



## Landscape Analysis of Industrial, Commercial, and Institutional Food Scrap Recycling in Nashville

### *Nashville Food Waste Initiative*

---

For more information, please contact:

Linda Breggin  
[breggin@eli.org](mailto:breggin@eli.org)

Darby Hoover  
[dhoover@nrdc.org](mailto:dhoover@nrdc.org)

# Table of Contents

## I. Introduction

## II. Methodology

## III. Discussion

### A. Background

1. *Metro initiatives related to food scrap recycling*
2. *Metro's municipal solid waste management practices*
3. *Regulatory landscape*
4. *Current infrastructure*

### B. Barriers and opportunities related to food scrap recycling infrastructure

1. *Overarching barriers to expanding collection and processing infrastructure*
2. *Barriers specific to expanding processing infrastructure*
3. *Barriers specific to expanding collection infrastructure*
4. *Overarching opportunities for expanding collection and processing infrastructure*
5. *Opportunities for expanding processing infrastructure*
6. *Opportunities for expanding collection infrastructure*

### C. Barriers and opportunities related to food scrap generators and feedstock

1. *Barriers to increased generator participation in food scrap recycling*
2. *Opportunities for increased generator participation in food scrap recycling*

## IV. Summary and Recommendations

## I. Introduction

Up to 40% of food in the United States is wasted.<sup>1</sup> Significant resources, including up to one fifth of the cropland, fertilizers, and agricultural water used in the United States, are used to grow food that is not eaten.<sup>2</sup> Food waste is the source of at least 2.6% of the United States' greenhouse gas emissions, and is the largest component of landfill waste by weight.<sup>3</sup> The value of this wasted food is estimated to be up to \$218 billion a year.<sup>4</sup> Food is wasted in all parts of the United States, and Nashville is no exception. Recent research by the Natural Resources Defense Council (NRDC) indicates that as many as 178,920 tons of food are wasted annually in Nashville, with an estimated 67% of this waste coming from industrial, commercial, and institutional (ICI) generators.<sup>5</sup> Accordingly, there is an opportunity to increase the amount of food scraps diverted from landfills, reduce the environmental and climate impacts of landfilling and return nutrients to the soil.

Previous Nashville Food Waste Initiative (NFWI) research has focused on food waste mitigation strategies,<sup>6</sup> such as preventing food from going to waste and rescuing surplus food, which are preferable to food scrap recycling.<sup>7</sup> Nevertheless, food scrap recycling plays a key role in efforts to divert wasted food from landfills and prevent associated methane emissions and nutrient loss—and is far preferable to landfilling as a means of handling food that is inedible or no longer suitable for human or animal consumption.<sup>8</sup> This report examines barriers and opportunities related to ICI food scrap recycling in Nashville.<sup>9</sup> Specifically, the report reviews key issues related to Nashville's food scrap recycling infrastructure, including: 1) the current capacity and extent of existing organics collection and processing infrastructure in the region (large-scale, permitted facilities within 100 miles of the city, including wastewater treatment facilities); 2) the ability of the current infrastructure to accommodate food scraps; and 3) opportunities and barriers related to expanding organics recycling capacity. In addition, the report examines ICI generators' views on food scrap recycling and opportunities to address perceived and actual barriers to wider adoption of recycling practices.

## II. Methodology

NFWI's research was conducted primarily through telephone interviews with stakeholders, who were promised confidentiality in order to encourage candid responses. Interviewees represent a broad range of stakeholder groups, including ICI generators that do and do not currently recycle their food scraps; current and prospective organic waste management companies; waste management consultants; non-profit organizations and advocates; and local, state, and regional governmental entities. Interviewees were asked questions about the barriers and opportunities to both increased infrastructural capacity and increased participation in food scrap recycling, as well as questions tailored to their specific areas of expertise. In all, 27 stakeholders participated in interviews with NFWI researchers. In addition, an online

---

<sup>1</sup> Gunders 2017.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Hoover 2017.

<sup>6</sup> The United States Environmental Protection Agency (US EPA) prioritizes food management strategies as follows: reducing the volume of surplus food; donating extra food to feed hungry people; diverting food scraps to feed animals; providing food scraps for industrial uses; composting; and landfilling/incinerating as a last resort. US EPA 2017.

<sup>7</sup> Food scrap recycling refers to the recovery of nutrients from and diversion of food scraps, whether through composting or anaerobic digestion.

<sup>8</sup> US EPA 2017; Gunders 2017.

<sup>9</sup> Future research could examine barriers and opportunities related to residential food scrap recycling in Nashville.

survey was distributed to food scrap generators through a trade association, and one response was received from a generator that is not currently recycling.

### III. Discussion

#### A. Background

##### *1. Metro initiatives related to food scrap recycling*

In addition to its overall environmental and social benefits, food scrap recycling is an important component of a robust and diversified solid waste management system. This is especially true in Nashville, which is at a pivotal juncture for its solid waste management policies and practices. In 2017, the Metropolitan Government of Nashville and Davidson County (Metro) set a long-term goal of achieving zero waste<sup>10</sup> and contracted with the consulting firm CDM Smith to develop a Long-Term Zero Waste Master Plan (“master plan”) for achieving this zero waste goal.<sup>11</sup> The Davidson County Solid Waste Region Board (SWRB), which is responsible for preparing comprehensive ten-year plans for the management of solid waste generated in the Nashville area, also is collaborating with Metro on the master plan.<sup>12</sup>

The development of the master plan will be influenced in part by current landfill capacity. Middle Point Landfill—where Nashville sends the majority of its waste—is likely to reach capacity and close in approximately six years, according to one interviewee. Also, Nashville is in the midst of a population boom. Its metropolitan area is the seventh-fastest growing in the country, and its population growth rate is three times the national average. As it continues to grow, so too will the amount of waste it produces and the concomitant strain on the region’s solid waste infrastructure. NFWI’s research takes into account the soon-to-be-finalized master plan, which will outline a set of long-range Metro policies and practices for solid waste reduction and management that were developed over more than a year and that reflect input from stakeholders with a broad range of interests. Consequently, this report is intended to provide supplemental information that can inform the development and implementation of the strategies outlined in the upcoming master plan, as well as other community-based projects and initiatives related to food scrap recycling.

In addition to the master plan, Metro has sponsored projects and programs related to ICI food scrap recycling. The former Mayor’s Livable Nashville Committee’s Subcommittee on Waste Reduction and Recycling drafted several recommendations related to food scrap recycling. One of these recommendations was for Metro to “work with large producers of organic waste to reduce or compost food waste.”<sup>13</sup> Specific actions outlined in the draft recommendations are to sponsor a Mayor’s challenge to restaurants to reduce their food waste (including through food scrap recycling) and to investigate the value of legislation mandating organics separation for companies generating more than one ton of food waste per week. As of February 2019, the Livable Nashville Committee’s recommendations have not been formally adopted by Mayor David Briley. But, some have been implemented, including the Mayor’s

---

<sup>10</sup> Defined in this case as diversion at or above 90%. Resource Recycling Systems 2018.

<sup>11</sup> Metro Public Works 2018a.

<sup>12</sup> In addition, the Greater Nashville Regional Council, which is comprised of thirteen counties, is active in assisting counties with annual reporting, implementation of local solid waste plans, and assessments of funding and capital needs based on growth projections. According to an interviewee, it could also facilitate the development of regional processing agreements. Metro 2018.

<sup>13</sup> Livable Nashville Committee 2017.

Food Saver Challenge, which was launched as a month-long pilot program in early 2017 and relaunched on an ongoing basis in late 2018.<sup>14</sup>

## *2. Metro's municipal solid waste management practices*

Metro does not provide curbside pickup of food scraps for businesses (or households), but has established drop-off points for residential compostable material at all four of its convenience centers (after piloting drop-off at two centers).<sup>15</sup> Furthermore, Metro does not provide most businesses with curbside pickup of trash or recycling. Only businesses located in the Urban Services District (USD) that are close to residential routes and need two or fewer trash carts emptied once per week are eligible for Metro trash and recycling collection. Other businesses must contract with private haulers for their trash and recycling needs. Private haulers are not required to provide food scrap recycling, but are required to offer traditional recycling services.<sup>16</sup>

Food scrap recycling in Nashville is minimal. Residential and commercial food scraps comprise 15.4% of all landfilled municipal solid waste (MSW) in the Metro waste stream, representing the single largest component.<sup>17</sup> Organics are the second largest component by weight of landfilled ICI waste, after paper, and food scraps comprise the majority of these landfilled organics.<sup>18</sup> However, organics comprise only 2.6% of generated ICI MSW recovered for recycling.<sup>19</sup> NRDC estimates that ICI sectors in Nashville generate approximately 120,000 tons of food waste per year.<sup>20</sup> Interviewees indicated that the sole local processor receives approximately 150 tons of food scraps per month (from both ICI and residential sources). Even if all food scraps processed by this processor were sourced from ICI generators, this would only represent 1.5% of food scraps generated by ICI sectors in Nashville annually. Accordingly, the vast majority of food scraps generated in Nashville are landfilled.

## *3. Regulatory landscape*

Metro has authority over several policy areas that affect the siting, construction and operation of organics recycling facilities. These include zoning ordinances and construction and stormwater permits.<sup>21</sup> Metro also regulates and permits trash haulers.<sup>22</sup> The State, rather than Metro, is responsible for permitting of new organics recycling facilities. A permit must be obtained from the Tennessee Department of Environment and Conservation (TDEC) by facilities that plan to compost 100 cubic yards or more per year of food scraps using an in-vessel method, or more than 50 cubic yards per year using other methods, such as windrows or aerated static piles.<sup>23</sup> Permit applications are submitted to field offices but, ultimately, applicants may need approval from several programs within TDEC, including the offices that regulate waste, air and stormwater.<sup>24</sup> The permitting rules reflect 2016 amendments intended

---

<sup>14</sup> Mayor's Office 2018.

<sup>15</sup> Metro Public Works 2018b; Siner 2017.

<sup>16</sup> Nashville, Tennessee, Code of Ordinances § 10.20.105.

<sup>17</sup> CDM Smith 2018.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid. Nationwide, in 2015, food scraps alone comprised approximately 15.1% of generated MSW (including residential and ICI) and 22% of landfilled MSW, but only 2.3% of recycled MSW (by weight). US EPA 2018a. Interviewees suggested that food scraps might comprise a relatively smaller percentage of landfilled waste in Nashville due to Nashville's lower paper recycling rates.

<sup>20</sup> Hoover 2017.

<sup>21</sup> Metro Water Services 2018.

<sup>22</sup> Metro Public Works 2018c.

<sup>23</sup> TDEC 2016.

<sup>24</sup> Ibid.

to encourage more diversion of organic material, in part by exempting small-scale composting projects, such as community gardens, from State permitting requirements.<sup>25</sup>

#### *4. Current infrastructure*

Middle Point Landfill in Rutherford County is the largest single recipient of Nashville's MSW and is expected to fill and close in approximately six years, at which point most of Nashville's disposed MSW will have to be sent elsewhere.<sup>26</sup> Nashville's existing food scrap recycling infrastructure is limited, with only one nearby commercial organics composting facility that accepts food scraps and three organics haulers.<sup>27</sup> The processor is permitted to take up to 43 cubic yards of food scraps a day and to produce up to 13,330 cubic yards of finished compost a year.<sup>28</sup> Interviewees indicated that the processor has not yet maxed out its permitted capacity and that processing could ramp up quickly to meet reasonable increased demand.<sup>29</sup> Interviewees also noted, however, that it is unlikely that Nashville could ever achieve its zero waste goals with only one food scrap processor. Moreover, interviewees stated that reliance on a sole processor is suboptimal because, in the event of permitting or operational difficulties and in the absence of other processors capable of recycling food scraps, there would be no option but for food scraps to be landfilled.

Metro Water Services (MWS) operates anaerobic digesters at its Central and Dry Creek Wastewater Treatment Plants. These digesters process wastewater sludge to produce "Class A" biosolid pellets at the Central Plant, a majority of which are then distributed to the agriculture community for use as fertilizer.<sup>30</sup> The Dry Creek plant currently landfills digested filter cake. Although these facilities do not currently process food scraps, MWS is reportedly considering launching a co-digestion pilot project in which one of these plants would accept food scraps. According to one interviewee, these scraps would be added to the digester process to produce biosolids pellets and biogas that would be used on-site to power the boilers and dryers.<sup>31</sup>

One additional means by which food scraps can be diverted in Davidson County is through the Tennessee Materials Marketplace. The clearinghouse aims to cultivate local circular economies by connecting manufacturers that may be able to make use of others' manufacturing byproducts.<sup>32</sup> It is unclear, however, to what degree this resource is used by food scrap generators.

Existing collection capacity in Nashville is to some degree limited by equipment and capital constraints. Haulers indicated that their operations are "as big as [they] need to be" (a sentiment expressed by one hauler and echoed by others) and that they could expand to meet additional demand as it arises. Interviewees also noted, however, that existing haulers may be unable to handle certain large sources of food scraps, because they do not have trucks capable of picking up from dumpsters or compactors. Altogether, haulers reported an ability to collect a total of approximately 37.5 tons of compostable material a day, and reported currently hauling approximately 8.5 tons a day.

---

<sup>25</sup> Schoetzow 2016.

<sup>26</sup> Metro Public Works 2018d.

<sup>27</sup> Other processors in the area accept yard and wood waste but not food scraps.

<sup>28</sup> Civil & Environmental Consultants, Inc. 2015.

<sup>29</sup> One interviewee indicated that this processor is currently planning to increase its processing capacity by transitioning from windrow to aerated static pile composting.

<sup>30</sup> Metro Water Services 2017.

<sup>31</sup> Food scraps processed into biosolids that are eventually landfilled or used solely for energy production are not considered to be recycled, an important consideration if wastewater treatment plant processing is to assist with the achievement of zero waste goals.

<sup>32</sup> Tennessee Materials Marketplace n.d.



As an alternative to commercial recycling facilities, some interviewees pointed to community-scale composting operations<sup>33</sup> as a cost-effective approach to expanding Nashville’s food scrap recycling infrastructure.<sup>34</sup> Because TDEC regulations require facilities to be permitted if they accept over a certain volume of food scraps,<sup>35</sup> community composting participation may be limited to residential and small business generators. Interviewees also advised that it is unlikely that ICI generators would participate in community-scale composting without using a compost hauler as an intermediary. Although one generator reported composting on-site, most interviewees indicated that ICI generators would be unlikely to do so and that smaller-scale composting is primarily effective for reducing the amount of residential food scraps sent to landfills.<sup>36</sup>

## B. Barriers and opportunities related to food scrap recycling infrastructure

### *1. Overarching barriers to expanding collection and processing infrastructure*

Interviewees stated that the current infrastructure is sufficient to meet current organic recycling needs, but noted that it would be unable to handle a significant increase in feedstock. At the same time, limited demand for food scrap recycling is the biggest barrier to expanding infrastructure. Although both haulers and the processor reported that they are increasing capacity to match steadily increasing business, numerous interviewees indicated that there is a “chicken-and-egg” problem in which both increased participation and increased capacity are necessary for Nashville to achieve zero waste in the future, but neither is likely to increase significantly without the other—or without some sort of government intervention, as discussed in detail below. Other interviewees, however, emphasized that demand must come first and that it must be driven by regulations as opposed to incentives.

Limited demand for food scrap recycling among generators is especially problematic because of the lack of robust local or regional markets for finished compost products. Where there is high demand for finished compost products, processors can obtain revenue from the sale of such products and may be able to charge haulers a lower tipping fee. This in turn reduces haulers’ costs and can allow them to offer collection at a lower cost, increasing their ability to be cost-competitive and allowing them to attract more business. Although interviewees stated that Nashville’s food scrap processor does not have trouble selling its finished products, increased demand for finished compost products could allow it to charge higher prices and offer haulers lower tipping fees and ultimately foster infrastructure development.

The last overarching barrier to expanding infrastructure identified by interviewees is Metro’s limited ability to financially support new infrastructure projects, including those that recycle food scraps. Under the current municipal solid waste management structure, residents living in the USD pay for waste collection through their property taxes, whereas residents living in the General Services District (GSD) must contract with private services for waste collection. Metro cannot change the County’s tax structure without amending the Metro Charter, which interviewees noted can be strenuous and time-intensive. Interviewees went on to explain that this makes it difficult for Metro to fund new solid waste infrastructure projects. In addition, interviewees indicated that, because many Nashville residents do not pay for solid waste collection directly, they may not realize the cost of waste disposal.

---

<sup>33</sup> Defined by ReFED as “small, community or neighborhood-level facilities that process 2,500 tons per year on average.” ReFED 2018. Community composting operations “typically use volunteers and less sophisticated equipment.” Ibid.

<sup>34</sup> Interviewees also indicated that community composting is likely to be addressed in the master plan.

<sup>35</sup> TDEC 2016.

<sup>36</sup> There is some degree of backyard composting occurring in Nashville and residential backyard composting is an important component of a zero waste plan. In addition, Metro has taken some steps to increase residential composting in Nashville, primarily through education and the sale of backyard composting bins. A substantial evaluation of residential backyard composting, however, is outside of the scope of this report.

## *2. Barriers specific to expanding processing infrastructure*

To facilitate food scrap recycling infrastructure development, interviewees emphasized that the process of siting and permitting new facilities should be as uncomplicated as possible. According to interviewees, however, the current process requires applicants to obtain multiple state and local permits and approvals. A prospective processor explained that the lack of coordination among state regulatory offices and between the state and municipal government exacerbates the regulatory hurdles associated with siting a food scrap processing facility. Interviews with government officials and others confirmed that navigating the permitting process is largely the responsibility of the applicant.<sup>37</sup>

In addition, community concerns—including those related to environmental justice<sup>38</sup>—appropriately limit the options available for new facilities. In 2011, one previous processing operation was dismantled by the state government after complaints from neighbors.<sup>39</sup> More recently, a prospective processing project was voted down by Metro Council, members of which cited community opposition as their primary reason for doing so.<sup>40</sup> In the recent case, some expressed concern that misinformation may have misled the community and hindered efforts to locate the facility<sup>41</sup>—although it is unclear how the community would have reacted to accurate information. In general, interviewees stressed that both active and prospective processors must ensure proper communication with, and establish means for addressing the concerns of, the communities in which they operate. According to one interviewee, it is important for processors to recognize that residents may have immediate and pressing problems, such as food insecurity, which should be considered when trying to engage communities in food scrap recycling facility issues.

## *3. Barriers specific to expanding collection infrastructure*

Interviews with current and prospective haulers identified a number of barriers specific to the collection of food scraps. In particular, haulers cited the difficulty and cost of developing cost-effective pickup routes with limited generator participation. This problem is intensified in rural areas with low population density. Moreover, as one interviewee noted, food scraps weigh significantly more per unit volume than general MSW, which can result in trucks meeting their weight capacity before they are full and can make organics collection routes up to three times as expensive as conventional routes. Also, collecting the food scraps of large-scale generators usually requires specialized trucks, the acquisition of which may be prohibitively expensive for some haulers.

Although no current haulers reported facing significant problems with contamination, prospective haulers expressed concern that contamination could increase costs, which could cause generators to lose interest in participation. One prospective hauler and processor proposed that, due to high levels of contamination, the most economically viable form of processing organics is waste-to-energy through incineration or a landfill-to-renewable natural gas system. Several others, however, emphasized that such methods of processing organics are undesirable because they are not likely to result in the reclamation of nutrients present in food scraps and cannot truly be considered “recycling.” One interviewee also noted that burning food scraps is largely counter-productive due to their high water content, which can impede incineration.

---

<sup>37</sup> Interviewees noted, however, that interactions with TDEC over compliance with regulations is generally not a problem once permits are obtained.

<sup>38</sup> Defined by the United States Environmental Protection Agency as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” US EPA 2018b.

<sup>39</sup> George 2011. The operator of this facility maintains that actions were taken prematurely.

<sup>40</sup> Garrison 2018.

<sup>41</sup> Junewicz 2018.



Lastly, interviewees observed that collection infrastructure was limited by the need to transport food scraps to the single regional processor, which is located in Ashland City—approximately 23 miles from downtown Nashville (about a 30-minute drive). These interviewees stated that haulers would be able to develop more cost-efficient routes and provide cheaper pickup if there was a processing facility located closer to South Nashville.

#### *4. Overarching opportunities for expanding collection and processing infrastructure*

This is a decisive moment for municipal solid waste management in Nashville, as Metro’s master plan is in the final stages of development. Although Metro has not indicated whether it plans to formally adopt the contractor’s recommendations or to modify them based on public input and other factors, it is likely that Metro will use the plan in some manner—whether for improving current solid waste management practices or more broadly as a roadmap to zero waste. In any event, the master plan’s release will provide an opportunity for Metro to consider policies that could increase the rate at which food scraps are diverted and recycled in Nashville. The master plan’s release also will provide an opportunity for Metro to consider broader, more fundamental changes to its solid waste management structure that could make it easier to enact and finance such policies and attendant projects.

Moreover, interviewees also suggested the possibility that the impending closure of Middle Point Landfill (to which most of Davidson County’s MSW is sent) could lend support to the expansion of organics recycling infrastructure, especially considering most jurisdictions’ reluctance to be home to a new landfill. Other interviewees countered, however, that there is no shortage of space in the region in which to construct a new landfill and that, therefore, the closing of Middle Point alone is an insufficient basis for the expansion of food scrap recycling. Nevertheless, interviewees identified the hurdles presented by the need for new landfill space. For example, an interviewee noted that planning, siting, permitting, and constructing a landfill can take up to 10 years, during which time Nashville’s MSW would have to be shipped farther away at greater cost. Another interviewee pointed out that the establishment of a new landfill could be controversial and raise issues of equity—a concern that arose during the aforementioned attempt to establish another food scrap processing operation in Nashville.

Interviewees identified several specific mechanisms by which both collection and processing infrastructure could be expanded. Most broadly, interviewees noted that under Tennessee’s Solid Waste Authority Act of 1991, a Tennessee county or counties can establish a solid waste authority (SWA) that can provide solid waste services and operate as an enterprise fund (rather than rely on tax revenue),<sup>42</sup> and have dedicated authority for solid waste management.<sup>43</sup> Interviewees explained that such an authority could eliminate the need for Metro to amend its charter to fund new infrastructure projects with tax revenue. In addition, they noted that an SWA could provide solid waste services for the entire County or counties that establish it. Accordingly, even if Davidson County established an SWA without the participation of neighboring counties, it could provide solid waste services for both the USD and GSD. Thus, according to interviewees, the SWA would make funding new infrastructure projects more feasible by relying on enterprise rather than tax revenues and by spreading the costs of new infrastructure over a wider base (i.e., all of Davidson County plus any other counties that join). Because the SWA would be managed as a business and be paid directly for waste services, this would also help eliminate the misperception that waste disposal is “free.”

Interviewees also noted that, even in the absence of an SWA, increased inter-county coordination on solid waste management could help expand infrastructure by spreading costs across a larger population base. For instance, an interviewee suggested that Metro could own an anaerobic digester that could take

---

<sup>42</sup> An enterprise fund is a government entity that provides goods or services at a fee and is self-supporting. Other examples include government-owned utilities and local airports. Kemp 2017.

<sup>43</sup> Tenn. Code §§ 68-211-903, 906 (Justia 2010).

food waste from the whole region while another county could run a regional recycling facility, and the costs of the facilities would be spread among many more people than if independently funded by Metro.

Interviewees also suggested a number of more specific tools for expanding infrastructure, such as a government procurement policy for compost products, which could improve the market for finished compost products. In addition, a procurement policy for finished compost products was a policy option presented in public materials drafted by a subcontractor working on the master plan.<sup>44</sup> A procurement policy could take many forms, but would entail requiring or encouraging government agencies (and/or commercial construction businesses) to use finished compost products as soil amendments in their own construction and landscaping projects.<sup>45</sup> A procurement policy, if enacted, could apply to Metro agencies such as Parks and Recreation and Public Works.<sup>46</sup> As noted, although interviewees reported that Nashville’s processor does not struggle to sell its finished compost products, a procurement policy could strengthen the market and allow the processor to charge higher prices for compost products or encourage the growth of new processing operations. This could in turn potentially allow processors to charge haulers a lower fee for food scraps drop-off, which would then allow haulers to charge a lower fee for pickup and potentially increase their customer base. Procurement policies enacted at the state level (by the Tennessee Department of Transportation or other state agencies) also could increase the market for local compost products.

Interviewees also mentioned subsidies in the form of grants or loans to haulers and processors. They reasoned that subsidies would enable businesses to rely less upon generators for funding and allow them to either lower fees to attract more business or invest in increasing capacity. In particular, interviewees specified that haulers would profit greatly from having a marketing budget. Although Metro has not provided any form of direct subsidy to haulers or processors, TDEC has provided grants to prospective processors through its Grants to Promote Materials Management program and could encourage growth of organics recycling infrastructure by continuing to do so. One interviewee noted, however, that TDEC grants can be used to pay for collection infrastructure, such as bins, but that they cannot be used to pay for the costs of service such as marketing.<sup>47</sup>

##### *5. Opportunities for expanding processing infrastructure*

In addition to the overarching opportunities to increase organics recycling infrastructure in general, interviewees identified opportunities to expand processing infrastructure in particular. These opportunities primarily relate to facility permitting. For instance, a number of interviewees posited that streamlining the permitting process could lower the barriers to entry for prospective processors. One suggested method of doing so is the creation of an ombudsman to coordinate among different agencies and/or multiple offices within an agency to aid applicants in navigating the permitting process. Another interviewee pointed out that, upon request, TDEC waives the annual \$3,000 permit maintenance fee for waste processing facilities that recycle 75% or more of materials received, but that it is unclear to what degree processors are aware of and utilize this exemption. Better publicization of this exemption could help encourage waste processors to expand their recycling programs or help lower the barrier to entry for prospective processors.

---

<sup>44</sup> Resource Recycling Systems 2018.

<sup>45</sup> According to one interviewee, it may be necessary for such a policy to require that the finished compost products include a minimum percentage of food scraps in order to ensure that a procurement policy actually stimulates food scrap recycling.

<sup>46</sup> Similar policies—or procurement policies that encourage both the purchase of finished compost products and other “environmentally preferable” products—have been enacted at the local and state level by Sacramento, CA and the New York State Department of Transportation, among others. Sacramento, California, Policy No. AP-4003; Platt 2016a.

<sup>47</sup> TDEC 2016.

## *6. Opportunities for expanding collection infrastructure*

Interviewees discussed mechanisms by which collection infrastructure could be expanded. One such approach proposed by an interviewee is a requirement that waste haulers operating in Davidson County offer food scrap collection in order to receive a collection permit. Haulers operating in Davidson County must offer recycling services in order to receive a permit, but they are not required to offer food scrap collection or organics recycling.<sup>48</sup> While this would necessarily increase food scrap collection capacity, other interviewees indicated that such a requirement could be expensive for and opposed by waste collectors and, most likely, would be difficult to impose. Interviewees also suggested that splitting the county into sectors with separate waste collection contracts could promote route efficiency and possibly encourage haulers to offer food scrap collection. The same interviewees noted that this idea was likely to be recommended in the master plan.

### **C. Barriers and opportunities related to food scrap generators and feedstock**

#### *1. Barriers to increased generator participation in food scrap recycling*

Interviewees (particularly generators) specified several reasons for the overall lack of participation in food scrap recycling among ICI generators in Nashville. As identified by interviewees, the main barriers to increased participation are: awareness surrounding food scrap recycling; cost; inconvenience of starting a new business relationship with a hauler; employee education and training; and lack of physical space. Each of these obstacles will be discussed in turn.

Lack of awareness was the most cited reason for low generator participation in food scrap recycling. Interviewees explained that generators are unlikely to think about their waste practices any more than necessary and that, in the absence of a “champion” who takes the lead on food scrap recycling, they are likely to do what is perceived as simplest (i.e., send all of their waste to a landfill). As one interviewee put it: “Waste is an afterthought in our culture—it’s not something you want to worry about, but [rather] the last thing on your mind when you’re operating a business.” This lack of focus on food waste is compounded by an overall lack of familiarity with food scrap recycling as an option or as a practice in general. Interviewees observed that there is little understanding among generators of the importance or environmental benefits of food scrap recycling, and that a perception exists that recycling would require employees to perform significantly more work for minimal benefit.

Even generators concerned about food waste and committed to being socially- or environmentally-conscious may not consider recycling a related effort. One generator contrasted food scrap recycling to food donation, which is immediately understood as a means of helping the community. Lastly, generators interested in recycling are often concerned that placing their food waste into a separate bin will result in odor or attract pests. Interviewees pointed out, however, that proper food scrap recycling should not increase odor or pest problems, because these are the same materials that would otherwise be collected in a garbage bin and separating them into a dedicated bin may, in fact, reduce these problems—especially if food scrap bins are collected more frequently or designed with airtight lids.

Cost was the second-most cited explanation for low generator participation in food scrap recycling. Interviewees noted that low tipping fees at landfills can make it difficult for recycling to remain cost-competitive. This reduces food scrap recycling because generators—especially restaurants, many of which cite extremely thin profit margins—are generally unwilling to spend more when doing so would put them at an economic disadvantage relative to competitors that do not recycle. Nevertheless, in some cases, large generators that recycle their food scraps can save money on waste collection by paying less for weight-based MSW pickup—particularly if the food scrap hauler charges a flat fee for collection. But, generators still may experience “sticker shock” at the potentially high cost of food scrap collection and

---

<sup>48</sup> Nashville, Tennessee, Code of Ordinances §10.20.105.

decide not to recycle as a result. According to interviewees, businesses also may not realize that they could save money by recycling food scraps because costs are not clearly allocated in their waste bills. Furthermore, interviewees indicated that the increased hassle of entering a new contract with a food scrap hauler and then dealing with multiple waste haulers could act as a deterrent, especially to smaller businesses whose proprietors may have to manage all their business operations.

The perceived and actual difficulty of training staff to adjust their behavior to recycle food scraps also was cited—both by businesses that currently recycle and those that do not—as a key impediment. Because it is not common practice in Nashville, employees are likely to be unfamiliar with what food scrap recycling entails and may improperly separate food scraps by either including unrecyclable components (such as glass or plastic film) or by tossing food scraps into trash cans. Similarly, as employees may not have a good understanding of the benefits of recycling food scraps, they may not feel invested in or committed to recycling efforts and may need to be frequently retrained and reminded of proper procedures. Food scraps are also heavier by volume than conventional MSW and, therefore, food waste bins may need to be taken out more frequently, which can lead to less-committed employees cutting corners. These additional training and time requirements could in turn increase labor costs for some generators. Interviewees added that the increased cost and hassle of training staff to recycle properly are intensified in high-turnover restaurants. Several interviewees did emphasize that recycling proceeds more smoothly once employees are in the habit of doing so properly and that it ultimately does not require much, if any, additional employee effort.

The last commonly-cited barrier to increased generator participation in food scrap recycling is lack of space in which to store an additional bin for food scraps. This can be a problem particularly in prep areas, in front-of-house areas, and on loading docks where waste bins are placed for pickup. It may be possible for generators to address lack of space in food prep and front-of-house areas on their own, but space on loading docks often is contingent upon the cooperation or permission of landlords, some of whom may have misconceptions about food scrap recycling (such as worries about attracting pests). Even if generators have cooperative landlords or own their buildings, it can be difficult to make space on a loading dock. As an interviewee noted, while generators may generate less “trash” by diverting food scraps, dumpsters of different sizes often differ only in height and, as a result, switching to a smaller dumpster may not actually free up any space on a loading dock.

## *2. Opportunities for increased generator participation in food scrap recycling*

Although interviewees revealed the presence of several barriers preventing generators from recycling their food scraps, they also suggested a number of means of overcoming these barriers and increasing ICI food scrap recycling in Nashville. Each opportunity will be discussed in turn.

The most commonly-suggested opportunity for increased generator participation in food scrap recycling was increased education on the practice, importance, and benefits of food scrap recycling. As discussed above, interviewees noted that most generators in Nashville are relatively unfamiliar with food scrap recycling. Although some may have heard of composting, they are unlikely to understand fully the social, financial, and environmental consequences of food waste or the multiple benefits of food scrap recycling. Furthermore, they may have misconceptions and unfounded concerns about what food scrap recycling entails.

Interviewees explained that better education on food scrap recycling could address these issues and that such education should occur at multiple levels. Inclusion of lessons about food waste and food scrap recycling in public school curricula or integration of food waste topics into informal educational programs sponsored by nonprofits could increase overall awareness of and interest in the topic, some of which would likely spread to ICI generators. For instance, Urban Green Lab is currently working with the World Wildlife Fund to pilot food waste prevention and composting education in public elementary schools, and also offers food waste education through its Sustainable Classrooms Curriculum and Mobile

Lab. One opportunity for increasing awareness of and familiarity with food scrap recycling would be to expand programs such as these across Metro Nashville Public Schools. Interviewees suggested that increased general interest in food scrap recycling could cause consumers to favor businesses that recycle, thus incentivizing generators to continue or begin doing so.

Targeted education efforts aimed at ICI generators also could increase interest in recycling and, on a more practical level, address concerns about associated labor and cost increases. Easily-available educational and instructional materials specific to Nashville also could take the onus off of generators that may be interested in recycling food scraps but unsure of where to start. Interviewees noted that education aimed at generators needs to be concise and would be received best if it comes from other generators perceived as peers. For instance, a short video in which a chef explains how and why to recycle food scraps might be more effective than an in-person seminar hosted by a government agency. Interviewees stressed that education and outreach aimed at generators should explain both the significance of food scrap recycling and how to actually do it (i.e., that it should address both the “awareness” and “training” barriers). Interviewees reported that Urban Green Lab, an environmental nonprofit that convenes corporations as part of its “sustainability roundtable” discussions, has facilitated the cultivation of internal food scrap recycling champions at local businesses in Nashville. Some interviewees also expressed interest in a peer mentor network for advice on best practices related to sustainability and food scrap recycling. Others, however, opined that it could be difficult to attract sufficient mentor interest and commitment given the time and financial constraints on restaurateurs and chefs.

Interviewees also suggested other mechanisms that could help interested generators successfully train employees to recycle food scraps properly. In particular, generators expressed interest in a short video or set of videos that concisely explain the steps of recycling. Generators currently recycling their food scraps also stressed that explaining the importance of food scrap recycling to employees could help encourage them to put their best effort into recycling and improve employee morale despite the minor additional duties required.

Interviewees proposed a wide range of opportunities for helping generators overcome cost as a barrier to food scrap recycling. As previously discussed, a procurement policy for finished compost products could increase demand for those products and allow Nashville’s processor to charge a lower tipping fee to haulers. Haulers could in turn charge generators less for pickup, thereby making food scrap recycling more cost-competitive with landfilling and increasing generator interest and participation.

Another policy approach suggested by a master plan subcontractor that could help make food scrap recycling cost-competitive with landfilling is a “pay-as-you-throw” or “save-as-you-throw” approach, whereby generators’ waste collection costs are based on the amount of waste they send to landfills.<sup>49</sup> Generators would be incentivized to divert food scraps from the landfill in order to decrease their waste collection costs. Detailed recommendations on the implementation of such an approach have not been provided by the contractor to date.

Interviewees also signaled that government incentive programs could effectively encourage generators to participate.<sup>50</sup> Although interviewees reported that direct financial incentives (such as tax deductions or credits or an exemption from the Metro Public Health Department permit renewal fee) would be most likely to incentivize businesses to begin recycling, they also noted that public recognition

---

<sup>49</sup> While some generators pay for weight-based waste collection, others pay a flat amount. Pay-as-you-throw regulations would establish requirements for waste haulers to charge based on weight. In other cases, save-as-you-throw policies have explored the use of tax credits or rebates based on the amount of waste a generator diverts. Rosengren 2018; Skumatz Economic Research Associates 2018.

<sup>50</sup> The City of Austin, Texas, pairs diversion requirements with a rebate program that offers businesses up to \$1,800 to cover the cost of recycling or composting programs. Austin Resource Recovery 2018.

programs could encourage generators to recycle in the interest of receiving good “free” publicity.<sup>51</sup> For instance, one hauler reported a significant increase in business following the launch of the Mayor’s Food Saver Challenge pilot, which recognized restaurants that take steps to reduce the amount of food they send to landfills.

In addition, some interviewees suggested that shared food scrap pickup sites (in which neighboring generators pool their food scraps in a single bin or dumpster) could allow participating generators to split the cost of collection and pay a low enough fee for them to be interested in recycling. Other interviewees (including a hauler), however, identified several problems with this approach: the difficulty of determining the source of any contamination; the increased generator effort required to dump bins in a central location (rather than just place them outside their facility); the need for one generator to lead and coordinate such a partnership; and the lack of hauler capacity to service a large dumpster (which may be required to hold food scraps from multiple generators). One interviewee also advised that haulers may not be interested in such a program, because they would not save a significant amount of money by making one stop as opposed to numerous closely-located stops. Other haulers, however, reported it would be less work and might lower their costs and enable them to charge customers less.

Interviewees also suggested means of helping generators overcome the challenge of dealing with multiple waste hauling services. In particular, a requirement that waste haulers offer food scrap collection (previously discussed as an opportunity for expanding infrastructure) would allow generators to begin recycling their food scraps within their existing waste contract. While there would likely be pushback from haulers concerned about the possible costs associated with a new requirement, haulers could presumably subcontract with compost haulers to provide services on their behalf. In addition, incentives to haulers could be built into such a requirement. For instance, and as mentioned above, if haulers were allotted specific regions of the County, this could reduce collection costs and save haulers money.

Lastly, interviewees proposed solutions to logistical challenges that generators may face. Although generators that currently recycle food scraps acknowledged that space constraints can be a challenge, they also explained that the problem of finding space in kitchens or other prep areas can be mitigated by the removal or downsizing of trash bins. This can also make it easier to train employees to properly separate food scraps, especially if they do not regularly work with non-compostable waste. Interviewees also stressed the importance of tailoring plans to each business’ specific circumstances in order to make recycling easy for employees.

Regarding limited space in which to store food scrap bins on loading docks, interviewees admitted that retrofitting is extremely expensive and that existing storage constraints may be difficult to address. Interviewees noted, however, that changes to building codes requiring loading docks to have room for three appropriately-sized bins (as opposed to the two bins for which space is currently required) would mitigate this problem in the future.<sup>52</sup> A preliminary report prepared by one of the subcontractors working on the master plan suggested changing the building codes to require access to and space for food scrap bins—and even the provision of bins themselves—as a way to increase ICI recycling. Interviewees stated that the master plan is likely to recommend a requirement that developers allocate space for three bins in building plans, but that challenges may remain even if such a requirement is enacted, because developers may use the space for other purposes.

---

<sup>51</sup> TDEC also administers the Get Food Smart TN program, which recognizes schools, restaurants, and other organizations that take steps to reduce food waste.

<sup>52</sup> This opportunity also may be timely in that Nashville is currently in the midst of a construction and population boom: there are over 175 major construction projects currently underway. Sharf 2018; Sichko 2018.



Interviewees also stated that some type of “organic waste ban”<sup>53</sup> that prohibits organic materials from being landfilled by requiring businesses to divert food scraps would increase food scrap recycling. Similarly, the contractors developing the master plan included in their presentation to the SWRB a “food waste ban” as a policy option for reaching Metro’s zero waste goal, indicating that regulatory restrictions on the disposal of organic materials are necessary to stimulate a growth in infrastructure and citing the experience of states implementing organics mandates as evidence. There also was some agreement among interviewees, however, that this approach would be difficult to adopt and implement. Specifically, a diversion requirement may be unpopular with generators. One interviewee stated that restaurants in particular are likely to bristle at an organic waste mandate due to their thin profit margins and to recent financial challenges and labor shortages facing the industry (both in Nashville and nationwide).

Furthermore, interviewees expressed concern that other problems would persist even if organics mandates were passed. In the case of a ban on landfilling organics, interviewees were skeptical that a total ban could be enforced, citing low awareness of and compliance with Nashville’s 2013 ban on landfilling cardboard as evidence that Metro lacks the resources to implement such a policy effectively. Interviewees also noted that Nashville’s organics recycling infrastructure would be unable to handle a rapid and massive increase in feedstock, and that collection and processing capacity would need to expand before a ban is enacted.

Some interviewees suggested that a diversion requirement focusing only on large generators (for instance, those with facilities of more than 8,000 square feet, or that produce more than 100 tons of food scraps per year) would be more palatable than a broadly-applied ban, because it would only affect large generators with the ability to pay for food scrap collection and would be easier to enforce. In addition, a large generator-only diversion requirement would encourage the growth of food scrap recycling infrastructure by providing haulers and processors with additional revenue without overwhelming current capacity, and could be gradually scaled up to include a greater percentage of generators (and/or lower thresholds for inclusion) as infrastructure expands and as generators become more comfortable with organics recycling. Additionally, requirements that large generators divert food waste could result in increased food waste prevention and surplus food rescue efforts, which yield greater financial and ecological returns than food scrap recycling. Interviewees emphasized that robust education campaigns would need to accompany even a large generator diversion policy.

Lastly, some interviewees also indicated that an SWA could promote these and other policies that would increase food scrap recycling. A subcontractor working on the master plan indicated that a single SWA could establish and enforce such policies more effectively than is possible under the current policy regime, in which responsibility and authority for solid waste management are divided among different entities (including Metro Council and Metro Public Works).<sup>54</sup>

#### IV. Summary and Recommendations

Altogether, this research highlights that, despite numerous barriers, there are many opportunities to facilitate both infrastructure expansion and increased generator participation in ICI food scrap recycling in Nashville.

---

<sup>53</sup> Existing organics waste mandates take many different forms. To provide a few examples, Portland, Oregon, requires “food scrap generating businesses” to divert food scraps and Austin, Texas, began by requiring generators of over 15,000 square feet to recycle organics and gradually expanded the requirements to apply to all generators. Platt 2016b; Brolis 2016; Koffman 2018.

<sup>54</sup> Skumatz 2018.

**Infrastructure expansion:** NFWI's research suggests several new policies, practices and projects that could facilitate the expansion of the food scrap recycling collection and processing infrastructure. Fortunately, Nashville is poised to consider many of these options in conjunction with the release and implementation of the master plan. These include:

- A local or state procurement policy that requires or encourages government agencies and/or commercial construction businesses to use finished compost products as soil amendments in their own construction and landscaping projects.
- Streamlined permitting processes for new organics processing facilities.
- State or local subsidies in the form of grants or loans to haulers and processors.
- Increased reliance on TDEC's waiver of its annual permit maintenance fee for waste processing facilities that recycle 75% or more of materials.
- A requirement that waste haulers operating in Davidson County offer food scrap collection in order to receive a collection permit.
- Separation of Davidson County into sectors with separate waste collection contracts.
- Comprehensive pay-as-you-throw (or save-as-you-throw) waste collection practices.
- The creation of a solid waste authority that can operate as an enterprise fund and provide solid waste services for both the USD and GSD.
- Increased coordination with nearby counties on infrastructure development whether through the creation of a solid waste authority or other means.

**Generator participation in food scrap recycling:** Lack of awareness of food scrap recycling and lack of understanding of how to implement food scrap recycling practices were identified as key barriers to increased generator participation in food scrap recycling. Educational materials tailored to specific audiences could encourage increased generator participation in food scrap recycling. These materials could address the benefits of recycling food scraps and provide practical guidance. Potential audiences and products include:

- Generators: Videos, handbooks, and workshops on the benefits of and practical tips for composting, as well as training materials and manuals for employees, which could be delivered through means including industry trade associations, Metro agencies, nonprofits and haulers.
- Processors: Community involvement handbooks or videos that could be used by current and prospective operators of processing facilities as well as community composters to effectively involve communities in their projects.
- Communities: Handbooks, videos and other products that support community efforts to understand and participate in permitting and related regulatory processes for processing facilities, as well materials on the benefits of commercial and community composting.
- Teachers and students: Additional curricula for teachers and activities for students on food scrap recycling, such as those developed by Urban Green Lab.
- General public: Programs hosted by nonprofits such as Adventure Science Center, Cheekwood Estate and Gardens, EarthMatters TN, the Land Trust for Tennessee, Trap Garden, Turnip Green, the Tennessee Environmental Council, Warner Park Nature Center, and Urban Green Lab to increase public awareness of and interest in food scrap recycling.

In addition to educational materials, policies and practices that could encourage increased generator participation in food scrap recycling, some of which would also foster infrastructure development, include:

- Financial or public recognition incentives for generators that recycle food scraps.
- Shared pickup sites for neighboring food scrap generators.
- Mandatory diversion requirements for large food scrap generators.
- Changes to building codes to require space for organics collection bins.
- Comprehensive pay-as-you-throw (or save-as-you-throw) waste collection practices.

**Recommendations by actor:** There are a number of actions that government entities, businesses, nonprofits, and consumers can take to encourage increased food scrap recycling. These include:

*For Metro:*

- Consider creating a solid waste authority that can act as an enterprise fund and provide solid waste services for both the USD and GSD.
- Consider greater regional coordination on infrastructure development, whether through the creation of a solid waste authority or other means.
- Consider pursuing comprehensive pay-as-you-throw waste management policies.
- Evaluate the potential of long-range, food scrap-specific recycling policies that could be adopted eventually, such as requirements that waste haulers offer food scrap recycling services and mandatory food scrap diversion for large generators.
- Evaluate and plan for ways to support business and nonprofit efforts to build processing facilities, including composting facilities and anaerobic digesters.
- Streamline permitting procedures for new organics recycling facilities.
- Pilot a co-digestion project at a MWS wastewater treatment facility that can accept and process food scraps and ensure that resulting biosolids are returned to the soil.
- Adopt procurement policies encouraging or requiring Metro to use finished compost products as a soil amendment in its own construction and landscaping projects.
- Offer grants, subsidies, rebates, or other financial incentive programs for food scrap haulers, processors, and generators.
- Amend building codes to require new commercial and multifamily properties to include space for an additional third bin for organics collection on loading docks.
- Work with Metro Nashville Public Schools to incorporate food waste and food scrap recycling topics into K-12 educational curricula.
- Continue and expand public recognition programs for generators that recycle food scraps, such as the Mayor's Food Saver Challenge.

*For state government agencies:*

- Adopt a procurement policy requiring or encouraging the use of finished compost products as a soil amendment in construction and landscaping projects.

- Increase coordination among TDEC permitting programs to make the permitting process easier on prospective organic waste processors, such as by creating an ombudsman position.
- Better publicize the annual permit maintenance fee exemption for waste processing facilities that recycle 75% or more of materials received.
- Continue and expand programs offering subsidies to compost haulers and processors.

*For generators:*

- Join the Mayor’s Food Saver Challenge and select food scrap recycling as a measure to implement.<sup>55</sup>
- Investigate the potential cost savings of food scrap recycling.
- Confer with peers, trade associations, or relevant nonprofits to investigate whether or not it might be feasible to begin recycling food scraps.
- Properly educate staff on the “why” and “how” of food scrap recycling.
- Designate a staff “champion” to take the lead on food scrap recycling efforts.
- Coordinate with other generators to identify shared food scrap pickup locations as a possible way to reduce pickup costs.

*For haulers and processors:*

- Continue to provide interested generators with educational materials and help train staff to recycle properly.
- Continue to offer incentives to potential customers participating in mayoral recognition programs.
- Explore the possibility of reduced fees for restaurants that pool food scraps at shared pickup locations.
- Apply for state grants and use funds to expand organics processing infrastructure and/or market to additional customers.

*For nonprofits and advocates:*

- Develop educational materials expressing the importance of food scrap recycling.
- Develop “how to” materials for generators.
- Develop materials that generators can use to train employees and to mark what materials belong in different waste bins.
- Convene and administer a peer network of generators that can provide guidance and discuss best practices.
- Draft model documents, such as procurement policies, based on best practices.
- Research and present best practices for financial incentives for food scrap recycling (for processors, haulers and generators).

---

<sup>55</sup> More information can be found about the Challenge at: <https://www.nashvillefoodsaver.com/>.

- Research and propose streamlined permitting procedures for food scrap recycling facilities, based on best practices.

*For consumers:*

- Patronize businesses that recycle their food scraps (or otherwise minimize food waste) and let them know their efforts matter.
- Encourage businesses that do not recycle food scraps to do so.

## Bibliography

- Austin Resource Recovery. 2018. "Zero Waste Business Rebate." City of Austin. <https://austintexas.gov/zwbizrebate>.
- Broden, Scott. 2018. "Middle Point Landfill expansion plans killed by Rutherford County Commission." *Daily News Journal*, April 16, 2018. <https://www.dnj.com/story/news/2018/04/16/middle-point-landfill-expansion-plans-killed-rutherford-county-commission/520078002/>.
- Brolis, Linda Bilsens. 2016. "Austin, TX – Universal Recycling Ordinance." Institute for Local Self-Reliance, May 10, 2016. <https://ilsr.org/rule/food-scrap-ban/austin-tx-universal-recycling/>.
- CDM Smith. 2018. *Metro Nashville and Davidson County, TN Waste Stream and Recycling Characterization Study*. Metropolitan Government of Nashville and Davison County. [https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/Nashville%20Waste%20and%20Recycle%20Characterization%20Study\\_Final.pdf](https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/Nashville%20Waste%20and%20Recycle%20Characterization%20Study_Final.pdf).
- Civil & Environmental Consultants, Inc. 2015. "Compost Company Full Permit Application." Tennessee Department of Environment and Conservation. [http://environment-online.tn.gov:8080/pls/enf\\_reports/f?p=19035:34051:::NO::P34051\\_PERMIT\\_ID:3830](http://environment-online.tn.gov:8080/pls/enf_reports/f?p=19035:34051:::NO::P34051_PERMIT_ID:3830).
- Garrison, Joey. 2018. "Innovative food-waste recycling facility planned near Bordeaux dead after backlash." *The Tennessean*, July 17, 2018. <https://www.tennessean.com/story/news/2018/07/17/food-waste-recycling-facility-bordeaux-nashville/792392002/>.
- George, Stephen. 2011. "TDOT Bulldozes Carver Food Park and digs itself a hole." *Nashville Scene*, April 14, 2011. <https://www.nashvillescene.com/news/article/13038035/tdot-bulldozes-carver-food-park-and-digs-itself-a-hole>.
- Greater Nashville Regional Council. 2018. "Solid Waste." <https://www.gnrc.org/agencies-programs/planning/solid-waste/>.
- Gunders, Dana, and Jonathan Bloom. 2017. *Wasted: How America is Losing Up to 40% of its Food from Farm to Fork to Landfill* (Report 17-05-A). Natural Resources Defense Council. <https://www.nrdc.org/sites/default/files/wasted-2017-report.pdf>.
- Hoover, Darby. 2017. *Estimating Quantities and Types of Food Waste at the City Level* (Report 17-09-B). Natural Resources Defense Council. <https://www.nrdc.org/sites/default/files/food-waste-city-level-report.pdf>.
- Junewicz, Nikki. 2018. "Controversial compost proposal still hopes to help Nashville's trash problem." *Fox 17 Nashville News*, July 18, 2018. <https://fox17.com/news/local/controversial-compost-proposal-still-hopes-to-help-nashvilles-trash-problem>.
- Kemp, Roger. 2017. "The Use of Enterprise Funds in America's Local Governments." *PA Times*, May 16, 2017. <https://patimes.org/enterprise-funds-americas-local-governments/>.
- Koffman, Rebecca. 2018. "Starting in 2020, many businesses must keep food out of the garbage." *Metro News*, July 27, 2018. <https://www.oregonmetro.gov/news/starting-2020-many-businesses-must-keep-food-out-garbage>.



- Livable Nashville Committee. 2017. *Draft Recommendations*. Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Portals/0/SiteContent/MayorsOffice/Sustainability/docs/LN%20DRAFT.pdf>.
- Mayor's Office. 2018. "Food Saver Challenge." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Mayors-Office/Transportation-and-Sustainability/Food-Saver-Challenge.aspx>.
- Metropolitan Government of Nashville and Davidson County. 2018. "Solid Waste Region Board." <https://www.nashville.gov/Government/Boards-and-Committees/Committee-Information/ID/96/Solid-Waste-Region-Board.aspx>.
- Metro Public Works. 2018a. "Davidson County Long-Term Zero Waste Master Plan." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Public-Works/Solid-Waste-Master-Plan.aspx>.
- Metro Public Works. 2018b. "Residential Waste and Recycling Facilities." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Public-Works/Neighborhood-Services/Recycling/Residential-Waste-and-Recycling-Facilities.aspx>.
- Metro Public Works. 2018c. "Recent Waste and Recycling Changes." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Public-Works/Neighborhood-Services/Trash-Collection/Upcoming-Waste-Recycling-Changes.aspx>.
- Metro Public Works. 2018d. "2017 Annual Solid Waste Progress Report." Metropolitan Government of Nashville and Davidson County, March 29, 2018. <https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/SWRB%20032918.pdf>.
- Metro Water Services, 2017. "Annual Disclosure." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Portals/0/SiteContent/Finance/docs/Debt/2017%20Continuing%20Disclosure/Metro%20Water%20and%20Sewer%20Annual%20Disclosure%202017.pdf>.
- Metro Water Services, 2018. "Who Needs A Grading Permit." Metropolitan Government of Nashville and Davidson County. <https://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Who-Needs-A-Grading-Permit.aspx>.
- Platt, Brenda. 2016a. "NYSDOT – Compost Procurement." Institute for Local Self-Reliance, March 1, 2016. <https://ilsr.org/rule/compost-procurement/nysdot/>.
- Platt, Brenda. 2016b. "San Francisco, CA – Composting Rules." Institute for Local Self-Reliance, March 30, 2016. <https://ilsr.org/rule/food-scrap-ban/san-francisco/>.
- ReFED. 2018. "Community Composting." <https://www.refed.com/solutions/community-composting>.
- Resource Recycling Systems. 2018. "Strategies for Pursuing Zero Waste Above 75%." Metropolitan Government of Nashville and Davidson County, February 27, 2018. <https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/DRAFTStrategies%20for%20Pursuing%20Zero%20Waste.pdf>.

- Rosengren, Cole. 2018. "UPDATE: DSNY awards Resource Recycling Systems \$1M contract for 'save as-you-throw' study." *Waste Dive*, January 29, 2018. <https://www.wastedive.com/news/update-dsny-awards-resource-recycling-systems-1m-contract-for-save-as-yo/437392/>.
- Schoetzow, Kim. 2016. "New Rules May Increase Composting and Decrease Food Waste." Tennessee Department of Environment and Conservation, July 7, 2016. [https://www.tn.gov/content/dam/tn/environment/solid-waste/documents/sw\\_compost-rules-article.pdf](https://www.tn.gov/content/dam/tn/environment/solid-waste/documents/sw_compost-rules-article.pdf).
- Sharf, Samantha. 2018. "Full List: America's Fastest-Growing Cities 2018." *Forbes*, February 28, 2018. <https://www.forbes.com/sites/samanthasharf/2018/02/28/full-list-americas-fastest-growing-cities-2018/#6a37ee6c7feb>.
- Sichko, Adam. 2018. "Nashville Crane Watch: The Big Map of Projects." *Nashville Business Journal*, December 21, 2018. <https://www.bizjournals.com/nashville/maps/nashville-crane-watch>.
- Siner, Emily. 2017. "Nashville Begins Accepting Table Scraps At Recycling Centers To Cut Down On Food Waste." *Nashville Public Radio*, October 6, 2017. <https://www.nashvillepublicradio.org/post/nashville-begins-accepting-table-scraps-recycling-centers-cut-down-food-waste#stream/0>.
- Skumatz Economic Research Associates. 2018. "Memorandum: Strategy Descriptions and City Budgeting for Nashville Strategies for Reaching 'High Performance' Diversion." Metropolitan Government of Nashville and Davidson County, February 13, 2018. [https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/DRAFTHighPerforming\\_SERA\\_020118DRAFT.pdf](https://www.nashville.gov/Portals/0/SiteContent/pw/docs/recycle/MasterPlan/DRAFTHighPerforming_SERA_020118DRAFT.pdf).
- Tennessee Department of Environment and Conservation. 2016. "Commercial Compost Permits." <https://www.tn.gov/environment/program-areas/sw-mm-organics/sw-mm-compost-permits/>.
- Tennessee Department of Environment and Conservation. 2017. "Organics Management Grants." <https://www.tn.gov/environment/about-tdec/grants/grants-materials-management-grants/grants-organics-management-grant.html>.
- Tennessee Materials Marketplace. n.d. "Food, agriculture, and organics." United States Business Council for Sustainable Development. <http://tennessee.materialsmarketplace.org/food-agriculture-organics/>.
- United States Environmental Protection Agency. 2017. "Sustainable Management of Food: Food Recovery Hierarchy." <https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>.
- United States Environmental Protection Agency. 2018a. "Advancing Sustainable Materials Management: 2015 Fact Sheet." [https://www.epa.gov/sites/production/files/2018-07/documents/2015\\_smm\\_msw\\_factsheet\\_07242018\\_fnl\\_508\\_002.pdf](https://www.epa.gov/sites/production/files/2018-07/documents/2015_smm_msw_factsheet_07242018_fnl_508_002.pdf).
- United States Environmental Protection Agency. 2018b. "Environmental Justice." <https://www.epa.gov/environmentaljustice>.