

THE ZERO WASTE MASTER PLAN



A GUIDE TO BUILDING JUST AND RESILIENT ZERO WASTE CITIES

.....
GLOBAL ALLIANCE FOR INCINERATOR ALTERNATIVES (GAIA)

ACKNOWLEDGEMENTS

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GAIA is a global network of more than 800 grassroots groups, NGOs, and individuals. We envision a just, zero waste world built on respect for ecological limits and community rights, where people are free from the burden of toxic pollution, and resources are sustainably conserved, not burned or dumped. We work to catalyze a global shift towards environmental justice by strengthening grassroots social movements that advance solutions to waste and pollution.

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Why Zero Waste?

WHY SHOULD CITIES WORK TOWARDS ZERO WASTE?

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We're facing a difficult road ahead: cities are contending with an economic downturn, the collapse of recycling markets, an escalating climate crisis, and a widening wealth gap leaving millions of Americans in a state of precarity. There's a clear need for systemic change.

These overlapping crises present an opportunity to build more resilient cities. By investing in a sustainable, just economy, we can mitigate the impact of future crises and bring much-needed relief to communities.



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Zero waste is an essential part of recovery. Through policies, programs, and infrastructure to minimize municipal waste streams and sustainably manage what's left, cities can support local economic development and livelihoods, improve air quality, and mitigate climate change. Zero waste is a means towards environmental goals and a holistic tool of social intervention towards well-being for all.

"Zero waste" is often conflated with recycling, and while recycling plays a role, we can't stop there. If business-as-usual waste growth continues, municipalities will likely face difficulties in securing the land and financial resources necessary to keep building additional waste management infrastructure. While improving waste management systems to more effectively recover and repurpose materials is necessary, emphasis must be placed on upstream strategies to reduce waste at the source.

PLANNING FOR ZERO WASTE

- **Accelerates economic recovery** – cities need equitable and inclusive recovery. Zero waste creates more jobs than traditional forms of waste disposal and presents new opportunities for local businesses.
- **Protects public health** – waste incineration causes serious health problems that low-income communities and communities of color are disproportionately living in. Zero waste reduces air pollution to ensure safe, liveable neighborhoods.

- **Manages the waste crisis** - China's ban on waste imports has created an unprecedented challenge for municipal waste management. At the same time, the volume of waste created continues to grow. Straightforward strategies to reduce waste and sustainably manage materials can alleviate this challenge.
- **Mitigates climate change** - landfilling and incineration are major climate polluters. Moving away from these outdated forms of waste management towards zero waste reduces emissions.

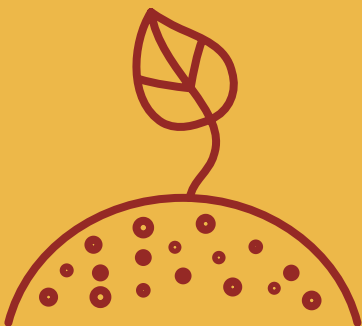
This toolkit is for policymakers, sustainability professionals, environmental advocates, and grassroots organizers seeking to replace outdated forms of waste management at the municipal level with smarter and more sustainable materials management practices. Together, we can build a green and just future for our cities.

Defining Zero Waste

The peer-reviewed and internationally-recognized definition of zero waste is:



The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning, and with no discharges to land, water, or air that threaten the environment or human health. ^[1]



1 Zero Waste International Alliance. (2018). *Zero Waste Definition*. <http://zwia.org/zero-waste-definition>



HOW ZERO WASTE WORKS

Actions in the waste sector assist municipalities in achieving emissions reduction goals. Downstream waste management policies such as recycling and composting have the potential to mitigate greenhouse gas emissions; upstream measures to reduce waste at the source help avoid greenhouse gas emissions altogether. The C40 Cities Advancing Towards Zero Waste Declaration states that “global waste generation is increasing faster than any other environmental pollutant.”^[2] These are clear signals for cities to take swift action to reduce the generation and disposal of waste.

The signatory cities have committed to:

1. Reduce the municipal solid waste generation per capita by at least 15% by 2030 compared to 2015; and
2. Reduce the amount of municipal solid waste disposed to landfill and incineration by at least 50% by 2030 compared to 2015, and increase the diversion rate away from landfill and incineration to at least 70% by 2030^[3]

In practical terms, zero waste has 5 overarching principles:^[4]

1. Implementing a goal to end waste disposal in dumps, landfills, and incinerators.

2 C40 Cities. (2018, August 28). Advancing Towards Zero Waste Declaration. <https://www.c40.org/other/zero-waste-declaration>

3 C40 Cities. (2018, August 28). Advancing Towards Zero Waste Declaration. <https://www.c40.org/other/zero-waste-declaration>

4 Global Alliance for Incinerator Alternatives. (2019, October). What's Zero Waste? Zero Waste World. <https://zerowasteworld.org/whats-zero-waste>

2. Requiring producers to redesign and take responsibility for the full lifecycle of their products.
3. Ensuring we do not consume more than the planet can continue to provide.
4. Developing systems and infrastructure to separate discards and recover maximum resources for reuse, recycling, and compost.
5. Grounding decision making in social and environmental justice, respecting and engaging all sectors that form the resources ecosystem.

ZERO WASTE: A JOURNEY, NOT A DESTINATION

Cities planning for zero waste doesn't necessarily mean not producing any waste. There are jurisdictional limits to what a municipality can do to reduce upstream waste production, although opportunities exist for cities to influence corporate actions and state policies. As with many other policies, zero waste is a journey, not a destination. Take the goal of zero pedestrian fatalities. For example: setting a goal of zero fatalities doesn't necessarily mean that policymakers believe that there will be no pedestrian deaths. Rather, it asserts that pedestrian fatalities are not acceptable, and that the municipality is taking actions towards the ultimate goal of zero deaths. Likewise, zero waste plans build the policies, programs, and infrastructure needed to get as close to a goal of zero as possible.

RECYCLING ALONE IS NOT ENOUGH

Recycling has long been positioned as a blanket strategy for sustainable waste management. Many cities have learned the hard way that recycling alone is not enough to address our waste management crisis. China's 2018 National Sword waste import ban exposed U.S. recycling systems as deeply flawed and reliant upon foreign waste markets. There is an increased level of awareness worldwide about the impacts of waste exports, and a growing number of countries are enacting regulations to prevent foreign waste from entering their borders. American municipalities have grown accustomed to exporting waste and the pollution that went along with it, and when China and other countries started to turn away our contaminated recycling, the costs for municipal recycling skyrocketed. Lack of domestic end markets for recycled materials—and the fact that most collected plastic is increasingly unrecyclable—has led to an increase of recyclables in ports and collection facilities.



With nowhere else to go, some of these recyclables are buried in landfills and burned in incinerators, creating climate emissions and damaging the health of local communities.

The case of plastic illuminates why recycling alone is not enough to solve the waste management crisis. Just 9% of all plastic ever discarded have been recycled,^[5] and the maximum recycling level for the current mix of plastic used is somewhere between 36% and 53%, even with the best available recycling technology.^[6] The majority of this waste is discarded in leaking landfills, burned in polluting incinerators, and filling up the ocean. While activists and policymakers make gains towards a renewable energy sector, the fossil fuel industry is looking to plastic as its new frontier. Without major intervention, plastic production will quadruple and comprise 15% of the global carbon budget by 2050.^[7] Meanwhile, municipalities and taxpayers are forced to pay to collect, sort, process, and transport a rapidly growing volume of waste. Human resource consumption is rising at an ever-increasing rate,^[8] and the problems extend beyond materials that have traditionally been considered as recyclable: food waste, fast fashion, and planned obsolescence in technology are all overburdening our waste systems. Organics in particular comprise a large portion of materials in municipal waste streams. Municipal compost programs reduce methane emissions from decomposing organic waste in landfills.

Furthermore, compost application enhances the soil's ability to sequester carbon, or act as a "sponge" that soaks up carbon in the atmosphere. There is growing momentum from city networks, transnational institutions, and foundations around food waste prevention and composting as a necessary climate action for cities: the number of U.S. communities with curbside collection programs increased 50% between 2009 and 2011,^[9] and 65% between 2014 and 2017.^[10] Composting, like recycling and reuse, holds a higher job creation potential than landfilling and incineration.^[11]

5 Geyer, R., Jambeck, J. & Lavender, K. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7). DOI:10.1126/sciadv.1700782

6 Denkstatt, (2015). The potential for plastic packaging to contribute to a circular and resource-efficient economy. Identiplast.

7 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company. (2016). The New Plastics Economy – Rethinking the future of plastics. <https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics>

8 World Wildlife Fund. (2018). Living Planet Report 2018: Aiming Higher. <https://www.worldwildlife.org/pages/living-planet-report-2018>

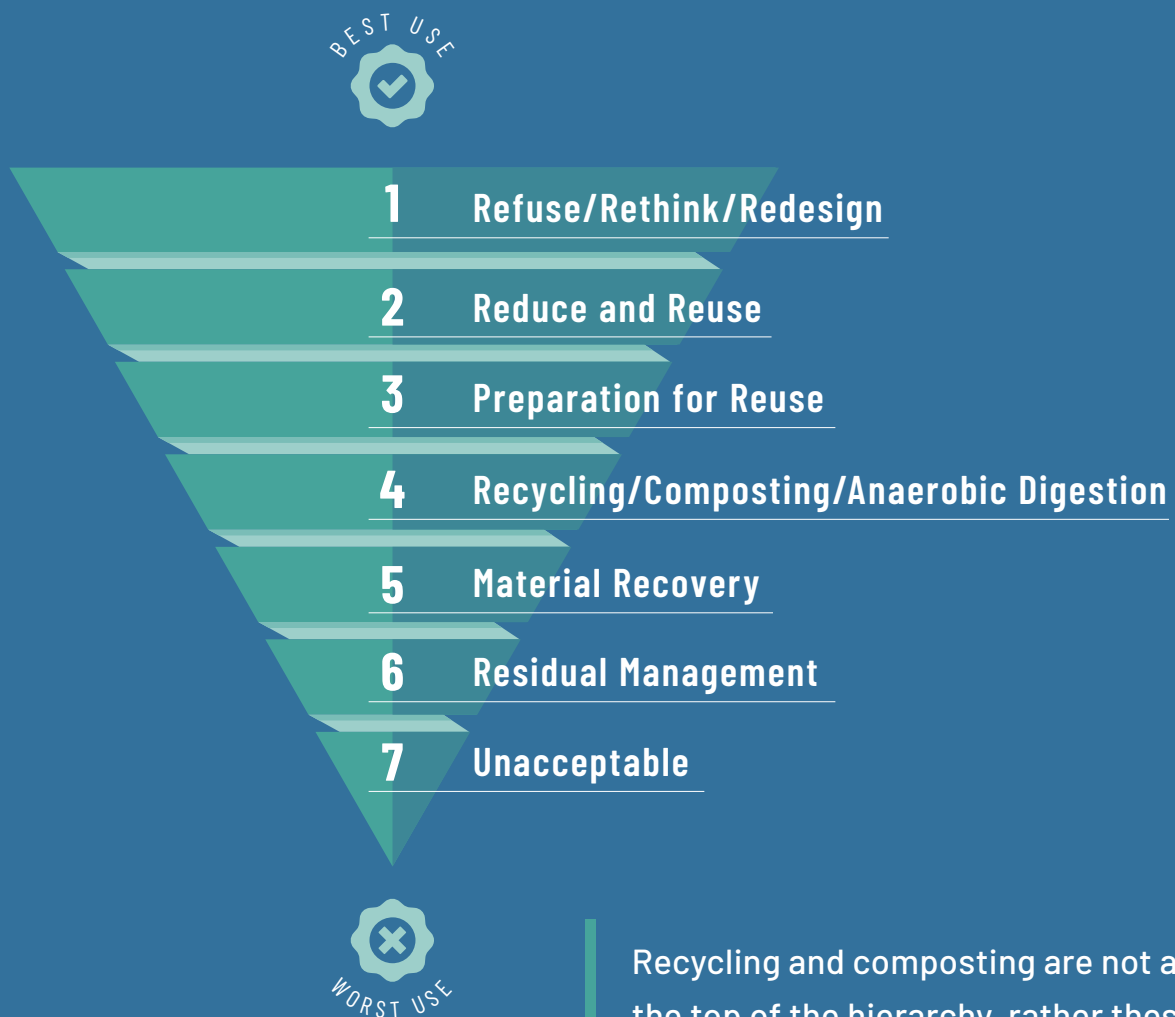
9 Yepsen, R. (2012). Residential Food Waste Collection In The U.S. BioCycle. <https://www.biocycle.net/wp-content/uploads/2012/02/bc120123.pdf>

10 Streeter, V., & Platt, B. (2017). Residential Food Waste Collection Access In The U.S. BioCycle. <https://www.biocycle.net/subscriber-exclusive-residential-food-waste-collection-access-u-s-complete-report>

11 Institute for Local Self Reliance. (2002). Recycling Means Business. <https://ilsr.org/recycling-means-business>

The Zero Waste Hierarchy

This hierarchy is used to rank resource management strategies in order of the highest and best use to the lowest of materials, with the aim of minimizing the amount of waste created in the first place.



Recycling and composting are not at the top of the hierarchy, rather these diversion strategies are ranked below strategies that prevent waste from being created in the first place.



REFUSE, RETHINK, REDESIGN

Key questions to consider

- a. How can cities persuade companies to manufacture their products and packaging using reused, recycled, or sustainably harvested renewable resources?
- b. What policies can incentivize or require companies to design waste out of their products and packaging and to sustainably manage their whole life cycle?
- c. What policies can incentivize or require food service establishments and other businesses to design waste out of their business models?

- d. How can cities and communities most effectively disseminate information for informed consumer decision making?
- e. How can cities help communities shift the dominant culture consumption and refuse what we don't need?

REDUCE AND REUSE

Key questions to consider

- a. What government programs and institutions reduce and reuse materials in their practices and purchasing?
- b. How do cities assist businesses, institutions, and households in purchasing appropriate quantities of foods to prevent waste due to spoilage or excess? How do cities ensure that surplus edible food is redirected to food insecure community members?
- c. Where might cities curb material consumption and optimize existing resources through an equitably managed local sharing economy?
- d. What programs, facilities, and businesses might support the continued use of goods and materials already in use?
- e. How accessible are product maintenance and repair services?
- f. What policies and initiatives can phase out the use of single-use items and cultivate reuse systems?

RECYCLING, COMPOSTING, AND ANAEROBIC DIGESTION

Key questions to consider

- a. How can cities implement diversion systems that recover high-quality, uncontaminated materials?
- b. What policies, incentives, public education, and cultural shifts are required to ensure proper waste separation?
- c. How and where might cities and regional governments develop local markets for recovered materials?
- d. How do cities and communities support localized composting projects where organic materials remain as close to the source as possible?
- e. How can cities ensure family-supporting wages for workers employed in waste collection, sorting, recycling, and composting?
- f. How can cities ensure that all residents have access to recycling and organics services?

RESIDUALS MANAGEMENT

Key questions to consider

- a. What discards remain? What materials are they, and which sectors do they come from?
- b. How can this information improve strategies further up the waste hierarchy to prevent further discards?

- c. How can landfills maximize use of existing space and minimize discharges (especially from toxic residuals) to land, air, and water? When and where can residuals/ landfill infrastructure and systems be scaled down and eventually closed as discards are reduced?

UNACCEPTABLE

Key questions to consider

- a. Waste to energy incineration, co-incineration, plastic-to-fuel, pyrolysis, gasification, landfilling of non-stabilized waste, ^[12] illegal dumping, open burning, and littering are all unacceptable waste management practices because they do not allow for material recovery, have adverse environmental impacts, and undermine the transition to zero waste by justifying continued production of discards. How can cities phase out these practices and/or ensure they are not adopted in the future?



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12 See Ch. 2 for more on landfilling.



CHAPTER

02

Laying a Solid Foundation

Communities around the world have embraced the goal of zero waste. In this chapter, we discuss how to get started building a constituency for zero waste and walk through the process of developing and implementing a zero waste plan.

ZERO WASTE COMMUNITY PLANNING

Zero waste community planning is similar to other types of planning (e.g. developing plans for transportation, community development, or water resources). It includes steps for analyzing the current situation, identifying and evaluating options, and selecting the preferred options. While the planning process can vary from community to community, the steps below are necessary to create a fully developed plan that meets the needs of the city and its residents.



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CREATING A PLAN FOR CITIES

1. **Make a zero waste commitment:** this formalizes the zero waste planning process.
2. **Ensure community participation:** meaningful public participation throughout the zero waste planning process is key to successful implementation.
3. **Evaluate current policies, programs, and facilities:** in understanding how the current waste system operates, including what materials are contained in a city's waste stream, allows planners and policymakers to identify a baseline for progress.
4. **Conduct service opportunities analysis:** assessing all the ways materials can be reused, recycled, or composted can help cities understand where they may develop new policies, programs, and businesses, or improve existing ones.
5. **Develop a menu of zero waste strategy options:** cities can select from the menu options (see Chapter 3) and adapt them to the needs of their city.
6. **Conduct an economic analysis:** once zero waste strategies are selected for implementation, it is important to calculate potential costs and cost-savings to justify new investments.
7. **Create guiding principles:** this creates an opportunity for community engagement and provides context to a zero waste goal by grounding it in community values.
8. **Set goals and metrics:** cities must include a measurable and time-bound goal against which to track progress.
9. **Leverage local processes to bring zero waste into policy:** climate action plans, general plans, the budgetary process, and waste contracts are some of the ways cities can express turn zero waste into policy.



ACTIONABLE STEPS FOR CITIES

STEP 1 MAKE A ZERO WASTE COMMITMENT

Communities can use these proven methods to jumpstart zero waste in their city:

1. Signing on to international/national/regional pledges - the movement to create zero waste communities got a significant push through the 2005 United Nations Environment Programme Urban Environmental Accords. Similarly, 28 global cities signed on to the C40 Cities Climate Leadership Group's 2019 Advancing Towards Zero Waste Declaration. These efforts were led by local elected officials who signed on to international pledges and then directed staff to initiate the planning process.
2. Proposing a plan - local advocates and municipal staff can also initiate the planning process by conducting research and then proposing a zero waste plan.

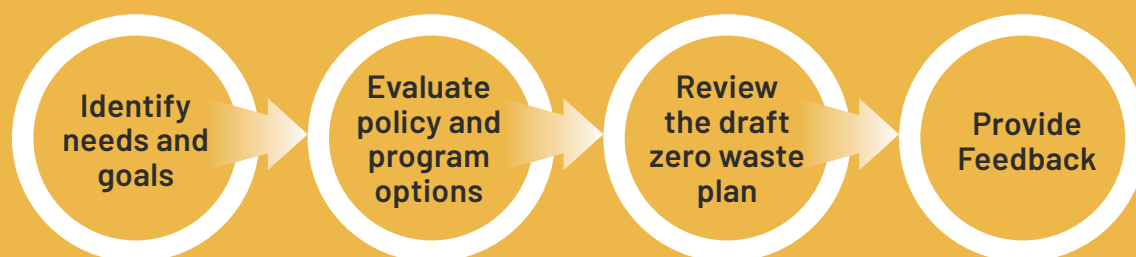
STEP 2 ENSURE COMMUNITY PARTICIPATION

The community should participate in every stage of the planning process: at the beginning to identify needs and goals, in the middle to evaluate policy and program options, and toward the end to review the draft zero waste plan and provide feedback. Forming a strong process to involve those affected by an issue in the development and implementation of solutions isn't just the right thing to do - it's the smart thing to do. Simply put, meaningful, consistent engagement with a diverse range of community stakeholders leverages the unique knowledge, networks, and leadership held by members of a community to strengthen municipal programs and policies.

A fully participatory process can involve:

- Community-wide visioning workshops held at the beginning of the process to identify goals, objectives, and guiding principles.

Stages of Zero Waste Community Planning



- Planning charrettes to identify zero waste policy and program options, and evaluate those options in a transparent community-based approach.
- Regular stakeholder engagement meetings with each of the affected stakeholder groups, e.g. residents, businesses, regulators, and service providers – such as reuse organizations, recycling/compost operators, waste haulers.

Municipal staff, program managers and community organizations can sponsor these workshops to get feedback about what is working well, what needs improvement, and how to move forward.

STEP 3: EVALUATE CURRENT POLICIES, PROGRAMS, AND FACILITIES

Evaluating existing waste management programs and achievements provides a baseline for progress. This should include researching the current collection, processing and disposal system of a city or community.

Communities take different approaches to regulating waste services. For example, in Austin, the city provides collection services for single-family residential customers, but most programs for multifamily and commercial customers are provided by private sector service providers in an open market system where customers can choose from a variety of collection service providers. In comparison, most California cities (including Los Angeles, San Francisco and San Jose) regulate multifamily and commercial collection through permits, franchises or contracts.

In evaluating the current system, there may be limitations to available data, including tons of trash, recycling and compost collected; the composition of the collected materials; and the diversion rates achieved through the collection system.



*The ultimate goal is to identify the tons of materials that are - and can be - **reduced, reused, recycled, composted, landfilled, or combusted** in a community.*



©United Workers

Community meeting on zero waste held by youth leaders from the group Free Your Voice in Baltimore.

Divertability Analysis Tool

Zero Waste USA's **Divertability Analysis Tool** helps communities gather and synthesize data. A set of tools are available in Excel format:

1. **Diversion, Disposal and Generation**
2. **Disposal Stream Composition**
3. **Market Commodity Estimate**

Users can plug in jurisdiction-specific or national default data and automatically create pie charts that illustrate the results.

Existing information can be supplemented by conducting materials characterization studies and performing brand audits at a range of scales, whether at the business, building, or city level.

Materials characterization studies:

- May be written into waste and recycling contracts;
- Generally involve sorting samples of materials from the trash, recycling, and/or compost and categorizing the samples by material type and percentage.

It takes a significant amount of resources to conduct a materials characterization study because multiple samples need to be carefully sorted to be statistically significant. Many communities can do this by using studies from other similar communities. The California Department of Resources Recycling and Recovery (CalRecycle) conducts periodic, comprehensive materials characterization

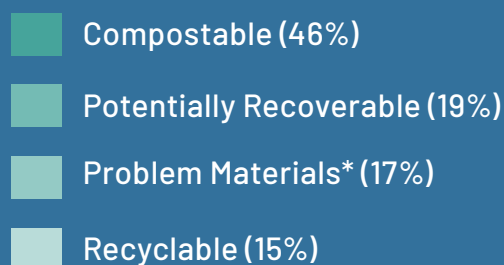
studies and publishes the data online.^[1] This information has been used to model material characterization for communities outside of California. For example, Austin and Boston have used CalRecycle data to model materials characterization estimates for their zero waste plans based on their specific residential demographics and commercial business composition.

There are several ways to characterize materials:

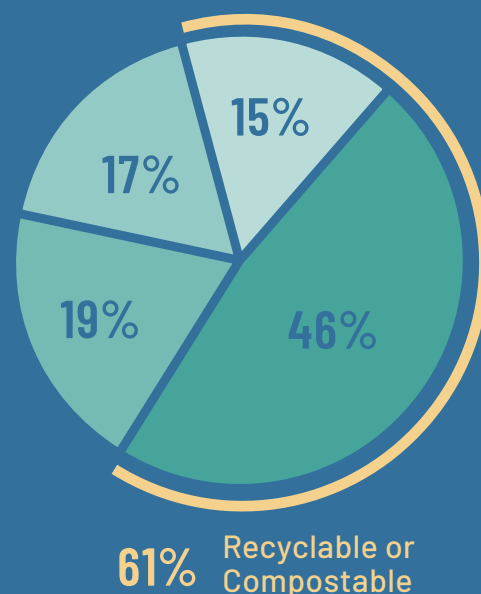
- Material categories can be divided into “market categories” (such as paper, plastic, metal), or further divided into specific material types to better understand the components of the material stream and the diversion potential of different strategies (such as banning single use plastics or creating textile programs).

1 California Department of Resources Recycling and Recovery (CalRecycle). Solid Waste Characterization Home. <https://www2.calrecycle.ca.gov/WasteCharacterization>

Sample Single Family Trash Characterization



* 17% should be redesigned or banned



- The information can also be summarized based on whether the materials are recyclable, compostable, potentially recoverable or problem materials. “Potentially recoverable” materials are technically or feasibly recyclable or compostable, but are not currently collected separately. “Problem materials” are those that do not have a market and need to be redesigned or banned.
- If samples are collected from trash, recycling, and compost, it is also possible to estimate the “capture rates” by material types. A capture rate indicates what proportion of a material type is being placed in the correct container

Communities can also conduct brand audits to determine the volume and type of specific consumer brands (e.g., Procter & Gamble, Unilever, Coke) found on the beach, in litter, or in the trash. Brand audits help target specific “problem products” and their brand owners. Brand audits are typically conducted by “citizen

scientists” that follow specific protocols outlined in the Break Free from Plastic Brand Audit Toolkit.^[2] This data can be used to inform purchasing decisions and build pressure for corporations to design waste out of their products and packaging.

STEP 4 CONDUCT A SERVICE OPPORTUNITIES ANALYSIS

Often referred to as a “gap analysis,” a service opportunity analysis identifies all of the services and facilities in the community or region through which materials can be reused, recycled and composted. The service opportunity analysis also identifies how materials are collected, where they are delivered, and whether there are any “gaps” in services or facilities that should be filled in order to reach zero waste goals. Understanding the current local and regional markets

2 Break Free From Plastic (2019). Brand Audit Toolkit. <https://www.breakfreefromplastic.org/brandaudittoolkit>

and market “gaps” can assist a community in developing new policies, programs, and businesses, or improve existing ones.

Most communities have vast networks of reuse and recycling vendors who may operate outside of the formal municipal waste management system. These include scrap dealers, thrift stores, repair shops, soil blenders, and local manufacturers that use scrap materials. By researching and contacting these vendors, a community can get a better understanding of local markets for reusable and recyclable materials and how to prepare materials for collection and processing. For example, some glass manufacturers may only want container glass and some reuse organizations may only want unpainted lumber. Perhaps your municipality hosts a number of festivals that generate a large amount of foodware waste, and identifies the need for large-scale reusable food serviceware rental and washing services, or industrial composting facilities that can process certified-compostable products.

STEP 5 DEVELOP MENU OF ZERO WASTE STRATEGY OPTIONS FOR YOUR COMMUNITY

Based on the evaluation of the current policies and programs and the analysis of service opportunities or market “gaps,” the next step is to develop a menu of all of the potential zero waste strategies for the community to choose from. These strategies are the policies, programs and infrastructure that the community could implement to reduce waste and increase reuse, recycling, and composting.

Examples of these policies are outlined in Chapter 3: Building a Zero Waste City. Once program staff and local advocates develop an initial menu of zero waste strategy options, community members can review and provide

feedback to help identify additional options for consideration, research, and analysis. This can be achieved through a workshop series where the needs and ideas of participants are incorporated into strategy options and presented back to the community with each phase.

For each potential zero waste strategy, the diversion potential can be estimated based on the potential capture rates of each strategy. Using factors from the U.S. EPA Waste Reduction Model (WARM)^[3] the greenhouse gas emissions reduction potential can be estimated. Similarly, the Institute for Local Self-Reliance^[4] has created a protocol for estimating the good green jobs potential of zero waste initiatives.

STEP 6 CONDUCT AN ECONOMIC ANALYSIS

Once a final list of zero waste strategies has been identified and selected for implementation, it is important to understand the potential costs and cost-savings of each zero waste strategy and the relative impacts on rate-payers or local communities. The level of detail of the economic analysis should be sufficient to include the annual or biennial budgeting process of the local municipality.

An economic analysis might include:

- An estimate of staff time needed to implement the strategy (based on number of hours or “full-time equivalent” staff members)

3 United States Environmental Protection Agency. Waste Reduction Model. <https://www.epa.gov/warm>

4 Institute for Local Self Reliance. (2002). Recycling Means Business. <https://ilsr.org/recycling-means-business>



Determining the local market value for discarded commodities may also be a part of an economic analysis. Discarded materials are valuable resources that should be kept in the economic mainstream. Understanding the value of these materials and their potential for creating economic value and good green jobs is important in justifying investments in new or expanded policies, programs and infrastructure.

- Capital costs (of materials and equipment)
- Collection and processing costs (if applicable)
- Potential cost savings from reduced landfilling and incineration

REDUCE

Every ton that can be reduced rather than discarded also saves time, energy, and resources. Mining, farming, manufacturing, warehousing, transportation and distribution of products are the “upstream” costs. Collection, processing, re-manufacturing or destructive disposals are the “downstream” costs. The Institute for Local Self-Reliance^[5] estimates that for every ton of discarded material “downstream,” there are 71 tons of discarded materials generated “upstream.” This is why prevention, or source reduction, has the greatest potential to save resources and money.

REUSE

About five percent of materials buried in landfills or incinerators are reusable items (household goods, equipment, building materials, furniture). However, these materials have the most value compared to recyclable or compostable materials. Urban Ore, a reuse operation in Berkeley, California, keeps 7,000 to 8,000 tons out of the landfill annually and generates approximately \$3 million per year in revenue. Using the Urban Ore example, reusable items have an average value of \$400 per ton.

RECYCLE

Recyclable materials are worldwide commodities bought and sold like any other commodity. The value fluctuates based on the quality of the material and market demand. Preserving the value through source separation (i.e., keeping the materials clean and dry) is particularly important for zero waste communities. Some, such as Milpitas and Windsor in California, have switched from single stream (commingled recycling) back to dual stream (separate collection for containers and paper) to preserve value. Mission-

⁵ Institute for Local Self Reliance. (2002). Recycling Means Business. <https://ilsr.org/recycling-means-business>

based recyclers like Eco-Cycle in Boulder, Colorado, and Eureka Recycling in St. Paul, Minnesota, address market conditions by sorting materials to the specifications of end market manufacturers, marketing newspapers and office paper separately instead of selling all paper together as “mixed paper”. Although the collection of mixed recyclable materials has a net cost to recycle (typically less than the total costs of landfilling and incineration), many commercial and industrial generators are able to sell source-separated recyclable commodities at a profit.

COMPOST: SOILS AND CARBON SEQUESTRATION

Compostable materials, such as food scraps and plant debris, are valuable resources in creating soil amendments for farmers and

landscapers. Compost application saves costs and water by reducing the need for chemical fertilizers, pesticides and irrigation. The “City to Soil” program in Goulburn Mulwaree Council in New South Wales, Australia, focuses on soil management not waste management. This helps residential customers understand why it is important to keep compostable materials uncontaminated, emphasizing that their discarded materials will be used by a farmer to grow food. The program reduced contamination by 40%, resulting in cleaner, quality compost products, which increased agricultural yields by 82%. The net costs were 50-70% lower than landfilling.

Carbon sequestration through application of compost on untilled lands has the potential to drawdown carbon dioxide from the atmosphere and reduce the impacts of global warming.

Market Commodity Estimate, California, 2014

Material	Tons	Est. Avg \$/Ton	Est. Annual Value
Reusable Goods	1,774,889	\$ 600	\$ 1,064,933,220
Paper	5,867,782	\$ 20	\$ 117,355,641
Metals	1,674,903	\$ 80	\$ 133,992,264
Glass	944,241	\$ 20	\$ 18,884,816
Polymers	4,586,312	\$ 100	\$ 458,631,240
Textiles	1,877,241	\$ 80	\$ 150,179,249
Chemicals	134,892	\$ 1	\$ 134,892
Putrescibles	8,160,938	\$ 7	\$ 57,126,568
Wood	4,541,349	\$ 8	\$ 36,330,788
Ceramics	1,483,807	\$ 4	\$ 5,935,228
Soils	1,551,253	\$ 7	\$ 10,858,769
Plant Debris	2,900,168	\$ 7	\$ 20,301,177
Total	35,497,774		\$2,074,663,852

Data Sources: CaliRecycle, Annual California Solid Waste Disposal and Disposal Facility-Based Characterization of Solid Waste, 2014 divided into 12 Market Categories, commodity values researched by Richard Anthony and Urban One

The Marin Carbon Project^[6] has demonstrated the potential of carbon sequestration through application of compost to rangelands. As a result, the California Health Soils Program has set aside \$20 million to fund farmers for carbon sequestration.

Estimating Market Value - Applying the Zero Waste USA Market Commodity Estimate Tool for the State of California 2014 disposal data results in over \$2 billion in lost revenue from the landfilling and incineration of discarded materials. Over \$1 billion is from reusable goods. Municipal staff or local advocates can use this tool to estimate the value of the discarded materials that are being landfilled or incinerated in their communities by researching current market prices in their area or using national averages and multiplying the value of the materials by the tons going to landfills or incinerators.

STEP 7 CREATE GUIDING PRINCIPLES

A key component of creating a zero waste plan includes the development of guiding principles through a stakeholder engagement process. Guiding principles reflect the community values, provide the context for zero waste, and create the opportunity for engagement and consensus-building around a zero waste goal.

Examples of guiding principles:

- The city of Los Angeles developed its guiding principles^[7] for its zero waste plan

by engaging with the community through a year-long process, involving over 250 workshops and key constituent meetings. This culminated in a citywide conference where community members, elected officials and city staff met to endorse the guiding principles.

- A consortium of environmental and labor groups known as Zero Waste Boston, formed in 2014 to guarantee workers a living wage and safe working conditions, created incentives and programs to promote locally-owned businesses and jobs; and improve public health and climate impacts through a zero waste planning process that prioritizes meaningful community input. The coalition and the City of Boston received a grant from the Commonwealth of Massachusetts Department of Environmental Protection to hold a Zero Waste Summit and, based on those discussions, develop a set of guiding principles^[8] that would assist the city in reaching a long-term goal of zero waste. The city then launched a zero waste planning process based on these guiding principles.
- United Workers, along with a number of local partners, initiated a zero waste planning process for the Baltimore community and engaged stakeholders throughout the city to develop its Fair Development Principles for the city's Fair Development Plan for Zero Waste.^[9] The principles outlined:

6 Marin Carbon Project. (2018) <https://www.marincarbonproject.org>

7 Los Angeles Sanitation. Solid Waste Integrated Resources Plan. [https://www.lacitysan.org/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-s/s-lsh-wwd-s-zwswirp?](https://www.lacitysan.org/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-s/s-lsh-wwd-s-zwswirp?_afPfm=zswirp)

8 Zero Waste Boston. (2019). Recommendations of Boston's Zero Waste Advisory Committee. https://www.boston.gov/sites/default/files/imce-uploads/2019-06/zero_waste_bos_recs_final.pdf

9 The Fair Development Roundtable, Institute for Local Self-Reliance, Zero Waste Associates, (2020). Baltimore's Fair Development Plan for Zero Waste. <https://cdn.ilsr.org/wp-content/uploads/2020/02/BaltimoreZeroWastePlan2020.pdf>

1. Development should benefit all and displace none.
2. Benefits of the development must be shared equitably and prioritize communities that are most in need.
3. Development decisions involving public subsidies require public participation.
4. Development decisions must be open and transparent.
5. Publicly-aided developers must meet human rights outcomes or be held accountable.

STEP 8 SETTING GOALS AND METRICS

There is no single way that cities set and track zero waste goals. Below are examples from international organizations.

The Zero Waste International Alliance (ZWIA) lays out specific tiered targets for “Zero Waste Best Practice Communities”, which are municipalities which have:

1. Achieved 50% diversion from landfills, incinerators and the environment
2. Achieved 70% diversion from landfills, incinerators and the environment
3. Achieved 90% diversion from landfills, incinerators and the environment
4. No waste burning and 90% diversion from landfills and the environment

The United Nations Urban Environmental Accords^[10] comprise 21 actions as proven first

steps toward environmental sustainability and include: “establishing a policy to achieve zero waste to landfills and incinerators by 2040.”

C40 Cities, network of 94 cities representing over 700 million people, established the Advancing Towards Zero Waste Declaration^[11] for reaching these ambitious goals and targets:

- Reducing the municipal solid waste generation per capita by at least 15% by 2030 compared to 2015;
- Reducing the amount of municipal solid waste disposed to landfill and incineration by at least 50% by 2030 compared to 2015, and increasing the diversion rate away from landfill and incineration to at least 70% by 2030.

To achieve these targets, communities must measure: generation, disposal, and diversion. “Generation” is the sum of tons diverted (from landfill and incineration) plus tons disposed (in landfills and incinerators), and is used to determine the diversion rate, which is tons of waste diverted divided by the total tons generated.

Diversion tons can include all materials that are reduced, reused, recycled and composted. Disposal tons include all materials that are landfilled and incinerated. Many municipalities closely track diversion and disposal tons and report these numbers to state agencies or publish them online. However, most communities across the U.S. do not have accurate or available records for diversion and disposal tons.

10 The United Nations (2005). Urban Environmental Accords. https://sfenvironment.org/sites/default/files/editor-uploads/initiatives/uea_Urban_Environmental_Accords.pdf

11 C40 Cities. Advancing Towards Zero Waste Declaration. <https://www.c40.org/other/zero-waste-declaration>


Generation
Diversion + Disposal
Diversion Rate
Diversion / Generation

Communities can develop these statistics by conducting a generation study. One methodology for conducting this study has been developed by CalRecycle in “Conducting a Diversion Study—A Guide for California Jurisdictions.”¹² The approach includes:

- Collecting data from the local jurisdiction or their contracted hauler
- Surveying local reuse, recycling and compost operations, transfer stations, landfills and incinerators
- Surveying commercial generators and their service providers
- Documenting diversion through waste prevention practices, such as grasscycling and backyard composting

Planners should note that the diversion metric has been criticized for two overarching reasons:

1. Not incentivizing waste reduction - this metric incentivizes composting and recycling but does not provide incentives for overall waste reduction measures, which are ranked higher on the zero waste hierarchy.

2. Measuring by weight - the diversion of inherently heavy materials like food scraps can skew data to make diversion rates seem artificially high. This might cause municipalities to overlook the widespread generation of lighter materials, such as plastic packaging.

Nonetheless, the diversion rate remains one of the most widely-used zero waste metrics, and is relatively straightforward to measure, record, and communicate. Planners can help address the flaws in the diversion metric by:

1. Ensuring their zero waste policies create pathways for system/product redesign, waste reduction, and reuse.
2. Creating policies that specifically target high-quantity, low weight materials such as single-use plastics.

STEP 9 LEVERAGE LOCAL PROCESSES TO BRING ZERO WASTE INTO POLICY

Many communities focus on projects to reduce greenhouse gas emissions and consider local actions through a lens of sustainability. Zero waste initiatives should be front and center in supporting these broader sustainability goals, as it creates jobs, conserves resources,

¹² California Department of Resources Recycling and Recovery (CalRecycle). Conducting a Diversion Study—A Guide for California Jurisdiction. <https://www2.calrecycle.ca.gov/Publications/Details/782>

saves energy, water and money. Advocates for zero waste can leverage local actions and ensure that zero waste is part of community actions in General Plans, climate action plans, and integrated resource plans. San Francisco's Climate Action Plan "0-80-100 Roots Framework"^[13] includes an emphasis on zero waste and carbon sequestration through application of compost on city lands.

Most of a local municipality's policy priorities are codified in its annual or biennial budget. As such, zero waste should be a part of these municipal budgeting processes and included in Capital Improvement Plans. Most of a local municipality's policy priorities are codified in its annual or biennial budget. How a community spends its resources reflects the priorities and values of the community.

Many municipalities contract for trash, recycling and compost collection services. These can be the largest contracts for municipal services a city will make. Contracts may be "evergreen" (renewed automatically) or they may be renegotiated or bid out on a periodic basis. Zero Waste Boston advocated for a zero waste goal and plan that included initiatives to be addressed in Boston's collection contract, including living wages for recycling workers and programs for increasing recycling and composting. Once accepted by the Mayor of Boston, the plan recommendations were then included in the bid process for new collection and processing contracts.

Local elections may also be entry points for bringing zero waste into policy. Advocates can

coordinate with candidates and their staff to see if they would be interested in making zero waste a part of their platform.

HOW U.S. CITIES ARE GETTING ON THE ROAD TO ZERO WASTE

Cities all across the U.S. are already creating and implementing zero waste plans, and their examples have valuable lessons to offer cities who are just starting or evaluating their next steps. Here's how the cities of Austin, Texas; Alameda, California; and Los Angeles, California got on the road to zero waste.

AUSTIN, TEXAS

In 2005, the Mayor of Austin took the city's leadership on sustainability a step further and signed onto the Urban Environmental Accords and committed to its goal of zero waste by 2040. Grassroots groups and nonprofits, including Texas Campaign for the Environment, Austin Zero Waste Alliance, Central Texas Zero Waste Alliance, and Austin-Travis County Food Policy Board lobbied the city to develop a zero waste plan. When the Solid Waste Services Department elected to hire a solid waste engineering firm (with zero experience in zero waste planning), the local advocates pushed back, ensuring that the city hired a mission-based consulting team dedicated to zero waste. The city's Zero Waste Strategic Plan^[14] was adopted in 2009. The plan reported that the value of materials sent to landfill, and lost to the local economy, was over \$40 million annually. In 2010, the city hired a new Solid Waste

13 San Francisco Department of the Environment. San Francisco Climate Action Plan. <https://sfenvironment.org/sfclimateaction>

14 City of Austin. (2008). Zero Waste Strategic Plan. http://www.austintexas.gov/sites/default/files/files/Trash_and_Recycling/Zero_Waste_Plan_-_full_version_-_Council_Adopted_w-resolution.pdf

Services Department director and changed the department name to Austin Resource Recovery to reflect its new priorities. The city adopted its Austin Resource Recovery Master Plan^[15] in 2011 which identified policies, programs and infrastructure to increase recycling rates from 38% in 2010 to 75% by 2020 and 90% by 2030. Austin has since implemented its Universal Recycling Ordinance which requires all businesses and multifamily properties to recycle and all food-generating businesses to compost. Austin had a 42% waste diversion rate in 2018, higher than the national average of 34% and the statewide average of 22%.^[16]

ALAMEDA, CALIFORNIA

Alameda's road to zero waste started with grassroots advocates who formed Alamedans for Climate Protection in 2006. They urged the City Council to join the UN's Cities for Climate Protection Campaign and develop a Local Action Plan for Climate Protection.^[17] The Local Action Plan was adopted in 2008 and called for a Zero Waste Implementation Plan to reduce greenhouse gas emissions. City staff and local advocates jointly formed a non-government organization, Community

Action for a Sustainable Alameda (CASA)^[18] to help the city implement the plan. CASA and the city have a unique partnership which allows the city to expand its reach beyond its traditional boundaries within the community. CASA can work with other governmental organizations (such as the school district, local utility and countywide waste management authority) and collaborate with other community-based organizations. The city and CASA partnered to develop the Zero Waste Implementation Plan^[19] which was adopted in 2010 and updated in 2018. The City has achieved a high diversion rate of 79% as of 2016.^[20]

The road to zero waste is long, but there are many friends and allies along the way. Zero waste advocates, policymakers, and sustainability managers can become a part of a worldwide network to share ideas, information and resources.

15 City of Austin. (2011). Austin Resource Recovery Master Plan. http://www.austintexas.gov/sites/default/files/files/Trash_and_Recycling/MasterPlan_Final_12.30.pdf

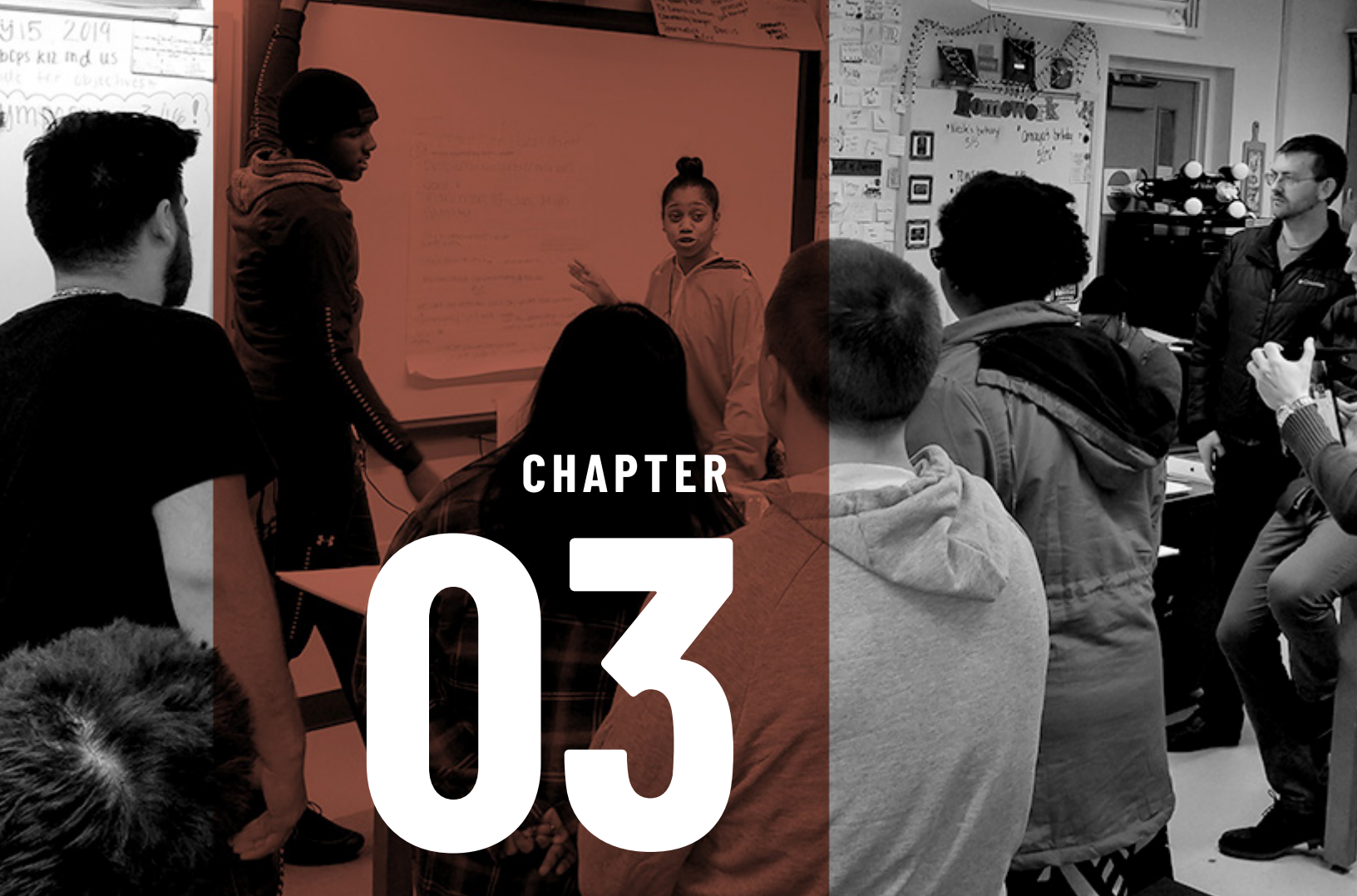
16 Scoggin, B. (2018). Austin Leads Major Texas Cities in Recycling Rate, Statewide Lags Behind National Average. TexPIRG <https://texpirg.org/news/txp/austin-leads-major-texas-cities-recycling-rate-statewide-rate-lags-behind-national-average>

17 TexPIRG. (2018). Austin Leads Major Texas Cities in Recycling Rate, Statewide Rate Lags Behind National Average. <https://texpirg.org/news/txp/austin-leads-major-texas-cities-recycling-rate-statewide-rate-lags-behind-national-average>

18 Community Action for Sustainable Alameda. <http://casa-alameda.org/>

19 City of Alameda. (2010). Zero Waste Implementation Plan. https://www.alamedaca.gov/files/content/public/departments/public-works/zero-waste/alameda_zero_waste_implementation_plan_9-16-10.pdf

20 Zero Waste Implementation Plan Update. (2018). R3 Consulting Group, Inc. <https://www.alamedaca.gov/files/assets/public/publicworks/city-of-alameda-zero-waste-implementation-plan-update-2018.pdf>



CHAPTER

03

Building a Zero Waste City

Local governments around the country are employing zero waste strategies tailored to their specific goals, capacities, and needs. Residents, businesses, nonprofits, and other local institutions are key partners in effective strategy design and implementation. This section describes the overarching options your municipality may select in creating your zero waste plan.



The road to zero waste is long, but there are many friends and allies along the way. Zero waste advocates, policymakers, and sustainability managers can become a part of a worldwide network to share ideas, information and resources.

CREATING A ZERO WASTE PLAN

- **Build zero waste infrastructure:** investments in local infrastructure that invigorates reuse and reduction efforts and provides for disassembly, recycling or composting at the end of a product's life can build a circular economy, create jobs, and open opportunities for economic development.
- **Ban disposables and create reuse/refill systems:** eliminating single-use disposable packaging and foodware and replacing them with reusable/refillable alternatives is a straightforward strategy to reduce waste at the source.
- **Support zero waste businesses:** assisting businesses in embracing zero waste practices and supporting businesses that provide zero waste goods or services is instrumental to the success of a zero waste plan.
- **Lead by example and build zero waste institutions:** leveraging the purchasing power of local governments and other institutions can create local markets for zero waste products and services, shift a substantial portion of municipal waste streams, and serve as a model for citywide change.
- **Write zero waste contracts:** cities can follow best practices to draft recycling contracts that increase transparency, promote waste reduction and diversion, and support workers' welfare.
- **Encourage source separation and waste reduction:** reducing and separating waste at the source is a necessary part of minimizing waste streams and ensuring that discards are uncontaminated and prepared for reuse, recycling, and compost.

- **Reduce and manage food waste:** food waste comprises a large portion of a municipal waste stream and creates significant landfill emissions. Cities can help households and businesses reduce food waste, divert scraps to compost, and redistribute edible food to people in need.
- **Implement universal recycling and composting:** providing universal access to recycling and composting, offering incentives for diversion, and finally, adopting mandatory recycling and organics diversion policies across sectors allows cities to significantly raise their waste diversion rates.
- **Manage construction and demolition debris:** cities should implement policies to reduce, recycle, and reuse construction and demolition debris, which typically comprise a significant volume of municipal waste streams, particularly in cities experiencing rapid growth.
- **Close the materials feedback loop:** while some upstream waste reduction measures fall within state, federal, or corporate decision making power, local governments can take steps to help slow the incessant influx of materials into their municipalities.



CHAPTER 03

1. Planning for Zero Waste Infrastructure

Getting to zero waste requires a bold vision to move away from the status quo. Historically, disproportionate investments in waste must be redirected to a broad array of local infrastructure that invigorates reuse and reduction and provides for disassembly, recycling or composting at the end of a product's life. Investing for zero waste requires careful planning for each facility, including knowledge of the current discard compositions and volumes, to ensure investments reflect long-term community goals and the economics don't disincentivize future opportunities for reduction and reuse. Local infrastructure investments in authentic circular and zero waste strategies eliminate the need for extraction of resources while equitably creating jobs and economic development opportunities.

PREVENTION

Reduction is the ultimate goal of a zero waste plan as it eliminates the upstream waste associated with extraction, manufacturing, and transportation.

- **Sharing:** facilitating convenient and accessible sharing of goods that are infrequently used reduces the demand for purchasing individual items. Successful examples of physical or virtual lending libraries exist for sharing or renting tools, equipment, and other household items.
- **Repair:** taking action to reverse planned obsolescence by repairing broken items results in job creation and extends the life of the product.
 - Repair Workshops provide training and technical expertise to simultaneously build capacity and community.
 - Repair Stores have declined over several decades, but were once a way of life. Investments in electronics, textiles, furniture and other repair options build a local economy and local resilience.
- **Reuse:** both an upstream reduction and downstream diversion outlet, investments in promotion, tax breaks, no interest loans and other business support help reuse enterprises compete with cheap, newly manufactured goods.
 - Reuse Store: many models of successful for profit and nonprofit reuse stores exist, focused on household goods and textiles, building materials salvage stores, antique stores, sporting goods and others.
 - Online material exchanges facilitate the trade of usable goods from businesses, institutions or residents.

- Reuse businesses such as cloth diaper services, reusable serviceware for events (some even with mobile dishwashers) and clothing rental allow consumers to participate in reuse with growing convenience.
- Donations of food to people, textiles and household goods are a popular and effective diversion method that support community organizations.
- **Minimizing food waste:** investing in the promotion of tools and education to help households reduce food waste and save money. Working with growers to fully utilize food produced through efficiencies, donations, and creating new markets such as sale of “ugly fruit”.
- Purchase goods with minimal packaging or no packaging at all.
- Farmer’s Markets and Food Co-ops have long offered opportunities for bulk purchasing using consumer’s reusable containers.
- A new wave of package-free zero waste stores have emerged focused on providing a wide variety of goods in bulk or without packaging.

Policies, such as bottle deposit legislation, right to repair, C&D recycling requirements and other disposal bans, can make infrastructure more cost effective and attract new businesses by bringing economic development and jobs to a community. Government can also support zero waste infrastructure through promotion of businesses with disposal guides, green business certifications and procurement policies.

RECYCLING PROCESSING

While recycling has been a primary investment strategy for many communities, recent reports show that there are still many communities lacking access to infrastructure to recycle many types of packaging.

1. **Materials Recovery Facility (MRF):** a MRF is where recyclables are sorted, densified, and sold for further processing or to end markets that use the commodity as feedstock in manufacturing. A MRF is often the lynchpin of how effective a recycling program can be, but not all MRFs are the

same. The type of incoming material a MRF is designed for (typically single stream or two stream), equipment and technology, number of people working and how fast the system is operated impacts what materials can be accepted, in addition to cost and quality. Non-recyclable material at the end of the line, called residual, is sent to a landfill or incinerator and is between 5% and 30% of incoming material.

2. **Plastics Recovery Facility (PRF) / Wash & Grind:** a secondary processor for plastics as a final step before the items can be used as feedstock in manufacturing.

3. **Glass Beneficiation:** commingling and compaction of glass during collection makes it difficult to sort to a marketable commodity. Glass beneficiation facilities further sort mixed glass by color and remove contaminants. They are typically able to recover up to 60% for bottle to bottle uses, with the rest going to insulation, sand-blasting, or other aggregate uses.
4. **Construction and Demolition (C&D) Waste:** many discards from construction products are reusable and recyclable. C&D recyclers sort incoming material for reuse and recycling prior to sending what's left to a C&D landfill.
5. **Scrap yard:** traditionally where scrap metal is bought, sorted, processed and sold.

Beware of false solutions that claim to be zero waste. This includes incineration, gasification, pyrolysis and other unproven technologies. Authentic zero waste solutions move us towards circularity by eliminating our need to extract new resources.

COMPOST PROCESSING

Composting infrastructure can facilitate a significantly increased diversion of food and yard waste. There are several different ways to compost, both onsite and through a commercial approach, each with a different cost and benefit analysis.

- **Onsite composting:** providing education and equipment so residents can compost food waste (but typically not animal products), reducing the need for transportation and demand on municipal scale infrastructure. This can be through backyard compost bins or vermiculture that uses worms (typically red wiggler) to decompose plant waste into castings.
- **Community Composting:** bigger than backyard but smaller than a commercial compost operation usually with a goal that the material goes the shortest practical distance to be composted and then is returned back to the community.
- **Commercial Composters:** these facilities often use an aerobic method such as aerated windrows or aerated static piles that require relatively low capital costs and take about 3-6 months to make finished compost for use in growing food or landscape. Anaerobic digestion is an alternative method that creates a biogas which is captured for use in energy or renewable fuels. Anaerobic is more capital intensive, but the process only takes between 15 and 40 days. The best system for a community is predicated on the incoming feedstock and availability of end markets.

Key Concepts - “Highest and Best Use” means using materials in a way that maximizes the environmental and social impacts of diversion. This can be measured through a life cycle analysis, a commitment to products that can be recycled again, markets with transparent supply chains and fair employment practices, and local markets that support communities and minimize transportation.

“Mission Driven Recyclers” are committed to highest and best use and are a great partner for a community. Recyclers that don’t own interest in disposal are typically more incentivized for recycling to work.

COLLECTION INFRASTRUCTURE

- In addition to processing infrastructure, collection infrastructure is needed in a community to efficiently capture diversion streams.
- Curbside Collection: fleets that go to each household every week or every other week. Many larger cities operate their own fleet or contract with a hauler for this service (referred to as organized collection). Other communities leave it up to the residents to contract directly with a hauler for services (called open hauling).
- Drop off: provides valuable access for residents and small businesses who don’t have access to curbside collection (for either compost or recycling), miss a pickup, or have extra material. Drop offs can also collect material source separated, resulting in a cleaner stream of material that can potentially be used for higher values.
- Hard to Recycle Drop Off: expanding on a drop off with the addition of hard to recycle items that aren’t typically collected curbside, or for materials like glass that may be dropped from a curbside program for economic reasons. Typically includes electronics, challenging types of plastics, reusable items, bulky goods and appliances.
- Product Stewardship Infrastructure: if there is a state bottle deposit legislation, redemption centers and buy-back locations become important and effective collection sites.
- Public Space and Event Collection: communities ideally have access to recycling and composting containers at public spaces like parks and municipal buildings. Many communities make event recycling containers available for loan.
- Commercial Collections: collection via carts, compactors, roll offs and dumpsters located at multifamily (apartments) and small business.

RECYCLED CONTENT MANUFACTURING AND COMPOST UTILIZATION

A critical piece of the infrastructure puzzle are businesses that utilize recycled content in their manufacturing process or utilize finished compost to grow food. Having viable, domestic end markets is key for making recycling and composting work while creating local economic development and job opportunities.

FINANCING STRATEGIES

The cost of implementing and operating these infrastructure investments can vary greatly depending on location, size and access to capital. While zero waste infrastructure

often has to compete on an unfair playing field with fossil fuel and disposal subsidies, there are creative ways that the community can work together to accomplish their goals. Municipalities can help bring in investments by providing long term leases on property, municipal bonding, long term contracts (to make traditionally financing easier) or through public/private partnerships where they maintain ownership of capital. Creative approaches to private financing can include working with groups aligned on their goals, including end markets that want access to high quality feedstock, industry groups looking to increase access to recycling, impact investors or through community investment. A great place to start is by bringing in a core group of constituents who can help demonstrate the need and ability to have long term support from a community and a long term supply agreement with an end market.



CHAPTER 03

2. Best Practices in Zero Waste Contracting

Recent trends in the recycling industry have made it challenging for municipalities and institutions to ensure that their recycling programs are stable, cost effective and deliver the environmental and social benefits their constituents expect. These best practices provide strategies to increase accountability, local control, transparency and help provide assurances that any investment in recycling provides an authentic and positive impact. It is critically important to begin with an understanding of the opportunities available in your local marketplace to determine which strategies are relevant to your community.



Recycling contracts can promote transparency, waste reduction, increased diversion and justice for workers.

1. **Create fair and transparent pricing that incentivizes reduction and increases accountability.** Traditionally, many recycling and waste contracts had fixed monthly costs or combined collection and processing into one price. There are several advantages to separating services into different contracts.
 - a. Directly contracting with a Material Recovery Facility (MRF) increases a city's accountability by controlling where material collected by a hauler is delivered and facilitating direct communication around what is accepted and what is contamination
 - b. Separating contracts for each service often results in more competitive bids because smaller, local haulers who may not be able to bid on everything can compete with vertically integrated corporations on the services they can provide.
 - c. Volume-based per ton processing fees for recycling and trash, rather than a fixed monthly cost, creates financial incentives for reduction and diversion. This allows a city to implement programs such as pay-as-you-throw, where residents that pay per-bag can choose a smaller trash container, decrease trash collection frequency (every other week or monthly) or share trash service with a neighbor.

- d. Including liquidated damages with strong financial penalties allows ongoing enforcement of performance standards relative to the contract without having to go through the legal hurdles of establishing default.

- 2. Use the Request for Proposal to Emphasize Social and Environmental Goals.** For a city to remain accountable after recycling leaves the curb, they need a well-crafted RFP process that includes evaluation of environmental and social impacts, such as highest and best use of commodities collected and how workers are treated.
- a. Recycling is one of the 10 most dangerous jobs in the U.S. and a city contract can help make it safer. Require living wages, sick time and predictable schedules with specific language that will not allow exemptions for temporary labor where applicable (a common practice in the recycling industry). Evaluate safety procedures and protocols (including OSHA reporting history) as part of the scoring process.
 - b. Evaluate how the facility operations impact the ability for materials to get better recycling values and environmental outcomes, including opportunities for environmental innovations, such as alternative transportation options (CNG, Electric) or renewable energy.
 - c. Tie in established community workforce creation and economic development goals.
 - d. Look for commitments to work with local and regional end-markets.

Best Practises

1. Create fair and transparent pricing that incentivizes reduction and increases accountability.
2. Use the Request for Proposal to Emphasize Social and Environmental Goals.
3. Structure RFP to Encourage Local Investment.
4. Implement Revenue Share
5. Utilize Accountability and Transparency Levers
6. Add or Drop New Items to the Recycling Stream.
7. Require Reporting and Metrics.
8. Encourage Education and Community Connection.

3. Structure RFP to Encourage Local Investment.

An RFP can also be structured to remove barriers and attract new investment with a goal of bringing in local economic development and job opportunities. The majority of recycling in the U.S. is controlled by waste haulers that receive most of their revenues from waste, not recycling. Independent and local recyclers (that don't have investments in waste disposal), or mission-driven recyclers (recyclers who have a defined organizational mission around zero waste) are often better aligned with a community's goals.

- a. Aligning contracts with capital depreciation allows companies to finance needed investments.
- b. Allow sufficient lead time to purchase capital and/or develop facilities. The RFP process may need to begin up to two years prior to the current contract ending.
- c. Encourage public/private partnerships through the provision of infrastructure (a site, equipment or building) or opportunities for financing through municipal bonds.

*The structure of the contract and RFP impact not only **how** services are provided and **employees** are treated, but also **who** will bid on the contract. More competition in the bidding process results in lower prices and more robust services delivered to the community.*

4. Implement Revenue Share, where a city pays a higher fixed processing cost with a rebate tied to actual market value, creates more stability in recycling by covering the processors' direct financial needs while allowing cities to benefit if/when markets rebound. This is an important tool to address market fluctuations (especially true in light of the impact of China's ban on importing recyclables) and ensure fair pricing for the hauler and the city. A well-structured revenue share can also incentivize a city to reduce contamination and a processor to market material for its highest and best use.

- a. Use published indices for targeted commodities: MRFs will make decisions on how much to invest in sorting (labor and capital) based on a cost benefit

analysis of what the end market will pay. Revenue share with a published index, incentivizes the processor to sort to the agreed-upon grades (or better) as they are obligated to pay the city the published value of those grades, regardless of what they sell them for.

- b. Composition Studies: The processor should be required to conduct a periodic (at least annual) sort of the city's material segregated from material the facility receives from other communities. With this method, there is a pay-back to the city for investing in strategies like reducing contamination or banning low-value; single-use plastics, as this results in a change of their composition to reflect a higher revenue share.

5. Utilize Accountability and Transparency

Levers can further influence marketing of recyclables for highest and best use, such as end products that are recyclable again (circular) or support local jobs and economies.

- a. Provide processors a larger share of the revenue if they market material locally or to a targeted “preferred” market (such as bottle-to-bottle) or make it a contract requirement.
- b. Apply liquidated damages for marketing material to restricted uses (such as alternative daily cover in a landfill).
- c. A city can contract directly with end markets and require the processors to send materials to that market.

6. Add or Drop New Items to the Recycling Stream.

There is great brand-owner pressure to add new types of packaging to the recycling stream. However, to maintain the integrity of a program, only materials with viable proven end markets that meet a community’s environmental goals should be included. Contract language should address the real financial impacts of markets and policies on a processor.

- a. Develop clear language about how items are added or dropped, that include the city in the decision process. However, a processor shouldn’t be forced to collect items if viable end markets drastically change or cease to exist for an agreed period of time.
- b. Include clauses that compensate a processor for drastic changes to the material stream due to policy implementation, such as a bottle bill.

7. **Require Reporting and Metrics.** Requiring accurate reporting is a critical part of establishing trust and transparency in a recycling program. Metrics should include at a minimum: weight, composition, contamination, market value and where materials are sold, participation and other customer service reporting. Hauling contracts need to address quality by including requirements for education at the curb, tracking contamination and participation, and setting maximum compaction rates to avoid the destruction of recyclables. In an automated collection program, requiring technology such as geo-location, radio frequency identification tags, and cameras in the hoppers makes data reporting and education much more feasible.

What items are included in a recycling program, how they are sorted and where they are marketed determines the potential environmental and social benefits a community can achieve through recycling. A contract should help a community hold a processor accountable for the ultimate destination of the recyclable materials.

8. Encourage Education and Community

Connection. A contract can specify ways to connect the recycling program deeper into the community.

- a. Community MRF tours are an extremely effective method of engaging residents around the nuances of recycling.
- b. Education requirements usually include an annual mailing, website, apps to help the residents participate and social media. A detailed process should be established for how the city's

communications team and the service providers work together.

- c. Haulers and processors should be required to provide data to the City to help target outreach and track progress, such as contamination and participation by neighborhoods.
- d. Haulers and processors can be required to provide recycling at a specified number of community events and service for municipal buildings and public spaces.

Definitions:

End Market: A manufacturer or secondary processor that uses recycled feedstock to create new products.

Liquidated Damages: A contractual mechanism for applying agreed-upon financial penalties for each incident in which a contractor fails to meet performance standards (including operational, customer service and reporting).

Material Recovery Facility (MRF): A processing facility where recycling is sorted and marketed to end-markets.

Revenue Share: A fixed "processing fee" that covers the processor's expenses and profit. The processor pays a revenue share (typically 80%) or rebate to the city based on the amount of recyclables delivered, the composition of commodities including contamination, and the value of the commodities for that month.

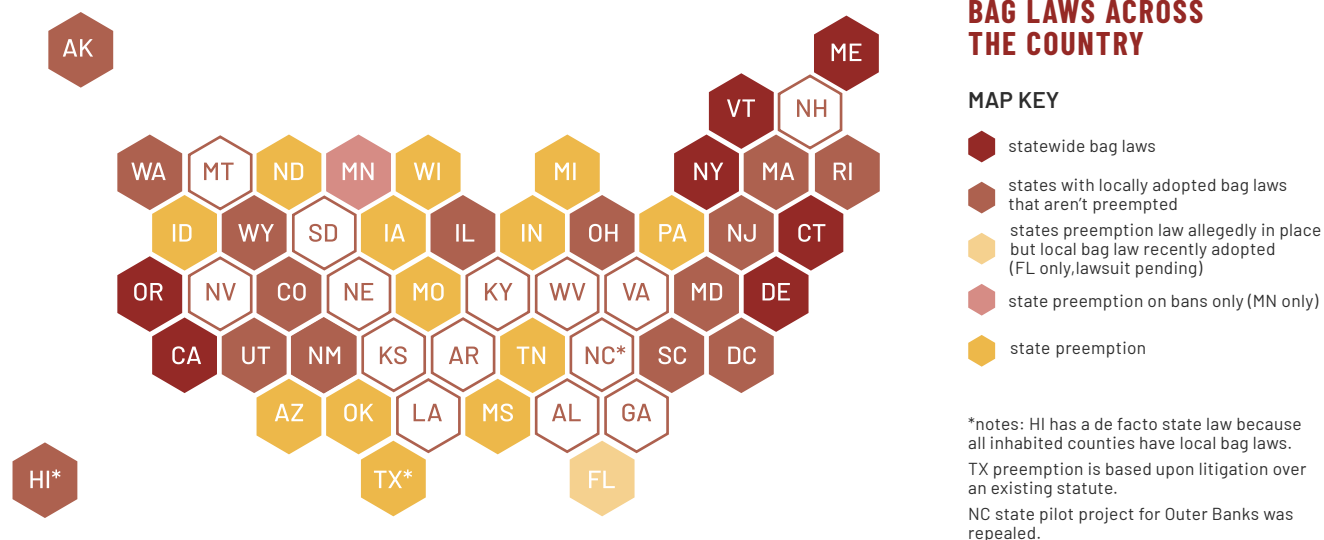
Request for Proposal (RFP): Typically used to solicit bids for city or institutional services.

CHAPTER 03

3. Legislating Reuse and Working with Businesses

BAN DISPOSABLES AND CREATE REUSE/REFILL SYSTEMS

There are over 400 bans or taxes on single-use plastic items in cities and states across the country^[1]. Bans on single-use plastic items can be an effective, top-down approach to reducing unnecessary plastic consumption and removing plastics from the waste stream. However, replacing plastics with other materials that still require resource extraction and disposal is not the long-term solution. Instead, cities must consider the zero waste hierarchy to prioritize reusable and refillable solutions in their legislation and ensure that zero waste alternatives to single-use plastics are readily available. This approach can also be viable in municipalities in states with plastic preemption laws^[2], also known as “bans on bans”. Below are examples of how some cities have phased out single-use plastic and promoted reusable and refillable systems.



*Adapted from Map developed by Korin Tangtrakul for PlasticBagLaws.org
Last updated August 13, 2019*

1 Zeitlein, M. (2019, August 27). Do plastic bag taxes or bans curb waste? 400 cities and states tried it out. Vox. <https://www.vox.com/the-highlight/2019/8/20/20806651/plastic-bag-ban-straw-ban-tax>

2 Gibbens, S. (2019, August 15). See the complicated landscape of plastic bans in the U.S. National Geographic.
<https://www.nationalgeographic.com/environment/2019/08/map-shows-the-complicated-landscape-of-plastic-bans/#close>

Safe reuse in the era of COVID-19

A total of 125 health experts have published a statement defending the safety of reusables: contrary to plastic industry claims, single-use disposables are not safer than reusables, and that **“reusable systems can be used safely by employing basic hygiene.”** Safety protocols can include:

- Sanitizing hard surfaces and reusable containers.
- Complying with the State food safety regulations, and the FDA’s guidance on [retail practices and food safety](#) during the COVID-19 pandemic.
- Having a health department-approved plan showing a process preventing cross-contamination of food, including contact surfaces.
- Using contact-free systems for customers’ personal cups, containers, and bags.
- Avoiding contact between customers’ reusable containers and serving surfaces, or sanitizing that surface each time there is contact.
- Requiring customers and employees to wear masks.



CASE STUDY

BERKELEY’S REUSABLE FOODWARE ORDINANCE

Berkeley, California’s reusable foodware ordinance went into effect in 2019. This legislation is groundbreaking in its ambition, consultations with community stakeholders, and support for local businesses. The ordinance doesn’t just ban plastics and switch them for another material. Rather, it works its way up the zero waste hierarchy by first phasing out single-use plastics in favor of single-use compostables, and then

replacing compostables for reusable systems. The city’s Zero Waste commission held four public hearings and collected comments from restaurant owners, environmental advocates, members of the disability community, and other residents to ensure the legislation was equitable and effective.

The ordinance prescribes three phases of implementation spaced out over a 15-month period to ensure businesses have enough time and flexibility to transition. The first phase mandates that food vendors can only give disposable utensils, straws, and other “accessory items” (such as stirrers and



©Ecology Center

Sophie Hahn of Berkeley, CA City Council and Martin Bourque of the Ecology Center pictured with public school children after a press conference announcing the passage of the city's Reusable Foodware Ordinance.



*In the era of COVID-19,
125 health experts
published a statement
agreeing that “reusable
systems can be used
safely by employing
basic hygiene.”*

condiment cups) upon request or at self-serve stations. The second phase requires businesses to use compostable foodware certified by the Biodegradable Products Institute for all to-go orders. It also encourages customers to bring their own cups by placing a 25 cents fee on all compostable cups. The fee exempts WIC and SNAP recipients to avoid placing a disproportionate cost burden on low-income residents. By the final phase, all businesses will use durable, reusable plates, cups, and utensils for dine-in meals, with exemptions for certain certified compostable and recyclable items such as napkins and foil wrappers.

The City of Berkeley has allocated funding for technical assistance and mini-grants to help businesses transition to reusable foodware. New businesses are also cropping up to help existing food service businesses meet the city's new requirements. Vessel Works is a free service which provides insulated stainless steel to-go cups to cafes throughout Berkeley (and Boulder, CO). Customers can checkout a cup using an app, fill it with a drink at a participating cafe, and then leave the cafe with their Vessel as they would with a single-use coffee cup. Customers have five days to return the cup to any participating cafe or kiosk in other locations. After that, there is a \$15 fine for missing cups, which are tracked through the Vessel app.

Advocates, policymakers, residents, and local businesses, old and new, have come together to enact and implement the nation's most stringent reusable foodware ordinance, which is a key strategy towards achieving the city's Zero Waste and Climate Action goals.

Providing public drinking water access

Single-use plastic bottle bans should be complemented by an expansion of public drinking water access. Several cities and institutions have banned the sale of single-use plastic water bottles on their properties, and more have prohibited the purchase of plastic bottled water using municipal or institutional funds. Most cities have inadequate public drinking water facilities despite broad public support for public water provision.^[3] However, fewer than 1 in 10 cities have requirements or development incentives for public drinking water provision.^[4] To address this, planners might incorporate water fountain requirements or incentives into zoning/design codes.

Cities could also alter municipal plumbing or building codes to increase the number of drinking fountains in buildings such as education facilities, libraries, and shopping centers. Calgary and New York City are also experimenting with using fire hydrants as an adaptable and scalable way to provide drinking water for outdoor public spaces.^[5] Low-income communities of color across the country are disproportionately burdened by lead-contaminated drinking water, notably in school drinking fountains. Reducing single-use plastic water bottles in environmental justice communities requires governments to address lead concerns through testing and remediation before they can work with local community groups to rebuild trust in public water supplies over the bottled water that residents may have experienced as a safer and less hazardous option.

3 Park, S., Onufrak, S., Wilking, C., & Craddock, A. (2018). Community-Based Policies and Support for Free Drinking Water Access in Outdoor Areas and Building Standards in U.S. Municipalities. *Clinical Nutrition Research*, 7(2), 91-101. <https://doi.org/10.7762/cnr.2018.7.2.91>

4 Park, S., Onufrak, S., Wilking, C., & Craddock, A. (2018). Community-Based Policies and Support for Free Drinking Water Access in Outdoor Areas and Building Standards in U.S. Municipalities. *Clinical Nutrition Research*, 7(2), 91-101. <https://doi.org/10.7762/cnr.2018.7.2.91>

5 Carpenter, T. & Woebken, C. (2019). The New Public Water. *Urban Omnibus*. <https://urbanomnibus.net/2019/01/new-public-water/>



SUPPORT ZERO WASTE BUSINESSES

Businesses are essential partners to municipalities and communities in reducing waste and implementing zero waste plans. Zero waste businesses include businesses with zero waste practices and those that provide zero waste goods and services, such as secondhand clothing stores, cloth diaper services, bulk stores, and mobile dishwashing unit rentals. It may be useful for communities to conduct a service opportunities gap analysis (see Chapter 2) to understand the landscape of existing businesses and where new opportunities may lie.

To support local zero waste businesses and simultaneously further economic justice, municipalities can employ the following strategies:

- Provide education and technical assistance for compliance with existing policies and incentives to go “above and beyond” existing regulations
- Offer grants to cover transitional costs for small businesses which may operate on thin profit margins or face significant cash constraints.
- Create recognition programs, zero waste business directories, and zero waste/green purchasing guides.
- Grow end markets for recycled materials by incentivizing businesses to use recycled content in their manufacturing processes, or buy products containing recycled content. (See below for a case study on “Growing markets for recycled material in Salt Lake City and the Twin Cities”.)
- Provide free or low-cost physical spaces, particularly during incubation and initial operations, and financial assistance for other significant capital costs.
- Translate materials and provide interpretation services.
- Incentivize businesses providing zero waste services to locate in underserved communities, with consultation from community members on what kinds of businesses are needed, where they should be sited, and what price points are locally affordable.
- Prioritize outreach, assistance, and incentives to businesses owned by or located in marginalized communities.



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CASE STUDY

GROWING MARKETS FOR RECYCLED MATERIALS IN SALT LAKE CITY AND THE TWIN CITIES

Developing local end markets for recycled materials helps safeguard the viability of recycling systems, creates jobs, and supports economic development. China's ban on imported recyclable materials has left U.S. end markets in flux after decades of reliance on exports. Building local markets for recyclable materials should be a part of a municipality's ongoing sustainability and economic development planning.

Salt Lake City does this by participating in the Utah Recycling Market Development Zone Program. The program incentivizes businesses to use recycled materials in their manufacturing for new products. It also benefits businesses that collect, process, and distribute recycled

materials. Businesses located in eligible parts of the city that use a minimum 25% of recycled materials in their processes receive a state tax credit on machinery, equipment, and certain operating expenses. While this is a state program, cities could develop and implement a similar city-level program.

Another approach for expanding markets for recycled materials is to encourage local purchasing cooperatives. Eureka Recycling is a mission-based recycler in Minneapolis that purchases post-consumer products in bulk and then passes on the savings to individuals, businesses, and organizations, who can buy 100% recycled paper and compostable products at a reduced cost. Eureka's Zero Waste Buying Co-Op also takes the burden of researching information on certifications, toxicity, and percentage recycled content off consumers. Facilitating zero waste purchasing increases demand for recycled materials, helping Eureka close the loop on the paper it recycles.

Mei Mei is a restaurant in Boston that contributes to a regional circular economy by using local ingredients and composting food waste.



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Permitting businesses to remove reusable goods from the waste stream and sell them back to the community creates jobs and allows municipalities to reduce disposal costs.



CASE STUDY

SALVAGE AND SALES REUSE OPERATIONS AT BERKELEY'S URBAN ORE

Permitting businesses to remove reusable goods from the waste stream and sell them back to the community creates jobs and allows municipalities to reduce disposal costs. Urban Ore is a salvage and sales business that contracts with the City of Berkeley for the right to retrieve reusable materials from the city's waste transfer station. Salvaged materials include doors, home goods, and furniture, and are transported to Urban Ore's large Ecopark retail store. Residents and businesses can also bring in their own reusable items. The operation retrieved 825 tons of materials from the city transfer station in 2014, and brings in a total of 7,000 tons of goods each year, roughly the same weight as the materials that Berkeley's curbside program collects for residential recycling.^[6] Urban Ore employs 40 community members who are paid living wage jobs with benefits, and have the option to participate in profit sharing performance incentives. Initially, the City incubated the Urban Ore by providing them a rent-free sales location until they were able to afford commercial rent.^[7] Support from the county's Source Reduction and Recycling Board allowed Urban Ore to purchase its West Berkeley property. Thanks to early financial support from local governments and continued salvage access to the transfer station floor, Urban Ore is now a successful business operation that provides zero waste services and good jobs.^[8]

6 United States Environmental Protection Agency. Zero Waste Case Study: Berkeley. Managing and Transforming Waste Streams – A Tool for Communities. <https://www.epa.gov/transforming-waste-tool/zero-waste-case-study-berkeley>

7 Urban Ore. <https://www.urbanore.com>

8 United States Environmental Protection Agency. Zero Waste Case Study: Berkeley. Managing and Transforming Waste Streams – A Tool for Communities. <https://www.epa.gov/transforming-waste-tool/zero-waste-case-study-berkeley>

CASE STUDIES

DESIGNING WASTE OUT OF PRODUCT DELIVERY

PACKAGE-FREE FOOD DELIVERY

Food delivery presents a clear opportunity to build new reuse models. Delivery comprises a growing share of food sales, and the COVID-19 pandemic has forced restaurants across the country to shift to takeout or delivery-only business models. However, food delivery and takeout create a large amount of single-use packaging waste for each meal consumed. A New York City startup called DeliverZero aims to change that by allowing customers to order food from restaurants that is packaged in reusable, returnable containers. Customers can return the containers to the delivery person the next time they order through the service, or drop them off at any of the restaurants using the platform. DeliverZero's founders say that being a zero waste business sets them apart from their competitors, allowing the company to spend less on advertising, which translates to a cheaper service for both participating restaurants and their customers.^[9] Although DeliverZero's reusable containers are made of plastic and have a limit to their number of uses, the company has created an innovative, replicable solution to the waste created by the growing food delivery sector.

9 Hirsh, S. (2020, January). How This New Company Is Taking the Waste Out of Restaurant Delivery. Green Matters. <https://www.greenmatters.com/p/deliver-zero-low-waste-packaging-seamless>

DESIGNING REFILL INTO BOTTLE DEPOSIT INFRASTRUCTURE

In Portland, Oregon, one nonprofit is taking advantage of existing infrastructure to transition the city's famous beer industry towards zero waste. The Oregon Beverage Recycling Cooperative (OBRC) works with beer brewers in Portland, where there are more breweries than anywhere else in the world, to build a statewide refillable bottle program that utilizes the state's bottle recycling system. The program uses special bottles that are designed to be refilled up to 40 times. Between uses, the bottles can be returned to the same grocery stores and other "redemption centers" used to collect other types of bottles. Their smart design allows them to be easily separated from the other bottles, and cleaned and refilled instead of recycled. While the new reusable bottles cost slightly more upfront, OBRC is able to provide them to brewers at a low price since washing and reuse is more cost efficient than producing new glass.^[10] The program is supporting local manufacturing and end market development by using recycled glass from a plant in Portland and looking to create even more local jobs by opening a new bottle-washing facility in the city.^[11]

10 Gribbins, K. (2018, September). The refillable glass beer bottle makes a comeback with the Oregon Beverage Recycling Cooperative. Craft Brewing Business. <https://www.craftbrewingbusiness.com/featured/the-refillable-glass-beer-bottle-makes-a-comeback-with-the-oregon-beverage-recycling-cooperative>

11 Profita, C. (2018, September). Oregon Launches First Statewide Refillable Bottle System In U.S. National Public Radio. <https://www.npr.org/sections/thesalt/2018/09/17/645548896/oregon-launches-first-statewide-refillable-bottle-system-in-u-s>

ZERO WASTE VENDING MACHINES

While zero waste is often dismissed as time-consuming and inconvenient, vending machines exemplify convenience. A handful of companies are using vending machines as a vehicle for consumers to receive goods, hassle-free, without waste. Fresh Bowl sells healthy, locally-sourced meals in reusable glass jars from vending machine kiosks located in public transit hubs and private office buildings across New York City at a price comparable to other cafes and restaurants. Customers can receive a discount on their next Fresh Bowl meal by returning used jars back to the kiosks. Since the kiosks are conveniently located where customers work or take transit, 85% of Fresh Bowl's jars are returned. Miami-based Ecopod is another zero waste vending machine start up with locations in residential buildings and convenience stores across Florida. The company's kiosks dispense personal care and household cleaning products into customers' reusable containers. Cost savings on packaging and transportation mean that its refills are significantly cheaper than buying new bottles of cleaners or detergents, saving consumers up to 50% on certain items. ^[12]

LEAD BY EXAMPLE AND BUILD ZERO WASTE INSTITUTIONS

Municipal governments and local institutions – such as college campuses, schools, and museums – contribute a substantial portion of their cities' waste streams and hold significant purchasing power. Local governments and institutions can shift practices within their own

operations relatively quickly, giving them an opportunity to model progress. In leading by example with their own internal operations, these entities have demonstrated that they can divert a significant volume of materials away from a city's waste stream, model policies that can be replicated and scaled, promote cultural shifts towards sustainability, and create local markets for zero waste products and services, all building towards a citywide transition to zero waste.



©Corey Stanton/DeliverZero

12 Kavalanz, P. (2019, March 8). This vending machine can help save the environment – and save you money. CNN Business. <https://www.cnn.com/2019/03/08/success/ecopod-vending-machine/index.html>

CASE STUDY

ZERO WASTE OPERATIONS ACROSS DEPARTMENTS THE CITY OF SAN FRANCISCO

San Francisco's City government contributes 15% of the city's waste stream^[13] and actively leads by example in reducing and managing its own waste. Mayoral directives have required city agencies to start participating in zero waste activities before matching policies are implemented citywide. The City also operates a virtual warehouse which takes in reusables such as furniture and office supplies from city-owned property that other departments, schools, and nonprofits may reuse. This reduces both disposal and purchasing costs. Every city agency also has a zero waste coordinator to report on internal waste management and communicate with dedicated staff at the Department of the Environment tasked with implementing zero waste within municipal operations. "If you're asking residents or businesses to do something," says the city's Senior Zero Waste Coordinator Jack Macy, "you should be doing it too".

CASE STUDY

CAMPUS ORGANIZING AGAINST SINGLE-USE PLASTICS AT ECKERD COLLEGE, FLORIDA

Student organizers across the country are leading the way towards building zero waste communities by phasing out single-use plastics on their campuses. Situated on the

13 Golkadas, V. (2012). San Francisco, USA: Creating a Culture of Zero Waste. Global Alliance for Incinerator Alternatives <https://www.no-burn.org/wp-content/uploads/ZW-San-Francisco.pdf>



©Young Grguras/PLAN

Composting station at Eckerd College

Florida coastline near St. Petersburg, plastics are a major concern at Eckerd College. After organizing to create campus cultural shifts towards zero waste, a student group called Eckerd Reduce Single-Use began campaigning in collaboration with FloPIRG, the local student Public Interest Research Group chapter, and Post-Landfill Action Network (PLAN), a national nonprofit which supports zero waste campuses across the country. Under a grant from the National Oceanic and Atmospheric Administration, Eckerd Reduce Single-Use organized students, faculty and staff to urge their president to sign a plastic-free pledge, creating top-down change from a grassroots student-led movement. The Break Free From Plastic Pledge designed by PLAN serves as



a template for college campuses and other institutions to develop long-term systemic solutions to waste. It is outlined in 3 parts:

- First - the College will implement purchasing guidelines to eliminate the procurement of unnecessary single-use plastics by January 1, 2020.
- Second - Eckerd College will work with external vendors to encourage the reduction of unnecessary single-use plastics bought under their purview.
- Third - Eckerd College will continue to invest in education, resources, and infrastructure to reduce plastic consumption on campus and in the neighboring community.

The college ban went into effect in tandem with the St. Petersburg Plastic straw and styrofoam policy, which references the Eckerd policy, and the pledge specifically requires the college to help reduce plastic consumption in its neighboring community: when campuses go zero waste, they can encourage surrounding communities to enact similar change.

“

*If you're asking residents
or businesses to do
something, you should be
doing it too.*

*Jack Macy
Senior Zero Waste Coordinator
City of San Francisco*

CHAPTER 03

4. Encouraging source separation and waste reduction

Mandatory recycling and organics programs only achieve zero waste goals if community members actually reduce and separate out their waste. Source separation means separating out discards before anything is thrown out so that a maximum volume of materials can get reused, recycled, or composted. A successful zero waste program provides communities with education, incentives, and accessible avenues for source separation. Moreover, designing programs to collect materials not typically accepted by curbside recycling programs further advance source separation and waste reduction.

This section covers:

- pay-as-you-throw (PAYT) systems and initiatives to decrease the frequency of curbside collection;
- assistance provision for large generators of waste;
 - facilities for hard-to-recycle-materials;
 - programs to manage textile waste; and
 - community education programs.

PAYT



A PAYT system allows residents to dispose of their source-separated recyclable and organic waste for free, and only charges them for landfill-bound waste. Since residents who throw away more must pay more, PAYT creates economic incentives to divert more of waste to recycling and compost, and to reduce waste overall. Advocates for PAYT argue that solid waste should be a metered utility, just like gas, water, and electricity.

PAYT is effective and popular with residents. One poll of 10 PAYT communities showed that the significant majority held favorable opinions of the program and its performance. In 2014, Americans threw out an average of 900 pounds of household solid waste per capita. In cities with PAYT programs, that average was half, at 440 pounds per capita.^[1] PAYT programs also reduce disposal costs for municipalities: Worcester, Massachusetts has saved over \$10 million since it implemented PAYT in 1993; Waterville, Maine saved over \$78,000 within its PAYT program's first six months.

1 Gardner, P. (2016). Changing the Payment Model: Pay-as-You-Throw and Financial Efficiency. Indiana Recycling Coalition Annual Conference. <https://indianarecycling.org/wp-content/uploads/2015/08/Paul-Gardner-WasteZero-presentation.pdf>



Equitable program design

PAYT rate structure design can be flexible to ensure that low-income households do not pay a disproportionately high share of their income on waste disposal, as compared to a more affluent household that generates the same volume of waste. Policymakers can offer a percentage or flat-rate discount, a certain number of free bags, or reduce the base service charge for low-income households. Cities may also reduce low-income households' cost burden through existing utility or low-income assistance programs. Additionally, the City of San Francisco conducted additional outreach to residents in low-income housing to ensure that residents understood how to use the city's program.



Challenges: multifamily buildings

Multifamily buildings can house a significant portion of an area's population and pose a challenge to implementing PAYT since waste is generally collected in a central location per building, not per household. This makes it difficult to disaggregate the volume of waste generated and extend the economic incentives for source separation that PAYT otherwise offers to households. Property owners might address this by distributing disposal savings to residents as rent reductions or cash rebates. However, this incentive has a less direct impact since it is distributed amongst all the tenants in a building.

CASE STUDY

DECREASING THE FREQUENCY OF CURBSIDE TRASH COLLECTION IN PORTLAND, OREGON

Portland has had a PAYT system since the 90s, but in 2011, the city decided to implement further incentives for residents to separate out their waste. It started collecting organics and recyclables on a more frequent schedule than landfill-bound trash. The new system generated a 38% decrease in landfill-bound residential waste and a threefold increase in compost in its first year.^[2] To ensure successful implementation, the city contracted with community groups to canvass neighborhoods prior to program implementation. Although some residents were initially skeptical about having less frequent trash pickups, they soon saw how much of their waste was actually compostable. As a result, 87% of survey respondents said they were satisfied with the city's new system.^[3]

CASE STUDY

PROVIDING ASSISTANCE FOR LARGE GENERATORS IN SAN FRANCISCO

To increase compliance with the city's mandatory recycling and organics separation ordinance, San Francisco began requiring large generators- the multi-unit housing,

office buildings, hotels, and city buildings that contribute 20% of the city's landfill waste^[4]- to conduct a recycling, composting, and trash audit every three years. Audits receive a pass when contamination levels are lower than 5% for compostables, 10% for recyclables, and 25% for trash. Buildings that fail the compliance audit are required to hire on-site Zero Waste Facilitators at their own expense for one year, or face substantial fines. Zero Waste Facilitators are trained individuals that help property managers comply with ordinances and reduce building refuse costs. They educate and provide feedback to tenants and staff to improve collection efficiency, and conduct back-of-the-house sorting to reduce recycling and compost contamination.^[5] The new requirement had strong union support for its job creation potential, particularly from the local janitorial SEIU chapter.^[6] Implementing waste management policies in large commercial and multi-unit residential buildings can be challenging, especially given potential logistical and tenant accountability issues. However, providing targeted support and financial incentives to help large generators comply with source separation policies creates green jobs and is key to achieving a zero waste goal.

2 City of Portland, Oregon. Zero Waste Case Study: Berkeley. History of Portland's garbage and recycling system. <https://www.portland.gov/bps/garbage-recycling/history-portlands-garbage-and-recycling-system>

3 City of Portland, Oregon. New Curbside Collection Service is coming to Portland this fall. <https://www.portlandoregon.gov/bps/article/363650>

4 City of Portland, Oregon. New Curbside Collection Service is coming to Portland this fall. <https://www.portlandoregon.gov/bps/article/363650>

5 San Francisco Department of the Environment. Refuse Separation Law - FAQ (Property Owners and Managers). <https://sfenvironment.org/zerowastefacilitator-faq>

6 Macy, J. (2020, February). Personal communication [phone interview].



©Eco-Cycle

Earth Day 2017 drop-off at Eco-Cycle's CHaRM, Center for Hard-to-Recycle Materials.

CASE STUDY

ECO-CYCLE'S CENTER FOR HARD-TO-RECYCLE MATERIALS, BOULDER, CO

Hard-to-recycle materials make up about 10-15% of the waste stream and include many durable products such as electronics, mattresses, appliances and more. These materials are challenging to recycle because they have limited or immature end markets; stringent market specifications; or materials where recycling costs likely are greater than revenues. Eco-Cycle is a nonprofit mission-based recycler in Boulder, Colorado, and launched the Center for Hard-to-Recycle Materials, or CHaRM in 2001. The CHaRM has grown to now accept 24 types of materials, with the goal of incorporating one new material into its program each year. The facility received over 55,000 visitors in 2019, and recovered over 5 million pounds of materials. Individuals and businesses self-haul their materials to

the facility, and Eco-Cycle also offers pickup services for businesses. CHaRM accepts scrap metals and certain other materials for free. The facility charges a \$3 fee per visit on other materials, such as plastic bags, large durable plastics, and cooking oil. Other items, such as porcelain fixtures and mattresses, require a material fee in addition to the \$3 facility fee. Facility and materials fees comprise roughly half of CHaRM's revenue while the sale of the materials brings in about one-third of the facility's revenue. The facility is also financially supported by the City of Boulder.^[7] The annual budget is approximately \$750,000 per year. Recycling these materials is labor intensive, and the labor required to manage hard-to-recycle materials makes up nearly half of the facility's total costs. Many of the materials that come through the facility have local recycling and reuse partners, resulting in even more local green jobs. Facilities like the CHaRM that collect

⁷ Eco-Cycle. Center for Hard-to-Recycle Materials. <https://www.ecocycle.org/charm>

hard-to-recycle materials facilitate waste diversion and green economic development. CHaRM also supports the Boulder community by partnering with organizations that employ people who would otherwise have difficulty finding work. The facility works with Blue Star Recyclers to hire adult employees who are on the Autism spectrum (whose neurodivergence often means they are able to accurately and painstakingly separate material components in electronics), as well as SpringBack, a company that employs disenfranchised workers, including individuals with felonies. The CHaRM is one of the key pieces of zero waste infrastructure needed in every community to replace landfills and incinerators, and the CHaRM has been replicated in several communities around the U.S. Learn more at www.ecocycle.org/charm.^[8]

CASE STUDY

Managing textile waste in New York City

Textile waste makes up nearly 10% of municipal solid waste in the U.S.^[9] While PAYT operations typically see a sustained 18% increase^[10] to secondhand clothing retailers, many municipalities also operate textile collection programs to improve diversion. The New York City Department of Sanitation (DSNY) works with local nonprofits to operate a textile program at schools, offices, commercial

businesses, and farmers markets across the city to make textile diversion as convenient as possible. DSNY helps buildings determine appropriate size and placing for their receptacles, which also provide donors with tax receipts as a donation incentive. Cities can design straightforward, distributed collection infrastructure targeting specific, commonly discarded non-recyclable items to rather shrink the municipal waste stream.

Some donated textiles are recycled into cloth for industrial uses, or into fibers for uses such as building and auto insulation. However, nearly half of clothing donated to charities in U.S. are exported to the Global South^[11], where the influx of cheap secondhand clothes is disrupting domestic textile industries.^[12] Cities should encourage charities to circulate and recycle donated textiles domestically before exporting secondhand clothing, and prioritize reducing excessive textile consumption overall.

8 Eco-cycle. (2016). Center for Hard-to-Recycle Materials. <https://www.ecocycle.org/charm>

9 United States Environmental Protection Agency. Facts and Figures about Materials, Waste and Recycling. Textiles: Material-Specific Data. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data>

10 WasteZero. Textiles Recycling. <https://www.wastezero.com/textiles>

11 Secondary Materials and Recycled Textiles. Advocacy. <https://www.smartasn.org/advocacy>

12 Secondary Materials and Recycled Textiles. Update on East African Community Ban on Importation of Used Clothing. <https://www.smartasn.org/advocacy/update-on-east-african-community-ban-on-importation-of-used-clothing/>



Zero waste educational assembly at Green Star School in Boulder, CO
©Eco-Cycle

CASE STUDY

COMMUNITY EDUCATION PROGRAMS IN BOULDER, COLORADO

Peer-to-peer influence is a powerful tool in building zero waste communities. The City of Boulder partners with Eco-Cycle, a local mission-based recycler, to provide one-on-one training and support for residents to become “Eco-Leaders” in their multifamily complexes. The program also provides in-depth group training on a variety of waste issues, and tours of local waste facilities. Eco-Leaders serve as neighborhood educational resources, distributing information and answering common questions about residential waste management. They’re also liaisons between their communities and Eco-Cycle, providing feedback about the recycling and composting services in their communities, offering suggestions for service improvement, and providing updates on implementation. Boulder’s Eco-Leaders help residents understand how to utilize municipal zero waste services, and help municipalities design more effective zero waste programs by adapting them to community needs.

Eco-Cycle is also building zero waste communities in partnership with two local school districts through its Green Star Schools program.

With guidance from Eco-Cycle, Green Star Schools reduce waste by addressing every part of a school’s waste stream, from the classrooms to cafeterias. Zero waste education is a major component of the Green Star Schools program. This includes site visits, waste audits, lunchroom monitoring, faculty meetings, and kick-off assemblies. Through classroom learning and participation in day-to-day zero waste activities, students learn to think critically about their own resource use and how they can reduce waste and take environmental action. The program annually serves more than 21,000 students at 55 schools in two districts.^[13] By working with students, faculty, staff, and parents, Eco-Cycle has helped each Green Star School divert up to two-thirds of its discards towards recycling and compost and fostered waste diversion habits that school communities will carry with them for life. In 2020, Eco-Cycle and the City of Boulder celebrated a huge milestone with all 27 public schools in the City of Boulder now part of the program. This earns the City of Boulder the distinction of being the first city in the United States to have comprehensive Zero Waste opportunities available to all public-school students, preschool through high school graduation.

13 Eco-Cycle. Eco-Cycle’s Green Star Schools® Program. <https://www.ecocycle.org/schools/greenstarschools>

CHAPTER 03

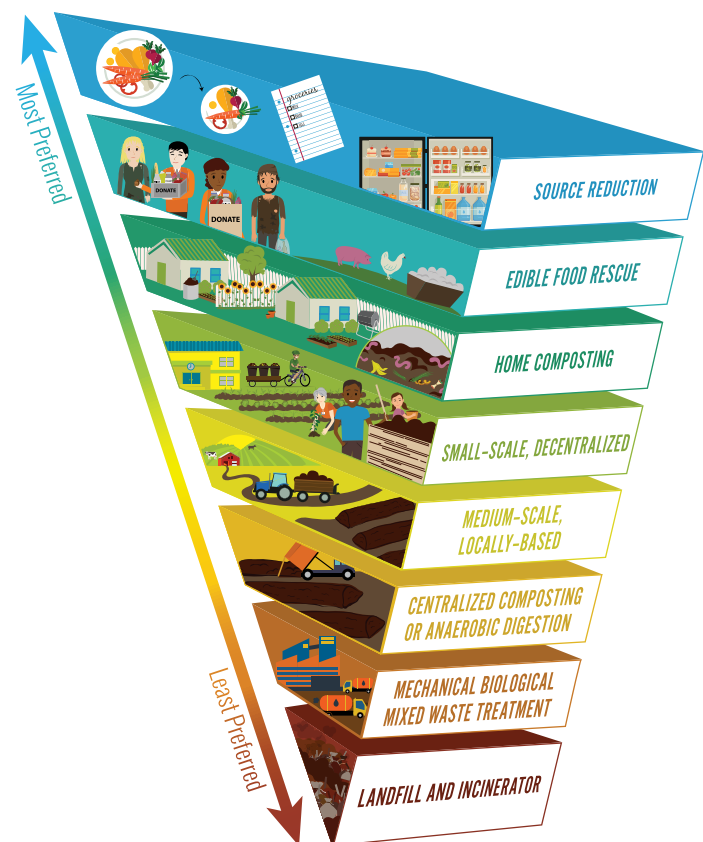
5. Reducing and Managing Food Waste

Up to 40% of the US food supply is thrown out each year – that's approximately \$165 billion worth of food ending up in landfills and incinerators^[1]. Not only is food waste an incredible economic waste, keeping food out of the waste stream is necessary to mitigate climate change. Decomposing organic waste in landfills produces methane, a greenhouse gas 84 times more potent than CO₂, and 9% of U.S. greenhouse gas emissions come from the agricultural sector.^[2]

The Institute for Local Self-Reliance zero waste hierarchy for food can to provide guidance on how to prioritize food waste management approaches:

This can be broken down into three main steps:

- Prevent food waste at the source.
- Recover edible food for donation and redistribution.
- Compost or anaerobically digest the rest.



Source: ilsr.org

1 Gunders, D. (2012). Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. National Resources Defense Council. <https://www.nrdc.org/sites/default/files/wasted-food-IP.pdf>

2 United States Environmental Protection Agency. Zero Waste Case Study: Berkeley. Sources of Greenhouse Gas Emissions. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

PREVENT FOOD WASTE AT THE SOURCE

There are multiple ways for communities to reduce food waste at the source:

- Cities can help inform operational changes to reduce waste by providing restaurants, school cafeterias, and other food service establishments with the technical assistance to identify wasteful practices and improve inventory management.
- Connecting growers and manufacturers to secondary resellers such as Daily Table (see the case study below) that sell unwanted produce and processed food at discounted prices avoids waste and supports food security.
- Encouraging retailers, foodservice providers, and consumers to purchase “ugly” produce prevents edible produce from being wasted because of irregularities in size, shape, or color.
- Communities can also request that institutions eliminate trays in all-you-can-eat dining establishments: the University of Austin saw a 48% decrease in students’ food waste less than two years after removing trays from dining halls, an initiative paired with food waste prevention education for both students and cafeteria workers.^[3]
- City agencies can also support community education programs to help save money and reduce wasted food, such as by distributing toolkits for households and businesses to calculate the costs of their food waste.
- Businesses can be encouraged to participate in voluntary food waste reduction programs with the promise of cost savings: one report found that restaurants saved \$7 in operating costs for every \$1 invested in programs to reduce food waste.^[4] It identified five key actions restaurants can take to successfully reduce food waste:
 1. Rethink inventory and purchasing practices.
 2. Create a “food waste inventory” to measure how much and where food is wasted to prioritize interventions and monitor progress.
 3. Engage staff.
 4. Reduce overproduction: Certain production techniques (such as batch cooking and buffets) can be more wasteful than cook-to-order preparation.
 5. Repurpose excess food: forecasting customer demand is not a perfect science. Having a Plan B for how to safely repurpose ingredients can allow a restaurant to generate revenue from potential waste.

STANDARDIZING AND CLARIFYING FOOD DATE LABELING

Misinterpretation of date labels on food is a leading contributor to food waste. Markers such as “use by” and “best before” do not serve as a

3 Jones, M., Meyer, S., Fighting Food Waste at UT Austin. The University of Texas at Austin. https://19january2017snapshot.epa.gov/sites/production/files/2016-01/documents/4_fighting_food_waste_at_ut_austin.pdf

4 Champions 12.3. (2019). The Business Case for Reducing Food Loss and Waste: Restaurants. <https://furtherwithfood.org/resources/business-case-reducing-food-loss-waste-restaurants>



©Anto Astudillo/GAIA

The Daily Table is a non-for profit grocery store in Boston that collects donated food from local businesses and offers them at discounted prices to lower income communities.

consistently accurate indicator of freshness – they are under-regulated and lack standard legal definitions or timeframes. Date labels also complicate food donation processes, causing confusion around what is and is not safe to redistribute. State and federal agencies and legislatures have the power to create a standardized, more useful dating system that consumers can better understand. Congress, the Food and Drug Administration, and the U.S. Department of Agriculture have this regulatory power. Federal governments can also improve guidance that would inform and streamline state-level legislation and regulations. The NRDC’s report “The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America” lists recommendations to “Standardize and Clarify the Food Date Labeling System”^[5]. Cities can also conduct outreach and education to promote public understanding of food date

labels as a way to prevent food waste and save money, particularly in times where household budgets are tight.

FACILITATING FOOD DONATION

11% of American households are food insecure^[6], and food not consumed for its primary purpose should be redistributed to feed people in need. Municipalities and nonprofits should conduct outreach to retailers, manufacturers, restaurants, and other businesses on local food donation options as well as donation liability laws. Collaboration between municipal and state governments can help standardize health department regulations for safe food handling for donation to reduce

5 Natural Resources Defense Council Report. (2013). The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America. <https://www.nrdc.org/sites/default/files/dating-game-report.pdf>

6 Coleman-Jensen, A., Rabbitt, M., Gregory, C. & Singh, A. (2019). Household Food Security in the United States in 2018. United States Department of Agriculture. <https://www.ers.usda.gov/webdocs/publications/94849/err-270.pdf?v=963.1>



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28%
Percentage of
curbside waste that
is compostable, the
majority of which is
food scraps.

confusion and liability concerns. Lastly, cities may implement or expand tax benefits for food donations and simplify donation reporting on tax forms. Cities could also help connect businesses to food donation operations such as Rescuing Leftover Cuisine, a nonprofit which works in 12 municipalities (including Atlanta, Dallas, and Columbus) to deliver excess food to homeless shelters, and also provides businesses with tax credit assistance services.

COMPOST

Food waste prevention programs means less leftover food for cities to manage. Leftover food not donated for consumption should be composted and returned to the soil, prioritizing decentralized and locally-based compost systems. Cities without universal organics diversion ordinances may target

large generators and require commercial establishments to compost (and/or donate) their organic waste. Nearly 200 U.S. commercial compost operations accept food waste^[7], and the hundreds of yard waste compost operations could be adapted to add food waste.

Composting should occur as close to the source of waste as possible to reduce transportation costs and emissions. Municipalities can facilitate home and community composting through education and technical assistance programs, and by providing grants and other financial incentives. Medium-scale, locally based composting covering small geographic areas is preferable to centralized composting where materials must be transported away from

7 Biocycle. (2020, June 8). 2,900 Commercial Organics Customers In Massachusetts. <https://www.biocycle.net/https-recyclingworksma-com-massachusetts-sees-additional-growth-in-commercial-organics-diversion/>

the communities in which they are generated^[8]. These types of compost systems can be located at or near community gardens, urban farms, and other local food production to strengthen local food economies. The Institute for Local Self-Reliance provides educational resources and technical assistance to communities interested in composting and anaerobic digestion projects.

It is widely known that composting organic waste returns nutrients to the soil. However, composting has a number of other applications that provide economic, climate, and environmental benefits to cities. Twenty-eight percent of curbside waste is compostable, and the majority of this is food scraps^[9] — diverting this waste saves money on hauling and disposal costs. Furthermore, composting creates twice as many jobs as landfilling and four times more than incineration per ton of waste^[10]. It also reduces methane emissions from organic waste decomposing in landfills, and serves an additional climate benefit of enhancing the soil's ability to capture and store carbon^[11]. Further beneficial municipal applications for compost include stormwater filtration — compost can filter out between 60-95% of stormwater

pollutants^[12] — slope stabilization, wetland revitalization, and brownfield remediation^[13]. Municipalities can create local markets for locally-created compost by writing compost use into RFPs for construction and landscaping projects.^[14]

CASE STUDY

CLOSED-LOOP FOOD SYSTEMS IN BOSTON

CERO is a bilingual worker-owned composting cooperative that is moving Boston towards its zero waste goals while building stronger communities. In 2015, Boston's waste diversion rate was under 25%. Even more troubling was the city's stark income inequality: the median wealth of white households was \$247,000, while Dominican and African American households had a median wealth of close to zero. CERO tackles these issues head on by creating dignified, well-paid work that also provides the city with the services it sorely needs to meet its zero waste goals and climate goals.

One of CERO's customers is Mei Mei, a family-owned Chinese-American restaurant that sees its business as a vehicle for social change. Mei

8 Institute for Local Self-Reliance. Hierarchy to Reduce Food Waste and Grow Community. <https://ilsr.org/wp-content/uploads/2017/02/HierarchyIG-FINAL-24x18.pdf>

9 United States Environmental Protection Agency. (2017). Advancing Sustainable Materials Management: 2017 Fact Sheet. https://www.epa.gov/sites/production/files/2019-11/documents/2017_facts_and_figures_fact_sheet_final.pdf

10 Bell, B., & Platt, B. (2014). Building Healthy Soils with Compost to Protect Watersheds. Institute for Local Self-Reliance. <https://ilsr.org/wp-content/uploads/2018/03/Compost-Builds-Healthy-Soils-June-2014.pdf>

11 University of California-Davis. (2019). Compost Key to Sequestering Carbon in the Soil. <https://www.sciencedaily.com/releases/2019/08/190814161818.htm>

12 Bell, B. & Platt, B. (2014). Building Healthy Soils with Compost to Protect Watersheds. Institute for Local Self-Reliance. <https://ilsr.org/wp-content/uploads/2013/05/Compost-Builds-Healthy-Soils-ILSR-5-08-13-2.pdf>

13 U.S. Environmental Protection Agency. (1998). An Analysis of Composting as an Environmental Remediation Technology. https://www.epa.gov/sites/production/files/2015-09/documents/analpt_all.pdf

14 United States Environmental Protection Agency. (2017). Advancing Sustainable Materials Management: 2017 Fact Sheet. https://www.epa.gov/sites/production/files/2019-11/documents/2017_facts_and_figures_fact_sheet_final.pdf

Mei serves locally grown food at a reasonable cost, provides employee education and empowerment training, and avoids food waste. The restaurant incorporates food scraps into recipes, provides low-cost food to employees through a wholesale program, donate what cannot be used, and has CERO pick up the rest for composting. Mei Mei and CERO's partnership represents a perfect food loop – Mei Mei sources some of its produce directly from the very same local farms that use compost from its food waste.

CERO also partners with Green City Growers, an edible landscaping and urban farming business converting unused spaces to places where food is grown, revitalizing city landscapes and inspiring self-sufficiency. They install gardens in people's homes, at restaurants, corporate offices, and grocery stores, and their clients use the produce in their businesses, cafeterias, or for donations – around 5,000 pounds of their produce is donated to food banks each year. They also run educational programs about growing your own food for students and seniors. Green City Growers has a goal to create a regenerative, local food system throughout

the country, and their partnership with CERO is an essential part of that system. Not only does CERO collect plant waste from Green City Growers to turn into compost, it also delivers the compost made from that waste for Green City Growers to enrich their soil.

In addition, CERO serves Daily Table, a nonprofit grocery store that collects donated foods from manufacturers, stores, and farms like Green City Growers and offers them to low-income communities at affordable prices. After distribution, CERO collects leftover food and composts it so that nothing is wasted.

Waste-conscious businesses and nonprofits like Mei Mei, Green City Growers, and Daily Table show the promise of local, sustainable zero waste food systems rooted in social justice. CERO's connects these efforts together in a loop that prevents waste while creating green jobs, healthy soil, and more vibrant communities. These organizations are helping Boston reach the ambitious goals set forth in its Zero Waste Plan while transforming Boston into a place where workers and communities can thrive.



Rie Macchiarolo, Lacey Oliver (Green City Growers) and Maya Gaul of CERO Co-op at the Green City Growers HQ in Somerville, MA.

CHAPTER 03

6. Laying Down the Final Steps: Universal Recycling and Composting, C&D Debris, and Closing the Materials Feedback Loop

IMPLEMENT UNIVERSAL RECYCLING AND COMPOSTING

Implementing universal, mandatory recycling and composting programs is a central part of municipal zero waste planning. Some municipalities may have separate recycling, compost, and trash collection services; others may require trash service providers to also offer recycling and composting as a condition of service provision. While municipalities may be at different starting points and employ different approaches and timeframes in implementing each phase. There are three overarching steps to target each waste-generating sector (e.g. single-family homes, multifamily buildings, commercial establishments of varying size, institutions, special events etc) no matter where municipalities are in the process of conceptualizing or implementing zero waste approaches:

1. Provide universal **access** to services to allow for voluntary waste diversion
2. Offer financial **incentives** for waste diversion, such as Pay-As-You-Throw policies or rebate programs.
3. Adopt **mandatory** recycling and organics diversion laws and ordinances.

Robust education and outreach programs prioritizing businesses and residents in marginalized communities should accompany each stage in order to increase participation and compliance, and to cement policy through cultural shifts. San Francisco, California, Boulder, Colorado, and Austin, Texas, each have universal ordinances with mandates for recycling and organics diversion targeting different sectors — their diversion rates are 80%^[1], 57%^[2], and 42%^[3], respectively, which are significantly higher than their state averages and the nationwide diversion rate of 34%.^[4]

1 SF Environment. (2011). Mayor Lee Announces San Francisco Reaches 80 Percent Landfill Waste Diversion, Leads All Cities in North America. <https://sfenvironment.org/news/press-release/mayor-lee-announces-san-francisco-reaches-80-percent-landfill-waste-diversion-leads-all-cities-in-north-america>

2 City of Boulder. Zero Waste Diversion. <https://bouldercolorado.gov/boulder-measures/zero-waste-diversion>

3 TexPIRG. (2018). Austin Leads Major Texas Cities in Recycling Rate, Statewide Rate Lags Behind National Average. <https://texpirg.org/news/txp/austin-leads-major-texas-cities-recycling-rate-statewide-rate-lags-behind-national-average>

4 TexPIRG. (2018). Austin Leads Major Texas Cities in Recycling Rate, Statewide Rate Lags Behind National Average. <https://texpirg.org/news/txp/austin-leads-major-texas-cities-recycling-rate-statewide-rate-lags-behind-national-average>



MANAGE CONSTRUCTION AND DEMOLITION MATERIALS

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Construction and demolition (C&D) materials comprise a significant amount of a city's waste stream, particularly in municipalities experiencing rapid growth. Cities can reduce C&D waste by reducing materials use at the source, requiring the reuse and recycling of C&D waste through ordinances or building permits, requiring contractors to sort out recyclable C&D waste at the source, creating zoning incentives for development using recycled or reused materials, and creating financial incentives for contractors to deliver C&D materials of a recovery facility through a deposit scheme.

PROMOTING ADAPTIVE REUSE

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Adaptive reuse is one source reduction approach for C&D materials. It involves renovating and retrofitting an existing building so it can be reused for new, modern functions and remain a community asset. Choosing

adaptive reuse over new construction reduces material use at the source, prevents demolition debris from entering the waste stream, and preserves community culture by preserving the unique visual character of a neighborhood. Adaptive reuse also creates local jobs: preservation of old buildings typically has a higher proportion of labor expenses and a lower proportion of material expenses compared to new construction.^[5] Studies show that new construction projects create 40 jobs per \$1 million invested, whereas the same investment in adaptive reuse creates 43-49 jobs^[6]. Any structurally sound building can be fit for adaptive reuse, such as old schools, abandoned warehouses, and historic homes. Incentivizing adaptive reuse through flexible land use regulations, permit fee reductions, and tax incentives should be taken into consideration when developing a holistic zero waste plan.

5 Mohamed, R., Boyle, R., Yang, A., & Tangari, J. (2017). Adaptive reuse: a review and analysis of its relationship to the 3 Es of sustainability. *Facilities*, 35(3/4), 138-154. doi: 10.1108/f-12-2014-0108

6 Historic preservation's impact on job creation, property values, and environmental sustainability.



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CASE STUDY

HOUSTON'S BUILDING MATERIALS REUSE WAREHOUSE

Managing C&D debris is particularly important in rapidly growing cities like Houston. Recognizing that many of its C&D materials could be diverted for reuse, the Houston's Solid Waste Management Department established the Houston Building Materials Reuse Warehouse through a waste reduction grant from the Houston Galveston Area Council.

The Warehouse makes it easy to reuse C&D materials: individuals and companies drop their materials off at the facility, and nonprofits are welcome to take materials for free. The project diverted 1,750 tons from landfills between 2009-2015, and gave away 90% of that – the warehouse provides the additional benefits of reducing C&D waste at the source and saving the costs of construction for local nonprofits.^[7]

7 Reuse Warehouse. Solid Waste Management Department of City of Houston. <https://www.houstontx.gov/solidwaste/reuse.html>

Determining what to do with residuals

Cities may still be left with some residual waste after community-wide waste reduction, reuse, recycling, and composting as they progress on the journey to zero waste. However, waste-to-energy incineration or landfill gas-to-energy harm public health and the environment — the best residuals management approach is a third option, Materials Recovery, Biological Treatment (MRBT)^[8]. MRBT is a process to pre-treat residual waste, recover as much as possible, biologically stabilize it, and then send it to landfill. Pre-treating waste prior to landfilling recovers additional recyclable dry materials, and minimizes landfill emissions by stabilizing organics through a process similar to composting. Thus, MRBT also supports high diversion rates in communities with successful source separation programs. MRBT systems can handle both mixed waste and source-separated waste, meaning that the system can be adjusted to a declining tonnage of residuals as cities reduce waste and improve source separated collection. MRBT is much less expensive than waste-to-energy, and takes less time to be built and operational. Additionally, unlike landfills or incinerators, MRBT infrastructure can be scaled so that communities can be self-reliant and manage residuals locally. However, MRBT should never be used in place of functioning programs to reduce and source-separate waste: it is critical that MRBT be added to a zero waste system. Note that MRBT does require a landfill for treated residuals; sending MRBT residuals to burn in cement kilns, boilers, or incinerators would all result in emissions and community impacts as described in the “Stumbling Blocks” chapter.

8 Morris, J., Favoino, E., Lombardi, E. & Bailey, K. (2013.) What is the best disposal option for the “Leftovers” on the way to Zero Waste? https://www.ecocycle.org/files/pdfs/best_disposal_option_for_leftovers_on_the_way_to_Zero_Waste.pdf



*Houston Building
Materials Reuse
Warehouse diverted*

**1,750
tons**

*C&D debris from
landfills between 2009-
2015, and gave away
90% that.*

Paying for a just transition

Examples in the chapter have funded their zero waste strategies through:

- A variety of state, local, and federal funding sources
- Partnerships with universities
- Revenues from recycling markets
- Service provision fees
- Service provision by local for-profit businesses
- General income taxes
- Eliminating subsidies for fossil fuels and incineration
- Additional tax revenue from new zero waste jobs
- Litigation, fees, and taxes to make polluters pay for their damage caused
- Requiring producers and retailers to manage their products end-of-life
- Long term: organizing and advocating for increased producer responsibility, shifting tax policy to increase revenue, and federal and state budgets that reflect environmental justice and social equity

CLOSING THE MATERIALS FEEDBACK LOOP

While cities can make certain upstream waste reduction measures, decisions made by state and federal governments ultimately affect the waste cities are made to handle, as do un(der)regulated corporate decisions. The incessant influx of under-regulated products and packaging can undermine a city's zero waste goals. However, there are steps cities can take to help close the materials feedback loop.

SHIFT THE BURDEN OF END-OF-LIFE MANAGEMENT ONTO PRODUCERS

Extended producer responsibility (EPR) represents a paradigm shift in waste management and helps cities get closer to their zero waste goals. Product stewardship and Extended Producer Responsibility (EPR) requirements shift responsibility for managing product waste management away from municipalities and onto producers. According to the Product Stewardship Institute^[9]:

- Product stewardship minimizes the health, safety, environmental, and social impacts of a product and its packaging throughout all lifecycle stages. Stewardship can be either voluntary or required by law, and while producers hold the greatest responsibility, other stakeholders (such as suppliers, retailers, and consumers) also play a role.
- EPR is a mandatory type of product stewardship. At minimum, producer responsibility is extended to financing and managing their products and packaging end-of-life. This reduces costs to cities and incentivizes producers to redesign products so that to minimize waste and toxics materials.

9 Product Stewardship Institute. What is Product Stewardship? <https://www.productstewardship.us/page/Definition>



Activists take a stand against big industry's role in the plastic pollution crisis at the Sustainable Brands Conference in 2019.

Local governments have limited jurisdiction over product stewardship and EPR compared to state and federal governments. As of 2014, municipal governments had passed just 3 of 81 such laws in the U.S – California's Alameda County and Washington's King County implemented EPR programs for pharmaceuticals, and New York City required producers to take financial responsibility for managing products containing refrigerants^[10]. However, municipalities are organizing themselves to influence action at the state level. Local governments in several states have formed Product Stewardship Councils as avenues to work with state governments and other organizations to pass state product stewardship and EPR legislation. The proposed Break Free From Plastic Pollution Act offers an example of federal EPR legislation and has also influenced similar legislation at the state level.

10 Product Stewardship Institute. (2014). Electronics EPR: A Case Study of State Programs in the United States. [https://www.oecd.org/environment/waste/United%20States%20\(PSI%20-%20Cassel\).pdf](https://www.oecd.org/environment/waste/United%20States%20(PSI%20-%20Cassel).pdf)

CONDUCT BRAND AUDITS

Cities can evaluate waste audits to understand trends in materials and product categories in residual waste to identify where waste must be eliminated through upstream measures. Waste audits can also look at branded waste: "Brand audits" to help identify the companies that are evading responsibility for their product and packaging waste by placing the burden on municipalities. The rate at which companies produce single-use plastic is an obstacle to even the most comprehensive municipal zero waste systems. Once the top corporate polluters are identified, governments and advocacy groups can exert pressure on companies to hold them accountable for their waste, or even ban certain items. The Break Free From Plastic movement's annual brand audits^[11] evaluate corporate plastic pollution on a global level and provide a helpful guide to conducting a citizen science brand audit.

11 Break Free From Plastic (2019). Brand Audit Toolkit. <https://www.breakfreefromplastic.org/brandaudittoolkit>



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PREVENT THE BUILDOUT OF FOSSIL FUEL INFRASTRUCTURE

Plastic is derived from fossil fuels, and the industry is planning a rapid increase in plastic production as governments pass laws to phase out fossil fuels other sectors of the economy. The petrochemical buildout is directly tied to the plastics crisis taking place in our cities. Mayors can call for an end to federal subsidies for fossil fuel infrastructure or federal moratorium on new infrastructure. Cities can also take action to ban or limit new oil and gas infrastructure locally. For example, Portland's City Council voted to adopt zoning code amendments^[12] banning the construction and expansion of fossil fuel terminals in 2016; New

12 City of Portland, Oregon. Fossil Fuel Terminal Zoning Amendments. <https://www.portland.gov/bps/fossil-fuel-zoning>

York City's Mayor recently issued an executive order^[13] to stop the construction of any new fossil fuel infrastructure within its municipal jurisdiction. City leaders can also join the growing number of municipalities around the world in divesting pension funds from fossil fuels and investing them in less risky, more sustainable assets – see C40 Knowledge Hub's "Divesting from Fossil Fuels, Investing in Our Future: A Toolkit for Cities"^[14] for global case studies and key steps.

13 Statement of Administration Policy Against Addition of Infrastructure that Expands the Supply of Fossil Fuels in New York City, the City of New York, Office of the Mayor, 2020. <https://www1.nyc.gov/assets/home/downloads/pdf/executive-orders/2020/eo-52.pdf>

14 C40 Knowledge Hub (2020). Divesting From Fossil Fuels, Investing in our Future: A Toolkit for Cities. https://www.c40knowledgehub.org/s/article/Divesting-from-Fossil-Fuels-Investing-in-Our-Future-A-Toolkit-for-Cities?language=en_US

Conclusion

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Local governments can employ a range of tried-and-true policy strategies for building zero waste cities. Implementation is most effective when changes are accessible, incentivized, and clearly communicated. Residents, businesses, and institutions which can also serve as essential partners in advancing zero waste and influencing change in their communities. Policies designed with stakeholder needs and broader municipal goals in mind can be inclusive of a variety of access needs and have public benefits beyond climate mitigation and sustainability.



CHAPTER

04

Stumbling Blocks

A variety of proposed “solutions” to the waste crisis are, at best, a waste of time and public funds. At worst, they can contribute greenhouse gas emissions to the climate crisis, degrade the environment, threaten the health and well-being of communities, and justify the ever-growing amount of waste being produced. While some of the practices listed below must be rejected outright, others are acceptable under specific conditions. The latter group should only be employed with careful consideration, and they should never be prioritized over the zero waste strategies described in later chapters that address the root causes of the waste problem.

PRACTICES TO AVOID

INCINERATION: WASTE-TO-ENERGY, CEMENT KILNS, AND REFUSE-DERIVED FUEL

Burning waste does not make it disappear. Rather, various incineration technologies- whether in waste to energy (WTE) plants, incinerators, cement kilns, refuse-derived fuel, or other industrial burners- enable the continued unsustainable consumption of natural resources while contributing to climate change, polluting the environment, creating public health hazards, and diverting public funding away from cheaper and more sustainable zero waste solutions.

Incineration is the least climate-friendly waste management option.

WTE incineration emits more greenhouse gases than coal-fired power plants per energy unit delivered to the grid.^[1] WTE should never be classified as a renewable energy source not only because it releases greenhouse gases but also because it requires a steady supply of non-renewable materials to burn.^[2] Moreover, the application of renewable energy subsidies towards incineration facilities diverts funding away from true renewable energy projects.

Incineration poses threats to public health.

Burning waste releases a host of toxic emissions including heavy metals, dioxins, and particulate matter. These toxics disproportionately impact the low-income communities and communities of color in which 80% of



*Burning waste
does not make it
disappear.*

1 Baptista, A., & Perovich, A. (2019). U.S. Municipal Solid Waste Incinerators: An Industry in Decline. Tishman Environment and Design Center at The New School & Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/failingincineratorsreport/>

2 Platt, B., Ciplet, D., Bailey, K.M., & Lombardi E. Stop Trashing the Climate. (2008). Institute for Local Self-Reliance, Global Alliance for Incinerator Alternatives, & Eco-Cycle. https://ilsr.org/wp-content/uploads/2008/06/fullreport_stoptrashingthecclimate.pdf

incinerators are sited.^[3] Living near an incinerator places residents at heightened risk for cancers, respiratory illness, and cardiovascular disease.^[4] Incinerator workers face even greater health risks as a result of direct exposure.^[5] While air pollution control equipment can reduce some of the toxic emissions from incinerator exhaust, it concentrates them in other byproducts such as ash.^[6] Highly toxic, this residual ash typically ends up in landfills (where it can be spread by the wind), mixed into asphalt and concrete, or mislabeled as soil fertilizer to be spread onto agricultural lands and contaminate our food chains.^[7] Incineration's devastating toll on human health is expensive: Baltimore's Wheelabrator incinerator, for example, costs the city \$55 million in emergency hospital visits, medical treatments, and lost work days due to health problems each year.^[8]

3 Baptista, A., & Perovich, A. (2019). U.S. Municipal Solid Waste Incinerators: An Industry in Decline. Tishman Environment and Design Center at The New School & Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/failingincineratorsreport>

4 Tait, P. W. et al. (2019). The health impacts of waste incineration: a systematic review; Australian and New Zealand Journal of Public Health. <https://doi.org/10.1111/1753-6405.12939>; The New School Tishman Environment and Design Center (2019). U.S. Solid Waste Incinerators: An Industry in Decline; Center for International Environmental Law (2019). Plastic & Health: The Hidden Costs of Plastic Planet

5 Tait, P. W. et al. (2019). The health impacts of waste incineration: a systematic review; Australian and New Zealand Journal of Public Health. <https://doi.org/10.1111/1753-6405.12939>

6 IPEN Dioxin, PCBs and Waste Working Group. (2015). After Incineration: The Toxic Ash Problem. https://ipen.org/sites/default/files/documents/After_incineration_the_toxic_ash_problem_2015.pdf

7 IPEN Dioxin, PCBs and Waste Working Group. (2015). After Incineration: The Toxic Ash Problem. https://ipen.org/sites/default/files/documents/After_incineration_the_toxic_ash_problem_2015.pdf

8 Chesapeake Bay Foundation (2017, December 11). CBF Study: Baltimore Incinerator Causes \$55 Million in Health Problems Per Year [press release] <https://www.cbf.org/news-media/newsroom/2017/maryland/cbf-study-baltimore-incinerator-causes-55-million-in-health-problems-per-year.html>



Incineration is expensive.

Burning trash is not a cost-effective way to generate energy or manage waste. In fact, the capital and fixed costs of waste-to-energy incineration are higher than those of coal, wind, and solar energy. According to the U.S. EPA, an average-size incinerator costs approximately \$100 million to build.^[9] The ongoing financial viability of an incinerator is dependent upon high tipping fees (the price users such as municipalities must pay per ton of materials incinerated) and access to renewable energy subsidies. Incineration can lock cities into expensive contracts: “put or pay” agreements require a municipality to pay a penalty if it fails to supply a minimum volume of waste, therefore

9 Baptista, A., & Perovich, A. (2019). U.S. Municipal Solid Waste Incinerators: An Industry in Decline. Tishman Environment and Design Center at The New School & Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/failingincineratorsreport>



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\$100M

*Cost to build and
average-size
incinerator*

creating barriers to recycling, composting, and waste reduction. These contract clauses have caused significant financial losses and bankruptcies for towns and cities.^[10] Existing U.S. incinerators are at or approaching their life-expectancy and will soon need additional capital investments, forcing local governments and taxpayers to pay for the maintenance of outdated technologies.^[11]

PLASTIC-TO-FUEL: GASIFICATION, PYROLYSIS, AND PLASMA ARC

Plastic-to-fuel (PTF) technologies such as gasification, pyrolysis, and plasma arc are experimental, high-risk, and costly processes for heating plastic waste to create a fuel that is then burned for energy. Policymakers and communities should be aware of the plastics and chemical industries' current state-level efforts to promote PTF by strategically shifting the classification of such facilities from solid waste to manufacturing. Attempts to use PTF in municipal solid waste management over the last few decades have exposed the practice as a risky investment with high capital costs, energy inefficiency, and low returns. In fact, billions of dollars have been lost through PTF investments.^[12] Facilities across the U.S., Europe, and Canada have struggled to generate enough product to be financially viable and have a track record of failures, including facility fires and explosions. PTF is sometimes advertised

10 Leonard, M. Burning Public Money for Dirty Energy. (2011). Global Alliance for Incinerator Alternatives. https://www.no-burn.org/wp-content/uploads/Burning-Public-Money-GAIA-2011_2.pdf

11 Baptista, A., & Perovich, A. (2019). U.S. Municipal Solid Waste Incinerators: An Industry in Decline. Tishman Environment and Design Center at The New School & Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/failingincineratorsreport>

12 Zero Waste Europe. (2019). El Dorado of Chemical Recycling, State of play and policy challenges. <https://zerowasteurope.eu/downloads/el-dorado-of-chemical-recycling-state-of-play-and-policy-challenges/>



as a “cleaner” approach than waste-to-energy incineration. However, many such facilities neglect to report comprehensive emissions data, and have been found to repeatedly violate emissions control limits. Moreover, most plastic is made from oil or fracked natural gas: therefore, plastic-derived fuel is a fossil fuel, and burning it releases toxic substances and greenhouse gases. Like other fossil fuels, plastic-to-fuel should be phased out to meet climate emissions reduction targets.

CHEMICAL RECYCLING (PLASTIC REPOLYMERIZATION)

Plastic repolymerization, also known as chemical recycling, is an energy-intensive process that turns plastic into liquids and gases which could, in theory, be used to make “recycled” plastic of a similar quality to new plastic. However, plastics and chemical industries use the term “chemical recycling” interchangeably with “plastic-to-fuel”, effectively conflating the two terms. There are important differences: chemical recycling aims to turn plastic waste back into plastic resin while PTF turns plastic into a fuel (which is problematic for the reasons outlined above). Most plants claiming to do “chemical recycling” are actually plastic-to-fuel plants. As of 2017, similar technologies have wasted at least \$2 billion of investments with canceled or failed projects across the globe. Over half of the plastic that is processed in these facilities comes out as climate pollution. That’s on top of the emissions from burning the resulting fuel. In one of the industry’s most celebrated “chemical recycling” plants, Agilyx, over 2x the amount of greenhouse gases are produced for each unit of product. GAIA recently published a report



“

If a technology ultimately destroys the resource it is processing, such as creating fuel that will be burned, it's not recycling.

*Lynn Hoffman
Co-President, Eureka
Recycling, Minneapolis,
Minnesota*

and one-pager^[13] investigating the US “chemical recycling” industry.

“If a technology ultimately destroys the resource it is processing, such as creating fuel that will be burned, it’s not recycling.” - Lynn Hoffman in testimony to the House Committee on Energy and the Environment.

How should policymakers treat chemical recycling? Decision makers should reject “chemical recycling” project proposals and

legislation that enables further growth of the “chemical recycling” industry, particularly in environmental justice communities. We don’t have any more time to waste on greenwashing techno-fixes like “chemical recycling”, and such projects should not receive public funds. Instead, cities and states need to focus on what actually works: reducing the amount of plastic produced and joining government leaders from around the world in transitioning to zero waste systems.

If however, chemical recycling projects are already underway, regulations must clearly distinguish true chemical recycling (plastic-to-plastic) from plastic-to-fuel, as described

13 Tangri, N. & Wilson, M. (2017). Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management. Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/gasification-pyrolysis-risk-analysis>

by EU policy.^[14] Secondly, chemical recycling should not compete with mechanical recycling, which would likely emit fewer carbon emissions and toxic byproducts, nor should it receive subsidies or regulatory incentives. Any chemical recycling facilities must be closely monitored for environmental and public health impacts, especially since thermal chemical recycling processes are known to release toxic substances despite data scarcity while little data on the toxicity and sustainability of solvent-based chemical recycling technologies is currently available.

LANDFILLING AND LANDFILL GAS-TO-ENERGY

Landfills can be costly, and they threaten the environmental health of nearby communities. As of 2020, the United States is on track to have just 18 years of remaining landfill capacity^[15], and according to the EPA, “it can cost over \$1 million per acre to construct, operate, and close a landfill in compliance with regulations”.^[16] Under U.S. superfund law, transporting waste to landfills – which are typically large and located far from their sources of waste generation – creates additional trucking costs and emissions. Rain and snow percolate through landfills and pick up contaminants from the waste, turning into a toxic liquid called “leachate.” Protective liners and leachate collection systems fail over

time.^[17] When leachate leaks into groundwater, it pollutes the water bodies and wells communities depend on.

Landfills also have significant climate impacts: decomposing organic waste in landfills is the second-largest contributor to human-related emissions of methane, a greenhouse gas that traps 84 times more heat than carbon dioxide over a 20-year period.^[18] The waste industry has invested heavily in promoting landfill gas to energy (LFGTE) systems to capture methane emissions. However only a fraction of the methane is successfully captured for conversion to energy. The emissions impact of methane leaking out from LFGTE systems exceeds the modest benefit of offsetting carbon emissions on the energy grid.^[19] Organic waste comprises nearly one-third of landfilled materials:^[20] investments in organics collection and composting infrastructure would lower methane emissions, help drawdown atmospheric CO₂, and significantly reduce the overall volume of landfilled materials. Instead of attempting to build “sustainable landfills”, climate-friendly

14 Directive 2018/851. Amending Directive 2008/98/EC on Waste. European Parliament, Council of the European Union. <http://data.europa.eu/eli/dir/2018/851/oj>

15 Waste Business Journal. (2019). Waste Market Overview and Outlook. Waste Business Journal. <https://www.wasteinfo.com/overview.htm>

16 United States Environmental Protection Agency. (2014). Municipal Solid Waste Landfills: Economic Impact Analysis for the Proposed New Subpart to the New Source Performance Standards. https://www3.epa.gov/ttnecas1/docs/eia_ip/solid-waste_eia_nspc_proposal_07-2014.pdf

17 Pecci, K. (2018, July 23). All Landfills Leak, and Our Health and Environment Pay the Toxic Price. Conservation Law Foundation. <https://www.clf.org/blog/all-landfills-leak-and-our-health-and-environment-pay-the-toxic-price/>

18 United States Environmental Protection Agency. (2017). Understanding Global Warming Potentials. <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>

19 Recycling Works Campaign, Sierra Club, & International Brotherhood of Teamsters. (2009). The Danger of Corporate Landfill Gas-to-Energy Schemes and How to Fix It. <https://teamster.org/sites/teamster.org/files/6310GreenhouseGasReportrevisedlowres.pdf>

20 Graham T., Tessler J., Orris P., Shimek J., Wilson M. & Witt H. (2015). Sustainable and Safe Recycling: Protecting Workers who Protect the Planet. Global Alliance for Incinerator Alternatives, Partnership for Working Families, MassCOSH, National Council for Occupational Safety and Health. <https://www.coshnetwork.org/sites/default/files/SafeRecyclingReport.pdf>



waste management policies should prioritize reducing the amount of waste entering landfills in the first place, with a focus on organic waste.

Mixed Waste Processing

A mixed waste processing system allows consumers to place all discarded materials – organics, mixed recyclables, and landfill-bound waste – in a single bin that gets sent to a materials recovery facility for sorting by a combination of human hands and machinery. Mixed waste sorting facilities are sometimes referred to as “Dirty Material Recovery Facilities” (MRFs). Dirty MRFs are more likely to have hazardous materials such as rotting meat, dirty diapers, and medical waste that threaten recycling workers’ health and safety on the sorting line because garbage is mixed in with

recyclables.^[21] Proponents of mixed waste processing argue that it takes the sorting burden off the consumer, requires no public education efforts, and captures recyclables from the waste stream that may have been missed through initial recycling separation. However, recyclables recovered from mixed waste processing are low in both quantity and quality. Many end-market buyers do not purchase from mixed waste processing facilities.^[22] Furthermore, lack of consumer education is a missed opportunity to start building the cultural shifts required to change

21 GAIA, Partnership for Working Families, MassCOSH, & National Council for Occupational Safety and Health. (2015). Sustainable and Safe Recycling: Protecting Workers Who Protect The Planet. <https://www.no-burn.org/wp-content/uploads/Safe-Recycling-Report-1.pdf>

22 Resource Recycling Systems & Institute of Scrap Recycling Industries. (2016). Mixed Waste Processing & Desirability of Recovered Paper Market Survey. <https://recycle.com/paper-mixed-waste-processing/>

consumption patterns and reduce the amount of waste produced.

Mixed-waste processing should not serve as the backbone of a municipality's waste management system. Where recyclables and organics are separated at the source, and proper worker safety precautions are in place, mixed waste processing may be used to recover additional recyclable materials from landfill-bound trash.

PRACTICES TO EMPLOY WITH CAUTION

MECHANICAL RECYCLING OF PLASTIC

Recycling – particularly of low-grade paper and plastic – is not enough to solve our waste crisis. The aftermath of China's 2017 ban on waste imports exposed recycling as deeply flawed, not only in a purely operational sense, but also in its positioning as the solution to the waste problem. For decades, municipalities were able to export poorly sorted bales of paper and plastic waste laden with low-quality materials and non-recyclable contaminants. Losing China as an escape valve for our waste means that bales are piling up at collection facilities and ports, eventually getting sent to landfills and incinerators or exported to Southeast Asian countries now facing an unprecedented volume of western waste that threatens the safety and wellbeing of its people, lands, and waters. A significant amount of discarded plastic, including multi-layered plastics (such as potato chip bags) lightweight and low-grade plastics (clamshell take-out containers) are technologically and financially infeasible to recycle. Even with the best available recycling technology, the maximum rate of recycling for the current mix



of plastics produced would be between 36% and 53%.^[23] Most types of plastic are financially impossible to recycle now, and will remain so for the foreseeable future. There is evidence from materials recovery facilities across the country that many plastics (particularly plastic types #3–7) collected for recycling are ultimately sent to landfills or incinerators.^[24] Domestic end markets for recycled materials are sorely underdeveloped, while the shale fracking boom makes virgin plastic extremely cheap, outcompeting recycled resin in the marketplace: Coca-Cola, Pepsi, and Nestle are the world's top corporate plastic

23 Denkstatt, The potential for plastic packaging to contribute to a circular and resource-efficient economy (Identiplast, 2015).

24 Greenpeace. (2020). Circular Claims Fall Flat: Comprehensive U.S. Survey of Plastics Recyclability. http://greenpeace.org/usa/plastic_recycling



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*Even with the best available recycling technology, the maximum rate of recycling for the current mix of plastics produced would be between **36%** and **53%**.*

polluters^[25] and use just 9%, 3%, and 2% recycled content in their products, respectively. ^[26] Plastic also degrades as it is recycled, limiting the number of possible practical new uses. The same piece of plastic can only be recycled 2-3 times before it becomes unusable.^[27] The massive task of collecting, sorting, transporting, and processing plastic waste falls upon municipalities, a burden that will only grow if plastic production quadruples by 2050.

Some materials are compatible with recycling. For example, nearly 75% of all aluminum ever produced in the U.S. is still in use today.^[28] While recycling is not enough to solve the plastics crisis, improvements to our recycling system - universal access, better education and incentives around sorting, and end market development for recycled materials - are necessary. More importantly, policymakers and advocates must prioritize the implementation of upstream waste reduction measures to reduce the volume of waste being created in the first place, support the development of reuse systems, and place pressure on producers to design waste out of their products and packaging.

25 Break Free From Plastic. (2019). BRANDED Volume II: Identifying the World's Top Corporate Plastic Polluters. <https://www.breakfreefromplastic.org/globalbrandauditreport2019/>

26 Ellen MacArthur Foundation. (2019). The New Plastics Economy Global Commitment: 2019 Progress Report. <https://www.ellenmacarthurfoundation.org/news/first-annual-new-plastics-economy-global-commitment-progress-report-published>

27 National Geographic Society Newsroom. (2018, April 4). 7 Things You Didn't Know About Plastic (And Recycling). National Geographic. <https://blog.nationalgeographic.org/2018/04/04/7-things-you-didnt-know-about-plastic-and-recycling/>

28 The Aluminum Association. (2017). Recycling. <https://www.aluminum.org/industries/production/recycling>



ANAEROBIC DIGESTION

Although the practice might initially appear similar to landfill gas-to-energy, unlike LFGTE, anaerobic digestion (AD) can be a zero waste practice. Separately collecting and managing discards is a key component of zero waste systems, and anaerobic digestion requires a clean, source-separated input of organic waste. Although this biogas does produce CO₂ when combusted, it is a more climate-friendly alternative to fossil fuels. When managed properly, AD's closed containment vessels ensure that significant odors and methane leakage are avoided. Furthermore, AD's byproduct takes the form of a nutrient-rich slurry that can be composted to enrich the soil. Policymakers should note that in order for AD to be climate positive, it should occur as close to the source of waste as possible; it must replace fossil fuels instead of just adding to overall energy production; and feedstocks should come from waste, not timber or food grown for the purpose of biogas production.^[29]

29 Environmental Defense Fund. (2019, April 15). Not all biogas is created equal. <http://blogs.edf.org/energyexchange/2019/04/15/not-all-biogas-is-created-equal/>

While compost is often a preferable option due to its climate benefits, low-cost nature, and scalability, anaerobic digestion is an acceptable form of organic waste management, particularly in dense, urban areas where odors from a large-scale composting facility would be of concern. Some municipalities have also found success in co-locating AD and composting facilities in an integrated system.^[30]

"REGRETTABLE SUBSTITUTIONS" FOR SINGLE-USE PLASTICS AKA NON-PLASTIC SINGLE-USE ALTERNATIVES

Some municipalities are promoting non-plastic single-use disposable items in an attempt to reduce single-use plastics. However, these "regrettable substitutions" swap one problem for another:

- **Paper:** Forest restoration and reforestation are key climate mitigation strategies fundamentally at odds with a rise in paper and cardboard as plastic substitutions.

30 Kadidis, A. (2018, November 27). Why Co-locate Compost and Anaerobic Digestion? Waste360. <https://www.waste360.com/business-operations/why-co-locate-compost-and-anaerobic-digestion>



While paper is recycled at a higher rate than plastic, large amounts of paper collected for recycling goes to landfills or incinerators due to contamination.

- **Bio-based and biodegradable plastic; compostable plastic; and molded fiber:**

Most bio-based plastic contains a significant amount of fossil-fuel-derived plastic. Both bioplastics and fossil-fuel derived plastics can be designed to be “biodegradable”. However, this requires specific heat and humidity conditions almost never available in the natural environment. Few U.S. cities have the industrial composting facilities required to process compostable plastics^[31], and many compost facility operators do not want to accept compostable packaging products.^[32] Moreover, the majority of

bio-based products are derived from agricultural crops. An increase in bioplastic production would further increase the share of agricultural land used for non-food crops, which is linked to food insecurity, environmental degradation, and agricultural emissions.

Many molded fiber foodware products are lined with Per- and polyfluoroalkyl substances (known as PFAS) to prevent oil and grease from seeping through. PFAS is a potentially carcinogenic chemical that impairs immune function. It persists in the environment and human body, meaning it doesn’t break down, can make its way up the food chain, and can accumulate over time.^[33] Items containing PFAS should not be composted and spread over soil. Most of these plastic packaging alternatives end up in landfills and incinerators. While phasing out single-use plastics is important, the implementation of reuse and refill systems should be prioritized over the use of regrettable substitutions.

31 The Times Editorial Board. (2019, December 22). Editorial: Compostable Plastic? Not So Much. Los Angeles Times. <https://www.latimes.com/opinion/story/2019-12-22/editorial-compostable-plastic-not-so-much>

32 Northern California Recycling Association. (2019, March 22). Oregon Composters Push Back Against Compostable Packaging. <https://ncrarecycles.org/2019/03/oregon-composters-push-back/>

33 United States Environmental Protection Agency. (2018). Basic Information on PFAS. <https://www.epa.gov/pfas/basic-information-pfas>

SNAPSHOT



AVOID

INCINERATION: WASTE-TO-ENERGY, CEMENT KILNS, AND REFUSE-DERIVED FUEL			
PROBLEMS	<ul style="list-style-type: none">• Expensive to construct and maintain. Aging incinerators require additional public investment.• Causes serious public health problems.• Least climate-friendly waste management approach.• Disproportionately sited in environmental justice communities.• Justifies continued waste production.	<ul style="list-style-type: none">• Ban construction of new incinerator facilities.• Phase out existing incinerators by 2030.	RECOMMENDATIONS
	PLASTIC-TO-FUEL, GASIFICATION, PYROLYSIS, AND PLASMA ARC		
	<ul style="list-style-type: none">• Risky investment: high costs, low returns.• Emits greenhouse gases in both production and burning of plastic-derived fuel.• Releases harmful pollutants in the form of air emissions and by-products.• Justifies continued waste production.	<ul style="list-style-type: none">• Halt investments in plastic-derived fuels alongside other fossil fuels.	
	CHEMICAL RECYCLING (PLASTIC REPOLYMERIZATION)		
	<ul style="list-style-type: none">• Often a trojan horse for plastic-to-fuel.• Toxicity, health and climate impacts remain unidentified.• Will not be technically or financially viable for at least 10 years.	<ul style="list-style-type: none">• Distinguish from plastic-to-fuel.• Monitor new facilities for environmental and public health impacts.• Do not prioritize over mechanical recycling.	
	LANDFILLING AND LANDFILL GAS-TO-ENERGY		
<ul style="list-style-type: none">• Disproportionately sited in environmental justice communities.• Leachate contaminates water sources.• Generates methane emissions.	<ul style="list-style-type: none">• Ban the construction of new landfills.• Phase out the use of existing landfills.• Make investments in composting, AD, and source reduction infrastructure of LFGTE.• Use landfill gas capture and other mechanisms to stabilize closed landfills.		
MIXED-WASTE PROCESSING			
<ul style="list-style-type: none">• Recovered materials are low in quantity and quality.• Sends remaining materials to incinerators or landfills.• Handling mixed waste can threaten worker health and safety.	<ul style="list-style-type: none">• Do not use as primary recycling system.• Use only to recover additional recyclable materials from landfill-bound trash after separation, if used at all.• Implement better worker safety precautions.		

RECOMMENDATIONS

EMPLOY WITH CAUTION

PRIMARY PROBLEMS	MECHANICAL RECYCLING OF PLASTIC		BROAD RECOMMENDATIONS
	<ul style="list-style-type: none">Plastic includes a wide range of different resins or types. Each of these types of plastic are only recyclable separately, and only under certain conditions. It requires separate collection, low contamination and material complexity, proper infrastructure, and markets for recycled material, etc.Can't keep up with the increasing rate of plastic production.Justifies further plastic production.	<ul style="list-style-type: none">Focus on reducing waste at the source; phase out production of hard-to-recycle products and packaging.Improve education, policies, and infrastructure for proper sorting.Develop and use domestic end markets for materials.Implement policies that increase refill and reuse systems.	
	ANAEROBIC DIGESTION		
	<ul style="list-style-type: none">Burning anaerobic digestion-derived biogas releases CO2.	<ul style="list-style-type: none">Do not prioritize biogas production over zero-emissions energy sources.Do not grow foods specifically for AD biogas production.If AD for food waste makes sense for the community, make sure byproducts are composted, not landfilled.	
	"REGRETTABLE SUBSTITUTIONS" FOR SINGLE-USE PLASTICS		
	<ul style="list-style-type: none">Perpetuate the throw-away economy.Have adverse environmental impacts.Complicate the material recovery process.Often end up in landfills or incinerators.	<ul style="list-style-type: none">Prioritize reuse/refill systems.Ensure that products marketed as biodegradable /compostable are certified as such.Ensure products are going to facilities that can process them.Ban the use of toxic materials in plastic substitutes.	



CHAPTER

05

Ensuring a Just Transition to Zero Waste

According to the Climate Justice Alliance, a “just transition is a vision-led, unifying, and place-based set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative one. If the process of transition is not just, the outcome will never be”.^[1] A just transition to zero waste is a part of this larger justice-centered transition towards a regenerative economy. Within this framework, zero waste is far more than just a means towards environmental goals, but rather, a holistic tool of social intervention towards well-being for all. As such, those striving to carry out a just transition to zero waste must:

1 Climate Justice Alliance. Just Transition. <https://climatejusticealliance.org/just-transition/>



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Zero waste is far more than just a means towards environmental goals, but rather, a holistic tool of social intervention towards well-being for all.

- Guarantee equitable access to all resources.
- Shift decision-making power to communities, particularly those most impacted by injustice.
- Create jobs for workers that pay family-sustaining wages and benefits.
- Guarantee occupational safety and health at recycling sorting operations, compost facilities, collections, and throughout the local waste system.
- Generate cultural changes towards sustainability and respect for resources.
- Ensure that interventions in one community do not harm a community somewhere else.
- Understand current patterns of consumption and disposal as part of a larger extractive supply chain.
- Engage communities in a way that meets them where they are, physically and in terms of background knowledge on waste, sustainability, and city planning.
- Make accommodations for disability and access.
- Hold polluters – particularly those who cause disproportionate harm – accountable for course-correcting their actions.
- Embody values of shared responsibility, justice, and sustainability.

This chapter examines the role of zero waste in building a just transition and outlines actions that municipalities can take in ensuring their transition to zero waste is grounded in justice.

Ensuring a just recovery from the COVID-19 pandemic

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The effects of the COVID-19 pandemic forshadow those of future crises. To “build back better” and foster long-term resilience, cities must make public health a top priority; invest in local economic development; heighten efforts to mitigate climate change; and safeguard democracy by protecting the interests of the public over industries which displace and pollute communities. When approached holistically, zero waste is a means towards these societal goals. Read GAIA’s principles for embedding zero waste in a just recovery here: <https://zerowasteworld.org/zwjustrcovery/>



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STRENGTHENING COMMUNITY CONTROL

A just transition to zero waste prioritizes the places where inequality has been most pervasive, redistributing power and resources so that communities have the authority to make autonomous decisions, meet their own needs, and model system change on a local level.

A holistic, grassroots-led approach to zero waste can address multiple local issues and leave communities stronger.

CASE STUDY

COMBATING ENVIRONMENTAL GENTRIFICATION IN DETROIT

Successful environmental justice campaigns can have the unintended consequence of making neighborhoods long perceived as

“undesirable” more attractive to development, driving up real estate prices and the cost of living, resulting in the displacement of working class residents. This phenomenon of “environmental gentrification” means zero waste plans can be a double-edged sword for communities, unless paired with comprehensive anti-displacement efforts.

Detroit’s incinerator caused some of the worst environmental injustices in the city: for decades, mostly low-income residents near the facility breathed in toxic emissions from burning trash that mostly came from wealthy, whiter suburban neighborhoods. However, the Breathe Free Detroit Campaign generated public pressure around the incinerator’s hundreds of emissions and odor violations, and in 2019, the incinerator’s parent company closed the facility.

Although successful in shutting down the incinerator, this grassroots campaign opened the doors to redevelopment. Investors had

long ignored the neighborhoods surrounding the incinerator because of the strong odors and well-documented health impacts of the incinerator emissions – the area had the highest asthma rate in the city while the incinerator was in operation, and much of the land lay vacant as pollution and foreclosures forced families and businesses to relocate. Shortly after the incinerator shut down, development pressures accelerated: new single-family homes and apartment complexes began to crop up, and the nearby Eastern Market commercial district started making development plans for expansion into the area.

Local stakeholders started looking at ways to prevent further displacement and place land under community control. Breathe Free Detroit has worked with local housing groups to compile “Rooted We Rise: A Resource Guide to Help Detroiters Stay in our Homes and Strengthen our Neighborhoods”, an anti-gentrification guide with resources for homeowners, rental, utilities, and legal assistance. Organizers distribute the guide by going door-to-door in the areas closest to the incinerator. Anti-displacement efforts are key to making sure those who successfully fought against environmental injustices are able to remain in their homes, reap the benefits of their victory, and continue growing power in their communities.

CASE STUDY

FIGHTING FOR COMMUNITY LAND CONTROL IN BALTIMORE

Community well-being is fundamentally connected to land questions of ownership: Who owns land, and what are their motivations and goals? What do they use the land for?

Baltimore has the second highest eviction rate in the United States, and the city’s vacant lots are the primary destination for approximately 10,000 tons of illegally dumped trash each year. Decades of racial and economic injustices have made it difficult for low-income communities and communities of color to own land. This has created conditions where the worst illegal dumping takes place in poor and black neighborhoods faced with the worst rates of rental eviction and vacant lots.

Land ownership “puts a community in a place of agency instead of constant reactivity” and provides the power to create change independently, says Greg Sawtell, an organizer at South Baltimore Community Land Trust. Community Land Trusts (CLTs) are a model for local control over land where community-controlled “land trusts” purchase lots



Community activist and Goldman Environmental Prize-winner, Destiny Watford, who shut down an incinerator proposal near her high school and is now one of the leaders behind the South Baltimore Community Land Trust.

and place them under permanent community ownership. Baltimore organizers see CLTs as an intervention tool to stop evictions, create affordable housing, and implement zero waste alternatives to dumping trash in vacant lots (or to the soon-to-close local incinerator). The city has committed \$20 million into a trust fund for CLTs and affordable housing development that will be funded through City Council legislation, general obligation bonds, and other sources of revenue. However, residents haven't been waiting for the city to act. Residents have already obtained ten vacant lots used for dumping into a park, community composting at a lot-turned-garden, and are drawing up plans for eight units of affordable housing.

PROTECTING OCCUPATIONAL HEALTH AND SAFETY AT RECYCLING MRFS

Recycling workers face serious hazards on the job, and their injury rates are more than double the national average. Occupational injuries are preventable, and local governments have the power and responsibility to ensure that zero waste jobs are good jobs. According to the 2015 **Sustainable and Safe Recycling** report^[2], municipalities can use their contracts, franchises, leases, and partnerships with private sector recycling companies as points of intervention to protect workers by evaluating the company's safety record and the strength of their health and safety programs. Contracts should also stipulate strong access and inspection rights for government personnel.

Heavy use of temporary staffing agencies has allowed companies to neglect responsibility for worker health and safety. Temporary workers often receive insufficient safety training and can be more reluctant (or not know how) to raise health and safety concerns or report injuries as they tend to have little to no protection from retaliation. Thus, municipalities should also prohibit contractors, leasees, and franchisees from hiring temporary and contingent workers to create recycling jobs that are safe and stable. Additionally, public education and outreach programs around source separation ensure cleaner, safer streams of materials entering a MRF. The public should understand that certain materials threaten the health and safety of recycling workers: hypodermic needles, for example, can carry life-threatening illnesses, and plastic bags can clog machinery and require workers to climb into heavy equipment and clean them out manually more frequently. The Sustainable and Safe Recycling Report details municipal best practices^[3] for making MRFs safer in the areas of contracting, temporary labor, standards for workers' rights, environmental health, and public education.

2 Graham T., Tessler J., Orris P., Shimek J., Wilson M. & Witt H. (2015). Sustainable and Safe Recycling: Protecting Workers who Protect the Planet. Global Alliance for Incinerator Alternatives, Partnership for Working Families, MassCOSH, National Council for Occupational Safety and Health. <https://www.coshnetwork.org/sites/default/files/SafeRecyclingReport.pdf>

3 Graham T., Tessler J., Orris P., Shimek J., Wilson M. & Witt H. (2015). Sustainable and Safe Recycling: Protecting Workers who Protect the Planet. Global Alliance for Incinerator Alternatives, Partnership for Working Families, MassCOSH, National Council for Occupational Safety and Health. <https://www.coshnetwork.org/sites/default/files/SafeRecyclingReport.pdf>

The COVID-19 pandemic and rising global temperatures have added additional layers of consideration for worker health and safety not covered by current federal worker protection legislation.

- Workplaces should be disinfected regularly.
- Workers should be provided with Personal Protective Equipment (such as masks and puncture-resistant gloves) and hand sanitizer.
- Workers deserve hazard pay and paid sick leave.
- Cities can create guidelines for how to separate and dispose of potentially infectious waste (such as syringes and tissues) e.g. double bag, seal, and educate residents, home health aids, and healthcare facilities to not place these materials in the recycling. Cities should conduct extensive outreach and may provide free waste bags to low-income households to help with compliance. Cities may also choose to use a different colored bag for infectious waste.
- Heat is the top weather-related killer in the United States.^[4] Workplaces must also provide employees – particularly those who work outside – with adequate water, shade, and opportunities to rest during the year's hotter months.

4 National Weather Service. (2020). <https://www.weather.gov/phi/heat>

SUPPORTING TRANSITIONING WORKERS

Plans to shut down outdated, polluting facilities, such as landfills, incinerators, and plastics production plants, should be accompanied by stringent policies to protect the wellbeing of workers whose livelihoods may be adversely affected by the transition to a regenerative, zero waste economy. Existing programs to support transitioning workers are limited in both prevalence and scope. However, Colorado's 2019 Just Transition law for coal workers, the defeated Washington Carbon Emissions Fee and Revenue Allocation ballot initiative,^[5] and a number of plans and frameworks proposed by political candidates, nonprofits, and research institutes put forward several provisions for consideration. Although federal funding and policy support would achieve the most robust degree of protection, municipal governments can still work with unions, nonprofits, employers, and state governments to ensure basic needs are met.

- **Workforce transition plan:** the agency responsible for overseeing an outdated facility should work with unions to develop a workforce transition plan at least three months before the facility's closure.
- **Social safety nets:** fast-track and provide assistance completing applications for SNAP, WIC, and other social safety nets; provide free or discounted public transportation fares to the laid-off worker and their dependents; extend the benefits of the federally-funded, state-administered programs like the Low-Income Home

5 H.B. 1314, 2019 Reg. Sess. (Colo. 2019); State of Washington House of Representatives. (2018). Summary of Initiative 1631. <http://leg.wa.gov/House/Committees/OPRGeneral/Documents/2018/Initiative1631Summary.pdf>



Energy Assistance Program, and other renters' and utility assistance programs to transitioning workers.

- **Healthcare:** until universal healthcare is available, laid-off workers and their dependents should be provided health insurance at no or minimal premium, deductible, or co-pay costs; municipalities or employers can also cover workers' COBRA payments.
- **Wage guarantee:** provide a wage differential benefit to cover all or part of the difference between a laid-off worker's previous salary in an extractive industry and their income at a new job, or supplemental income during job retraining for a set time period.
- **Pension support:** ensure employees are not deprived of their pension credits or right to a pension, and support early retirement for those who no longer can or wish to work.
- **Education and retraining:** provide career counseling and employment placement services; cover retraining costs; streamline entry and provide tuition support to local community and technical colleges; and

support paid apprenticeship programs. Education and retraining opportunities before the closure should be available to workers in extractive industries while they are still working, not just after they are laid off.

- **Priority job placement:** prioritize hiring laid-off workers in all government sponsored projects; provide employers with tax credits and other incentives for hiring laid-off workers; write priority hiring policies for transitional workers into zero waste RFPs.
- **Community investment:** offer grant funding to nonprofits and workforce development entities in areas affected by a significant number of layoffs; make economic development investments in said communities to build and repair needed infrastructure and increase community capacity; offer local businesses lines of credit to support economic diversification; create new skilled union jobs for local and laid-off workers in environmental remediation and construction to clean up former polluting facilities and polluted sites.

Conclusion

THE WAY FORWARD

The intersecting economic, health, and political crises of our time make ever more clear the urgent need to change course. It is clear that we cannot go “back to normal.” Bold, transformative economic and social change is needed not just to recover, but to build more just and resilient cities.

At the heart of that transformation must be a reimagining of the way we make, consume, and dispose of precious resources. The current model where natural resources are extracted and wasted is not only bad for the environment, it’s bad for our health, and our economy.

We must invest wisely in proven solutions to the intersecting crises of waste, pollution, and climate change. By pivoting away from extractive industries, we have an unprecedented opportunity to scale up zero waste solutions. Already, hundreds of cities around the world have developed zero waste systems saving them millions, creating jobs, and building up local economies. Policymakers, advocates, and institutions can stand on the right side of history and rebuild stronger, more resilient local economies while preserving our planet. As the Masterplan shows, the solutions already exist. It’s time to put them into action.



The Zero Waste Masterplan

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