugly produce" markets and sports venues), can expand your resource base and help to achieve goals more swiftly and effectively. For example, partnerships with nonprofits can gain you volunteers to help with composting projects, partnerships with businesses can help you co-develop ideas for source reduction during manufacturing, and partnerships with schools (K-12 as well as institutions of higher education) can gain you a supportive place to implement a pilot program.

Photo credit: Harvard Square seen from a nearby building, Chensiyuan, Wikipedia Commons-CC BY-SA 4.0

Case Study of Plan Utilizing Strategic Partnerships:
Cambridge Climate Protection Plan (Massachusetts)

- Climate Protection Task Force, 2002.[11]
- Type of Plan: Climate Change
- Target: None specified
- Plan's Level of Detail on Wasted Food: Moderate; has its own brief section with two strategies for addressing wasted food

Cambridge's plan expands the government's reach by mapping out partnerships with the business community, academic institutions, and residents. While Cambridge's government employees can work as executors of several projects, they also empower projects by others through facilitation and connecting partners. In the long term, Cambridge's team plans to facilitate commercial collection of wasted food by connecting community gardens and farms with composting facilities as well as by partnering with businesses to prepare them for a state ban on wasted food disposal. In the near term, they are working with the local universities to expand their resources with student volunteers and expert input. Together with these partners, they set up and built up the use of composting programs at Harvard and MIT. They also partner with nonprofits, supporting their work to address wasted food.

In 2014, Massachusetts instituted a state-wide ban on landfilling commercial food waste: http://www.mass.gov/eea/agencies/massdep/recycle/reduce/food-waste-ban.html.[12] Each municipality within Massachusetts including Cambridge must now adjust their own plans to comply with this state level policy.

- **Disincentives to move up the hierarchy.** Composting is often financially incentivized to be the preferred or only strategy to combat wasted food. Staff from several municipalities shared their concern that having a goal to increase the recycling rate may actually undercut wasted food prevention or rescue efforts, because of the competition for both feedstock and attention. And where jurisdictions' wasted food programs are funded by "tipping fees," i.e. fees waste haulers pay to dump waste in a landfill, there is a further perverse incentive to collect *more* waste for landfills in order to keep the programs funded.

    - **Further economically incentivize strategies to address wasted food.** People want to do what is best and if you can keep that economically incentivized, they will be more likely to do it. Some general guidelines for developing approaches to incentivizing wasted food reduction, especially further up the hierarchy, include reviewing current policies and economics, such as fees, taxes, contracts, ordinances and permits to identify some changes that could be made to financially incentivize prevention; getting stakeholder input; and gaining elected official support for the top identified strategies. One example to incentivize recovery is to offer restaurants and supermarkets tax credits to donate high-quality food to food banks and lower-quality food to farms for animal consumption.

    - **Consider alternative incentives to tax breaks.** Unfortunately, tax incentives are not necessarily accessible for all. Small to medium size growers and some food businesses do not have enough tax liability to take advantage of tax credits, and for some, the credit would need to be relatively large to offset the administrative burden of filing. It is important to consider how the solutions you seek respond to the actual barriers that people in your jurisdiction face. With small to medium size growers, key barriers to minimizing wasted food are often the cost of packaging, transportation, and extra labor. An example of a strategy to address these barriers is Pennsylvania's program to pay growers an agricultural subsidy to support transport.

Photo credit: Panoramic view of the Downtown Houston skyline, Henry Han, Wikipedia Commons-CC BY-SA 3.0

Case Study of Plan Solely Focused on Addressing Wasted Food:

Commercial Food Waste Collection in the Houston-Galveston Area Council (H-GAC) Planning Region (Texas)

- Houston-Galveston Area Council, 2015.[13]
- Type of Plan: Wasted Food
- Target: None specified
- Plan's Level of Detail on Wasted Food: High; sole focus of report

This report analyzed challenges, opportunities, and solutions associated with commercial wasted food collection and diversion in the Houston-Galveston Area Council's (H-GAC's) 13-county region. The Council hired a team of solid waste consultants to conduct this analysis, which included reviewing current trends concerning wasted food diversion activities in the US and conducting interviews with a wide variety of entities involved in wasted food in the H-GAC planning region (including generators, collectors, and processors). The five-year action plan developed based upon this analysis laid out short term goals for the first 12 months such as hosting a quarterly commercial wasted food roundtable; developing training materials for generators of wasted food; focusing initial wasted food diversion efforts on commercial food processors, wholesale food distributors, and retail grocery stores; and developing a GIS database of wasted food generators, collectors, and processors in the H-GAC planning region with their physical location.

In the mid-term (one to three years), the action plan sets out goals including: coordinating food waste diversion programs with restaurants, exploring wasted food diversion to farms, and developing model ordinances for use by local governments to incentivize wasted food diversion from landfills by large commercial wasted food. The long-term goals included evaluating the feasibility of developing a new wasted food composting facility located in central Houston near Produce Row (a business district that includes a large number of produce and vegetable companies). The project team shared the plan widely so it could serve as a resource guide for local governments, private businesses, and entrepreneurs to develop a network of contacts within the H-GAC region concerning wasted food diversion activities.

- **Setting the "wrong" goals.** Several staff members expressed regret over setting too many goals, goals that did not aim high enough, or goals that were too ambitious. In cases where goals set were not Specific, Measurable, Agreed upon, Realistic, and Timely (SMART), they often were not achieved. Many said they aimed in the future to set realistic yet optimistic goals, with prioritization and an action plan clearly laid out.

  - **Set evidence-based targets.** Several municipalities said that setting targets that are ambitious yet strongly supported by evidence of their achievability and impact provides a rationale for pushing forward ambitious actions. These actions are more likely to gain support from funders/legislators. Be sure to consider what other concerns you could bring in to build political will including greenhouse gas reduction, water conservation, agricultural land conservation, food security, healthy eating, climate resiliency, jobs and the economy.

- **Contamination of compost stream.** The quality of compost is extremely important; you need a clean input stream in order to get quality compost. Part of what makes composting projects costly or failed and therefore difficult for planners to promote is the issue of organic waste stream contamination– from plastic utensils, products marketed as "compostable" that are not completely compostable, and non-compostable bags that line compost bins. Toxic contamination from highly-fluorinated compounds found in most compostable packaging products also poses a contamination question, since these compounds are persistent in the environment and bioaccumulate, posing unknown health concerns.

  - **Plan composting educational campaigns in conjunction with other strategies.** For example, in conjunction with rolling out new composting bins in a neighborhood and/or business complex, an education campaign should be implemented to teach consumers what should and should not go in these bins as well as the importance of other strategies to minimize wasted food. Many consumers believe that discarding food is not a problem if they compost it; education can help address this misconception.[15]

Photo credit: Madison, WI, Richard Hurd, Wisconsin Public Radio (CC-BY)

Case Study of Plan Setting Evidence-Based Targets:
The Madison Sustainability Plan (Wisconsin)

- Sustainable Madison Committee, 2011.[14]
- Type of Plan: Sustainability
- Target: 75% waste diversion by 2020
- Plan's Level of Detail on Wasted Food: Moderate; has its own brief section with two strategies for reducing wasted food

Madison, Wisconsin set its target based on studies of what they could reach by incorporating wasted food and other organics. While it is necessary to get political will to pass a plan, there often needs to be more political will to obtain the resources necessary to implement that plan, including trucks, an anaerobic digester, etc. Cities, just like Madison, must allocate resources to many important public services so it can be a tough decision to divert resources from police stations and fire stations to public health and environmental projects, including addressing wasted food. The Madison team combats these barriers by gaining public support through educational pilots and regularly updating the public on progress. The specific aims of pilots were to teach residents about the benefits of composting, raise consciousness on how much food they waste (note: it is important that they acknowledge compost as waste), help them get over the "yuck factor," and get them to think more about their purchasing choices. Over time, the team has seen growing public support and they plan to gradually expand pilots to continue this trend.

Negative perception of composting due to history of failure. Modern composting initiatives must grapple with the fact that older facilities across the country have failed over the past several decades, particularly due to odor concerns—leaving many residents with negative perceptions of composting. Unless these past perceptions and rational concerns are addressed, new expansion of composting efforts will likely not gain the public support needed to make it into a plan.

- **Gain public support with a new pilot project.** While it may be nearly impossible to combat prior negative experiences with composting, sometimes, a new and improved small-scale pilot project can help change perceptions. Demonstrate how composting or another prevention, recycling, or recovery strategy can work well while educating the public, legislators, and potential funders with a pilot project. There may be myths in your municipality about composting being expensive or complicated but by conducting a pilot with supportive residents (such as at a school or environmental center), you can dispel these myths and show off how positive the program has been for the pilot participants. Support from the community can be a major driver for gaining funding. There may even be ways to incorporate messaging about the EPA recovery hierarchy into the pilot so participants do not become blind to composting avoidable waste and still think about prevention and recovery strategies.

- **Assure that composting facilities are planned well** to avoid negative public impacts in the first place where possible. Facilities must have high enough compost processing capacity to process the organic waste generated within their jurisdiction—with several facilities ready to pick up extra capacity in case one fails. Composting facilities must be developed using strategies to minimize and contain odors as well as waste that can attract pests, and ideally be located sufficiently distant from residences. Additionally, if it is not part of current zoning codes, there should be a full process to engage and reassure the community as part of siting decisions. It is important to work with zoning officials early in the process and ensure they understand how a composting facility or any other type of technology to handle Wasted Food is different from a solid waste disposal facility

Photo credit: Ruth Bonneville / Winnipeg Free Press Files

Case Study of Plan Utilizing a Pilot Program:
Kane County Solid Waste Management and Resource Recovery Plan (Illinois)

- Kane County Department of Environmental Resources, 2015.[16]
- Type of Plan: Waste Management
- Target: None specified
- Plan's Level of Detail on Wasted Food: High; described in its own multi-page sections with many proposed strategies

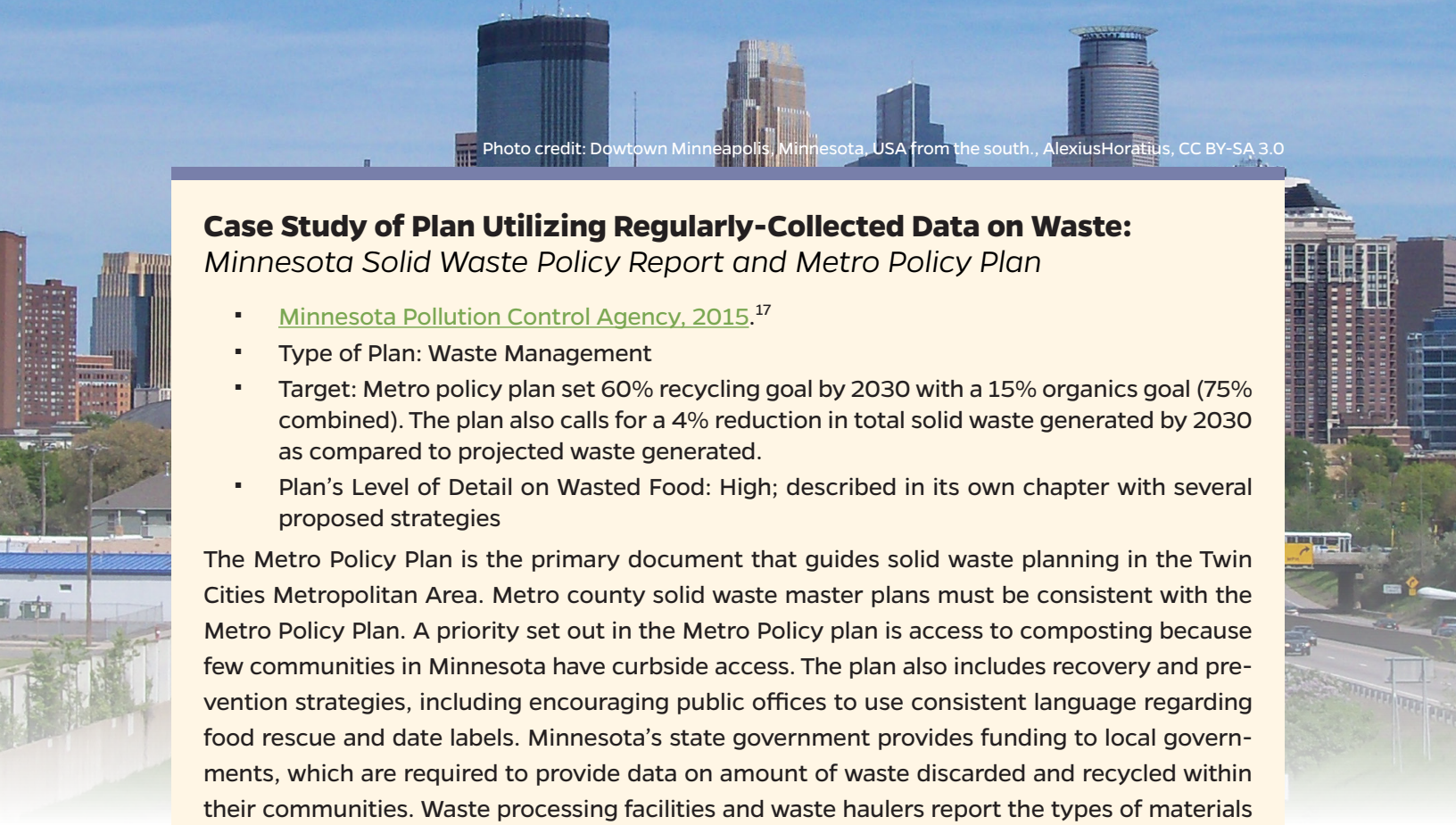
The Kane County Department of Environmental Resources refers to wasted food as "food scraps." In 2009, a study found that 13% of the waste stream in Illinois was food scraps. Over the next few years, several public acts were passed by the Illinois legislature, lowering regulatory barriers for composting facilities to accept food scraps. The rationale for diverting food scraps from their landfills includes increasing landfill capacity, reducing methane emissions, and recovering valuable resources via composting and anaerobic digestion.

Their 2015 plan shared that they were actively working to advance composting in the state by working with the Illinois Food Scrap Coalition (IFSC) and a broad base of stakeholders including generators, haulers, processors, and landscape professionals. Kane County began its first residential food scrap collection pilot program in May of 2017 in the Mill Creek Special Service Area, a neighborhood of 2,300 homes in central Kane County. Food scraps are combined with yard waste for weekly curbside collection April through November. Free market haulers also collect food scraps from commercial generators throughout the county, and the plan encourages municipal and township program managers to consider future implementation of curbside collection including pay-as-you-throw billing structures. The county additionally provides backyard compost bins for sale at a low cost to residents through a partnership with the University of Illinois. The plan identifies a strong partner in their plan, IFSC, which formed of Illinois county recycling program coordinators and other stakeholders in 2012 to advance food scrap composting by working to create networks between generators, haulers, and processors, while also working on commercial business education and outreach and advancing end-markets for the finished compost. While the IFSC had discussed changing their mission to include recovery, they decided to stick to composting because there are very active food recovery organizations in the area doing that work, the largest of which is the Northern Illinois Food Bank, located in Kane County.

or landfill. In many instances, local zoning excludes solid waste disposal facilities, which was intended for landfills, but if the state laws identify composting facilities as solid waste disposal facilities, the locality might reject a composting facility on basis of being a solid waste disposal facility. Zoning officials are often more willing to approve zoning permits if they know that the facility is permitted and regulated by the state.

- **Have composting site managers get certified** (e.g., from the US Composting Council) so they are well equipped to manage their facility well. With good management and newer approaches to composting (e.g., aerated piles, in-vessels, and conducting operations inside buildings), odors and other issues that were more prevalent in former decades can be prevented and mitigated.

- **Use this as an opportunity to push solutions up the hierarchy.** In some jurisdictions, a negative perception of composting could be leveraged to instead push for implementation of prevention and/or recovery solutions, which often garner more positive environmental impacts than composting.[8]



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Case Study of Plan Utilizing Regularly-Collected Data on Waste:
Minnesota Solid Waste Policy Report and Metro Policy Plan

- Minnesota Pollution Control Agency, 2015.[17]
- Type of Plan: Waste Management
- Target: Metro policy plan set 60% recycling goal by 2030 with a 15% organics goal (75% combined). The plan also calls for a 4% reduction in total solid waste generated by 2030 as compared to projected waste generated.
- Plan's Level of Detail on Wasted Food: High; described in its own chapter with several proposed strategies

The Metro Policy Plan is the primary document that guides solid waste planning in the Twin Cities Metropolitan Area. Metro county solid waste master plans must be consistent with the Metro Policy Plan. A priority set out in the Metro Policy plan is access to composting because few communities in Minnesota have curbside access. The plan also includes recovery and prevention strategies, including encouraging public offices to use consistent language regarding food rescue and date labels. Minnesota's state government provides funding to local governments, which are required to provide data on amount of waste discarded and recycled within their communities. Waste processing facilities and waste haulers report the types of materials they collect and how much to the state annually. The Minnesota Pollution Control Agency gets this data on the types of waste being collected and its weight throughout the state and uses the data to set goals and measure progress toward them.

Strategies for wasted food reduction vary greatly by jurisdiction. In some jurisdictions, greater emphasis is placed on the technological role of meeting goals. While prevention strategies result in the greatest environmental benefits, counties often emphasize waste diversion to reach their recycling and organics goals. In order to maximize success, Minnesota Pollution Control Agency staff has been working with a wider array of partners (such as food rescue organizations, non-governmental organizations, and universities) to be more effective with source reduction since most county partners are focused on end-of-pipe waste management that is lower in the EPA food recovery hierarchy. MPCA encourages partners to utilize existing tools—including EPA's Food: Too Good to Waste and Save the Food—for tips on prevention including how to document changed behaviors as well as how to measure food that is wasted before and after interventions.[18,19]

Setting targets has helped Minnesota move past a plateau in waste collection and led to the state legislature putting more money into recycling programs. The Metro Policy Plan is a 20-year plan that is redone every six years. Since the adoption of the 2010 plan, the state has seen intense growth in organics composting. Their biggest challenge since developing their plan has been expanding the reach of access to organics recycling and ensuring adequate capacity to compost all of the collected organics. The amount of source separated organics material collected in 2015 was more than double what was collected in 2011. In the metro area, there are seven counties and 160 municipalities, each having their own way of managing waste—and the economics of waste management do not always align with prevention strategies.

- **Data collection issues.** While data collection is important to most jurisdictions, not all have the capacity to conduct a waste characterization study, pilot composting study, etc. Many mentioned that having data on the exact climate impact as well as the exact cost savings of wasted food reduction would help them to frame the issue and impact better to influential stakeholders. Unfortunately, both of these calculations depend highly on what food is not wasted, what is done with it instead, and local costs.

    - **Check out EPA's Waste Reduction Model** (WARM).[5] This tool was created to help solid waste planners and organizations track and report greenhouse gas emissions reductions from many different waste management practices. The newest version has been updated to differentiate yard trimmings and paper waste from food scraps.

    - **Use existing data to develop estimates of the cost and impact of each action included in the plan to address wasted food.** For example, several articles offer data on the methane mitigation potential from reducing the landfilling of wasted food: Potential for Reducing Global Methane Emissions from Landfills, 2000-2030; and the Food and Agriculture Organization of the United Nations' report, Food Wastage Footprint & Climate Change.[20,21]

    - **Partner with local organization(s)** that could help with more local and relevant data collection. You may be able to expand your capacity through a partnership with a local university researcher, graduate, or undergraduate student, or nonprofit to enable collecting the needed data, doing a pilot study, etc.

- **Waste management crossing jurisdictional borders.** Many interviewees, particularly state-level employees, reported concerns about the local and fragmented nature of waste collection. For example, some jurisdictions have their own waste collection service but do not have a composting facility, anaerobic digester or landfill within their borders so they must contend with politics across several jurisdictions to implement their plans.

  - **Highlight this concern in your plan** to help identify solutions across jurisdictions. To what extent can partnerships with others in those jurisdictions help minimize political barriers?

  - **Work at the state level when possible to address cross-county challenges**.

  - **In some of these cases, it may be easier to focus planning on prevention and recovery strategies** than increasing local waste processing capacity, because the latter may have to compete with the waste feedstock needs of a landfill or waste-to-energy plant.

  - **Consider franchising waste management**, i.e. hiring a private company to handle composting, recycling, etc., to minimize the need for large centralized infrastructure and lower the risk of needing to keep waste generation high, such as to feed an incinerator.

- **Lack of scale.** Most small municipalities lack the budget to make large scale infrastructure improvements like building composting facilities.

  - **Partner with others** to generate sufficient capacity for a larger facility depending on the feedstock needed. The state and agencies like the US EPA may be able to help municipalities partner with one another if they are not already connected. Sometimes large scale infrastructure is not the optimal solution, depending on the distances the waste would have to travel to get sufficient feedstock to operate a composting or anaerobic digestion system. Weigh the different strengths of different infrastructure projects in smaller places and a smaller scale project may be the most cost-effective.

ADDITIONAL WORDS OF WISDOM FROM ONE JURISDICTION TO ANOTHER

- **Keep in mind your local context.** While the plans identified in this report provide many examples of effective approaches, there are no one-size-fits-all solutions to combat food loss and waste. Each jurisdiction has its own unique resources and challenges. In reviewing examples, consider how your jurisdiction compares on factors including size, geography, political leanings, stakeholder interests, and extent of existing activities on the issue.

- **Make a plan for evaluation.** Having data to show progress contributes to building and keeping support from the public, legislators, and funders. In order to show progress, baseline data and ongoing evaluation activities are needed. Strategies used in the plans we reviewed include feasibility studies, wasted food stream analyses, program evaluation, and surveillance. Evaluating the connection between the plan goals, activities—and actual environmental outcomes is also important to assure that the plan is having its intended impact. Some helpful resources for evaluation strategies include:
  - LeanPath: Food Waste Prevention for Food Service Organizations.[23]
  - A Guide to Conducting and Analyzing a Food Waste Assessment.[24]
  - Food Waste Management Calculator.[25]
  - Waste Reduction Model.[4]
  - Food Loss and Waste Accounting and Reporting Standard.[26]
  - Food: Too Good to Waste: An Evaluation Report.[27]

- **Plan for success in the implementation phase while still in the planning phase.** Having a vision plan is great when first starting out, but beyond that, having concrete action steps to meet goals and targets in a plan for reducing wasted food is essential for success. Clearly specifying roles, action steps, deadlines, and measures of enforceability can help in the implementation phase—which is often harder than the planning phase. For example, if the government has partnerships, which partner(s) will implement an "ugly produce" promotion campaign, which partner(s) will be in charge of running composting workshops; what will be each partner(s)

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Case Study of Plan at State Level Addressing a Range of Diverse Local Contexts:
Maine Materials Management Plan

- Maine Department of Environmental Protection, 2014 update.[22]
- Type of Plan: Waste Management
- Target: Recycle or compost 50% of Municipal Solid Waste (MSW) tonnage per year by 2014; Reduce biennial generation of MSW tonnage by 5% every 2 years starting in 2009
- Plan's Level of Detail on Wasted Food: Moderate; has its own brief section with two strategies for reducing wasted food

In Maine, the responsibility for waste services rests at the municipal level, and there are nearly 500 municipalities across the state. Each municipality is supposed to be "showing reasonable progress" toward the state's 50% recycling or composting state goal. Currently, there is a ~40% statewide average recycling rate and a wide range of cooperation, with some municipalities diverting over 50% and others having little or no recycling program at all. About half of the communities partner with others to provide services.

To account for the unique resources and challenges of the municipalities across the state, this Maine state-wide plan lays out a toolbox of ways that each municipality could reduce their wasted food. The majority of the Maine population lives south of Augusta, leaving the northern population more spread out with farther distances for shopping and with the need for more localized solutions - e.g., local food scrap composting operations, engaging the agricultural community to increase participation in food scrap composting, and developing outreach and education strategies to assist food scrap generators with separation programs. By contrast, the options that may be preferred by municipalities south of Augusta include more centralized composting operations due to their higher density and hence larger capacity. The state's toolbox encourages interventions including developing new infrastructure for composting and anaerobic digestion, and providing technical and regulatory assistance to support the development of regional processing facilities for tasks such as collection, sorting, and composting.

metrics for success and deadlines? How do these efforts align with a broader strategic plan?

- **Enable community input.** Many municipalities held community meetings to gain feedback on their plans, although some realized they were only able to gather a certain portion of the community. To gather an audience more representative of the wider community, some municipalities used online ballots and a variety of advertising methods including flyers, radio ads, and social media posts. In other cases, participation is supported by specific outreach to key community leaders; scheduling meetings outside the regular workday; conducting surveys by canvassing door-to-door, phone, mail, or email; going out to existing community meetings and functions rather than expecting community members to travel and clear extra time; and by providing food and childcare at meetings.

- **Consider wasted food reduction strategies first if you have no organics collection program yet.** It could be the cheapest option—setting up composting programs, anaerobic digesters, etc., requires a significant investment in new infrastructure. Existing collection programs can integrate prevention as tools and resources become available.

- **Share your stories of success and failure.** Don't make others re-invent your broken wheel or miss out on a great strategy you've discovered. Don't be shy about what you would do differently to overcome internal and external limitations.

- **Build on what is already out there.** Make sure you stay on top of the best prevention, recovery, and recycling strategies and technologies. Further, go and see other sites if you can before you choose a solution for your jurisdiction; what you see on paper will not help nearly as much and seeing how it works in reality. Some highly recommended resources are:
  - Further with Food.[28]
  - Biocycle Magazine.[29]
  - Food: Too Good to Waste Implementation Guide and Toolkit.[18]
  - Sustainable Management of Food.[30]
  - A Roadmap to Reduce U.S. Food Waste by 20 Percent[8]
  - Save Food: Global Initiative on Food Loss and Waste Reduction.[31]

- United States 2030 Food Loss and Waste Reduction Goal.[32]
- Save the Food.[19]
- Legislation to reduce food waste.[33]
- Recycling, recovering and preventing "food waste": competing solutions for food systems sustainability in the United States and France.[34]
- Household waste prevention—a review of evidence.[35]
- Addressing food waste reduction in Denmark.[36]
- Quantifying food losses and the potential for reduction in Switzerland.[37]
- Preventing Food Waste: Case Studies of Japan and the United Kingdom.[38]
- The basis of a policy for minimizing and recycling food waste.[39]
- The impact of Local Authorities' interventions on household waste collection: a case study approach using time series modelling.[40]
- ReFED Innovator Database.[41]
- Food Waste Policy Finder.[7]
- [Wasted Food Prevention White Paper: The West Coast Climate and Materials Management Forum has performed interviews with nine government agencies regarding their food waste policy implementation. Report expected to be released in late 2017.] [42]
- The Business Case for Reducing Food Loss and Waste.[43]
- Reducing Food Waste by Changing the Way Consumers Interact with Food.[44]

Don't forget to be innovative. In addition to building on existing policies and plans, it can be effective to start with a clear understanding of the problem in your jurisdiction, the drivers for action, the barriers, and the stakeholders and resources that can come together to tackle wasted food.

Conclusion

In summary, the number of plans with goals to address wasted food is increasing. Most commonly, wasted food is addressed in waste management plans, with primary focus on composting. This is consistent with a recent analysis examining stakeholder approaches to wasted food across food value chains.[45] The author, Dr. Marie Mourad, recommends that advocates encourage government and corporate actors to work together to improve the sustainability of solutions, to focus at the prevention end of the hierarchy, and to question consumption patterns and food systems in a holistic way rather than piecemeal. Jurisdictions that include numerical targets for waste diversion within their plans have set very diverse, often ambitious targets. Currently, only some plans include strategies for evaluation and few focus on wasted food prevention—two major gaps were identified in this analysis.

This report provides jurisdictions with a summary of what others are doing along with their successes and challenges. While this report can guide discussions on creating and improving food loss and reduction plans, every jurisdiction is different, with its own unique resources and challenges. There is no silver bullet, but this report has reviewed a suite of options that jurisdictions can evaluate in context of their local situations to develop ambitious and effective plans to address food loss and waste, and contribute to the national goal of halving food loss and waste by 2030.

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Appendix A: Definitions

These definitions have been adapted from ReFED's A Roadmap to Reduce Food Waste by 20 Percent Report as well as from the Natural Resource Defense Council's (NRDC) report, Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill.[9,46] Please note that these definitions are specific to wasted food, although the terms themselves may have broader definitions.

- **Anaerobic digestion:** process by which a machine breaks down biodegradable material in the absence of oxygen through a series of biological procedures to produce biogas which can be combusted to generate electricity or be converted into transportation fuels
- **Animal feed:** feed for animals, in this context made from food that would otherwise be wasted; usually manufactured with heat treatment and dehydration, and either mixed with dry feed or fed directly
- **Avoidable food waste** (also known as "edible wasted food"): the edible portion of food discards that may have been avoidable with effective prevention activities
- **Backyard composting:** individual-level composting by residents
- **Bins for composting:** bins or containers for storing compost within businesses or homes (as an intervention: provision of these bins)
- **Business partnerships for donations:** voluntary or mandatory programs that facilitate donation partnerships between food businesses and food banks or meal programs
- **Commercial composting:** composting by commercial food businesses (e.g., restaurants, food retailers, food service organizations)
- **Commercial education:** awareness campaigns to raise awareness of wasted food and promote responses among commercial entities like food service organizations and supermarkets
- **Commercial greywater:** greywater aerobic digesters use combinations of nutrients or enzymes and bacteria to break down food organics until soluble; the greywater is then flushed into the sewage system
- **Community composting:** neighborhood-level composting units
- **Composting:** process whereby plants, foods, and other organic material is converted into fertile soil by letting it decompose through the action of aerobic bacteria, fungi, and other organisms; composting facilities speed up this process through active turning and combining of feedstocks
- **Compost-related infrastructure:** infrastructure related to compost collection, storage, and processing
- **Consumer education:** often large-scale consumer education campaigns to raise awareness of wasted food and promote strategies to reduce waste and increase composting
- **Donation incentives:** incentives to increase farm and business donation of food, commonly these are tax benefits and simplifying donation reporting for tax deductions
- **Donation logistics and infrastructure**: approaches leveraging technology, specifications, and best-practices to enhance the efficiency of matching food donors and recipients, and to improve storage and transport of donated food

- **Donation requirements for governments:** requirements for government agencies to donate unused, surplus food
- **Education in schools:** education to raise awareness of wasted food and motivate responses among students in schools
- **Equipment and building specifications:** infrastructure-related requirements for businesses within the food supply chain
- **Feasibility studies:** studies of pilot programs and related efforts preliminary to fully implementing wasted food activities
- **Food loss**: the edible amount of food, postharvest, that is available for human consumption but is not consumed for any reason
- **Food retail infrastructure:** retail inventory management systems to track the time left to sell an item and to help reduce the length of time before perishable items are sold
- **Food safety regulations:** regulations related to food safety
- **Formation of advisory groups:** activities promoting the formation of cross-sector advisory groups related to wasted food
- **Government purchasing of compost:** rules requiring governments to purchase and use compost in public facilities
- **Grants and research:** funding for research projects related to wasted food
- **Job training in waste management:** training individuals for employment related to composting and wasted food management
- **Landfill ban:** ban of disposal of materials at a landfill; may be restricted to certain types of materials such as electronics but in this case organic waste; intended to divert this waste to recycling, composting, and other destinations, and in some cases to prevent waste
- **Landfill fee:** fee charged for disposal of materials in a landfill
- **Markets for compost:** activities to promote the marketability and demand for compost-based products
- **Master composter training:** training for community members interested in becoming "master composters"
- **Organics diversion:** diversion of organic waste, including food, plant trimmings, and paper, from being landfilled or incinerated
- **Packaging improvements:** improvements to food packaging including changes in package size and design to reduce waste
- **Produce specifications:** "accepting and integrating the sale of off-grade produce (short shelf life, different size/ shape/ color), also known as 'ugly' produce, for use in foodservice and restaurant preparation and for retail sale"
- **Program evaluation:** formal evaluation of wasted food related activities
- **Food Recovery:** saving food for animal or human consumption that would otherwise be disposed
    - Most commonly used to refer to recovery for direct human consumption, but some states also refer to other strategies using this as an umbrella term including recycling and putting discarded materials to any beneficial use including processing into value added products and creating animal feed
- **Residential composting:** composting at home, typically for the purpose of processing compost at home or curbside municipal collection

- **Source reduction:** working with those who generate waste, including consumers, to reduce unnecessary production, purchasing and serving of excess food
- **Standardized dates:** standardizing the date label on food packages to create a consistent labeling scheme and reduce consumer confusion
- **Standardized donation regulations:** creating nationally standardized health regulations for safe handling and donation of food
- **Supply chain management:** managing the supply chain to reduce product loss, such as by using direct shipments, cold-chain-certified carriers, and careful management of time spent in transit
- **Surveillance:** activities to measure and monitor wasted food
- **Training for professionals:** training employees on how to work with and process wasted food for composting or other purposes
- **Value-added processing:** processing foods (in this case, those that are donated or would otherwise be wasted) into products that are less perishable, such as soups, sauces, or juices
- **Waste diversion**: keeping waste out of the landfill, often through composting or other approaches; less commonly used to refer to source reduction activities even when they have this result.
- **Waste stream analysis:** formal study of waste within a jurisdiction
- **Waste tracking and analytics:** tracking commercial food discards (such as in restaurants) in order to identify wasteful practices and operational strategies to prevent them
- **Zero waste certification:** zero waste certification for waste management professionals
- **Zero waste:** exact definition varies by jurisdiction, but generally defined as 90-100% diversion of materials from the landfill

Appendix B: Reports Reviewed

Key		
Plan Type		Level of Detail on wasted food
CC	Climate change plan	Minimal - Described exclusively as a component of another section (e.g., recycling or energy reduction)
WM	Waste management plan	Moderate - Described in its own brief section with one to two proposed strategies
WF	Wasted food plan	High - Described in its own chapter or multi-page section with three or more proposed strategies
ZW	Zero waste plan	
SU	Sustainability plan	

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
			Municipality			
Albuquerque, NM, USA	City of Albuquerque Climate Action Plan: Recycling and Zero Waste	2009	The Recycling and Zero Waste Workgroup of the Climate Action Task Force	CC	30% recycling rate by 2020	Moderate
Ann Arbor, MI, USA	Waste Less: City of Ann Arbor Solid Waste Resource Plan Update 2013-2017	2013	Environmental Commission, Resource Recycling Systems	WM	40% diversion by 2017	Moderate
Austin, TX, USA	Zero Waste Strategic Plan	2008	Gary Liss & Associates, Richard Anthony Associates	ZW	Zero compostable organics by 2015	Moderate
Baltimore, MD, USA	The Baltimore Sustainability Plan	2009	Baltimore Commission on Sustainability, Baltimore Office of Sustainability	SU	None specified	Moderate
Barcelona, Spain	Waste Prevention Plan for Barcelona 2012-2020	2013	Barcelona Department of Environment and Urban Services	WM	Recover 10% of wasted food for food banks by 2020	Moderate
Berkeley, CA, USA	Berkeley Climate Action Plan	2009	The City of Berkeley	CC	50% reduction by 2020	Moderate
Boston, MA, USA	Greenovate Boston: 2014 Climate Action Plan Update	2014	Climate Action Plan Steering Committee	CC	None specified	Moderate
Brattleboro, VT, USA	The Climate Action Plan	2003	Brattleboro Climate Protection Task Force	CC	None specified	Minimal
Cambridge, MA, USA	City of Cambridge Climate Protection Plan	2002	Climate Protection Task Force	CC	None specified	Moderate
Dallas, TX, USA	City of Dallas Local Solid Waste Management Plan: 2011-2060	2013	HDR Inc., CP&Y Inc., Risa Weinberger & Associates Inc., City of Dallas Sanitation Services Department	WM	40% diversion by 2020	Moderate

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
Denver, CO, USA	A Master Plan for Managing Solid Waste in the Mile High City	2010	Denver Public Works	WM	30% reduction by unspecified deadline	Moderate
Fort Collins, CO, USA	Road to Zero Waste Plan	2013	Zero Waste Associates, HDR Inc., Zero Waste Strategies	ZW	75% diversion by by 2020	High
Fort Lauderdale	Sustainability Action Plan: Update 2011	2011	Sustainability Advisory Board, Carbon Solutions America, City of Fort Lauderdale Green Team	SU	increase recycling rate by 50% by by 2020	Minimal
Fresno, CA, USA	Zero Waste Strategic Plan	2008	Solid Waste Management Division	ZW	75% diversion by 2012	Moderate
Hartford, CT, USA	2015 Annual Report: Recommendations to Improve Food Access & Food Security	2015	City of Hartford Advisory Commission on Food Policy	WF	None specified	Moderate
Hong Kong, China	A Food Waste and Yard Waste Plan for Hong Kong: 2014-2022	2014	Environment Bureau	WF	40% reduction in per capita disposal rate by 2022	High
Houston, TX, USA	Commercial Food Waste Collection in the H-GAC Planning Region	2015	Houston-Galveston Area Council, Risa Weinberger & Associates Inc., NewGen Strategies & Solutions	WF	None specified	High
Madison, WI, USA	The Madison Sustainability Plan: Fostering Environmental, Economic and Social Resilience	2011	Sustainable Madison Committee	SU	75% waste diversion by 2020	Moderate
Minneapolis, MN, USA	Minneapolis Climate Action Plan	2013	Sustainability Office	SU	Increase organics collection to 15% of waste stream by 2025	High
New York City, NY, USA	One New York	2015	City of New York	SU	100% diversion of waste to landfills by 2030	Moderate
Oakland	Zero Waste Strategic Plan	2006	Public Works, Oakland Climate Action Coalition	ZW	100% diversion by 2020	Minimal
Palo Alto	Zero Waste Strategic Plan	2005	Gary Liss & Associates, Palo Alto Zero Waste Task Force	ZW	Zero Waste by 2020 by 2011	Moderate
Philadelphia, PA, USA	Philadelphia Food Policy Advisory Council Annual Report 2015	2015	Philadelphia Food Policy Advisory Council, Zero Waste Subcommittee	WF	100% diversion by unspecified deadline	High
Phoenix, AZ, USA	Solid Waste Strategic Plan: 2016-2021	2016	City of Phoenix Public Works Department	WM	None specified	Moderate
Portland, OR, USA	Portland Recycles! Plan	2008	City of Portland Office of Sustainable Development	WM	None specified	Moderate
Princeton, NJ, USA	Sustainable Princeton Community Plan	2008	Sustainable Princeton Steering Committee, Princeton Environmental Comission, New Jersey Sustainable State Institute	SU	None specified	Moderate

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
San Diego, CA, USA	City of San Diego Zero Waste Plan	2015	City of San Diego Environmental Services Department	ZW	75% diversion by 2020	Moderate
San Francisco, CA, USA	Zero Waste Plan	2004	San Francisco Department of Public Works	ZW	10% diversion by 2020	High
San José, CA, USA	Integrated Waste Management Zero Waste Strategic Plan	2008	City of San José Environmental Services Department	ZW	zero waste by 2022	Moderate
Seattle, WA, USA	Seattle's Solid Waste Plan: 2011 Revision	2011	Seattle Public Utilities, Solid Waste Advisory Committee	WM	70% recycling by 2025	Moderate
Tallahassee, FL, USA	Greening of Florida: Solid Waste Management Roadmap	2009	Environmental Policy and Energy Resources, Kessler Consulting Inc.,	WM	75% recycling rate by unspecified deadline	Moderate
Toronto, CA	Final Long Term Waste Management Strategy	2016	HDR Inc.	WM	3% additional diversion by unspecified deadline	Moderate
Troy, NY, USA	Food Waste Recycling in the Capital District	2015	Climate Action Associates LLC, Capital District Regional Planning Commission	WF	None specified	High
Tucson, AZ, USA	City of Tucson Waste Diversion Plan and Roadmap	2014	Cascadia Consulting Group Inc., Environmental Services Department	WM	None specified	Moderate
Vancouver, CA	Food Waste Diversion Plan	2014	Council of the City of Vancouver	WF	50% diversion by 2020	High
Washington, DC, USA	Sustainable DC Plan	2013	Green Ribbon Committee, Green Cabinet, Mayor's Office	SU	0 waste, 15% waste generation reduction by 2032	Moderate
			County			
Alameda County, CA, USA	Zero Waste Implementation Plan	2010	HDR Inc., Gary Liss & Associates, City of Alameda Department of Public Works	ZW	None specified	Moderate
Arlington County, VA, USA	Arlington County Solid Waste Management Plan	2004	Department of Environmental Services, Solid Waste Committee, Office of County Manager, County Board	WM	Increase 2004's recycling rate by 47% by 2024	Minimal
Boulder County, CO, USA	Boulder County Zero Waste Action Plan	2009	Boulder County Resource Conservation Advisory Board, Zero Waste Technical Committee	ZW	Reduce commercial food compost by 2140 tons by 2011-2013	Moderate
Cook County, IL, USA	Cook County Solid Waste Management Plan: 2012 Update	2012	Delta Institute, Cook County Department of Environmental Control	WM	None specified	Minimal
Cuyahoga County, OH, USA	Solid Waste Management Plan Update: 2013-2028	2013	GT Environmental Inc., Cuyahoga County Solid Waste Management District	WM	25% of solid waste by 2028	Moderate

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
East Central Iowa Region	Regional Comprehensive Integrated Solid Waste Management Plan	2011	East Central Iowa Council of Governments Solid Waste Technical Advisory Committee	WM	50% waste reduction by 2017	Moderate
Hawaii County, USA	Zero Waste Implementation Plan for the County of Hawaii	2009	Department of Environmental Management, Recycle Hawaii, Richard Anthony Associates	ZW	80% diversion rate by 2013	Moderate
Kane County, IL, USA	Solid Waste Management and Resource Recovery Plan: 2015 Update	2015	Kane County Division of Environmental and Water Resources, Development & Community Services Department	WM	None specified	Moderate
King County, WA, USA	Comprehensive Solid Waste Management Plan	2013	Department of Natural Resources and Parks Solid Waste Division, Solid Waste Advisory Committee, Metropolitan Solid Waste Management Advisory Committee	WM	45% single-family recycling, 55% overall recycling rate by 2015	Moderate
Lincoln and Lancaster County, NE, USA	Solid Waste Plan 2040	2013	HDR Inc.	WM	1,940 pound reduction in per capita rate of disposal by 2018	Minimal
Macon County, IL, USA	Municipal Waste Management Plan Update	2012	Patrick Engineering, Macon County Environmental Management	WM	None specified	Minimal
Mecklenburg County, NC, USA	Solid Waste Management Plan	2012	Kessler Consulting, HDR Inc., Mecklenburg County Solid Waste, Land Use and Environmental Services Agency	WM	None specified	Minimal
Miami-Dade County, FL, USA	GreenPrint: Our Design for a Sustainable Future	2010	Mayor's Sustainability Advisory Board, GreenPrint Core Planning Team, Climate Change Advisory Task Force, ICLEI Local Governments for Sustainability	SU	None specified	Minimal
Napa County, CA, USA	Napa Countywide Community Climate Action Plan	2009	Climate Campaign, MIG Communications,	CC	75% diversion of organic waste by 2020	Moderate
Prince George's County, MD, USA	Comprehensive Ten-year Solid Waste Management Plan FY2012-FY2022	2012	Department of Environmental Resources	WM	None specified	Minimal
Santa Cruz County, CA, USA	Composting Organic Waste in Santa Cruz County	2015	Santa Cruz County Board of Supervisors	ZW	None specified	Moderate
Spokane County, WA, USA	Spokane County Solid Waste and Moderate Risk Waste Management Plan	2015	Spokane County, SCS Engineers	WM	65% recovery rate by 2020	Moderate
Tilamook County, OR, USA	Tillamook County Comprehensive Materials and Solid Waste Management Plan	2012	Green Solutions, Chris Bell & Associates, Tillamook County Solid Waste Advisory Committee	WM	None specified	Moderate
State						

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
Arkansas, USA	2014 Statewide Solid Waste Management Plan	2014	Arkansas Department of Environmental Quality	WM	None specified	Minimal
California, USA	AB 341 Report to the Legislature	2015	California Department of Resources Recycling and Recovery	WM	75% recycling rate, 50% diversion of organics from waste stream by 2020	High
Connecticut	Comprehensive Materials Management Strategy	2016	Connecticut Department of Environmental Protection	WM	60% diversion by 2024	Moderate
Delaware, USA	Statewide Solid Waste Management Plan	2010	Delaware Solid Waste Authority	WM	82% diversion by unspecified deadline	Moderate
Kansas, USA	Adequacy of Waste Reduction Practices in Kansas	2013	Bureau of Waste Management, Kansas Department of Health and Environment	WM	None specified	Minimal
Maine, USA	Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report	2014	Maine Department of Environmental Protection_x000D_	WM	50% recycling rate by 2014	Moderate
Maryland, USA	Zero Waste Maryland: Maryland's Plan to Reduce, Reuse and Recycle Nearly All Waste Generated in Maryland by 2040	2014	Maryland Department of the Environment_x000D_	ZW	35% recycling goal for food scraps by 2020	High
MASSACHUSETTS, USA	Massachusetts 2010-2020 Solid Waste Master Plan April 2013: Pathway to Zero Waste_x000D_	2013	Massachusetts Department of Environmental Protection, Executive Office of Energy and Environmental Affairs	WM	35% diversion for organics by 2020	High
Michigan, USA	Michigan's Residential Recycling Plan	2015	Michigan Department of Environmental Quality	WM	Doubling recycling rate by unspecified deadline	Minimal
Minnesota, USA	2015 Minnesota Solid Waste Policy Report	2016	Minnesota Pollution Control Agency	WM	75% recycling rate for Metro Area by 2030	High
Montana, USA	Integrated Waste Management Plan 2013	2013	Montana Department of Environmental Quality, Energy and Pollution Prevention Bureau	WM	22% recycling rate by 2015	Minimal
New Jersey, USA	New Jersey Statewide Solid Waste Management Plan	2006	New Jersey Advisory Council on Solid Waste Management, Department of Environmental Protection	WM	50% diversion by unspecified deadline	High
North Carolina	An Update of the North Carolina Solid Waste Management Plan	2013	North Carolina Department of Environment and Natural Resources	WM	Substantially increase the amount of waste recycled and composted by 2013	Moderate
Ohio, USA	Ohio State Solid Waste Management Plan 2009	2009	Environmental Protection Agency Division of Solid and Infectious Waste Management	WM	25% diversion of solid waste for residential/ commercial by unspecified deadline	High

Key

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Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
Oregon, USA	Materials Management in Oregon	2012	Oregon Department of Environmental Quality, nvironmental Quality Commission	WM	100% ban on food scraps (in consultation with local governments) by 2025	High
Rhode Island, USA	Solid Waste 2038: Rhode Island Comprehensive Solid Waste Management Plan	2014	Rhode Island Department of Administration, Division of Planning	WM	None specified	Moderate
South Carolina, USA	South Carolina Solid Waste Management Annual Report	2014	South Carolina Department of Health and Environmental Control, Division of Mining and Solid Waste Managemen	WM	None specified	High
Tennessee, USA	2015 - 2025 Solid Waste and Materials Management Plan	2015	Tennessee Department of Environment and Conservation	WM	40% recycling rate by 2025	High
Vermont, USA	Vermont Materials Management Plan: Moving from Solid Waste towards Sustainable Management_x000D_	2014	Vermont's Agency of Natural Resources	WM	33% reduction in organic waste by 2019	High
Washington, USA	The State Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics_x000D_	2015	Department of Ecology	WM	None specified	High
Country						
Australia	National Waste Policy: Less Waste, More Resources: Implementation Report 2011	2011	Australia Standing Council on Environment and Water 2012	WM	Reduced biodegradable material to landfill by unspecified deadline	Moderate
Austria	Federal Waste Management Plan 2011	2011	Austria Federal Ministry of Agriculture, Forestry, Environment and Water Management	WM	Reduce the accumulation of discarded foodstuffs by unspecified deadline	Moderate
Bulgaria	National Waste Management Plan 2014-2020_x000D_	2014	Bulgaria Ministry of Environment and Water	WM	Separation of 50% of municipal bio-waste by 2020	Minimal
Denmark	Denmark Without Waste	2013	Denmark Ministry of the Environment	WM	60% recycling of organic waste by 2018	Moderate
France	Fighting Food Waste: Proposals for a Public Policy	2015	France Ministries of Agriculture and the Environment	WF	50% reduction in food waste by 2025	High
Germany	Substantive implementtation of Article 29 of Directive 2008/98/EC -Scientific-technical foundation for a national waste prevention programme	2013	Germany Federal Environment Agency	WM	50% reduction in food waste by 2030	Moderate

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Location	Plan Title	Plan Year	Agency	Plan Type	Target	Level of Detail on Addressing Wasted Food
Ireland	National Strategy on Biodedradable Waste	2006	Ireland Minister for the Environment, Heritage and Local Government	WF	35% of biodegradable municipal waste generated in 1995 by 2016	High
Italy	National Food Waste Prevention Plan	2014	University of Bologna Department of Agricultural and Food Sciences, Last Minute Market	WF	5% reduction per unit of GDP of municipal waste by 2020	High
Japan	History and Current State of Waste Management in Japan	2014	Japan Ministry of the Environment	WM	Specific goal set for 26 industry groups. For example, convenience stores have a target value of 44.1 kg/million JPY by 2014	High
Malaysia	Development of a National Strategic Plan for Food Waste Management in Malaysia	2015	Malaysia Ministry of Housing and Local Government	WF	25% household recovery of waste by 2015	High
Myanmar	Keynote Address - "Issues on Post Harvest Losses"	2015	Myanmar Ministry for National Planning and Economic Development	WF	Zero loss or waste of food by unspecified deadline	High
Netherlands	Policy Letter on Sustainable Food Production	2013	The Netherlands Ministry of Agriculture	SU	20% reduction in food waste by 2015	Moderate
Norway	Norway National Waste Management and Prevention Plan: From Waste To Resources	2013	Norway Ministry of Climate and Environment	WM	None specified	Moderate
Portugal	European Compost Network Country Report of Portugal	2010	European Compost Network	WM	35% reduction in total amount of biodegradable municipal waste by 2020	Moderate
Scotland	Scotland's Zero Waste Plan	2010	Natural Scotland, Scottish Government	ZW	75% recycling of all waste by 2025	Moderate
Singapore	Factsheet on Food Waste Management_x000D_	2015	Singapore Ministry of the Environment and Water Resources, National Environment Agency	WF	70% recycling rate by 2030	High
South Africa	The National Organic Waste Composting Strategy	2013	South Africa Department of Environmental Affairs	WF	Zero waste by 2022	High
South Korea	Waste Prevention Policy	2016	South Korea Ministry of Environment	WM	20% reduction of food waste by unspecified deadline	High
Spain	Spanish Strategy: More Food, Less Waste	2013	Spanish Ministry of Agriculture, Food and the Environment_x000D_	WF	Limit food loss and waste by unspecified deadline	High

Key

CC Climate change plan **WM** Waste management plan **WF** Wasted food plan **ZW** Zero waste plan **SU** Sustainability plan

Appendix C: Methods Overview

INCLUSION AND EXCLUSION CRITERIA

Plans reviewed for this report were publicly issued planning documents from government entities, with actionable content on preventing, diverting, reducing, and/or managing food loss and waste. We included plans including content on addressing wasted food, including climate change plans, waste management plans, wasted food plans, zero waste plans, and sustainability plans. Documents were excluded if they did not include actionable strategies (i.e., those only stating scope or urgency of wasted food issues) or only described addressing wasted food (including diversion from a landfill and overall) and prevention in terms of future considerations. These inclusion and exclusion criteria were developed using data gathered from a preliminary review of wasted food plans and published grey literature reviews of wasted food policies.

Plans were identified through multiple search methods. Many municipal and state plans were identified through Biocycle magazine's surveys of residential wasted food collection in the United States. Additional plans were identified via Google using the terms "food waste plan" and "food loss plan." Government websites for all 50 states and the 50 largest metropolitan areas in the United States were also searched using the same terms. In addition to searches, the study team reviewed online directories of state, national, and supranational wasted food initiatives. This included the Association of State and Territorial Solid Waste Management Officials Reference Sheet of State Solid Waste Management Plans, the Food and Agriculture Organization's SAVE FOOD directory of wasted food initiatives, the European Union Commission Expert Group on Food Losses and Food Waste directory of commission and member state activities in preventing and addressing wasted food, and other composting and solid waste management directories (i.e., www.wasteportal.net, www.compost-network.info, http://compostingcouncil.org/). We also searched Google Scholar using the terms "food waste" or "food loss" and "plan" or "government". Papers identified through this search were reviewed for references to government wasted food plans. A search of Lexis Nexis State Statutes and Regulations was performed using the term "food waste", though we sought plans rather than statues or regulations. We also followed up on any mentions of wasted food planning that we encountered in the course of our ongoing work on wasted food. In some instances, a single jurisdiction had multiple documents related to wasted food planning. In such cases, information from multiple plans was used to populate the abstraction tool. Similarly, in some instances, a single metropolitan area had both a county-level and municipal plan. These cases were treated as separate municipal plans given the distinct approaches taken by counties and cities.

INTERVIEWS

Plans were numbered 1 to 93, and a random number generator was used to choose 40 numbers. The research team searched the 40 plans selected for primary authors and then used an internet search engine to find contact information. Emails were sent to these authors with details of the study, a consent form, and an explanation that the research team would like to speak with the person on their team with the most direct involvement in the development and/or implementation of the parts of the plan addressing wasted food.

After receiving a consent form and scheduling with the research team, seventeen 15-60-minute semi-structured interviews were performed November 2016 - January 2017. Generally, one research

team member conducted each interview while another recorded the interview and took notes, though some interviews were performed solo. Questions were chosen and ordered as appropriate to each interviewee and the flow of conversation:

BACKGROUND

1. Please describe your role in developing and/or implementing your jurisdiction's plan.
2. We have identified [Name of Jurisdiction's Plan]. Are there other plans in your jurisdiction that address wasted food that we should be aware of?

TARGET-SETTING

3. How were your target(s) or broad goals selected?
    a. PROBE: What was the reasoning?
    b. PROBE: How important were targets in other jurisdictions, in shaping your jurisdiction's thinking about this?
4. How effective do you think the activities or recommendations in the plan will be at enabling your jurisdiction to reach its target [or broader goals]?
    a. PROBE: Can you describe the pathways by which the activities in the plan help reach the targets?
5. What else would be helpful in meeting the targets?
6. How are you assessing progress toward the target?
    a. PROBES: Baseline data collection; Measurement; Methods – what, how, frequency, how quantified, etc.; Cost-benefit analysis
7. We want to understand more about how setting targets affects how the plan plays out. In what ways does having a target affect:
    a. What is in the plan?
    b. Implementation?
    c. Funding?
    d. Cooperation with partners?
8. [If applicable]: What does zero waste mean in your jurisdiction's context?

PLAN DEVELOPMENT

9. What contributed to the momentum to pass this plan and wasted food target?
    a. PROBE: What external stakeholders, if any, were critical to developing the plan?
    b. PROBE: What kind of intra-governmental support and collaboration helped?
10. What components received the most pushback from external stakeholders, and for what reasons? From internal stakeholders?
11. Were there other wasted food components discussed but not adopted into the plan? If so, why?
12. How far along is your jurisdiction in implementing its plans for wasted food?
13. [If not already covered] Can you point to successes coming out of the plan, either directly or indirectly?
14. What elements of the plans for wasted food have been the easiest to implement? most challenging? Have certain components of the plan received more attention than others during implementation?
15. If applicable, how were funds raised/allocated to implement the plan
16. [If not already covered] What have been some barriers to implementing the plan? What has been helpful?

NEXT STEPS

17. What research, if any, do you think is needed to help you in advancing wasted food goals?
18. How often is your plan updated?
    a. What updates do you hope or expect to see in relation to the wasted food components?
    b. Do you see areas for improvement?
19. To what extend to you think it is likely that wasted food will be incorporated into other planning documents from your jurisdiction, such as a food or sustainability plan?
20. What would you have done differently if you could go back?
    a. What advice would you give other jurisdictions starting out on developing plans?

The Johns Hopkins Bloomberg School of Public Health's Institutional Review Board (IRB) determined that the study was not human subjects research.