

# Food Waste: The Impacts on Communities and Environments

Susan M. Kooiman, Tylor Dove, and Emma Warner  
Southern Illinois University Edwardsville

Food waste is an increasingly important issue faced across the world. Approximately one-quarter to one-third of all food supplied for human consumption is lost or wasted and therefore not consumed (Gustavsson et al. 2011; Kummu et al. 2012). This results in a cumulative 1.3 billion tons of lost or wasted food globally each year (Gustavsson et al., 2011). While some of this occurs in the stages of production, post-harvest, and processing (referred to as *food loss*), the majority is the result of *food waste*, or losses at the stages of distribution and consumption (Stancu et al., 2016).

Addressing food waste is important because it has social, economic, and environmental impacts. Approximately 65% of food waste at the household level is avoidable (WRAP, 2009), so the reduction of food waste in households and promotion of practices that keep unavoidable food waste out of landfills, particularly composting, can help diminish the negative impacts of food waste. Action at the level of both communities and individual households can contribute to food waste reduction. Many researchers have begun testing and exploring this issue, and we aim to offer some potential solutions that individuals, families, and communities can use to begin the overall reduction of household food waste and its environmental impacts.

## The Negative Impacts of Food Waste

Addressing food waste is important for several reasons. First, there are tremendous economic costs associated with food waste. In the United States alone, \$166 billion is lost on wasted food each year (Read & Muth, 2021). The average household wastes approximately \$2000 annually on uneaten food (SWACO, 2023). Not only is money lost, but energy, water, and land are wasted on producing food that is not consumed and instead thrown into landfills. These losses impact everyone from individuals and families to communities, industries, and governments.

Food waste also causes and exacerbates existing social inequalities. Approximately 1 in 10 people face hunger worldwide (UN World Food Program, 2023). In the

United States, 34 million people, including 9 million children, face hunger every day, and food insecurity is present in 100% of U.S. counties (*Feeding America*, 2023). According to the UN World Food Program, reversing current food loss and waste could preserve enough food to feed *two billion people*. Higher income countries are also bigger contributors to food waste. In Europe and the United States, food waste at the household level accounts for 50%-60% of all total food waste, meaning that individual households in developed nations are the largest producers of food waste (Kummu et al., 2012; Monier, 2011; Stenmarck et al., 2016).

There are considerable environmental impacts of food waste. Soil erosion, deforestation, water and air pollution are all connected with food production, storage, transportation, and waste management (Mourad, 2016). Approximately 20% of land and water used in the United States food system go towards food that is lost or wasted (Cuéllar & Webber, 2010).

Food waste is also a major contributor to greenhouse gas emissions (Monier, 2011; WRAP, 2009). Based on conservative estimates, 170 million metric tons of greenhouse gases are produced by food waste in the US. This accounts for 16-18% of the total emissions associated with US food systems and 6% of global greenhouse gas emissions (Read et al., 2020). Food waste that is left to decompose in a landfill will become a mixture of greenhouse gases consisting of methane, carbon dioxide, and nitrous oxide. Methane is the worst greenhouse gas, and traps 83% more heat than carbon dioxide. (“Methane: A Dangerous Problem, An Easy Solution” n.d.) To avoid environmental catastrophe, current global emissions need to be reduced 43% by 2030 and begin reducing before 2025 (*FAO Publications Catalogue 2022*, 2022).

The climate crisis is possibly one of the biggest threats that humans today face, and it is a problem we created ourselves. The Earth’s temperature has continued to increase by 0.14-degrees Fahrenheit every decade since 1981 and continues to do so because of human carbon outputs. (“World of Change: Global Temperatures” 2020). Fossil fuels, the agricultural sector, and food waste in landfills all produce these carbon outputs. Left unchecked, this warming will create massive weather changes all around the world, impacting everything from glacial melting in the arctic circle, desertification of the African continent, and the intensification of the west coast forest fires with many more unknown catastrophes.

Unfortunately, communities are not impacted by climate crisis or environmental injustice in the same ways. Often times poor communities of color live in closer proximity to landfills and dumping grounds for toxic waste within the United States; these communities are considered to live within or near “environmental sacrifice zones” (Taylor 2014, p. 47) Furthermore these communities are often times left out of the conversation when talking about the impact that climate crisis will have on them.

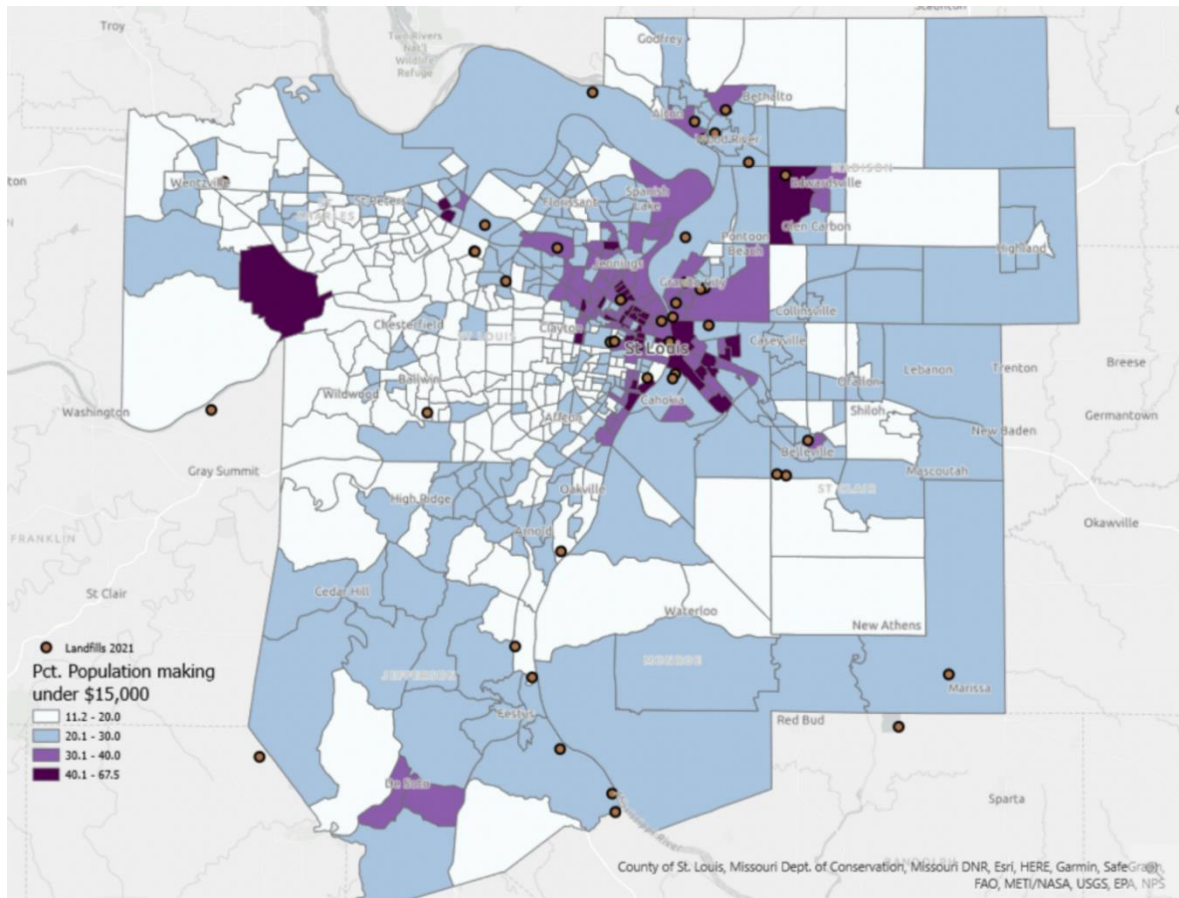


Figure 1. Poverty and Proximity to Landfills in the St. Louis Metropolitan Area. GIS model by Stacey Amilian Brown (2023)

These environmental inequalities are visible within our local St. Louis Metropolitan area and Metro East community. *Poverty and Proximity to Landfills* (Figure 1) shows regional communities of varying economic levels, with landfills represented by the black spots. The map shows that the communities with the

highest saturation of landfills are the East St. Louis (ESTL) area, North County St. Louis (STL), and the Alton area, which are also lower-income communities. These are the region's environmental sacrifice zones. Many of the sacrifice zones are also occupied by communities of color. These marginalized communities, surrounded by major sources of pollution, such as manufacturing plants and landfills, face disproportionately higher rates of asthma, cancer, and chronic illness. The environmental impacts of food waste disproportionately affects lower income and marginalized communities, amplifying existing social and economic inequalities.

### Common Misconceptions Surrounding Food Waste

There is a general lack of public awareness food waste and its impacts and many inaccurate perceptions of wasteful practices. Research has demonstrated that people severely underestimate the amount of food that they waste. The Garbage Project, which was led by William Rathje of the University of Arizona, used archaeological techniques on modern-day refuse and landfills to understand American disposal habits. One aspect of their study, conducted in collaboration with the USDA, asked households to estimate or measure how much food they were throwing away. The investigators then went through their trash and accurately measured the amount of food waste per household. The average household was wasting an eighth of a pound of food per person per day, much higher than what the households were reporting (Rathje & Murphy, 2001).

Another common misconception held by many people is that even if food waste enters landfills, it is biodegrading alongside other materials such as paper products. However, the Garbage Project discovered that conditions in landfills generally do not have proper moisture or oxygen levels to promote the breakdown of organic materials; items like bread rolls, heads of lettuce, hot dogs and fully readable newspapers have been found in landfills, presumably there for years (Rathje et al., 1992; Rathje & Murphy, 2001). The American public seems especially prone to a belief that organic materials will decompose in landfills; they throw away 20% - 30% more organics than people in many European countries. Biodegradation does, of course, happen in landfills, contributing to the release of massive amounts of methane into the atmosphere, but even this does not occur at the rate that much of the public perceives. More recent estimates have also found that people waste even more food than previously thought (Verma et al., 2020). Raising awareness about food waste is, therefore, extremely important.

## The Benefits of Limiting Food Waste

At the household level, food waste can be reduced at both the front end and back end of consumption. Approximately 65% of food waste at the household level is avoidable (WRAP, 2009). Households can take steps to reduce the overall amount of food that they waste and throw away (front end reduction), and food refuse that cannot be avoided can be composted or recycled (back-end reduction).

Monetary costs of food waste are immense, and at multiple levels. Since an estimated 50% of food available for consumption is wasted along the food chain, that leads to an estimated \$166 billion annual of lost investment in food production, distribution, and consumption in the US alone (van der Werf et al., 2021). Reduction in food waste at all stages would save producers, consumers, and governments from the local to federal levels.

Since over half of food waste occurs at the household level, much of the economic benefits of waste reduction would benefit the average consumer. A family of four wastes approximately \$2000 a year on food that is purchased and never eaten (SWACO, 2023). There are many strategies that consumers can use to both save money and reduce food waste. This includes strategies such as creating shopping lists and meal plans, checking inventories before shopping to avoid overbuying, proper food storage, and using and consuming leftovers (Schanes et al., 2018; Stancu et al., 2016; van der Werf et al., 2021). There are also a variety of ways in which governments, communities, and organizations can curb food waste, both at the household and institutional levels.

## Systems and Plans That Are Working

Several studies have found that Consumer Education Campaigns (CECs) are effective in reducing food waste within communities (Read & Muth, 2021; Reynolds et al., 2019; Schanes et al., 2018; Stancu et al., 2016; SWACO, 2023; van der Werf et al., 2021). CECs are defined as “public awareness advertising campaigns using multiple media that promote waste-reduction behaviors by consumers” (Read & Muth, 2021). Some of these initiatives have been nationwide, such as the “Love Food, Hate Waste” campaign in Britain, while most in North America have been implemented in specific regions or cities such as the “Save More than Food” project in central Ohio and the “Reduce Food Waste, Save

Money” campaign in London, Ontario (Schanes et al., 2018; SWACO, 2023; van der Werf et al., 2021). On average, these types of initiatives have reduced food waste by 28% (Reynolds et al., 2019).

Studies have also shown that the biggest motivators for people to change their habits around food waste are economic, or saving money, rather than environmental or social motivators (Stancu et al., 2016). Therefore, CECs should emphasize the monetary aspects of food waste reduction to encourage wider participation and food habit behavioral change. These changes are proven effective at the local level, and although the cost of a nationwide CEC would cost \$198 million annually but would result in \$2 billion in savings on food each year. While there are other methods for reducing food waste and the production and distribution level, such as spoilage preventive packaging and standardized date labeling, CECs are the most cost-effective (Read & Muth, 2021). Besides the economic savings, reducing food wasted in the US by 50% would decrease the environmental impacts and resources use of the US food system by 8-10% (Read et al., 2020).

One potentially powerful intervention that could impact future food waste reduction is the implementation of programs aimed at educating children about the subject. One such program, aimed at reducing plate waste in primary school cafeterias, helped reduce main dish waste at a rate of 33% (Liz Martins et al., 2016). A similar program in a university cafeteria resulted in a 15% reduction in food waste (Whitehair et al., 2013).

### Reducing Unavoidable Food Waste: Composting

The preceding approaches all address the reduction of *avoidable* food waste; however, *unavoidable* food waste, which includes items like coffee grounds, vegetable peels, etc., require another approach (van der Werf et al., 2021). No matter the food saving efforts of a given household, some avoidable and unavoidable food waste will be produced. The question then becomes how to reduce the environmental impacts of these products. The primary approach is composting, alongside other recycling options.

Composting is the process of turning organic materials into nutrient-rich soil. This decomposition in a controlled setting significantly reduces the greenhouse gas emissions of decaying food waste, especially compared to decomposition that

occurs in landfills. The resulting product, fertile soil, is a free and useful byproduct of the practice. Composting is an environmentally sustainable practice since it reduces these emissions while improving both soil and animal health (Walters, 2023).

Adoption of this practice or another sustainable waste processing method at the institutional level can significantly reduce greenhouse gas emissions. Southern Illinois University Carbondale built a Vermicomposting Center, which was funded by a \$150,000 grant from the Illinois Department of Commerce and Economic Opportunity in 2006. The center reduces organic waste going into landfills, recycles food waste within the university, enhances food production efforts on campus farms and gardens, and provides education and research opportunities for students and faculty. At SIUC approximately 12,800 pounds of food waste generated in campus dining facilities is composted each year. Their composting practice greatly reduces the campuses GHG emissions (Walters, 2023).

### Composting in St. Louis and the Metro East Area

Composting can have a great impact at the community level, as well. Across the United States, a great number of programs, initiatives, non-profit organizations, and businesses have been established to encourage and aid the practice of composting. One example is Good Dirt Composting Collective, a grassroots group in Edwardsville, IL, that formed in 2020 with the focus of educating the community about and advocating for composting. They partner with other community organizations and businesses, such as Goshen Market, The Watershed Nature Center, Madison County's Green School program, Willoughby Farm, New Earth Farm, New Cahokia Urban Farm and the Illinois Food Scraps Composting Coalition to raise awareness and organize initiatives promoting composting. Their work primarily consists of providing presentations at organizations such as the scouts, rotary clubs, garden clubs, and tabling at Goshen Market and local festivals and social media. They were instrumental in removing most restrictions of Edwardsville's composting ordinance that was passed in 2022, making it easier for households to have their own compost bins. Good Dirt was successful in setting up a free food scrap drop-off location at the Goshen Farmer's Market in Edwardsville, and they are currently campaigning for New Earth Farm, a St. Louis-based composting service, to extend their drop-off service to Edwardsville to create a year-round, long-term option for food waste disposal services.

Good Dirt's partners are making impacts of their own at community, regional, and state levels. New Earth Farm has already established residential food scrap pick up locations and provides household pickup services within the city of St. Louis, Missouri. They turn these food scraps into compost, much of which is distributed back to the paid subscribers.

Legislation targeting the disposal of food waste is the potential future direction that many local, state, and federal governments may have to consider as they deal with overextended landfills and increasing pollution issues. The Good Dirt Collective recently worked to reduce restrictions on residential composting in Edwardsville, making easier for individual households to compost. New York City passed a mandate that will require residents to separate food waste from other waste in June 2023 (Rubinstein, 2023). The nation of South Korea banned food scraps from landfills over twenty years ago and has developed systems for transporting food scraps from homes and businesses to a series of plants across the country and turn the waste into animal feed, compost, and biofuel in clean facilities that draw far fewer complaints from communities than food-laden landfills (Yoon, 2023). Businesses and residents have to pay for all of the food waste they dispose of, which, in turn, encourages people to consider how much food they buy versus how much they eat, thereby reducing food waste produced and saving residents money on both purchasing and disposal.

Composting is a great return on minimal investment. By simply allowing food waste to decompose, households, businesses, institutions, and cities could reduce smells and air pollution resulting from nearby landfills and provide free, fertile soil to give back to the land. Ultimately, recycling food scraps in this way can lead to cleaner communities and beautification of landscapes through cost-effective actions. Composting, along with production of feed and biofuel, is a productive means of recycling waste that is beneficial to both people and the environment.

### Benefits of Food Waste Reduction and Recycling

There are many reasons to reduce food waste. Actions to reduce food waste can help address an array of economic, social, and environmental problems. Ultimately, the issue of food waste is increasingly important as populations and their subsequent waste production grow. The health, well-being, and living conditions of communities could be improved by food waste reduction, which



includes conscious, money-saving front-end actions on the part of consumers, and more efficient, economical, and cleaner options for dealing with food waste.

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