



**Climate Action Planning in the
City of Oakland:
Greenhouse Gas Emissions
Reduction Through Food Waste
Policy Implementation**

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Introduction to the City of Oakland Food Waste Problem

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Food waste is a major source of greenhouse gas emissions in the United States and the City of Oakland. In Oakland, 40.3% of the waste stream is composed of food scraps (StopWaste.org, ES-13). Food waste comes from homes, offices, businesses, and restaurants. Commercial sources are responsible for large quantities of the food waste generated each year. In 2008, 15,179 tons of food waste was generated from commercial venues alone (2008 Alameda County Waste Characterization Study, A11-9). The City of Oakland adopted a Zero Waste goal in 2006. Part of this goal was to reduce tons of waste disposed by 90%, or 40,000 tons per year (Strategic Plan for Zero Waste, 3). There are two courses of mitigation available for food waste. One is to reduce consumption through increased efficiency in the food system. The other area of mitigation is to offset methane emissions from decomposing food by turning food waste into compost on a large scale. Oakland must adopt policies to address both areas in order to reduce emissions to target levels. Food waste is an important area of study and management because it has consequences both as a wasted commodity, and as a major producer of methane gas.

Commercial food waste collection is not mandatory within Oakland despite the fact that commercial sources produce large quantities of food waste. Although food scrap collection services are available to businesses in Oakland, participation is optional.

Large amounts of food is wasted every year in Oakland while concurrently, rates of hunger are rising. The Alameda County Food Bank serves 250,000 individuals each year (Alameda County Food Bank, 4). A study published by the food bank reveals that 43% of the clients utilizing their services are between the ages of 0 and 17. Food insecurity affects many of Oakland's residents. Between 2007 and 2011, 19.6% of people in Oakland were below the poverty level (US Census, People Quick Facts).

Edible food that is not re-directed from restaurants and businesses to those in need is typically thrown away and diverted to a landfill. Food is a precious resource that may be utilized in much more productive ways than it is currently used. Adopting additional policies that address food waste can help Oakland to properly re-direct these resources. Useful and edible food can be preserved for community members in need. Food that cannot be salvaged can be used as a valuable soil amendment in the form of compost. An assessment of urban agriculture in Oakland estimated that there is a total of 35 (and growing) community gardens and urban farms. The same study estimates that there are 17,606 private, backyard gardens in Oakland (Oakland Food System Assessment, 28). Food waste can be recovered to fertilize these gardens. Ultimately, the policies suggested in the following section will reduce GHG emissions from food waste, and establish productive outlets for wasted food in the City of Oakland.



Methodology for Development of Food Waste Policies

An interview conducted with Heather Klein at the City of Oakland in November 2012 revealed that food waste was an area of study that hadn't been fully pursued by the City at that time (Klein, personal communication). Food waste has been identified as a significant producer of methane emissions, and therefore holds high emissions reduction potential.

The object of this report is to provide guidance for the City of Oakland about how emissions from food waste can be mitigated by creating a commercial composting program and increasing food waste recovery. These policies were written using information provided by the City of Oakland as well as through research conducted about food waste. They are intended to provide viable suggestions about how the City of Oakland may take steps towards adopting a mandatory commercial composting program, well as promote more food recovery organizations within the city.

It is recommended that the City of Oakland pursue increased rates of composting as a solution because of the high emissions reduction possible from composting. Food wastes in Oakland (and California) result in a significant amount of greenhouse gas emissions. A report published by the Environmental Protection Agency (EPA) finds that an estimated 6,158,120 tons of food waste is sent to a landfill each year in California. Eliminating food waste from landfills is equivalent to a reduction potential of 5,837,189 metric tons of CO₂e ("Reducing Greenhouse Gas Emissions through Recycling and Composting", 8).

The EPA has developed the Waste Reduction Model (WARM) to help solid waste planners to track and report greenhouse gas emissions. The WARM model calculates baseline GHG emissions as well as alternative waste management practices- taking into account composting, land filling, combusting, and other methods. Using the WARM calculator, the EPA has estimated that a net annual reduction of 5,837,189 metric tons of CO₂e is possible if food scraps were composted in California ("Reducing Greenhouse Gas Emissions through Recycling and Composting", 9).

Food scrap diversion from landfills offers a great amount of GHG reduction potential. Although data is not available specific to the City of Oakland at this time, this data from the EPA demonstrates the significant annual reduction potential of removing food scraps from the waste stream. Removing food scraps from the waste stream in the City of Oakland would display similar trends in emissions reduction, yet on a smaller scale.

City of Oakland Food Waste Goals

- Offset emissions in landfills by turning food waste into compost city-wide
- Reduce consumption through increased efficiency in the food system



Commercial Food Waste Collection Policies Suggested for Implementation in Oakland, CA

These policies were developed to serve as a supplementary document to the Oakland Climate Action Plan (CAP). They have been written to guide future policy related to reducing food waste in Oakland. The Oakland CAP was adopted on December 4, 2012 to identify actions that the City may take to reduce GHG's associated with Oakland (City of Oakland Draft Energy and Climate Action Plan, 3). The CAP presents actions that Oakland will take to achieve a 36% reduction in GHG emissions by the year 2020. This includes diverting 375,000 tons of waste from landfills through "waste reduction, reuse, recycling, and composting" (City of Oakland Draft Energy and Climate Action Plan, 3). Although Oakland has an extensive recycling and waste management program, food waste is still a largely unexplored sector with significant GHG reduction potential. Currently, Oakland residential and commercial composting is optional. Wide-scale commercial composting programs are run by private, for-profit enterprises. Typically, restaurants and other businesses that produce significant amounts of food waste put these scraps and excess food into the landfill- resulting in high costs of disposal for them, significant methane emissions, and a valuable wasted resource. Most food waste is still not composted or recovered.

The 2006 Zero Waste Goal that called for a 90% reduction in waste sent to the landfill is recognized and integrated with the CAP (Strategic Plan for Zero Waste, 5). The Zero Waste Goal included strategies to reduce waste and encourage recycling and composting programs (City of Oakland Draft Energy and Climate Action Plan, 33). Implementing policies to re-direct discarded food to food recovery organizations or converting it to compost can reduce the amount of organic material sent to landfills each year. Compost produced from diverting food scraps can be made into a valuable soil amendment for urban farms in Oakland.

One of the priority actions identified within the Oakland CAP included restructuring the solid waste management system to increase progress towards the city's Zero Waste goal. This includes potentially mandating program participation, creating incentives, and expanding services and collection frequency (City of Oakland Draft Energy and Climate Action Plan, 71). Mandatory commercial and business composting services would reduce the amount of greenhouse gas emissions attributed to waste disposal and methane production in landfills. Targeting food waste as an area of reform would contribute significantly to GHG reduction targets in Oakland. Although both the CAP and the Zero Waste Goal propose strategies to reduce emissions through waste reduction, there is still limited policy that deals specifically with food waste. The new policies included in this document are needed to address this critical sector of the waste stream. Amending policies to restructure the food system in Oakland can reduce rates of hunger among citizens, support Oakland's successful urban agriculture movement, and reduce emissions.

The following policies and actions are suggestions for implementation. They have been separated into "mandates" and "incentives". The mandates section is written to anticipate the adoption of a mandatory commercial food waste collection program. The incentives section suggests implementation measures that would transition the City of Oakland to a more comprehensive commercial composting system.

I. Mandates:

Policy 1: Implement a mandatory food scrap collection program for all restaurants, commercial businesses, and offices within the City of Oakland

- 1.1** All properties within Oakland that serve as commercial or office use must subscribe to sufficient levels of collection service. This includes compost, recycling, and trash
- 1.2** Appropriate containers must be supplied to properties within the City of Oakland
- 1.3** Containers must be appropriately sized for the expected amount of waste generated at each location

Conduct audits of businesses to determine volume of food waste each week, month and year.

Food Waste Diversion volume must be determined using the following formula provided by the Composting Council (US Composting Council, 4):

- i. Determine the size of the waste containers currently at the venue and how often they are emptied

Example: If a restaurant has one 20-cubic yard dumpster for trash emptied twice per week:

- The weekly amount of waste is: 20 cubic yards x 2 = 40 cubic yards
- The monthly amount of waste is: 40 cubic yards x 4 weeks = 160 cubic yards
- The yearly amount of waste is: 40 cubic yards x 52 weeks = 2080 cubic yards

- ii. Using these numbers, the proportion of food waste residuals amongst the typical amount of waste can be determined for each venue.

- iii. Conduct a visual survey of dumpsters and determine the percentage of trash that is food waste. Also ask employees at the venue what the typical percentage by volume of the whole container is food waste.

Example: If the dumpster is found to typically contain 80% food waste residuals and 20% of other waste:

- The weekly amount of food waste diverted would be: .80 x 40 cubic yards = 32 cubic yards
- The monthly amount of waste is: .80 x 160 cubic yards = 128 cubic yards
- The yearly amount of waste is: .80 x 2080 cubic yards = 1664 cubic yards

- iv. Using this method to calculate volume of food waste indicates the amount of compost that can be diverted. These numbers also indicate the required size and amount of containers needed to handle food waste.

- 1.5** Businesses and offices must provide adequate training for employees on how to separate food waste from other waste material (particularly in restaurants or other high-volume waste producers). This training must be conducted at least once per year.

Policy 2: Pursue a more comprehensive assessment of food-producing farms and gardens within Oakland

- 2.1** Determine volume of compost that urban farms can utilize each month
- 2.2** Encourage the development of additional food-producing farms and the creation of community gardens to accommodate the volume of compost produced by commercial food sources.

Policy 3: Work with Waste Management of Alameda County to prepare for the collection of food waste residuals. Explore options for expanding existing programs and incorporating additional collection at commercial venues (City of Oakland Draft Energy and Climate Action Plan, 71).

- 3.1** Inventory existing compost venues and determine current capacity and expansion potential.
- 3.2** Explore opportunities for grants and other sources of funding

Policy 4: In cases where there is inadequate space available on the premises for food waste collection (at restaurants, businesses, etc.), establish common sites for collection and disposal in strategic locations throughout the city.

Policy 5: Site new composting facilities

- 5.1** Encourage establishment of on-site composting facilities at restaurants and businesses that generate significant amount of food scraps (when space is available). These businesses are currently using these methods:

i. Sierra Nevada Brewing Company (Chico)

- In 2011, 99.7% of solid waste was diverted from the landfill
- Organic waste from the on-site restaurant and brewery was converted into compost
- Compost was used as an amendment to barley field, hop field, and restaurant garden

ii. Hilton San Diego Bayfront Hotel

- Food composting: compost left over food from restaurant, employee cafeteria, and hotel events
- Donates untouched food to a local organization that distributes food to the homeless community of San Diego

(CalRecycle Waste Reduction Rewards Program)

- 5.2** Create standardized best management practices for managing composting facilities specific to Oakland. Follow guidelines established by the U.S. Composting Council in: “Best Management Practices for Incorporating Food Residuals into Existing Yard Waste Composting Operations”.

Policy 6: Check that tonnages are reported on a monthly basis, and that tonnages are conducive to full participation in the program.

- 6.1** Use food waste diversion amounts (calculated above) to determine compliance

Policy 7: Reforms in Oakland Grocery Stores

- 7.1** Require grocery stores to compost food that is inedible, rather than disposing of it as landfill waste
- 7.2** Encourage grocery stores to donate food that isn't sold to local food distribution charities
- 7.3** Create programs to educate grocery stores about food waste. Discourage food vendors from disposing of produce for cosmetic reasons

II. Incentives:

Policy 1: Create incentives for businesses in Oakland to divert food scraps and waste from landfills.

- 1.1** Adjust costs of food waste collection to half the garbage collection rate
Model after "Beaverton Composts" program (Fong).
- 1.2** Seek sources of funding to support a commercial food waste collection program
- 1.3** Encourage restaurants in Oakland to use locally-sourced food in meal preparation and to divert food scraps for composting purposes
- 1.4** Offer incentives to restaurants that donate extra or unused food items to food recovery organizations in Oakland

Policy 2: Food Recovery

- 2.1** Expand Alameda County Waste Management Authority's edible food donation program (Oakland Food System Assessment, 96)
- 2.2** Create partnerships with food rescue organizations to re-distribute food to organizations in need.

Examples of Food Recovery Organizations:

- Boulder Food Rescue: Picks up excess food from businesses and delivers to organizations that feed the hungry (<http://www.boulderfoodrescue.org/>)
- Food Shift: An Oakland-based organization that works to reform food systems by reducing waste through increasing awareness and initiating consumer behavioral changes (<http://www.foodshift.net/>)
- Food Runners: A San Francisco-based organization that picks up excess perishable food from various sources and delivers it to shelters and programs that feed the hungry

(<http://www.foodrunners.org/>)

- 2.3** Offer training programs for restaurant staff on how to properly separate food waste from landfill waste

Policy 3: Urban Agriculture Policies: Create a closed-loop food system

- 3.1** Create partnerships with urban farms in Oakland to distribute compost produced from commercial food waste collection
- 3.2** Encourage establishment of additional urban farms in Oakland to:
- Increase local food sources
 - Reduce GHGs attributed to food transportation
 - Decrease risk of damage to produce in transit
- 3.3** Explore composting-potential at Oakland urban farms and encourage urban farms to increase current composting facilities. Reward farms that can accommodate commercial food waste collected in the City of Oakland

Policy 4: Launch a program to educate residents of Oakland about preventing food waste. Begin by distributing brochures to community members and creating a program modeled after Scotland's "Love Food Hate Waste" (<http://scotland.lovefoodhatewaste.com/>) website. (See attached brochure for distribution)

Authorities for creating food waste policy:

This section is meant to describe the major sources used as guidelines for creating the policy within this report. The City of Oakland should consult these sources when developing future food waste policies.

CalRecycle: Cal Recycle is a program that coordinates California's waste management and recycling programs. Cal Recycle encourages waste reduction and recycling in California through acts and initiatives. The Cal Recycle website may be a resource for Oakland when creating food waste programs and policies. The Food Scraps Management Case studies provide examples of successful waste reduction programs at a small and large scale.

EPA: The Environmental Protection Agency seeks to protect human health and the environment. The EPA is working to address climate change by developing regulatory initiatives to reduce greenhouse gas emissions. Some of these initiatives and policies are related specifically to waste management. The City of Oakland may consider EPA reports regarding the reduction of GHG emissions through composting and recycling when developing their own policies.

ICLEI: ICLEI, and in particular the U.S. Community Protocol, assists local governments to develop GHG emissions inventories for their communities. The ability to estimate GHG emissions associated with factors in their community allows policy-makers to make more informed decisions about how to reduce emissions (US Community Protocol, 8). The City of Oakland should utilize best management practices established by ICLEI to continually measure emissions attributed to food waste. Emissions calculations may help quantify progress after the suggested food waste policies are implemented.

Scotland's Love Food Hate Waste Campaign: In 2007, the Love Food Hate Waste (LFHW) Campaign was created in the United Kingdom by Zero Waste Scotland (Love Food Hate Waste). The campaign aims to reduce food waste by offering advice on storage tips, recipes, and meal planning. The City of Oakland should look to the LFHW campaign as a model for a similar program to be implemented in Oakland. LFHW offers an easy-to-navigate website with videos and a downloadable app.

US Composting Council: The US Composting Council works to promote compost use in order to spread environmental benefits to society. They work with policy-makers, public entities, and other organizations to conduct research and establish best management practices related to composting. The document used in this report was prepared by the US Composting Council to assist existing compost facilities expand their operations to include the processing of food residuals (US Composting Council, i). It is recommended that the City of Oakland utilize the Food Waste Diversion Volume calculations in order to estimate anticipated volumes of commercial food waste in Oakland. It is also recommended that standards established for the management of residuals established by the US Composting Council be taken into consideration when developing a commercial food waste ordinance (US Composting Council, 9).

Lifecycle Emissions Meter for the City of Oakland

ICLEI has developed a method to calculate greenhouse gas emissions attributed to food use. This formula is meant to measure emissions that are associated with the community of study's use of materials and services. These materials and services are derived from GHG's used in the production of food. The product of this calculation are the GHG's resulting from the community-wide flow of food. This includes food used by homes as well as food used by businesses and hospitality industries (Appendix H- "Emissions Associated with the Community's Use of Materials and Services", 8).

In order to find the community-wide flows of food, the food used by homes is added to the food used by businesses and hospitality industries. The U.S. Bureau of Labor Statistics Consumer Expenditure Surveys are used to determine the monetary expenditure on food consumed in households. There is no data available for the City of Oakland, but the expenditure on food in San Francisco was \$3567. (Appendix H- "Emissions Associated with the Community's Use of Materials and Services", pg.8)

Restaurant tax receipts and revenue from other food vendors is used to estimate the food purchases made outside the home. If restaurant tax receipts are not available, there are other methods of estimating revenue from food vendors. For the following calculation, the US Economic Census was used to determine restaurant revenues in Oakland. Data is available that shows revenue from "Food services and drinking places". This category includes full service restaurants, limited service eating places, food service contractors, caterers, mobile food services, and drinking places. ("Accommodation and Food Services: Geographic Area Series": 2002 Economic Census). This subsector category will adequately cover the food used outside the home in Oakland. Below is the chart displaying these census results:

Geographic area name	2007 North American Industry Classification System (NAICS)	Meaning of 2007 North American Industry Classification System (NAICS)	Meaning of Type of operation or tax status code	Year	Number of employer establishments	Employer value of sales, shipments, receipts, revenue, or business done (\$1,000)
Oakland city, California	722	Food services and drinking places	Total	2007	775	553,049

Monetary amounts are converted to 2002 dollars to be consistent with the Economic Input-Output Life Cycle Assessment (EIO-LCA) developed by Carnegie Mellon. As seen in the above chart, the business done in Oakland, California in 2007 was \$553,049,000. Converting this amount to the value of 2002 dollars would yield:

\$553,049,000 in 2002 dollars= \$479,852,200 (BLS Price Inflation Tool)

This number can then be used to determine the total amount of sales that were used for food purchases. Census data does not provide the food-only portion of restaurant sales, and therefore must be adjusted. The ICLEI Community Protocol suggests multiplying the restaurant revenue by 0.25 since approximately 25% of restaurant receipts pay for food (Appendix H- "Emissions Associated with the Community's Use of Materials and Services", 8)

Completing this calculation would yield the following:

$$(\$479,852,200) \times (0.25) = \$119,963,050$$

The number of Households is also required to calculate the life cycle GHG's resulting from food consumption at home. In 2011, the number of households in Oakland was 157,374 ("Economy-wide Key Statistics: 2007 Economic Census").

Subject	Oakland city, California									
	Total		Married-couple family household		Male householder, no wife present, family household		Female householder, no husband present, family household		Nonfamily household	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total households	157,374	+/-3,582	52,048	+/-2,452	9,649	+/-1,610	24,676	+/-1,803	71,001	+/-4,205

The number of households is multiplied by an emission factor attributed to food. As determined by the EIOLCA, the emissions factor for food is 1.6 kilograms of CO₂e for a typical household diet in the US (Appendix H- "Emissions Associated with the Community's Use of Materials and Services",8).

The entire calculation for GHG's from both food consumption at home and in restaurants is as follows:

Life Cycle GHG's from food at home:

$$(\$3,567/\text{HH}/\text{yr}) \times (157,374 \text{ HH}) \times (1.6 \text{ kg CO}_2\text{e}/2002\$) \times (1\text{mt}/1,000 \text{ kg})=$$

898,164.89 mt-CO₂e

Life Cycle GHG's from food consumed at restaurants:

$$(\$479,852,200/\text{yr}) \times (0.25) \times (1.6 \text{ kg-CO}_2\text{e}/2002\$) \times (1 \text{ mt}/1,000 \text{ kg})=$$

191,940.88 mt-CO₂e

Total Life Cycle GHG's from food consumption:

$$(898,164.89 \text{ mt-CO}_2\text{e}) + (191,940.88 \text{ mt-CO}_2\text{e}) = \mathbf{1,090,105.77 \text{ mt-CO}_2\text{e}}$$

Using the equation recommended by ICLEI and input values specific to Oakland, the calculation yields that the total life cycle GHG's from food consumption equates to 1,090,105.77 metric tons of CO₂e per year.

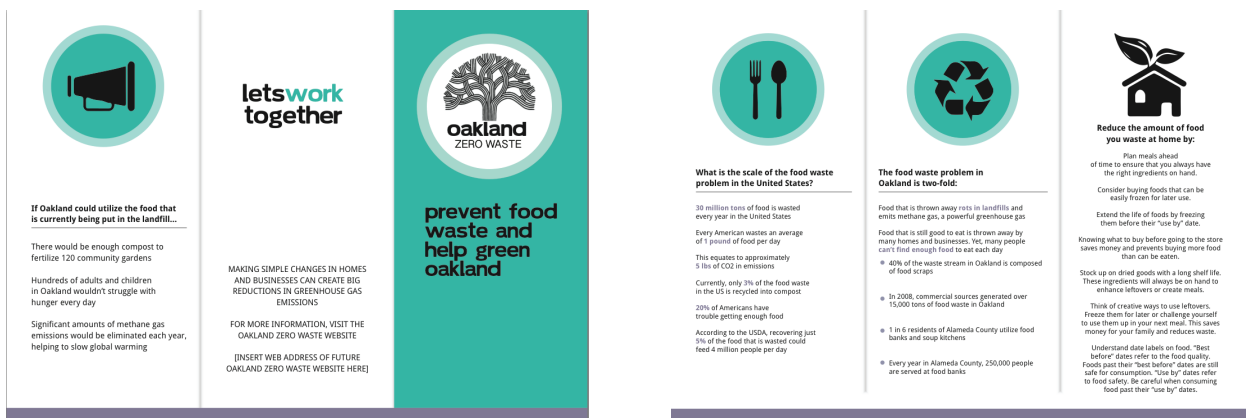
Description of Supplementary Materials:

Oakland Food Waste Brochure: “Prevent Food Waste and Help Green Oakland”

This brochure has been designed for public distribution to inform residents in Oakland about food waste. It is intended to be one element of a new Zero Waste campaign developed by the City of Oakland. The brochure contains information about the scale of food waste, the consequences of wasted food (both in terms of methane emissions as well as societal impacts), and some tips about reducing food waste.

As was mentioned, it is recommended that Oakland develop a food waste prevention campaign similar to the UK's 'Love Food Hate Waste' project. This would entail creating a website to provide information and tips on how food can be conserved. The campaign for Oakland may be developed to provide information that pertains to both residential and commercial food consumers.

This brochure may be customized and updated by the City of Oakland. If desired, pictures may replace the black images currently on the brochure. Once Oakland has created a “Prevent Food Waste and Help Green Oakland” campaign, a consistent style should be created that applies to both the website, brochure, and other distribution materials.



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