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From Farm to Fork to Landfill: Food Waste and Consumption in America

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Introduction

On the last day of fifth grade it was my turn to serve lunch duty in the school cafeteria, a coveted role because it meant getting excused from class half an hour early. I skipped to the cafeteria to help set up and then with great enthusiasm doled out macaroni and cheese, pizza, and applesauce to my classmates. Once all the students had passed through the line, we began cleaning up. Because it was the last meal of the school year, student helpers were directed to toss all the prepared food, including fresh fruits and vegetables, into a line of black garbage bins nearly as tall as I was. The cafeteria workers pulled out trays from the refrigerators and cleared shelves of leftover ingredients, pouring everything into the bins. As the smell of the previous week's lunch hit me full force, I couldn't help but wonder why we were throwing away so much good food. Did it have to go to waste? I asked the lunch lady, but she repeated that I should keep tossing it all in the trash. There wasn't time to bring the food anywhere else, and it couldn't be used again at the school since summer vacation was only moments away. It didn't make sense to me, but I did as I was told, dumping out five-pound bags of lettuce, bulky containers of yogurt, bags full of bagels, half-eaten pizzas, and packages of baby carrots.

This question of what to do with food destined to go to waste has stuck with me over the years. If my small elementary school was throwing away so much good food in just one day, how much food was being tossed out at other schools, businesses, universities, restaurants, supermarkets, and homes? Where was it going? Did no one else realize the potential this food held? These questions became more difficult to answer as I got older and came to realize the web of facets that construct our food system and facilitate the creation of food waste. Rather than repurpose food as compost or donate

food to the hungry, the most dominant method, and most convenient option, is to toss good food in the trash.

Waste is created throughout the food supply chain, with producers as well as consumers guilty of throwing away food. This massive quantity of food, although often edible and completely biodegradable, is mixed in with the rest of our garbage and sent away for disposal, eventually hidden within a mountain of trash where static conditions keep organic materials from decomposing. What happens to food we don't want is a matter kept hidden from most Americans. The invisibility of the system of waste disposal in the United States allows us to maintain a willful ignorance of our consumption problem and subsequent waste accumulation.

By evaluating the parallel yet separate systems of waste disposal and food production, I hope to illustrate the ways in which both of these industries encourage the creation of food waste and conceal its harmful effects. Food waste has significant environmental, social, and economic implications that are finally becoming too pressing to ignore. In some parts of the country, municipalities are beginning to reconsider and restructure disposal methods to accommodate food waste—for instance, by composting it. This trend, mostly confined to the West Coast at present, is an incremental step in the right direction. Ultimately, however, it disregards the shockingly simple yet seemingly impossible truth: we must stop wasting food. It is necessary to prioritize source reduction of wasted food, rather than rely upon infrastructure that keeps waste "out of sight, out of mind." This reality will require innovative discussions, initiatives, and changes that completely reconsider how we produce and consume food as well as what we do with the leftovers.

The idea of the unseen toll of waste has stayed with me since my naïve wonderings in the school cafeteria. It wasn't long until I had my own worm bin in my dorm room at Pitzer College and committed myself to spending the summer studying composting initiatives. While I initially viewed food waste solely as an issue of waste processing, I came to realize that this is a much more complex concern. I began further questioning the invisible spaces that waste occupies. Does it make sense for my garbage to be trucked 150 miles away only to be buried underground? How much of my own food ends up there? Why is it that I gladly relinquish all responsibility for my waste once I've deemed it worthless, even if it holds the potential to be reused or repurposed, or even to become a quality meal for someone in need? What will it take to bring food waste into the spotlight?

Fortunately, discussion of urban sustainability, waste reduction, and food systems are slowly beginning to reach a national audience, albeit slowly. The topic of food waste, although discrete and specific, is beginning to establish a place in this necessary dialogue. Its pertinence is best demonstrated through direct information and startling numbers that make the effects of food waste very real. One reason that individuals may be slow to realize the extent of the waste situation and our complicity as consumers is that we view the issue as impersonal and intangible. Yet each American generates nearly 200 pounds of food waste a year, estimated to be the highest amount of any country (Bloom 2010, xiii). In a country where tremendous wealth and extreme poverty exist side by side, Americans throw away over 34 million tons of food each year (Environmental Protection Agency 2010, 5). This loss of food represents a total of $165.5 billion, or $390 worth of food purchased but not consumed by every American annually (Buzby and Hyman 2012,

561). Despite the resources required to produce food, between 30 and 50 percent of food grown for human consumption in the United States never reaches a human stomach (Institution of Mechanical Engineers 2013, 2).

Most of our moldy leftovers, forgotten produce, and prepared and packaged meals are sent to the landfills—large heaps of garbage stewing at the edges of society. Food waste is the single largest component of municipal solid waste reaching landfills (Gunders 2012, 14). Although estimates vary throughout the country, approximately 27 percent of garbage is food and yard debris, and another 29 percent is paper or other organic waste, all of which is biodegradable (Environmental Protection Agency 2010, 4). Organics—waste material that was once living, such as food, plant debris, and some paper—that become preserved in lifeless landfills account for 25 percent of total U.S. methane emissions (Gunders 2012, 1). Landfills have become the most convenient places to dispose of biodegradable materials, despite its potential to naturally decompose. In both 2000 and 2008, just 2.5 percent of food waste was composted in the United States, suggesting that attitudes toward food waste have not improved despite an increase in awareness, policy changes, and the establishment of new facilities to process organic wastes (Bloom 2010, 16).

The same inefficiencies that allow food to be regarded as waste influence the way food is produced. Although most food waste is disposed of in landfills, it ends up there because of the way the food system has been designed to accommodate a globalized food market. Staggering amounts of finite resources are allocated to produce the food necessary for human survival. Getting food from farm to fork consumes 10 percent of the total U.S. energy budget, uses 50 percent of land, and swallows 80 percent of all

freshwater consumed in the United States (Gunders 2012, 1). When food is wasted, these resources are likewise lost. At least 300 million barrels of oil a year are used to produce food that will never be consumed, which represents approximately 4 percent of total U.S. oil consumption (Hall et al. 2009, 2). Growing, shipping, and selling food that is destined to be thrown away uses more energy than is currently produced by offshore oil drilling (Humes 2012, 15). Additionally, more than one-quarter of our total freshwater consumption is attributed to food that never gets eaten (Hall et al. 2009, 2). Despite the significant loss of the valuable resources that are required to produce food, more than 6 billion pounds of food are left unharvested in the field or unsold by the producer each year (Gunders 2012, 8). Additional losses occur once food begins its journey to meet the consumer. Of the food that makes it to the supermarket, 43 billion pounds are never consumed (Gunders 2012, 10). These wasteful habits have become more pronounced as consumers become more separated from the source of their food; per capita food waste has progressively increased by over 50 percent since the 1970s (Hall et al. 2009, 11).

These inefficiencies have drastic impacts for food-insecure families. At least 49 million Americans, or 15 percent of the population, remain hungry despite the surplus volume of food produced every year (Buzby and Hyman 2012, 562; Bloom 2010, 50). Reducing food losses by just 15 percent would yield enough food to feed more than 25 million Americans, at least half of the people currently without enough to eat (Gunders 2012, 1). However, this situation is not confined to the United States. One-third of the total human food supply is wasted each year, equaling 1.3 billion tons of wasted food annually (Gustavsson et al. 2011, 4). Globally food supply chain losses account for one-quarter of freshwater and one-fifth of cropland and fertilizer use (Kummu et al. 2012,

486). Eliminating global food waste would not only save these vital resources, but provide enough food to feed three billion people, sufficient to accommodate the entire world's population with 130 percent of their nutritional requirements (Rominger, Emert, and Ushimaru 2012, 231). Although redistributing food to those in need holds the potential to eliminate global hunger, the nature of the globalized food system makes this ideal nearly impossible to achieve. In the United States Americans currently produce twice as much food as needed to meet the nutritional needs of every citizen, yet both wasted food and poverty remain all too common (Rominger, Emert, and Ushimaru 2012, 231).

The reckless creation of food waste is not surprising given how much Americans consume and subsequently dispose of their goods. Americans are the world's number one producers of garbage: we consume 30 percent of the planet's resources, produce 30 percent of all its wastes and at least a quarter of global greenhouse gas emissions, despite being home to only 4 percent of the global population (Rogers 2005, 2; Bloom 2010, 18). These wasteful practices are not solely the result of development and globalization, but are unique to American culture. Our nation produces 50 percent more garbage per person than other developed countries with similar standards of living (Humes 2012, 4). Production is so inefficient that for every 100 pounds of product made in the United States, an average of 3,200 pounds of waste are generated (Hawken 1997, 44). These wasteful yet socially accepted production and consumption practices have accelerated in recent decades, resulting in a tripling of annual American waste production in the past 60 years (Royte 2005, 11). Currently, total municipal solid waste generation in the United

States can be broken down into roughly 7.1 pounds of garbage generated per capita each day (Humes 2012, 4).

An analysis of food waste requires that we recognize this startling quantitative data while expanding upon it to draw qualitative conclusions. In order to better understand the role of wasted food in our society, I evaluate the existing literature on food waste and additional sources that explore the relationship between people and either their food or their waste. I examine these accounts through a consumption lens to understand the broader implications of food waste. Secondary sources drawn from extensive library and database research form the basis of this thesis. Additional sources such as government reports, city documents, news articles, and conversations enrich this study.

To better understand the challenges involved in sustainably managing food waste, I decided to explore the situation at Pitzer College. Because I have been involved with the on-campus composting program for nearly four years, I want to evaluate the effectiveness of the composting program and determine how food waste could be better managed on campus. The student-run composting program processes some of the pre-consumer food waste from the dining hall, which then becomes fertilizer for the on-campus organic garden. Although this processing system creates compost, it does not resolve many of the challenges that remain for reducing food waste on campus. The kitchen generates a high volume of pre- and post-consumer food waste, most of which cannot be accommodated through composting because of the lack of space and support for the program. A large portion of food waste generated on campus continues to be sent to a landfill. I hope to

better understand the effects of this contribution and the obstacles that have prevented food waste from being addressed on campus.

Through this thesis I seek to conceptualize food waste as both an issue of food production and waste disposal. A literature review of scholarly discussions of food waste assesses the primary environmental, social, and economic impacts that are directly associated with food waste and the dominant ideology of overconsumption that has fueled the cyclical creation and disposal of goods. Although most data specifically on food waste focuses on quantitative information and scientific studies, I hope to contextualize waste through a historical account of consumption trends and the establishment of waste management infrastructure in the United States. I consider the ways that waste is viewed and attempt to understand how our culture has made waste invisible. Next I examine the development of industrialized food production and the formation of food as a commodity. I stop at each step of the food supply chain, from farm to consumer, to understand how food is lost within this system. I analyze the social position of food waste through these two frames, waste processing and food production. I also seek to recognize the large, systematic failures that have led Americans to waste more than citizens of any other country in the world. Composting and innovative waste processing strategies will be considered, along with their feasibility and practicality in urban environments. I acknowledge the benefits of establishing infrastructure that keeps waste from the landfill, but also recognize that reducing food waste at the source must be prioritized as the most ideal option. This paper will then explore food waste in a localized context at Pitzer College, with the aim of demonstrating the challenges inherent in food waste management. I will examine policy initiatives such as zero waste before analyzing

the physical and mental spaces that food waste occupies. Despite its existence as a hidden reality, food waste deserves to be prioritized as a legitimate social, environmental, and economic issue.

Literature Review

Food waste is a specific yet highly critical issue that implicates the large, incongruous systems of both food production and waste processing. An investigation of food waste in the United States reveals an emerging category lodged between discussions of production and consumption, one that bridges the gap between what we produce and how we treat what remains. Following food from production to either consumption or disposal—and stopping along the way to examine the ways in which food is managed, transported, and treated—reveals that food is lost in all parts of the supply chain. It may end up lying unharvested on a field, spoiled during a cross-country journey, expired at a supermarket, lost in the back of the fridge, or left prepared but uneaten on a plate. Much of this wasted food will eventually make its way to a landfill. The prevailing ideology toward waste in the United States mandates that our refuse be hidden from view in sites invisible to most urban residents. But as poverty affects more Americans, natural resources become depleted, and agricultural and financial systems suffer, it becomes clear that reducing food waste has the potential to alleviate hunger, lessen environmental impacts, shrink a growing mountain of waste, and create a more stable and equitable food supply.

Food waste is slowly gaining momentum as a critical issue, particularly in cities where its volume and impacts are more pronounced than in less densely populated areas. There is little dispute over the urgency of addressing food waste and its broader implications, despite the lack of government participation in this discussion. While scholarly sources identify food waste as a legitimate concern, the methods used and

suggestions proposed when presenting the topic vary based on whether food waste is being framed as an environmental, social, or economic issue. Multiple angles can be presented concurrently and it becomes clear through conducting research and evaluating sources that food waste is a triple-bottom line issue that demands insight and attention from a wide spectrum of stakeholders. Although inherently interconnected, social and economic analyses of food waste often build upon a stable environmental framework.

When viewed as an environmental issue, it is necessary to consider the volume of food wasted and the excessive resource consumption that affects land, water, and energy sources through the production of food that is never consumed (Kantor et al. 1997; Hall et al. 2009). Economic considerations reveal the monetary value of wasted food and the inefficiencies present in the food system (Buzby et al. 2011; Buzby and Hyman 2012; Venkat 2012). A social perspective emphasizes the necessity for greater food recovery and the potential to feed millions of food-insecure families (Rominger, Emert, and Ushimaru 2012; Jones 2006). Although these perspectives are distinct, analyses of food waste often link these factors together, especially when presented in nonacademic sources (Gunders 2012; Bloom 2010). Food waste can also be stripped of its contextual framework and viewed as a deep-seated issue of consumption (Dunn 2008; Bauman 2007; Clapp 2002).

An environmental perspective of food waste beginning in the agricultural sector suggests a deeper analysis of the food system and the ways it promotes food waste. Several studies have focused on the United States Department of Agriculture's Economic Research Service tool's Loss-Adjusted Food Availability data, which has been built upon by various sources, creating a complimentary and expanding data set. Because of the

difficulty inherent in quantifying something that every human interacts with and most take for granted every day, much of the discussion on food waste currently centers around scientific studies and reports which attempt to estimate the amount of food that is wasted.

Linda Scott Kantor, Kathryn Lipton, Alden Manchester, and Victor Oliveira (1997) reviewed this data to estimate the amount of food that is available for consumption at the retail and consumer levels but is not consumed. Kantor et al. quantify food losses at each stage of the supply chain and present food loss as a legitimate concern, primarily through the potential for wasted food to be diverted toward food recovery. While food recovery programs would certainly help alleviate the impact of food losses and poverty for food-insecure families, the authors do not suggest that the food system is flawed in its facilitation of the creation of food waste; rather they simply suggest that there is potential to rescue some of the food that is wasted. This source represents the most recent government-led report exclusively on food waste, even as the subject's relevance has increased in the 16 years since the study was published.

In addition to estimating the volume of food that is lost each year due to systematic inefficiencies, studies have focused on the economic effects of this loss. Jean Buzby, Jeffrey Hyman, Hayden Stewart, and Hodan Wells (2011) used the same Department of Agriculture tool many years later in a study that focuses exclusively on fruit and vegetable losses in the supply chain. Buzby et al. suggest that financial loss is inherent in food loss and point out inefficiencies in the food system. When the economic value of food is considered, this loss appears much more substantial than when presented by Kantor et al. Jean Buzby and Jeffrey Hyman (2012) again examine the food system to

determine the total and per capita value of food losses. In this study they include all food and estimate the total financial value of food loss at the retail and consumer levels, which sets their research into a more comprehensive perspective. Using this data to determine the economic impacts, Buzby and Hyman recognize that reducing food loss will require a multifaceted approach ranging from grassroots initiatives to nationally mandated policies. Kumar Venkat (2011) further extrapolates upon this data to make a connection between the economic impacts of wasted food and the potential for greenhouse gas emissions and climate change. He analyzes food commodities, discovering that reducing food waste would simultaneously mitigate harmful greenhouse gas emissions that contribute to climate change and would save money. Venkat's analysis implies that wasted food has economic and environmental consequences as well as a much larger societal impact through its contribution to global climate change.

Food waste can also be framed as an issue of resource extraction and consumption. Kevin D. Hall, Juen Guo, Michael Dore, and Carson C. Chow (2009) study the increase of food waste and its impacts by conducting their own calculations of the amount of energy content wasted in natural resources when food is not consumed. They focus on the growth of food waste over time and the losses in freshwater and fossil fuels, which in turn contribute to global climate change. While Hall et al. focus on specific commodities and resource losses, the connection to greater social consequences is not as strong as in Venkat's analysis of food waste.

A solely social perspective focuses on the human impacts of wasted food, primarily demonstrated through the existence of poverty and the potential for food rescue programs. Craig Rominger, Stan Emert, and Kenji Ushimaru (2012) discuss the quantity

of food waste in relation to poverty in their evaluation of the food supply chain. They suggest that enough food is grown globally to feed the world's population, but a large portion is lost after harvest. While Rominger, Emert, and Ushimaru suggest specific technological solutions for reducing post-harvest food losses in order to reduce food waste and help alleviate hunger, Timothy Jones (2006) focuses on a national strategy for reducing food losses. He argues that the United States needs a national food center to address food waste as a public policy issue because the amount of wasted resources poses a threat to national security. His recommendation would create a national center offering a systematic way to prioritize the elimination of food waste before it even occurs. Rominger, Emert, and Ushimaru as well as Jones favor approaches that recognize the staggering amount of food lost throughout the food system and offer specific recommendations and strategies for how food can be better managed.

Because academic sources on food waste are not widely accessible to the public, nonacademic sources have the potential to elicit a much more public response. Dana Gunders (2012) clearly emphasizes the urgency of addressing food waste in a Natural Resources Defense Council Issue Paper. In this accessible report the environmental, social, and economic effects of food waste are weighed equally. Gunders discusses resource consumption, monetary losses, landfill implications, poverty, agricultural impacts, and global comparisons in order to present food waste as a legitimate concern. Though composting is acknowledged as a viable processing method, source reduction is understood as the most desirable way to reduce waste. This report received the largest response and most publicity of any document on food waste because it comprehensively compiled a variety of sources to create a multifaceted, accessible report available to the

public. The report was widely circulated and received acknowledge from the mainstream press.

Jonathan Bloom (2010) reaches a same general conclusion as Gunders in *American Wasteland: How America Throws Away Nearly Half of Its Food*, the only book published to date focused solely on American food waste. Through thorough investigation, Bloom directs attention to agricultural and retail inefficiencies and the consequences of food waste tossed in landfills. He strongly advocates the necessity to reduce this food loss at the source. His argument boils down to his three final recommendations to eliminate food waste: establish a national food recovery coordinator, create a national public-service campaign to raise awareness about food waste, and ban the disposal of food in landfills (2010, 292). He rarely mentions composting or other waste processing methods, and instead believes that the key to reducing food waste is in addressing both individual consumption and widespread systematic change.

Theorists on consumption have identified the societal setting that allows wastes to proliferate as a "society of consumers." Currently, the mainstream system of waste disposal encourages consumption without acknowledging the potential consequences. It reflects a lack of understanding and awareness of the impacts our behavior and habits cause. Robert Dunn (2008) explains how societies organize themselves around ideologies of choice and personal fulfillment, which are manifested through the objects we associate with. These objects in turn determine our lifestyle, which guides us through social interactions and consumer practices, allowing our patterns of consumption to be legitimized by a larger audience. Lifestyles, defined by these practices, provide a social structure for our excessive consumption habits to thrive upon. Zygmunt Bauman (2007)

expands upon the concept of a society of consumers. He finds that the dominant social attitude toward consumption encourages mindless spending and disposal of goods without recognizing the later implications. Americans have embraced this consumer lifestyle, relying on our material goods as a way to display our personal traits and values.

Much in the way that the society of consumers has encouraged Americans to consume more goods, the "throwaway" society has perpetuated this cycle of consumption and disposal. Jennifer Clapp (2002) deconstructs our social relationship to waste in which she argues that our predominant structure of waste disposal within a global economy hides the true impacts of our consumption habits by distancing people from their waste. This physical and mental distance is maintained by an "understanding gap" between production and consumption that further inflates this distance. These factors have maintained a throwaway society in which consumers are completely separated from the production and disposal of the things they consume. Clapp believes that consumers will have little incentive to limit their consumption and subsequent waste creation unless they are forced to become responsible for the byproducts of their overconsumption.

The multiple dimensions of food waste present complex considerations and produce recommendations based upon the emphasized perspective, yet it is clear by reviewing the literature surrounding food waste that quantitative data surrounding the environmental implications has become the primary means to communicate the necessity to prioritize food waste as a legitimate local, national, and international concern. Although the discussion reaches far deeper than numbers, it is this information that has become the most valuable in creating awareness of food waste and which in turn carries the greatest potential to be translated into strategies, policies, and initiatives that will

reduce the amount of food carelessly and systematically wasted in the United States. I will draw upon these quantitative studies and analyses within a qualitative context to demonstrate how food waste carries implications beyond the lost food itself. By examining the primary systems that facilitate this reality, waste disposal and food production, I hope to demonstrate the necessity to challenge the dominant attitude toward consumption that enables these social manifestations to thrive. By uncovering the potential of food to fulfill its intended purpose of nourishing human bodies, rather than festering in a landfill, food can be reimagined to demonstrate its true value.

Chapter 1:

A Short History of Consumption and Waste in the United States

In an overlooked corner of Los Angeles County sits one of its most important features. This vital site has made the city livable for over 50 years. Hundreds of people visit this place each day, and every single person in Los Angeles contributes to its existence. Without this place the city would look much different. Despite its giant size, most people do not acknowledge its existence. This is America's largest landfill.

Puente Hills is a literal garbage mountain, standing over 500 feet tall. Despite its massive size, its presence goes undetected by most residents of Southern California. Though invisible to most Americans, landfills are a significant aspect of the current waste management infrastructure used in the United States. We need this infrastructure to take away and hide our coffee cups and cantaloupe rinds, our cardboard and clamshell packaging, our defunct gadgets, our worn-out recliners and shrunken clothes, our single-use disposable products. It's easy for our massive personal waste tab to simply slip out of mind when we know it will eventually leave our homes and communities, never to be seen again.

The way we create and dispose of waste reflects historical events and social trends that have shaped how and what people consume. The dominant ideology toward consumption in the United States has been the product, in part, of a distanced food system and concealed waste infrastructures. Because urban residents have been detached from both of these processes, most Americans consume food and other goods without much acknowledgment or awareness of their role in these systems. Although we have

become reliant on waste infrastructures to whisk away our discards, our relationship with waste did not used to be this disconnected from production and consumption. Waste infrastructure, particularly landfills, has created a situation wherein valuable resources, such as food, are disguised as garbage despite their embedded potential to be much more.

In this chapter I explore the role of historical developments in influencing early consumption trends and fostering the acceleration of waste creation. Industrialization, urbanization, and the post-World War II production boom are all seen as factors in encouraging consumption. This historical setting eventually led to the proliferation of single-use and disposable products, which are now commonplace and a significant aspect of consumer waste. Expanded waste processing facilities became necessary to accommodate the flow of waste materials coming from urban areas. While this situation led to the development of vast landfills across the United States, other countries, and some American cities, have taken on the challenge to return to an earlier American relationship with waste, in which materials were used and reused, with minimal waste created. Yet problems regarding policies, locations, and management of waste facilities remain extensive in the United States. As long as these facilities remain invisible, so will our garbage. In order to expose and resolve our waste problem, we must first acknowledge our cultural predilection for consumption.

The State of Our Waste

Our current relationship with waste has been shaped by an extensive history that has determined consumption trends and spurred an increase in the accumulation of goods. Seventeenth and early eighteenth century American settlers operated households so

efficiently that little waste was created (Rogers 2005, 32). Moreover, an ideology of resourcefulness and acknowledgement of limited resources made families conscious of their environments and belongings. The lack of affordable manufactured goods made excess consumption impossible for the majority of Americans. Personal possessions were limited, and disposable goods would have been seen as wasteful and impractical. Materials were reused and repurposed because their inherent value was evident. Clothes were patched rather than tossed out, bottles were reused, cloth was repurposed, metal was melted down, and cooking fat was made into soap and candles (Strasser 1999, 12-13). There was little food waste because any excess was fed to animals, applied to the garden as fertilizer, or repurposed into other meals (Strasser 1999, 29). Journalist Heather Rogers explains the distinction between food and other resources:

> Prudent consumption was directly linked to the availability and cost of manufactured goods; as long as commodities were expensive or difficult to obtain, they were tended and mended to last as long as possible. Thus, the primary discards in the eighteenth century and early nineteenth centuries were organic discards—food scraps, manure, and human waste (2005, 29-30).

Although these wastes existed, they were easily useful because of their potential to serve as fertilizers on nearby fields or as feed for livestock. Because many people remained in close contact with their food sources, a sustainable food cycle was maintained. Little food went to waste because it held tangible purpose other than for human consumption. However, as industrialization led to the formation of large, growing cities, farmers were pushed to the edges of town while many residents bought in to the city life. This localized nutrient cycle was significantly disrupted.

Industrialization and an influx in manufactured goods in the late eighteenth century brought a drastic change in consumption. The sudden surge in the production of

commodities changed the relationship between people and their possessions. Mass-produced goods, now made in the United States rather than in Europe, significantly reduced the purchasing cost of many products, making them much more accessible and readily available (Rogers 2005, 31). This change in consumption patterns in turn influenced the way people disposed of their goods. While many possessions had once been homemade or continually modified and repurposed, the flow of newly designed and manufactured goods spurred a steady increase in product accumulation. If something broke, it was often easier and more economical to buy another item to replace it than to fix the original. This ignited a cultural pattern of generating refuse and accepting obsolescence and disposability as valued conveniences, or even necessary truths. These changes forced a need to dedicate spaces to accommodate the discards of our consumer society.

Though industrialization began to create the modern consumer, the relationship between Americans and their food was not immediately impacted. Because food was still a limited resource for many, food scraps retained value and were put to good use. In a society that was still largely agricultural, farmers fertilized their fields using organic wastes such as kitchen slop and food, along with animal dung, street sweepings, and ash (Strasser 1999, 30). Leftover food was saved, cooked into soup, or mixed with animal feed (Bloom 2010, 31). Households used every bit of food they produced or purchased, simply because it would be impractical not to. Because many families tilled land or raised animals, food could easily be disposed of onsite with beneficial rather than negative implications. Food waste operates in a different realm than most other waste. Changing interests and fashions, which facilitate the tossing of many usable, durable, and once-

stylish products, does not apply as readily to food waste, which maintains a relatively constant existence, although it varies greatly by culture. Historian Susan Strasser discusses the value of food:

> Food and food waste also stand apart from other kinds of household production and household trash. Food puts cultural questions in relief; people from different cultures regard different foods and parts of food as edible, and throw different parts away. Food and food waste attain and lose value both as other products do—in the economic framework of production and consumption—and from the natural cycles of growth and decay. Food has not generally been subject to technological or style obsolescence, though most food loses value with age (1999, 28).

Because food never goes out of style, though culinary trends certainly come and go, its embedded value changes based on how it is produced and either consumed or disposed of. Food requires significant energy, labor, and money to produce; therefore its best use is for human consumption. When food is used to fertilize fields, which in turn will produce more food, some value is retained. Food loses this value completely when it is placed in a landfill.

Rates of consumption and waste generation progressively increased into the nineteenth century as manufacturing increased alongside enhanced wealth and economic stability. As production continued and people flocked to urban areas, significant blocks of humanity began to falter under the weight of their own waste. Poor working conditions and lack of public health awareness led to disease epidemics, spurred by the lack of waste management infrastructure. Garbage was often piled onto the streets to be left for scavengers or wandering animals (Rogers 2005, 39). Because many cities at this time did not have formal systems of waste management to accompany growing industrialization, waste became a very public and much contested issue.

Early waste disposal strategies and infrastructure were built to accommodate the growing mountain of garbage and address the visible spread of filth and disease. While some cities elected to toss their waste into nearby bodies of water, many urban areas did not have such convenient natural features to exploit and were forced to directly address what to do with the garbage clogging their streets. Open dumps, large stewing pits of garbage, were an easy yet revolting solution. Although this method allowed city residents to dump their waste away from their homes and spheres of perception, it caused significant water and air pollution, odor issues, and rodent infestation. Thus began a cultural practice of removing household garbage from urban areas to land outside the city center, a tradition that has contributed to the invisibility of waste to most city residents, and which still predominates today.

By the early twentieth century, garbage in urban areas was too prolific to ignore, and it became evident that further innovation would be necessary to secure permanent sites for disposal of the country's mounting waste. Unregulated dumping of waste was convenient for many city residents, but it was messy and unsightly. Waste incineration came into widespread use in the 1910s as a way to greatly reduce the volume of municipal trash through burning (Blumberg 1989, 8). The idea of eliminating the problems associated with dumping made incinerators an attractive alternative, yet they proved to be more costly than depositing garbage on the land (Louis 2004, 314). Both large incinerators and single-family incinerators for use in the backyard were designed. Despite the ability of the incinerator to eliminate waste, their cost, as well as evidence of significant air pollution through the release of harmful compounds and heavy metals into

the air kept it from becoming a widely accepted method of processing city garbage (Thomson 2009, 3).

At the same time that incineration was attempting to stake its claim to municipal garbage, another method emerged that changed the way city waste was to be disposed. The emergence of the sanitary landfill, a British invention begun in the 1920s, transformed the landscape of waste when it made its way to America (Melosi 2005, 182). The nation's first planned landfill was constructed in Fresno, California in 1934 (Rogers 2005, 87). By compacting garbage and covering it with a layer of dirt, the potential for contamination and spread of vermin was significantly reduced when compared with the open dump (Rogers 2005, 87). Though landfills posed the potential for significant environmental and human impacts, they offered many benefits, especially when compared with the other disposal options. Despite their enormous size, landfills are easy to ignore if they are out of view and are much less aesthetically offensive than open dumps. Their inexpensive processing and maintenance fees appealed to cities desperate for a place to store large volumes of garbage, including food waste. Rogers elaborates, "Alternative processes like grinding garbage, municipal hog feeding, and composting also lost out to the vastly less expensive landfill, as did incineration" (2005, 79-80). Dumping garbage on land was much less expensive and offered a convenient way to dispose of waste without the need to separate or process the materials.

The practicality of landfills increased during World War II, when the war created a great social need for inexpensive and convenient waste disposal on military bases. By 1944 over one hundred domestic military bases were disposing of their wastes in sanitary landfills, and one year later an equal amount of American cities were using this method

(Rogers 2005, 94; Louis 2004, 315). Despite the rise of military landfills, the diversion of materials and goods toward wartime efforts limited the number of commodities available to citizens, and this factor subsequently lowered production, consumption and disposal rates in the United States. By 1942, the government prohibited the manufacture of nearly six hundred consumer products in order to conserve raw materials (Strasser 1999, 230). Families responded to this national policy of thriftiness by adjusting their consumption habits. When government-controlled food rationing took effect in 1943, families were forced to limit their intake of meats, fish, cheeses, canned milk, canned produce, and other staple foods (Bloom 2010, 79). This mandated frugality heightened awareness of food consumption and waste. People were less likely to waste food if there was less available.

Food rationing and propaganda campaigns aimed to increase awareness of consumption habits and the need to conserve resources were initiated as a way to foster a sense of national pride and support. Government-supported campaigns enlisted Americans to limit their consumption of both food and commodities for the sake of national security and prosperity. Journalist Jonathan Bloom writes, "American war propaganda portrayed waste as unpatriotic and even beneficial to our enemies" (2010, 80). By generating waste, a citizen could be targeted as inconsiderate of the need to conserve resources, which many saw as a personal responsibility. Wartime mantras such as "Use it Up, Wear It Out, Make It Do, Or Do Without" encouraged citizens to limit their consumption because it was their patriotic duty (Strasser 1999, 232). This approach, though forced, instilled an appreciation of the value of food and goods—a respect still acted upon by some individuals who lived through this era of resourcefulness.

Sustainable ideologies toward consumption were short-lived as beliefs in reuse and conservation began to be labeled as archaic and old-fashioned in the postwar period. The new, modern society that emerged after World War II instead valued mass production of commodities and industrialized agricultural systems. This period was significant in the history of garbage because of the cultural changes that resulted from its influence on production systems. While the war had fostered a renewed appreciation of the value of manufactured goods and raw materials, including food, both consumption and disposal increased rapidly in postwar America. Newfound prosperity as well as a burgeoning expansion of production, especially in the plastic industry, contributed to the steep increase in consumer products in the 1950s (Kollikkathara, Feng, and Stern 2009, 980). Bloom notes that "after years of rationing and deprivation for both the war and the Depression, postwar Americans simply consumed, not bothering to think twice about the results" (2010, 67). The boom in production influenced a new kind of consumerism; between 1945 and 1960, consumer spending surged by 60 percent (Rogers 2005, 109). Urbanization increased rapidly as the 1950s ushered in an era of suburban living, polished appliances, and tidy garbage bins lined up at the curb. By this point Americans were tossing out more than twice as much garbage as their European counterparts (Rogers 2005, 65). According to Rogers, "The golden era of consumption had arrived, bringing the full materialization of modern garbage as we know it: soft, toxic, ubiquitous" (2005, 103). The need for expanded waste processing facilities made landfills desirable because they were cheap and convenient. In 1945 nearly one hundred municipalities had established sanitary landfills, yet within fifteen years the number grew to 1,400 (Rogers 2005, 96). This rapid switch from conservation-based consumption to

consumerism demonstrates a key shift in American history. Bloom states, "America transitioned from a grow-your-own, ration-adhering nation to a culture of excess" (2010, 67). This setting laid the groundwork for future developments that would build upon this social and historical context.

By the 1950s many Americans had become largely oblivious to the household waste that left their homes, which opened up a space for the rapid transition from reusable goods to products and packaging made with plastic. These materials were often designed and manufactured to be used only once, then tossed in the trash. The mass production and commoditization of goods created a demand for plastic, especially used as hardy packaging, since goods were now traveling farther distances between production and consumption. Because plastic does not biodegrade like organic compounds, and instead slowly photodegrades— meaning that it can only break down into smaller and smaller pieces— plastic never disappears entirely, and can remain completely intact after burial in a landfill (Clapp 2012a, 201). Every bit of plastic ever manufactured continues to exist on the planet. Today about one-third of municipal solid waste is discarded packaging, and at least 40 percent of that is plastic (Clapp 2002, 160; Rogers 2005, 5). These materials end up clogging landfill space or escapes disposal to exist into the future as a land or water pollutant.

We now have an expectation that our household purchases will come protected in plastic or other easily disposable materials. The invention of synthetic materials has fueled ideologies of product disposability and exacerbated the issue of waste disposal in landfills. Landfills were largely established in order to accommodate a boom in the production and consumption of goods, creating a need for a reliable place to store

discards. Today there are over 2,000 operating landfills in the United States, with thousands of others closed because of poor management or lack of capacity (Environmental Protection Agency 2009, 14). The legacy of our consumer society is enshrined in these mountains of garbage.

The transformation of waste from a burden to an expected and accepted byproduct of consumer behavior is in large part due to advancements in production. Rogers notes that during early industrialization, the capitalist mode of production, which values economic efficiency over ecological or social values, significantly altered how food was produced and how garbage was conceptualized and processed in both rural and urban areas. She writes:

> Not only were rural areas becoming less the domain of the subsistence farmer and more the site of intensified, capitalist food production, but the new ways of handling waste signaled a similar transformation in the domestic arena. The treatment of excrement and other wastes by professionals, instead of by those who generated it, was a change that came as industrialization and the market system took greater hold in cities. Garbage as we know it today is one outcome of a fully realized capitalist system (2005, 50).

Garbage has become a necessary output of American capitalism, and in turn has become engrained in our consumer culture. The capitalist tendencies that proliferated during the industrialization of production allowed products to become disposable and replaceable. Sociologist Mike Featherstone explains, "The rapid turnover of goods and the encouragement of a throw-away mindset within contemporary consumer culture means that we are only beginning to consider the implications of the accumulation of discarded things and their by-products" (2011, xxi). In order to acknowledge mindful consumption, it is necessary to challenge the acceptance of cultural tendencies normalized through capitalist practices and ideologies.

The Physical and Cultural Space of Garbage

Garbage at the current scale is a new phenomenon; never in human existence have we been so burdened by our discards. Though the rate of garbage creation has been accelerating since the establishment and growth of major American cities, the greatest explosion of waste generation has occurred within the last fifty years. The mass production of goods within a globalized market, the disposability of these products, and the disconnection between consumers and their fabricated and organic garbage has burdened established waste processing facilities. Because they are scaled to hold large quantities of waste, landfills have become the primary means to dispose of the remnants of our excessive consumption. Increasingly, landfills are just too convenient to avoid becoming the assumed resting place for anything we no longer need. Industrial wastes, construction debris, old clothes, furniture, metal, wood, plastic, paper, leaves, and food are all sent to the landfill simply because it easy to do so. Though recycling facilities for specific materials do exist, successful diversion from the landfill requires that the consumer be aware that these facilities exist and be motivated and able to take responsibility for the future of their waste. Currently 69 percent of American municipal solid waste is disposed in landfills across the country, 24 percent is either recycled or composted, and 7 percent is incinerated (van Haaren, Themelis, and Goldstein 2010, 16).

Our neglect of waste has led us to dispose of excessive food and organic waste in landfills, which contributes to climate change and creates air and water quality concerns and odor issues. The disposal of food waste in landfills is also fundamentally flawed given the natural biodegradability of organic materials. All food has the potential to

naturally decompose when exposed to bacteria, fungi, and insects, which use their enzymes to break the large organic compounds into fatty acids, water, and carbon dioxide. But food and other organic wastes in landfills cannot decompose as they would in nature or if left to breakdown in a garden (Royte 2005, 90). The lack of oxygen in landfills once trash is disposed, compacted, and covered makes it nearly impossible for anything to break down, even easily decomposable food waste. Below the top eight feet of a landfill, few of the aerobic microbes that thrive on oxygen and organic wastes can survive, allowing anaerobic conditions to take over (Royte 2005, 90). Eventually anaerobic bacteria, known as methanogens, consume food waste and produce underground plumes of methane, carbon dioxide, and water (Royte 2005, 90). In the United States landfills are the leading source of methane, a greenhouse gas that is nowhere near as common as carbon dioxide, but much more potent and harmful (Bloom 2010, 16). Methane traps heat far more effectively than carbon dioxide, giving it 21 to 25 times the potential to contribute to global warming (Bloom 2010, 16). Excessive food waste has allowed landfills to become the largest anthropogenic source of methane in the country, accounting for approximately 32 percent of total methane emissions (Royte 2005, 91).

In recent years, the specter of methane and other emissions released from landfills due to the disposal of organic wastes has provoked a policy response. Because this toxic emission is recognized as dangerous to human and ecological health, especially its potential to contribute to climate change, the Environmental Protection Agency now requires methane collection systems at the largest modern landfills. Moreover, while this initiative has diverted harmful pollutants toward energy production, more than half of all

landfills are still letting their methane escape because they are not categorized as "large" (Bloom 2010, 16-17). Although these systems reduce the contamination potential of this substance, known as landfill gas, they capture at most 75 percent of the methane being emitted (Royte 2005, 93). The gases that escape collection and rise through the layers of garbage can escape into the atmosphere.

Methane and other pollutants released by landfills pose serious threats to humans and our environments. In addition to contributing to climate change, landfill gas includes airborne wastes from things like adhesives, household cleaners, plastics and paints, all of which are harmful to human health (Rogers 2005, 5). Landfills also emit sulfides which cause significant odors, volatile organic compounds which contribute to air pollution, and even benzene and vinyl chloride, which are known human carcinogens (Thomson 2009, 14). Groundwater pollution is another byproduct of the disposal of waste in landfills. Despite modern attempts to limit water contamination, the threat continues to exist. Older landfills have no liner to keep leachate—a liquid that collects in landfills primarily as a result of rain infiltration—from leaking down to groundwater sources (Thomson 2009, 16). Despite modern measures to limit the ecological affects of landfills, toxic substances frequently leach into the soil, water, and air where its presence is enough to cause great concern.

Many landfills were established in order to accommodate the expansion of consumerism after World War II, when the release of methane and other pollutants were not as clearly understood as they are today. Because of this setting, waste processing facilities were freely established in and around many cities without much regard for future city planning. The placement of landfills now depends upon specific city and state

policies, which have created diverse waste situations in different areas. New landfills are rarely established today because of their environmental and human health impacts. Siting a waste facility in an urban area is virtually impossible, and even new rural facilities are rare. Because the number of active landfills is shrinking due to public opposition, ecological concerns, and limited capacity, garbage is now traveling longer distances from the point where it becomes waste to the place it is laid to rest. Many cities are now searching for new disposal options, yet faraway landfills continue to be favored. The complex web of responsibility surrounding waste management had made it difficult to revise city management plans or create sustainable policies because the current infrastructure necessary to take garbage to landfills is heavily relied upon.

Many landfills were originally established on the edges of town or in rural areas, but are now being absorbed into sprawling cities or other inhabited areas because of urban growth and expansion. Neighborhoods have been forced to grow around these facilities. Historically, as well as currently, many of these facilities have been situated in disadvantaged and low-income communities, which are burdened with the responsibility of living with someone else's trash. Although additional landfill space will eventually be needed to satisfy the waste stream, it is nearly impossible to site a new landfill, especially anywhere near an urban area. Proposed facilities have been met with intensive opposition from city residents who cannot bear the thought of their own, let along someone else's, garbage imposing on their personal space. Though landfills continue to operate outside of cities, many densely populated areas, particularly in the eastern United States, do not have the space to accommodate a constant supply of consumer wastes. If no nearby landfill is available, waste is often trucked or shipped to facilities in other states. At least

24 percent of municipal solid waste travels to another state to be disposed of (Thomson 2009, 3). Though this solution burdens some communities with waste generated far away, it remains more convenient than imagining, proposing, and constructing new facilities, revising waste management policy, or attempting to target consumption.

Though landfills remain the most convenient and accessible option for waste disposal in the United States, some progressive local and national governments, especially in Europe, have begun thinking of waste as a resource and are prioritizing new waste management policy. While this is a novel initiative in the United States, countries such as Germany, Netherlands, and Austria have begun transitioning away from viewing waste as a landfill burden (Humes 2012, 25). Although the United States has largely been unable to break free of its disposal habits, other countries have revamped old policies and broken their reliance on landfills. All Western European countries have waste policies with waste prevention at the core (Melosi 2005, 236). The European Union Landfill Directive requires that states reduce the amount of organic waste that is landfilled by 65 percent relevant to 1995 levels by 2016 (Levis et al. 2010, 1487). Furthermore, in many developed countries with significant waste generation, creation of advanced processing facilities such as waste-to-energy, advanced recycling methods, and anaerobic digestion have defined garbage, recyclables, and food waste as usable resources.

While food waste processing methods such as large-scale composting are rare in the United States, other cultural examples, again primarily located in Europe, have begun to move beyond composting in favor of anaerobic digestion. Anaerobic digestion is an industrial process for food waste management that relies upon the decomposition of organic matter by microbes in an oxygen-free environment (Ward et al. 2008, 7928). This

environment is created within an enclosed tank that initiates the decomposition of food and subsequent release of gases. Unlike in a landfill where the resulting gases are able to escape into the atmosphere, within this completely enclosed setting the gases are captured and have the potential to become biogas, which can be used to generate energy (Khalid et al. 2011, 1738). Given the inevitability of wasted food, innovative application of technology, such as through anaerobic digestion, hold the promise of turning waste into a resource, through which it will retain some value. In Europe more than 200 anaerobic digestion facilities process the majority of municipal food waste (Mortensen 2013, 30). In many of these contexts the practical implementation of facilities was established through policies aimed at waste reduction and a commitment to redefine waste.

Initiatives to give wasted food and other garbage new purpose have been successful on a localized level within a willing population, but addressing waste within a global context poses much greater challenges. Americans lead per capita waste generation and consumption trends, but we're not the only culprits—a staggering amount of waste is created all across the earth each year. Consumers in developed nations produce the vast majority, though countries once viewed as less developed or economically struggling have increased their total and per capita waste creation, particularly in the last decade. Globalization and its many associated facets have driven local economies to buy into a globalized market of production and consumption. The proliferation of plastic as a cheap material and commodity has facilitated the increased accessibility of many goods, which in turn may increase consumption as well as the unavoidable accumulation of waste. Because many countries lack the elaborate

infrastructure available in the United States to remove waste quickly from sight, it ends up polluting land and water sources and negatively impacting human health.

Developed countries have also created a globalized market in the trade of garbage. Without landfill space to properly conceal all of our discards, we send some of it along with industrial wastes, scrap metals, and recyclables to other countries where people who produce nowhere near the volume of waste that we do deal with the refuse of our excessive consumption. The United States is the world's largest exporter of waste, sending 28 million tons to other countries annually (Kellenberg 2012, 73). Though much of this material is exported with the intention of being recycled or repurposed, a large amount of American waste is sent to countries without stringent environmental regulations (Kellenberg 2012, 73). This reality suggests that the United States exports harmful wastes to places where it will not be properly managed or processed, threatening the health of humans and the environment. Because Americans have been able to find people in other countries to deal with our wastes, we have no incentive to curb its existence or the root cause of its existance: our consumption. This distanced separation from garbage has influenced its excessive growth and detached movement throughout the world.

Although some municipal solid waste generated in the United States is transported oversees, most remains in the country. Because landfill space is limited, garbage often is not laid to rest in the city, county, or even state in which it was produced. Interstate trade in waste has been common since the 1990s, when many landfills closed (Melosi 2005, 215). There is currently no active landfill for New York City to rely upon; trash is instead exported to thirty-seven landfills in outlying states, including

Pennsylvania, Ohio, South Carolina and Virginia (Clapp 2002, 52). Discards from Portland and Seattle are sent to the same landfill in northeast Oregon. Environmental policy expert Vivian Thomson explains that "garbage has long been trucked, barged, and moved by rail across state lines, but such interstate movement has increased noticeably in the past fifteen years" (2009, 3). Because we do not see where our waste goes and the impacts it has, there is little personal incentive to reduce our consumption and in tandem the amount of waste that we produce. The lack of waste infrastructure visible to most Americans has supported the physical and psychological distance Americans keep between our garbage and our selves. We've become numb to the impacts of our personal consumption.

Although the impacts of our waste are invisible to most Americans, especially in urban areas, not every community has this privilege. The people most affected by American garbage often live in communities outside of city centers where a processing facility was sited many years before. Many of these people represent historically disadvantaged and low-income groups. Strasser notes that, "If landfills put trash out of sight and out of mind for most people, they did neither for the poor. In most cities, landfills—like incinerators—were placed in the poorest neighborhoods" (1999, 272). Today many communities recognize that landfills are not desirable uses for public land, given the environmental and health risks they pose upon the immediate community. And increasingly, communities understand that these sites express a form of environmental injustice and social oppression, as disadvantaged citizens are disproportionately subjected to these unpleasant and potentially harmful sites. Global food expert Jennifer Clapp states, "With the ecological impacts of waste dumps better understood today, fewer

communities are willing to accept them" (2002, 158). Oftentimes underrepresented groups without the social stability to resist new development cannot withstand pressures the way that more privileged communities can, and toxic and unappealing facilities become yet another problem for the poor.

Once the reality of unequal exposure to environmental risks is recognized as inherent in waste infrastructure, it is necessary to consider the conditions under which this disproportionally harmful reality occurs. The historical development of cities and of waste facilities has created a separation between the two spheres; they are not compatible. Despite the lack of space in dense cities, it is critical to find sustainable ways to dispose of waste. This raises the question: who is responsible for waste? Waste rarely remains in the space in which it was created, unless it is improperly disposed of and becomes litter or pollution. In addition to the tangible movement and placement of waste, a deeper social force has influenced the relationship between individuals and their waste. The Not in My Backyard (NIMBY) syndrome has been identified as an important force in the distancing of waste. This concept suggests that residents believe certain developments are necessary in society, but they do not want any of the negative externalities or effects to impact their personal life in anyway. In the context of waste, it is assumed that residents support infrastructure that efficiently processes waste, as long as these facilities are located outside of their communities. Clapp elaborates upon this concept:

> The Not in My Backyard (NIMBY) syndrome with respect to the siting of waste dumps has meant that some communities keep dump sites out of their neighborhood while others are paid to take them. A number of studies have shown that such dumps tend to end up disproportionately in poor communities. This placement of waste disposal from rich to poor occurs within local communities, within countries, and globally (2002, 160).

Although many people are willing to protest the negative social and environmental effects of landfills, action often goes only as far as to guarantee sites are not established in one's own community, not the communities of others. Those with lesser social influence often cannot make an impact great enough to discourage the development or persistence of a potentially harmful waste facility.

The social and environmental issues that waste has perpetuated reveal the unequal, socially defined ways in which waste is produced and comes to disturb different communities. Landfills allow the remnants of a consumer society to be disguised as a stigmatized, yet intrinsic byproduct of consumption. The historical trajectory of production and consumption illustrates the ways in which consumer decisions influenced the creation of facilities in order to process the wasted remains of the dominant consumption habit. One of the fundamental flaws within waste management infrastructure is the almost exclusive focus on the downstream affects of waste. Rather than prompting us to question our consumer habits or ask why waste is generated in the volume is it today, large-scale waste processing facilities instead allow us to accept waste as inevitable. Instead of focusing on what we *waste*, it is necessary to also consider what we *consume,* and why. It is possible to rethink production and consumption so that waste does not have so large of a burden.

The Puente Hills landfill is slated to close later this year. A new landfill is being constructed over 230 miles outside of the city. Like Puente Hills it promises to challenge the frontiers of waste processing: this landfill will only acquire garbage by train, to accommodate the long haul to this desert site. Creating a dominant ideology that challenges the upstream sources of waste, rather than further complicates the downstream

affects, is necessary to transition away from a reliance on landfills. This ideological change will be especially pertinent in diverting food from the landfill toward more practical uses. The physical and social space of landfills has allowed them to conceal their contents, especially partially rotten—yet preserved—food and organic wastes. Though it is necessary to establish innovative programs and alternative methods of processing to inhibit the dumping of organic materials in landfills, it is even more important to examine the systematic inefficiencies that allow food to go to waste.

Chapter 2:

Lost and Wasted in America: The Story of Our Food

I was excited for dinner. My friend's kitchen was open and welcoming, and all the ingredients we needed were neatly lined up on the counter. We had plans to create a feast at this ranch a few hours outside of Claremont. I decided to help make a large batch of guacamole, mixing the dip in one bowl and sticking the resulting food scraps in another. When I was finished the two bowls sat side by side, yet one was filled with food, and the other with inedible, unavoidable waste. A pile of avocado pits, lime peels, onion and garlic skins, and tomato tops remained. At home and at school I am an avid composter, meticulously collecting my food scraps to add to the compost bin, but here there was no compost pile, no garbage disposal, and no easy place for me to dispose of these food scraps besides the trash bin. Because throwing food in the trash makes me cringe, I decided to take my food scraps home with me. I bagged it up and stuck it in the back of the car.

Although I was willing to make the extra effort to keep my food waste from the landfill, what about those who do not possess the determination, or perhaps the absurd desire, of taking their food waste with them on a 2-hour road trip to reach the compost pile? We are used to being completely separated from waste; it exists out of sight and out of mind, with the trashcan serving as the public intermediary. The consumer has control over the creation and disposal of their personal food waste, but the remainder is not as visible.

While giant landfills hide food waste and other remnants of our excessive consumption, the production of food causes impacts that are equally segregated from the average American consumer. Like the waste processing system, food production has become industrialized through historical developments that have favored urbanization, growth, and globalization. Many Americans, especially those residing in large urban areas, have no sense of how the food they eat came to be because the distance between the consumer and their food has been stretched across cities, states, and even countries. It's possible, if not expected, to consume at one meal food produced on multiple continents. The lack of awareness toward food exacerbates the food waste crisis by disconnecting consumers from the systems in which they play a large, albeit anonymous, part.

I first evaluate the American food system to demonstrate the distance between producer and consumer and the systematic inefficiencies that allow food waste to go unnoticed. Food waste is created by individuals through ordinary household habits, but also by farmers, distributors, and retailers in processes maintained by the global food market. Evaluating this upstream waste through each step of the food supply chain demonstrates that the production of and access to food is heavily regulated and controlled. Good food is wasted not because there are not mouths to feed, but because the system keeps food from those who truly need it.

Food and Farmland in America

Just like the industrial revolution changed the way goods were produced and wastes disposed of, the modern agricultural revolution fundamentally altered the

relationship most Americans have with their food. Industrialized agriculture was increasingly adopted in North America in the last part of the nineteenth century and first part of the twentieth century (Clapp 2012b, 25-26). The small family farms of early America were slowly diminished as urban growth and economic development drew people away from their farms and into the city to find work, which in turn generated a greater demand for food production to support the urbanizing population. Historian Jennifer Jensen Wallach writes that, "The new class of city dwellers who found homes in urban centers developed a much different relationship to their food than that of previous generations of Americans. Displaced from the farm, most went from being producers of the food they ate to mere consumers who purchased foods grown, harvested, and butchered by someone else" (2013, 90). The industrialization of production eventually came to impact the agricultural sector, changing the way food was produced.

The industrialized nature of food production affected many aspects of the production process. Subsistence and family farms were replaced by large, expansive farms as the industrialized production of food came to favor mass growth over small-scale production. The number of total farms in the United States shrunk by 70 percent from 1935 to 1997, while the average acreage of a single farm more than tripled (Bloom 2010, 65). Ecologist Rob Hengeveld notes that because the industrial farmers were able to produce large amounts of food and sell at lower prices than the small farmers, "a new type of farming originated—the entrepreneurial type—directed not so much to local consumption, but to making profit on the domestic or international market" (2012, 61). Profit making, rather than subsistence, thus became the underlying rationale for agricultural production under the industrial model.

This way of producing food could not be sustained without significant assistance. Agricultural production thus became reliant upon innovative industrialized processes and agricultural methods, such as utilizing commercial seeds, machinery, synthetic additives, and irrigation, as well as divisions of labor, to produce large quantities of single crops to be sold for profit (Morgan, Marsden, and Murdoch 2006, 113). This growth in the agricultural sector created significant economic growth and made a greater variety of foods available, but also allowed industrialized methods of production to flourish. In the nineteenth and twentieth centuries synthetic fertilizers were developed, which facilitated the intensified production of industrialized agriculture by improving soil efficiency (McDonough 2002, 95). Fertilizer use rose by a factor of ten between 1950 and 1998 (Clapp 2012b, 51). Pesticides were widely adopted in the 1950s because they made crops less susceptible to disease outbreaks, allowing for rapid yield increases (Oosterveer and Sonnenfeld 2011, 47). The discovery of insecticides based on synthetic organic compounds increased the use of pesticides in agriculture (Allen 2004, 25). Other advancements were aimed at making the seeds themselves more productive. Between just 1996 and 2010 the amount of land planted with genetically modified crops increased by 87 times (Clapp 2012b, 53). These developments were swiftly and enthusiastically adopted because of their potential to increase food production.

Advancements in industrialized methods of production made agriculture more productive, but they also formed irreversible ecological impacts. Synthetic substances and additives deplete land over time, initiating a vicious cycle that requires the application of more synthetic substances. Additives that allow soil and seeds to produce more output than previously possible are now considered commonplace. As a result of

excessive use of these substances, the United States is losing soil ten times faster than it can be replenished (Bloom 2010, 22). Although these manufactured substances secure high yields, they require inputs of substantial quantities of energy and they deplete increasingly exhausted soil (Oosterveer and Sonnenfeld 2011, 47). Because industrial food production seeks to produce the largest amount of food, and therefore generate the largest profit, little regard has been given to maintaining healthy and productive agricultural spaces that can be maintained for long-term food production.

Despite the ecological concerns, the industrialization of agriculture has been deemed successful generally— it has made more food, and more varieties of food, available to a greater market of consumers. While food scarcity, poverty, and hunger had long been global concerns, industrialization created a wider and more accessible market for food in America. Sociologist Hugh Campbell elaborates: "The industrial revolution signaled a dramatic transformation of this universal reality, eventually banishing food scarcity from the industrial world and rendering hunger a problem that was manifest 'out there,' at a safe distance from industrializing societies" (2011, 31). Food was now more readily available, especially in the United States, because of these industrial processes. Industrialized food production was normalized through years of advancements that promoted these methods as invaluable in increasing access to food. Industrialization has now gained control of the food system and refuses to let go.

Although these methods increased food production and created a profitable economic market, they neglected to address emerging concerns about the possible implications of operating an agricultural system that relies heavily on mass production and synthetic substances. The spread of the industrial model and its affiliated attributes

has contributed to extensive agricultural impacts and broader ecological devastation. Altering the composition of what food was planted and where caused extensive exploitation of farmland. This degradation occurred, and continues to occur, because food is no longer grown for human subsistence, but rather to generate income. Land is no longer recognized as a finite resource that must be sustainably managed, but is rather regarded as exhaustible. Hengeveld believes that food production has transformed farmland into wasteland. He notes, "sooner or later, fertile land becomes wasteland because it is exhausted, polluted, urbanized, or mined, and it erodes, desertifies, or salinizes" (2012, 104). Hengeveld regards this depleted land as another form of human-made waste because ultimately exploited land will have to be abandoned once its use is no longer profitable.

We have also changed the way we perceive of the nature of food itself. No longer seen primarily as something with nutritional value, food, now subject to industrialization, has become heavily marketed and commodified. Food is now produced, sold, and consumed as if it were any other commodity. Economic forces, rather than human stomachs, control the production of food. Clapp continues: "We have moved increasingly away from food being viewed primarily as a source of nourishment and a cultural feature of society, and toward food as any other product that firms produce, sell, and trade" (Clapp 2012b, 17). Food now represents a major sector of the American market: about 40 percent of primary commodity trade is in food and agricultural products (Clapp 2012b, 57). The disconnection between the impacts of food production and the finished commodity has shaped the position of food within this system. If food is viewed as a commodity, consumers may be more likely to waste it since commodities are often

plentiful and easily replaceable. This attitude toward food as a product, rather than a necessity for human survival, has in turn contributed to the loss of American food culture, which occurred alongside the rise of convenience consumption and fast food. Many American meals are no longer eaten sitting down at a table with other people, and the food is rarely grown, prepared or packaged close to where it is consumed. Food culture will continue to dwindle so long as consumers are separated from the source of their meals and food is seen as a commodity.

In the same way that most Americans have become separated from our waste through an invisible processing system, the distance between people and what they eat continues to grow. Bloom notes that, "America's gradual shift from a rural, farming life to an urban, nonagricultural one removed us from the sources of our food" (2010, xii). The physical and mental space between consumers and their food has increased with the commoditization of food within the global economy (Clapp 2012b, 17). According to Clapp, the average plate of food eaten in North American now travels around 1,500 miles before it is consumed, a distance far enough that the person who produced the food and the person eating it will almost surely never meet (2002, 1). This distance extends further than physical separation. "The distance between consumers and food can also be mental, as in the gap in knowledge we have about the social, ecological, and economic relationships associated with the foods we eat," explains Clapp (2012b, 2). Food system expert Colin Sage discusses the implications inherent in this paradox, through the concept of distanciation:

> This term suggests more than a high number of food miles separates primary producers from final consumers within the contemporary agri-food system; rather there is a lack of information, of knowledge, about the conditions of production and the supply chain through which those

> products pass. Hiding such information, making traceability difficult to establish, serves the interests of those who intermediate on behalf of consumers: the large processing, retailing and food service companies (2012, 264).

By distancing consumers from their food, not only is the physical distance extended, but we also become ignorant of the journey of our food. This separation makes food and its production intangible for the consumer.

Despite increasing demand to shorten this distance, it is maintained by an important distinction in how food is obtained now, compared with how it was acquired a hundred years ago. Most food is now purchased in large supermarkets rather than bought directly from a farmer or grown by the consumer. Large supermarket chains emerged in the 1960s and 1970s in industrialized countries as a niche market for the wealthy but have become an everyday market in nearly all parts of the world (Clapp 2012b, 109). Three-quarters of food sales in industrialized countries now pass through supermarket checkouts (Pretty 2011, 21). Many consumers do not recognize the production steps that were necessary to bring the food to the market because it is from this point of purchase that many Americans begin their relationship to food. Hengeveld believes that it is the supermarket that facilitates the great distance between our food and our bodies. He writes, "You may only know of them as your local large food retailer, or from the small letters on the package, but their existence has major ramifications throughout society and on a global scale. Your food store is only the tip of the iceberg" (2012, 62). Retailers function as a middleman between consumers and their food, allowing this distance to thrive and lengthen without acknowledging the physical and mental separation. Our favorite supermarket may only be a few minutes from our home, but in reality the innate distances in food extend much further.

This distance, in addition to other changes in food production, neglect to recognize the value of food as something necessary for survival, rather than just a commodity. Production is now contingent on profit, which controls the industrialized food system. Because of this, food is no longer produced based on local need but rather based upon market demand. Given the variables present in agricultural production, excess food is expected and assumed. The consumer, either through overconsumption or disposal, covertly absorbs this excess. Sage explains, "The rationale of the modern food system is to maximize the throughput of products such that food produced in excess of what is actually required for a sufficient diet may end up either going directly to a landfill or are eaten and contribute to rising levels of body fat" (2012, 206). Food is not produced based on need or demand, but through industrialized supply chains that encourage the production of commodities, regardless of what is being produced. Industrialization of food production systems has contributed to the distance between producer and consumer, and therefore facilitated the production of food, some of which inevitably will be lost.

Food Waste and the Industrialized Food System

Although household food waste may be tangible to the consumer, understanding the vast array of policies, regulations, and stakeholders required to bring food grown in another state or even hemisphere to American consumers is much harder to grasp. The details of this large, abstract system facilitate keeping the majority of food waste far away from the average consumer. The American government has been absent from the national discussion on food waste, despite mounting efforts from independent sources as well as

examples set by other countries. The only government-supported study on food waste in the United States was conducted in 1997, which ended with the conclusion that more studies were needed. This study found that at least 27 percent of edible food available for human consumption in the United States was lost to human use in 1995, a percentage that has only increased (Kantor et al. 1997, 3). It also suggested that substantial amounts of food losses were occurring at all steps of the supply chain, but neglected to account for food wasted on farms, which is often referred to as pre-harvest losses. This staggeringly large category is not included in the designation of food waste or food loss. While the term food waste implies waste that occurs as a result of human action or inaction, food losses, the designation applied in most studies, represents the food that is available for consumption but is not consumed because of human or natural acts (Buzby et al. 2011, 494). Food loss can therefore include food wasted due to moisture loss, pests, mold, and human practices after it is harvested. Food that is grown but not harvested because of technicalities concerning supply and demand is not classified as a food loss, and is therefore not addressed in government reports. Recognizing these overwhelming losses and addressing the multiple sectors that facilitate food to be grown but not consumed is a necessary step to comprehensively evaluate the food system.

In order to track down the inefficiencies that allow good food to be wasted, or not even be harvested, each step of the complex agricultural system must be evaluated, including food that is lost at the farm. Food waste expert Jonathan Bloom addresses all sectors of the food supply chain in *American Wasteland*, the only book in publication focused exclusively on American food waste. Although organic food production and sustainable farming methods are staking a progressively larger claim to the food market,

most food that reaches the supermarket, both fresh and processed, has been produced on a large-scale, single-crop farm, likely with the assistance of synthetic fertilizers, pesticides, and genetically modified seeds. Despite the support in place to guarantee a successful crop yield, agricultural losses are common, if not expected. Harsh weather, disease, and insects are all outside of the control of farmers but have the potential to be very destructive (Bloom 2010, xii). Sage notes that "at the first stage of the food chain, at field level, losses can occur as a consequence of circumstances beyond the capability of farmers to prevent them" (2012, 200). Valuable resources are allocated to produce these crops, yet unfortunate circumstances can keep them from making it to the market. Farmers must foresee and be prepared to react to these potentially devastating situations. Gunders notes, "given the variation and risks inherent to farming, it is difficult for farmers to grow exactly the amount that will match demand" (2012, 7). Because it is more lucrative to overestimate rather than underestimate crop yields, most farmers plant more than they will be able to harvest in order to ensure a profitable output.

Despite the wastes that will inevitably occur, the overproduction of crops is necessary to guarantee a successful yield and therefore generate profit. A significant portion of crops, especially fruits and vegetables, are therefore left unharvested or deemed unfit to enter the market, not because they unripe, tainted, or diseased, but because of technicalities in the system. Approximately 7 percent of planted fields in the United States are typically not harvested each year, although this number can swing up to 50 percent for a particular crop in certain situations (Gunders 2012, 7-8). Many crops are harvested based on a quick judgment of appearance that is done to predict quality and readiness. Individual plants within a large field that have not matured at the rate deemed

sufficient for the crop may miss their one chance to be harvested and instead remain on the field indefinitely, eventually plowed back into the soil (Bloom 2010, 4). Other crops may be harvested too late; if an item shows any evidence of decay at the time of harvest it may be spoiled by the time it reaches the consumer (Bloom 2010, 4). Rather than waste time and resources to harvest and transport the crop, those inefficiencies are also left on the field.

Because the food market is so heavily controlled, the food that does make it to market is expected to be fresh and flawless. Most food sold in supermarkets is packaged, forcing farmers to adhere to strict requirements on the size and shape of their crops so that distributors and retailers will accept them. Supermarkets demand uniformity in the size, shape, color and texture of foods (Bloom 2010, 97). These aesthetic criteria attempt to provide consumers with only the most appealing, marketable items. Bloom notes that, "in many parts of the American food chain, appearance trumps taste" (2010, 95). We have come to expect our tomatoes to be plump and red, our carrots to be straight, and our citrus perfectly spherical. Although aesthetic criteria for produce make supermarket displays more uniform across time and space, placing all crops under the same stringent requirements is unreasonable given the natural variations that occur while plants grow. Little can be done to guarantee that an entire crop of potatoes, cucumbers, or lemons end up a uniform size and shape. Without a market to sell deformed, misshapen, abnormally large, or oddly small produce it either remains on the field where it will be turned back into the soil, losing the valuable resources that were required to produce it, or it is tossed in the can.

If a harvested item does leave the farm and begin a journey to a processing facility, distribution center, retailer, or supermarket, another hurdle remains: getting it there. The growing distance between producer and consumer has created a need to keep food clean and cold across city, state, and country lines. Food transport currently represents more than 20 percent of all goods shipped in the country (Bloom 2010, 20). Lengthy transport makes it easier for food to spoil or become contaminated, and also adds high costs. Many crops are transported in large, refrigerated trucks that guzzle diesel (Bloom 2010, 5). Produce is the most common victim of transport waste, since the window of time between when it is harvested and when it is likely to spoil is relatively short. Transportation therefore becomes responsible for an avoidable yet projected portion of food loss that is facilitated by the vast information gap resulting from this distanced system.

The next step of the food supply chain, retail, generates the most activity because food is finally marketed to the consumer as a commodity. Once food makes it to the supermarket, there are a variety of new ways in which food can be wasted before it goes home with a buyer. Most supermarkets, especially national chains, purchase much more food than they expect to sell in order to guarantee that the store shelves will always be shocked to give an impression of abundance and to accommodate an unforeseen spike in consumer demand (Bloom 2010, 111). Stores assume this loss and build it into their operating budget, because the cost of purchasing food destined to go to waste is considered worth the investment, as long as shelves appear stocked. Bloom notes that a large supermarket that he worked for budgeted $12,000 for unsold produce each month

(2010, 161). Food waste is encouraged when these inefficiencies are built into the supply chain.

Another retail inefficiency considers the technicalities of food marketing. Food that has not been purchased by a printed expiration date enters the waste stream, regardless of whether or not it has actually gone bad. Most food sold in supermarkets is expected to have a visible expiration date on the package in order to maintain freshness and avoid food spoiling. Although well intentioned, this labeling system is a significant contributor to retail-level food waste. Dates printed on products can be misleading because so many different classifications are used. Some food labels declare "sell by" dates, while others read "best by," "display until," "use by," "enjoy by," or "best before." Although these designations are meant to keep the customer from consuming spoiled food, expiration dates have caused extensive confusion, rather than increased food safety. Even though "best by" represents the manufacturers estimation of when an item will remain at peak freshness, consumers often confuse with date with an ultimatum for when something can be consumed (Bloom 2010, 164-165). Most of these dates suggest a timeframe of product quality for retailers, but stores are encouraged to toss perfectly good food if the package suggests it. Transportation time must be factored into the short timeframe in which fresh food can be eaten, meaning that some food never makes it to market simply because a date on the package suggests it is unsellable. Bloom writes: "Knowing that they have to ship produce great distances, and that stores don't like to receive packaged produce less than a week before the sell-by date, manufacturers often throw away food with as much as three weeks of life left in them" (2010, 115). Because supermarkets assume nearly out of date food will not be sellable before reaching the cut-

off date, most food loss from this sector doesn't even reach the consumer. Instead, food is either tossed by the distributor or into the supermarket dumpster.

The technicalities surrounding expiration dates also keep supermarkets from donating the food that they are unable to sell. Many supermarkets are hesitant to donate their wasted food because of liability concerns if someone were to get sick. Although food contamination and spoiling are legitimate health concerns, national legislation has been put forth to protect well-meaning donors. The Bill Emerson Good Samaritan Act of 1996 provides protection for individuals, businesses, and restaurants that donate surplus food to those in need, as long as it is done in good faith (Bloom 2010, 144). Despite this legal protection, supermarkets are weary of the logistics of food donations and remain cautious of the bad publicity that they could receive if someone became sick from consuming their food. In order to guarantee that their food is fresh and healthy, supermarkets remove "expired" food from the shelves everyday and toss it into dumpsters that will be sent to the landfill. Although some Americans have caught on to this glaring inefficiency, spurring a rise in organized food rescue, as well as dumpster diving, most consumers never question where food goes if it is not purchased in the supermarket.

Food is wasted through similar processes at restaurants, which exist completely at the mercy of customers. Even though customers leave an average of 17 percent of restaurant meals uneaten, restaurants overcompensate for unknown demand by purchasing additional ingredients and preparing extra food (Gunders 2012, 12). Food accounts for between 30 and 70 percent of a restaurant's total waste stream, which includes waste produced in the kitchen as well as on the customer's plate (Bloom 2010,

120). Rather than run the risk of purchasing less food and depriving customers of their meal choice, restaurants, especially new ones that may not yet have a sense of how much food will be sold, find it necessary to keep plentiful food on hand, a large portion of which will never be eaten.

The legacy of wasted food continues once it reaches the home, as unfinished meals represent a large factor in food waste at the consumer level. Once food enters the home, neither the food system nor waste processing system is immediately to blame for food that is not consumed. At this point in the supply chain, food is wasted for trivial rather than systematic reasons: the two-for-one deal on berries was too good to pass up, the salad wilted before it could be eaten, that extra bag of shredded cheese was forgotten at the back of the refrigerator, or dinner was left served, but uneaten, on the plate. Sage notes that, "Responsibility for food waste might be attributed to the usual suspects—big business or the failure of governments to regulate adequately—but ultimately it rests with our own shortcomings to avoid the allure of purchasing more than we need" (2012, 205). Although consumers are in complete control of this step of the supply chain, the distance from production is far enough away that consumers may not realize the total amount of resources and energy required to bring that food to their home, as well as the impact their food may hold if they choose not to eat it. This lack of understanding of the entire system of food production has separated people from the true cost of their food and assisted the acceptance an ideology of excessive consumption.

Social Repercussions of Wasted Food

Although significant agricultural and financial losses exist within the food supply chain, most consumers remain oblivious to the effects of food waste. Because we are so disconnected from our food, we have no sense of the losses inherent in this system, even though they occur within all sectors. Instead, the food system maintains an illusion of a plentiful, never-ending supply, which has made food cheap and accessible to many Americans. Although the loss of food before it reaches the consumer is absorbed into the system, consumers may be more encouraged to reduce their own food waste if the personal monetary benefits are clear. The average family of four wastes $2,200 worth of food each year on groceries that are purchased by never consumed (Bloom 2010, 24). Families would not have to purchase as much food if less was wasted.

If we could view this situation apart from its political, economic, and social determinants, it would seem ludicrous that food waste exists in the capacity at which it does today. There is no legitimate reason that healthy, edible, resource-rich food should not be eaten, especially given the reality of poverty in America. Inedible food parts and rancid meals are obviously excused, but most food waste falls outside of these parameters. While the amount of food waste that each individual is responsible for each year is staggering, the amount of waste that occurs due to economic inefficiencies and market logistics is even more appalling. Most food waste occurs as a byproduct of poor choices made throughout the supply chain. Many of these are trivial decisions that may seem insignificant individually but carry greater implications when regarded within a larger context. Sage believes that "the most morally problematic and largest sources of waste appear to be through retailer outgrades of fresh produce, discards arising from convenience foods, and poor stock management and overeating by consumers" (2012,

208). These human errors may seem isolated, but together they allow the food system to accommodate significant losses that are also entirely avoidable.

The food supply system has been designed to accommodate these inefficiencies, despite the potential of food to hold much greater purpose. Poverty continues to be prevalent across the United States, in spite of the overall wealth of the country. Today more than 49 million Americans do not get enough to eat (Bloom 2010, 43). More than enough food is available to feed every person, yet many families are considered food-insecure, which the United States Department of Agriculture defines as having "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Bloom 2010, 43). Although enough food is produced to meet the needs of every person, inefficiencies allow millions of Americans to go hungry.

Food banks and food rescue missions have emerged from the necessity to redistribute food and feed hungry Americans. While some initiatives are policy driven, others lobby businesses to donate food that they would otherwise send to the landfill. Recovering food has the potential to alleviate poverty and reduce food waste. But this task is much more challenging than simply moving food from one point to another. We cannot easily transfer our extra, about-to-expire food to someone else in another city or state without extensive organization and infrastructure. Environmental policy expert Peter Oosterveer and environmental sociologist David Sonnenfeld note that, "Much hunger in the world today is the result not of the quantity of agricultural goods produced, but rather of their inequitable distribution" (2011, 51). Because enough food is presently being produced to feed all people, systematic inefficiencies must be identified in order to

initiate recovery and redistribution. Of food recovery Bloom notes that "to fundamentally change the landscape of American hunger, we need to examine all facets of the food chain and concentrate our efforts on the areas with the potential to yield the most" (2010, 48-49). Farms often have a large food surplus, but much of it goes unharvested, and is thus difficult to access by urban food rescue organizations. System-wide changes are necessary to make this food accessible to those who could use it.

This incongruity—excessive consumption paired with severe hunger—characterizes food in America. Sociologist Patricia Allen notes that "a defining contradiction of American agriculture has been the persistence of hunger despite its having the world's most productive agrifood system" (2004, 22). Although existing side by side, these two realities rarely intersect. Bloom expands on the inconsistencies within the food system, stating, "We have an embarrassing level of hunger for such a wealthy nation, an obesity crisis that threatens to drain our capital and human resources, and a habit of squandering food that is severe enough to harm our already fragile environment" (2010, 58). Because of the lack of awareness of these inefficiencies, facilitated through the growing distance between consumers, their food, and their waste, food waste continues to slip through the cracks of our broken supply system.

Chapter 3:

Wasted Potential: Transforming Food Waste into a Resource

The pile is buzzing, and literally burning hot. Steam rises from the top of the compost heap, along with a faint odor. It could be pleasant, pungent, or putrid depending on whom you ask. Thousands of microorganisms feast in the compost each day, along with a swarm of hummingbirds, an unexpected but frequent visitor. When the new food scraps appear, the hummingbirds zip away while the pulse of activity within the pile gears up for another meal. Bins of food arrive, filled with eggshells, melon rinds, banana peels, cauliflower stalks, and bits of peppers, cilantro stems, and potato peels. This waste is welcomed at the compost pile. Composting, such as at this small site at Pitzer, provides a home for the food waste so often shunted from view.

Despite acknowledgements from most sources and scholars that the culture surrounding food must change in order to reduce waste, this lofty, intangible prospect is impossible to immediately enforce given our cultural context. Instead, most emerging efforts are focused on establishing new sites and facilities to divert food from landfills. This response certainly has benefits, especially environmental, yet it ignores the disconnection between consumers and the processes that bring their food to them and take their waste away. These forces have facilitated a physical and mental distance from food waste. Because this reality seems very theoretical, most initiatives instead are aimed at reducing the impacts of the food waste that already exists through the development of alternative waste processing facilities that treat food waste as a resource, rather than a weighted burden.

To clarify the perspective of food waste as a problem of waste processing, I first emphasize the difficulties and inherent challenges of managing food waste through an example at my college campus. I evaluate small-scale composting and explore the ways in which food waste could be better managed within a localized context. I then examine composting and food waste management on a larger scale. I contextualize recovery methods for food within a framework of desirable options to understand how composting fits into a broader framework, before exploring the emergence of large-scale composting initiatives as a way to keep food waste from reaching the landfill. Municipal programs in particular carry the potential to divert significant volumes of wasted food, but they also manifest their own problems that surface at composting facilities. Finally, I consider waste reduction initiatives, such as city mandates and policies, as well as zero waste initiatives that seek to radically alter how goods are produced and how waste is disposed of.

Creating Food Waste Awareness at Pitzer College

Increasingly, city governments, as well as local businesses and institutions, have attempted to tackle the challenge of establishing policies and sites to better process waste in urban areas. Because of the obvious difficulty of moving hundreds of tons of urban food waste, localized examples have been successful in diverting less significant amounts from the landfill. These smaller and more manageable entities can better accommodate focused initiatives for food waste management. Many colleges and universities have used this capability to challenge themselves to implement sustainable waste management and reduction policies. Because most colleges have dining halls and other food service

establishments, college campuses produce a large volume of food waste. They have a significant opportunity to address waste in this context.

Many campuses across the country have seized upon the opportunity to address food waste head-on. Initiatives to both reduce food waste at the source and to process it more effectively have successfully raised awareness about food consumption and waste disposal. Currently the total population on American college and university campuses, including students, staff, and administrators, is around 20 million individuals (Chen 2008, 24). This large subpopulation, though dispersed nationwide, is equivalent to the population of a large U.S. state. This sector holds great potential to establish waste reduction policies that divert a large section of food waste.

Pitzer College, a small liberal arts college, prides itself on pursing environmental and social responsibility and has undertaken many green initiatives in recent years. Although students are active in many environmental initiatives, there is not a focused discussion of food waste on campus despite the presence of environmental clubs and a student-run composting program. A large dining hall and three small eateries are located on campus, all of which generate food waste. The McConnell Dining Hall, operated by Bon Appétit Management Company, serves three meals a day and has dozens of employees who work to supply food for Pitzer's students and staff. Although the dining hall is an integral part of Pitzer's campus, Bon Appétit operates as a partner business with the college. Despite the good intentions of Bon Appétit and Pitzer, students have not exhibited much awareness toward food waste on campus. By speaking with employees at Bon Appétit, Pitzer, and the City of Claremont, I attempted to gain a stronger sense of the extent of food waste at Pitzer College and how its management can be improved.

Pitzer uses waste hauling services offered by the City of Claremont to remove refuse from campus. In 2012 the City of Claremont generated nearly 20,000 tons of landfilled waste, 5,000 tons of recyclables, and 8,800 tons of collected yard debris, or green waste. Most of the city's garbage is sent to the Olinda-Alpha Sanitary Landfill in Brea, with a small amount sent to Puente Hills Landfill (LaPrade 2010, 66). Green waste is turned into mulch by a private company in Pomona that does not accept food waste (LaPrade 2010, 16). Although Claremont currently diverts about 68 percent of total collected waste from the landfill, a high amount for a small city, the city could divert about 20 percent more waste if a food waste collection program were implemented (LaPrade 2010, 109). Revising city waste policies would significantly reduce food waste disposed in landfills and increase the Claremont's diversion rate.

Within the Claremont Colleges campus, Pitzer students are completely separated from waste infrastructure and management. Food waste in the dining hall goes unseen because students do not participate in food preparation and simply stick their plate and any uneaten food on a conveyor belt to be whisked away when they are done eating. The all-you-can-eat setup of the dining hall allows students to pile their plates with food without much consideration as to whether they will eat it all. Although the Pitzer dining hall is trayless, which has proved to reduce food consumption and subsequent waste by up to 25 percent, staggering amounts of waste remain (Kwon 2009, 3). Acknowledging the presence of food waste on college campuses and incorporating appropriate policies to better manage waste will be necessary to create truly sustainable campuses. In a thesis on university food waste management, Sockju Kwon found that limited space, lack of governmental enforcement, and the need to train employees are the three main barriers to

food waste management on college campuses (2009, iv). Changes that significantly disrupt current management methods or require additional labor, as composting or other waste processing methods do, are not likely to be approved without a pairing of student initiative and significant support.

Pitzer's on-campus composting program was started by students to divert food scraps from the dining hall and provide compost for the student-run organic garden. Currently bins full of food waste are transported across Pitzer's campus from the dining hall to a small composting area. Student composters layer food scraps from the dining hall as well as campus cafes with organic matter, such as leaves, hay, or wood chips, in piles supported by large pallets that serve as walls. Water is applied and the materials are left to decompose for a few months. The pile draws microorganisms, which consume the organic material and generate heat. Composting occurs on campus Monday through Friday, processing hundreds of pounds of food waste each week.

The composting program at Pitzer accepts only pre-consumer food waste resulting from meal preparation in the dining hall kitchen, a space which students rarely enter. Although dairy and meat can decompose and contribute to compost, they draw pests and odors and are therefore not ideal for small-scale operations, such as the set-up at Pitzer. Because Bon Appétit prepares most food from scratch, there is a large volume of inedible fruit and vegetable scraps generated on campus. Watermelon, pineapple, and cantaloupe rinds, orange and lemon peels, carrot and onionskins, bell pepper cores, coffee grounds, and stalky vegetables such as broccoli and celery are foods commonly found in the yellow bins where food waste is collected. Occasionally a batch of wasted produce, like

wilted spinach, soggy strawberries, or sprouted potatoes makes it over to the composting site as well, along with the sporadic piece of bread or serving of grains.

The volume of pre-consumer waste is more burdensome that the post-consumer waste generated by students in the dining hall. Although a sizeable amount of waste results from student's overfilled plates, this food is sent to the landfill because it is too challenging to compost on campus and because the material is rarely sorted properly and made free of contaminants. Four large bins stand against the wall in the dining hall next to the conveyor belt for dishes: two are marked "landfill," and the others "compost." The compost bin is intended to collect food scraps, with the exception of meat and dairy. Although Bon Appétit hoped that clearly marking the bins would encourage students to dispose of their waste more responsibly, compostable and non-compostable materials remain poorly separated. Forks and waxy paper end up in the compost bin, while leftover food is tossed in the trash. There are not enough dining hall employees to be able to assign someone the task of sorting through this material to pull non-compostable items from the compost bin. Furthermore, even if plate waste was cleanly separated from meats and trash, there is not enough space or student support to compost these remains on campus. Most students and staff expect that their leftovers are being composted on campus, while in reality they are not. Both the landfill and compost bins end up in the trash. Although the volume of this waste is less than the volume of dense kitchen scraps, this situation poses serious concerns. People may be tempted to waste more if they believe that their leftovers will be composted. Advertizing this wasted food as compost misleads students and staff who believe this is a sustainable aspect of the dining hall.

Though Pitzer represents a small, localized context of food waste, many challenges exist in improving its management. Because it is unfeasible to process more food waste on campus with the methods currently used, discussions must reach beyond small-scale composting. Neighboring Claremont McKenna College recently purchased a food waste dehydrator, which processes all the dining hall's food waste into a compost-like amendment that is used around campus. This is possible at Pitzer if students and administrators prioritize better management of on-site wastes. If all of the Claremont Colleges worked together to purchase an industrial composter, the food waste burden of the entire campus could be relieved and the resulting compost could either be used on campus or sold in the community. Though this outcome would be ideal, it would require cooperation among many stakeholders, significant investment and cost, as well as ample space to site the facility and therefore remains an unlikely prospect. If the City of Claremont establishes a partnership with a composting facility and implements food waste collection, which is being discussed at City Hall, the Colleges may be able to move their food waste off-campus. This solution would accommodate the processing of large volumes of waste, but might also aggravate existing issues at composting facilities.

In addition to better management practices, localized efforts aimed at source reduction are necessary to raise awareness about the amount of food waste generated on campus. Though the majority of food waste on campus is produced through kitchen preparation, students are personally responsible for the waste generated on their plates at the dining hall and any food thrown away in dorm rooms. Informational signs in the dining hall on food waste would raise awareness about the amount of waste created on campus and make students more conscious of their consumption habits. Conducting

studies and analysis to estimate of the amount of waste generated on campus, as well as the volume of food loss in the dining hall, would provide a better sense of where inefficiencies exist and offer a clearer path toward improvement. Although there is great potential to reduce the creation and poor management of food waste at Pitzer, prioritizing innovative improvements will require facilitating a larger discussion of food waste on campus in order to enact change.

Kicking Food Waste to the Curb

Alongside institutions, many individuals, businesses, organizations, and municipal governments are struggling with how to how to deal with wasted organic materials. The federal Environmental Protection Agency, as well as many local governments, advocate viewing food waste within the context of a food recovery hierarchy, which prioritizes ideal options for food waste at the top of the diagram and leaves undesirable options at the bottom (Environmental Protection Agency 2012, 2). This diagram provides a useful way of viewing waste recovery methods by placing each option in relation to others.

Source reduction is understood as the most ideal way to recover food, which would prevent waste before it is even created. Eliminating the immense volume of food waste before it is generated would save the valuable resources that are lost when food goes to waste and keep food from reaching the landfill. Although ideal, source reduction will necessitate large systematic changes within the waste processing and food production sectors. The next most desirable way to utilize wasted food is to feed it to humans, which is the intended market for most crops. Although providing food for

people to eat seems simple, the wastefulness of the food system demonstrates the inefficiencies that keep food from those who need it. Food rescue organizations, food recovery and gleaning initiatives, and even dumpster diving can all help recover food labeled as waste. Feeding wasted human food to animals is recognized as a mediocre solution. Although historically this was the dominant method used to dispose of household food scraps, it is unfeasible for most urban residents who now live far away from farm animals, although large volumes of food waste have proven to be a useful amendment to farm animal feed in some contexts.

Without animals to feed, the EPA identifies the next best option on the food recovery hierarchy as using it for industrial processes, such as generating energy from waste. This use for food recognizes the embedded value in waste and its potential to generate a needed resource. When this is achieved, it is most often with anaerobic digestion facilities, which are becoming common in both developed and developing countries yet remain rare in the United States. Although these facilities operate effectively around the world, they require waste to be burned, albeit in sanitary, enclosed facilities that capture the resulting emissions and use them to generate energy. Anaerobic digestion has proved to be an ideal method for processing waste, but its similarities to incineration contribute to it being viewed unfavorably in the United States. Additionally, the capital costs for these facilities are huge and determining how to supplement a city's energy needs with anaerobic digestion is not yet widely understood. Despite these challenges, this method is becoming more common, or at least discussed more frequently, as the amount of urban food waste rises, because it allows some of the value put into producing food to be saved and diverted toward generating power.

The least desirable option for disposing of food is placing it in a landfill or incinerator, which are the most common methods. Burning and burying food waste makes the assumption that food is garbage and does not carry the embedded potential to be something more than discarded waste. Yet the EPA designates one more step on the food recovery hierarchy between generating energy and becoming garbage, and this step allows food to retain a small portion of its initial value. Composting food waste allows the nutrients in the food to be returned to the soil through the creation of a soil amendment. Many individuals in urban areas keep household compost piles, but large-scale municipal composting programs have only recently become a consideration. I learned of the complexities of citywide composting systems during the summer of 2012 when I conducted a research project on cities that have implemented composting programs. I focused on the new program in Portland and referenced the more established food waste composting policies in Seattle and San Francisco. This prior research has provided the basis for my knowledge of the benefits, as well as challenges, of large-scale composting. Much of the information presented here is derived from that research.

The basis of composting rests upon the natural ability of food and other organic materials to decompose under the right conditions to produce compost, which is defined as a biologically stable material derived from the composting process (Alexander 2013, 44). Composting occurs with the natural decomposition of organic materials that break down with the help of microorganisms that are drawn to the decomposing materials. The process is natural and occurs on its own in nature, but can be expedited by maintaining specific ratios of carbon, oxygen, and nitrogen. As Bloom notes, “composting is not something you facilitate as much as let happen” (2010, 211-212). The microorganisms

will regulate themselves, creating an ideal environment for food and other organic wastes to decompose into a rich, organic humus (Lynch 1990, 58). Repurposing food scraps as compost, rather than as landfilled garbage, decreases waste flow to landfills, reduces the methane emissions that rise from landfills, and creates a valuable soil amendment.

Creating compost is especially beneficial given the soil depletion that has occurred through a globalized and chemical-dependent food industry. The excessive use of fertilizers and pesticides to control crops has destroyed farm soils. Architect and designer William McDonough and chemist Michael Braungart state that "soils now yield more crops than they naturally could, but with some severe effects: they are eroding at an unprecedented rate, and they are drained of nutrient-rich humus" (2002, 95). Because depleted soil requires additional applications of fertilizer to keep the field productive, a vicious cycle begins. Creating compost from food and other organic wastes and applying it to a garden or field nourishes the soil by allowing the nutrients in the organic materials to be made available to the soil and plants, creating a sustainable nutrient cycle.

Because of the practical benefits of compost in the garden, as well as the potential to divert food scraps from the garbage bin, many families now manage household food scraps in backyard compost bins that are supplemented with onsite yard debris such as leaves or grass. This simple personal initiative allows families to process food waste at the home in urban areas, as long as yard space is available. While composting is most feasible for motivated individuals and families who live in single-family housing, backyard composting is less practical for those without a yard or people who live in apartments or other small or shared living spaces. Because it requires personal initiative and offers few tangible benefits, many Americans are not able to allocate the space, time,

or money to create an onsite compost pile. Despite the resources and initiative required, some cities are taking the initiative to create citywide composting programs that provide curbside pickup of food waste and organic materials, alongside garbage and recycling services. Municipal composting programs ask consumers to place their food scraps in a designated bin, often with yard debris, to be collected at the curb. Because many dominant consumption and disposal habits are based upon convenience, efforts that provide consumers with the infrastructure to process waste in a different way hold the potential to encourage a new mindset and attitude toward waste, while diverting a large portion of existing waste.

To address mounting concerns over waste management in urban areas, some American cities have developed waste diversion goals that require revamped municipal collection systems and disposal methods in order to be successful. Diversion is regarded as the amount of waste that is diverted away from disposal in a landfill, usually through recycling and composting programs or reuse initiatives. With sustainability efforts on the rise nationwide, especially within the governmental and business sectors, recycling and composting initiatives are increasingly deemed feasible in more urban areas. Currently, there are approximately 183 municipal food and yard debris collection programs in 18 states across the country, reaching two and half million households (Yepsen 2013, 23). Although these programs are concentrated on the West Coast and not yet nationwide, citywide composting is a growing trend. Portland, Seattle, San Francisco and neighboring Alameda County in California have all initiated citywide food waste collection. San Antonio, Texas; Denver, Colorado; and Santa Fe, New Mexico, are among the cities

planning to adopt the service. The number of active composting programs in the United States has increased by more than 50 percent since just 2009 (Yepsen 2012, 23).

In urban areas, households are dependent on their local waste collection service to remove their refuse from the marginal space that is the curb: part private domain, part public sphere. All household waste used to be tossed in one bin to be dumped or burned, but now materials are separated into multiple collection bins to be taken to different facilities. Plastic and paper recyclables were first allocated their own bin, followed by yard debris, which is often taken to food-exempt composting facilities or mulched with other organic materials. Over 60 percent of yard debris is now composted, but less than 3 percent of food is diverted from the landfill (Levis et al. 2010, 1486).

Some municipalities now allow food waste to be added to the same bin as yard debris and taken to a modified composting facility that has been approved to process food waste. Wherever municipal food waste composting is offered, all organic waste is collected in one bin, placed on the curb, sent to a transfer station, then brought to a large-scale composting facility, where it is received, chopped up, mixed, placed into outdoor piles, covered, and provided a generous supply of oxygen necessary for the composting process to naturally occur. The implementation and success of a composting program depends on the presence and availability of a composting facility.

Appropriately siting a composting facility to process food waste is essential to the functioning of a municipal food waste composting program. Siting is also likely to be a highly contentious proposition. Composting facilities are often located away from urban areas, in primarily rural, agricultural communities. Trucks must haul food waste to the facilities, which generates greenhouse gas emissions as well as increases traffic and air

quality concerns for the immediate community. Although composting facilities do not pose the same water and air contamination risks as landfills, the volume of decomposing food can raise a big stink. Despite their environmental advantages, composting facilities are not always the best neighbor.

The communities immediately surrounding composting facilities often bear the smelly brunt of our urban efforts to be good environmental stewards. While there are many benefits of our food scraps being taken away for composting, we forget that "away" is often someone's backyard. Siting a new composting facility is therefore extremely difficult for local governments because no one wants their community to be a dumping ground for a large volume of rotting food. Existing facilities face constant odor complaints, and communities have organized against the placement or expansion of planned facilities. To the community member, the daily impact posed by a composting facility may not be that different from a landfill.

Municipal composting is not as easy as simply tossing food in a different bin. It requires thoughtful planning, infrastructural development, and increased consumer education. Although acceptance is increasing, composting operations continue to pose similar risks to other waste processing facilities. Odor remains an undeniable reality, both for urban residents moving food scraps between their kitchen and collection bin and for the people who share their communities with the facilities. Because multiple government players share the responsibility of siting, regulating, and maintaining the program, the concerns of affected communities may not be directly addressed because of the constant volley of information among stakeholders. This relationship between urban programs and outside-of-city disposal is problematic. While there are obvious benefits to urban

residents whose participation in the composting programs may raise awareness of the content and size of their personal waste habits, members of communities on the receiving end of this compost collection may not themselves have a food waste collection service. We are placing the burden of waste on the wrong people.

Although the environmental benefits of composting are numerous, implementing an economically viable program is challenging. Politics can easily hinder well-meaning efforts. Large-scale composting requires substantial infrastructure, which can translate to additional costs for a city and its residents. The success of curbside composting programs relies completely on the support of residents to change their habits and accept a new system. And while the benefits of composting food waste clearly outweigh the negatives of tossing it in a landfill, resistance toward composting remains. Rather than address the fundamental problem of massive waste generation, large-scale composting adheres to the same paradigm that has kept our waste invisible for so long.

In addition to the structural elements that make it challenging to implement composting programs and the infrastructure they require, composting fails to address the significant consumption of resources that go into producing food that is not consumed. Journalists Sarah Dominguez and Laura Moreno note that "while composting, instead of disposal, reduces the impact of this wasted food by 'closing the loop,' it does not ensure that the resources used to grow, process and transport food are not wasted when food goes uneaten" (2012, 29). This important distinction demonstrates why composting food waste is only a small improvement one notch above disposing of it in the landfill. Despite these challenges, composting initiatives are a step in the right direction and have begun to provoke a necessary discussion on food waste management. Because we cannot expect

all food waste to be removed at the source, food waste processing will be necessary in some capacity. Yet we must continue moving up the food recovery hierarchy, in search of more sustainable solutions.

The Zero Waste Challenge

Although few citywide composting programs currently exist nationwide, they are becoming more desirable as cities and states revise waste management policies in the face of mounting disposal costs and recognition of the environmental and social impacts of waste facilities. State- and city-implemented waste diversion goals also rely upon food waste processing to be successful. To meet these goals ambitious individuals, businesses, organizations, and even cities have adopted zero waste initiatives, a concept that hopes to completely re-envision how waste is managed by creating unique and specific ways for products to be produced and later recycled. Instead of viewing waste as a burden, we can potentially recognize that waste has embedded value and the capacity to be repurposed. Though adoption of zero waste goals holds promise, it requires extensive infrastructural and ideological changes.

Zero waste allows waste to be reimagined as a resource, which provides it economic value. By focusing on economic potential, rather than disposal, waste can hold significant power as an economic tool. To create a future of zero waste, where discards become a source of value rather than a burden, we must develop and prioritize new industries and technologies that allow our waste to become a visible and vital resource. By reconfiguring our sense of waste so that we recognize its impact on our communities

and its potential as a resource, we can create sustainable systems in which all waste has latent value. Zero waste thinking gives waste no place to hide.

Rather than completely eliminate waste, as the name may imply, zero waste seeks to redesign how products are produced, so that nothing is sent to the landfill when the product has reached the end of its life. Rogers clarifies: "Zero waste refers to eliminating refuse before it gets made, at the front end, instead of the current norm of treating trash only after it already exists, at the back end" (2005, 224). Instead of being sent to a landfill, products needs to be designed so that they can be effectively and sustainably repurposed and recycled. Designing future "waste" as something that can easily be recycled or reused would limit the waste burden of landfills, reduce the use of new materials, limit the extraction of resources, and create responsibility for how waste is managed. Despite these benefits, zero waste seems a far-off goal for many because it would require completely restructuring the systems of production and consumption. Vast infrastructure would be required to recycle waste that currently must be disposed of in a landfill. To sustainably manage food waste, zero waste does not consider composting as the most desirable solution.

Within a zero waste mindset, anaerobic digestion is the desired processing option for food waste. Although composting initiatives keep food from the landfill, little value is retained when compared with the possibility of generating energy from wasted food. Author and activist Tristram Stuart suggests that there is more to food waste than composting. He writes, "It is an ecologically favorable disposal method compared to landfill, but it is still a tragic waste of edible food" (2009, 35). Stuart believes that

composting should not be assumed to be a satisfactory method for disposing of food waste. Instead, wasted food has the potential to generate an additional output: energy.

Anaerobic digestion feature enclosed tanks void of oxygen where bacteria break down food and other organic wastes. These facilities are widely used to stabilize biosolids at wastewater treatment centers, but rarely for food waste processing in the United States (Levis et al. 2010, 1487). Unlike the large-scale composting facilities that rely upon large volumes of yard waste to create well-balanced compost, anaerobic digestion is most effective with just food or non-woody organic wastes. Within the digester, methane forms when food waste is consumed; this resulting biogas is then captured and can be used to generate electricity (Bloom 2010, 19). Unlike the methane capture systems at landfills, anaerobic digestion captures the gas within an enclosed tank from which it cannot escape. The residual material, known as effluent, can be used as a soil conditioner, similar to compost.

The biogas that is captured in anaerobic digesters can be used onsite to power offices or other facilities or transferred to city buildings. This energy is considered renewable because no new energy sources are being exploited. Stuart explains that when methane is burned carbon dioxide is formed, which is less potent and harmful than the initial methane that would have been released through the decomposition of food in an aerobic environment (2009, 234). Additionally, he explains that this gas is not considered to be a greenhouse gas emission, because the carbon that is released comes from plants that have already absorbed carbon from the atmosphere, unlike the burning of fossil fuels, which releases stored carbon (2009, 234). Because of the potential to generate renewable energy, anaerobic digestion allows food to retain more value than it does when

composted. Bloom asks bluntly, “why make dirt when you can make energy?” (2010, 259). Although energy production is desirable, establishing accessible anaerobic digestion facilities to process huge volumes of food waste would require vast infrastructural developments and systematic changes that would depend upon policy decisions and facility siting. Anaerobic digestion facilities also have large capital costs and would require huge investments, which are difficult to acquire with a new and unfamiliar technology.

San Francisco, California is one of a few innovative cities planning to confront the challenges of implementing anaerobic digestion facilities, as well as take on the broader goals of zero waste. San Francisco recently became the first American city to declare a goal of zero waste by 2020, which would necessitate establishing an anaerobic digestion facility to process food waste. In terms of waste diversion, no city in the United States has pursued recycling and food waste management to the extent San Francisco has. Regarded as a leader in establishing municipal environmental programs, the city was the first in the country to implement a full residential food waste collection program in 1997, which is now available to all residences and businesses. The Mandatory Recycling and Composting Ordinance of 2009, also the first in the country, requires that all residential and business properties subscribe to waste collection services and properly separate their recyclables and compostable waste from garbage. San Francisco’s current diversion rate is 80 percent and continues to grow (Yepsen 2013, 23).

The city has also been rigorous in adhering to waste reduction goals. A city resolution that mandated a 75 percent landfill diversion rate by 2010 was met ahead of schedule, prompting San Francisco to become the first American city to declare the goal

of zero waste. By official resolution, the city aims to eliminate dependence on landfills by building up recycling infrastructure as well as acknowledging the necessity to address waste before it is created. To reach zero waste, San Francisco plans to transition from its highly successful citywide food waste composting program to use of anaerobic digestion facilities, thus efficiently processing food waste to retain more value. If the city's collected organic material—600 tons a day—went to energy production rather than composting, the entire city garbage truck fleet and a portion of public transportation could be powered each day (Yepsen 2013, 25). Because most residents do not have yards that generate large volumes of yard debris, as in other cities, the majority of organic material in San Francisco is wasted food, which is ideal for processing within this system.

Anaerobic digestion plants have some operational differences from aerobic composting facilities. Their industrial nature means they can be more easily sited in urban areas, which would substantially decrease transportation costs and emissions associated with moving food waste extended distances for disposal in a composting facility or landfill. The facilities would also likely be constructed in established industrial areas. Though many areas with industrial activity are separated from residential areas, it is probable that social issues would arise. Siting new anaerobic digestion facilities could present environmental justice concerns if they end up in the same communities where waste facilities have historically been placed. Though the facilities are enclosed and few pollutants have been reported, anaerobic digestion is an unfamiliar technology that works primarily with the production and management of gases. Like composting facilities, anaerobic digesters are eyesores and their development will undoubtedly face opposition.

San Francisco's appetite for innovation distinguishes it as one of the nation's leaders in waste reduction. Leadership of this caliber is instrumental in helping government officials and citizens rethink our relationship to food waste, and eventually to reach municipal waste goals. It will push more of us to recognize that we must continue to move away from a mindset that accepts landfills as the final resting place for all waste. Ultimately, all the products that we consume have to be disposed of somewhere, whether that be a compost facility, recycling center, digester, or landfill. This simple reality must force us to confront the need to develop new methods of disposal and work even harder to reduce the initial creation of waste.

Conclusion:

The Waste Dilemma

Every meal we eat generates food waste. The scraps remaining from food preparation may clutter the counter or simply be swept into the trash. Leftovers may be packed up and stuck in the back of the fridge, only to be rediscovered weeks later. Other food waste is entirely invisible to us because it occurs far from our homes. Even if we can't see it, everything we eat carries with it the impacts of the resources lost along the way. Because most Americans are disconnected from the food and waste systems, we have no sense of the resources that went into the food that makes it to our dinner table and no incentive to consume responsibly. Food waste bridges the gap between two segments of our physical and cultural realities: it is part food and part waste. These two distinct qualities must be recognized to their highest potential in order to alleviate the effects of food waste.

The most environmentally, socially, and economically sustainable way to reduce the impacts of food waste is to eliminate it at the source. Generating less food waste saves money, reduces emissions, conserves resources required to produce and transport the food, helps alleviate hunger, shrinks landfills, and provides the simplest and most logical answer to our excess of waste. Yet the gap between taking less to the landfill or composting facility and generating less food waste will require deep changes based in ideology rather than innovation; people will need to view food as a necessary human resource rather than a disposable commodity. Consumption patterns, which continue to rise, challenge this alternate attitude. Although this approach affects the behaviors of the

average American, the bulk of wasted food occurs upstream of the consumer. For a reduction ideology to hold, we need fundamental change in the ways that we create, process, and conceptualize our waste.

Food waste is gaining slow recognition as a legitimate problem, yet it is primarily discussed as a management issue, rather an issue of deeper societal concern. There needs to be an ideological shift to thinking upstream from the consumer, which will require participation from the sectors of agricultural production, retail, waste processing, and government regulation and policy. A hopeful future for food waste relies upon prioritizing food as a necessary element of human life. Given our immense wealth and surplus of food, there is no reason that poverty should exist in this country. This coexistence of abundance and hunger is a defining contradiction within American culture. The system is flawed, in that millions of Americans can go hungry while we waste a remarkable amount of food. We must confront our forgotten leftovers before the mold has time to grow.

The social setting in the United States favors the expansion of a consumerist, throwaway society over one that endeavors to reduce, reuse, and recycle. Efforts to limit consumption and lessen the mindless creation of waste are met with resistance from consumers who do not want their personal habits to be attributed to cultural forces with negative impacts. This ideology also surrounds food waste. We have become so separated from our food that we perceive of it as just another commodity that we purchase and then throw away. The distances that exist between food production, processing, distribution, retail, and disposal have allowed American consumers to become ignorant of the places where our food is produced and disposed.

Our consumption habits embody engrained philosophies of excess. These philosophies are made tangible in infrastructure that encourages consumers to remain oblivious to food waste. Industrialized food production and waste processing demonstrate innovations that have allowed America to flourish in times of economic instability and global uncertainties. Compared with the lives of early colonists, the experience of modern Americans concerning both food and waste is one of luxury. Agricultural production is so productive that urban residents need not worry about where their next meal will come from. Waste is now managed so efficiently that its presence is rarely detected once it leaves the home. This cultural and historical context, reinforced through centuries of development, has enabled an ignorance of food waste.

Burgeoning quantities of consumer waste reflect the physical and social position of landfills, which operate in an unfettered sphere of existence. While unsightly and unpleasant, our mountains of garbage go largely unnoticed, especially to Americans living in large urban areas. Despite their many environmental, social, and economic impacts, the existence of landfills is rarely questioned simply because to do so would bestow responsibility upon us as consumers to deal with our waste ourselves, or find another place to put it. The convenience of landfills in our lives allows us to turn a blind eye to our trash. Why challenge waste when the infrastructure to move it swiftly away from our homes is already in place?

Without demanding that consumers become more mindful of their wasted food, food waste holds little chance of being regarded as a serious issue. Because the existence of food waste does not affect the average consumer, any incentive to limit it in households will likely be labeled an attack on personal choice. Despite this, the consumer

sector may hold the greatest capacity to effect change within the much larger system. The farms, businesses, corporations, and retailers that make the modern food system are unlikely to drastically alter their production and distribution processes without significant consumer demand. Because this entire industry is designed order to provide food to the greatest number of people as a route to maximize profits, it behooves the industry to listen to its vast number of consumers. The food industry has a large lobbying presence, but ultimately consumers hold the ability to force changes in this system by demanding greater accountability and attention toward wasteful processes. Challenging these forces will require not only structural changes, but ideological ones.

Rethinking what we waste necessitates reconsidering our consumption habits and recognizing the places where the remnants of our consumer lifestyles are hauled. The extensive distance between consumers and our waste hides the reality of this space, rendering waste as an intangible concept. We must remember that what we consume also becomes what we dispose of; that our homes are filled with future waste. If we allocate more money to commodity consumption, we are consigning more goods to disposal in order to accommodate new purchases. Development and economic efficiency rely upon the creation of waste in order to make room for more purchases. Waste, and its infrastructure, is a now a necessary byproduct of American consumer society. Landfills in particular demonstrate the excessiveness of our consumption habit and suggest that this reality should be maintained. It is difficult to target consumption because we never question why people consume. The force of consumption is beyond scrutiny.

Challenging commodity production and the throwaway society will require significant changes, not just in how waste is disposed, but in how it is conceptualized in

the lives of those who create it. The social position of waste will need to change, which requires altering the dominant modes of production. In order to change the way something is regarded once it becomes waste, it must be constructed in a way that retains value. Instead of thinking of the products of our consumption—both food and manufactured goods—as losing value when we no longer find it useful, "waste" needs to be recognized as a substance or material that holds value to be reused or recycled.

In order to systematically address the specific concerns of food waste, it will be necessary to implement social and political changes that acknowledge its inherent value. Bloom suggests three policy recommendations that he believes hold the most potential to eliminate food waste, not just from our landfills but also from our collective consciousness. I share his belief that establishing a national food recovery coordinator, creating a national public-service campaign to raise awareness about food waste, and banning food from landfills can force an acknowledgement of food waste and its implications (2010, 292). A national perspective will demonstrate the enormous potential to reduce food waste. Such an approach will require significant government participation on the topic of food waste, which has not yet occurred in the United States.

Establishing a food recovery coordinator would target food waste at its source. Addressing food losses, especially within the farm and retail sectors, holds significant potential to yield large quantities of food to be redistributed to those in need, but donations are often hindered because of lack of accessibility or liability concerns. Establishing a federal office for food recovery would facilitate food donations and reduce the amount of good food carelessly sent to landfills. A national coordinator could organize the collection and redistribution of food in a systematic way. This

recommendation prioritizes recognizing food at its highest potential: as a source of nourishment for the human body.

Bloom's next recommendation, creating a public-service campaign, would make food waste a more concrete reality to the average American. Other national governments have conducted similar initiatives, which have been successful in reducing waste, especially at the household level. Making clear the financial losses that individuals and families experience when they purchase food that is not eaten could make the personal economic impacts of food waste more tangible. England's Love Food Hate Waste campaign has been very effective at spreading awareness of food waste. The initiative includes radio and print ads, partnerships with organizations, public event participation, and a website filled with practical information and simple recipe suggestions (Bloom 2010, 269). An American equivalent of this campaign would make consumers more active in the greater food waste dialogue.

I agree with Bloom that banning food waste from landfills would initiate infrastructural, as well as ideological, changes. While viewing food waste within a waste management perspective does not directly challenge the root issue of consumption, implementing a ban at this level would signal a necessary discussion of where this waste could be disposed of or treated. Asking individuals to limit the food they send to landfills may not elicit a significant change, but completely banning food and other degradable materials from landfills certainly would. This would reduce the volume of waste in landfills, since nearly half of landfilled materials are easily biodegradable. Initiatives have begun on a statewide level to correct this wasteful practice. Yard debris is banned from landfill disposal in 24 states, but this does not apply to food (Mark 2012, 36).

Vermont passed legislation in 2012 mandating the separation and proper disposal of recyclable materials, including food waste, from solid waste by 2020 (Miller 2012, 17). The state of Massachusetts is expected to ban commercial and institutional organics from the landfill by 2014 (Neale 2013, 35). Even an incremental step, such as requiring the reduction of biodegradable municipal waste sent to the landfill by a specific mount, as done by the European Union, would be monumental in reducing American waste (Bloom 2010, 295). Utilizing this strategy requires challenging the spaces where waste is sent and working from that point forward to limit the amount of waste sent to other facilities.

Though policy will initiate infrastructural change, social change must also come from revised ideologies and consumption habits. Establishing a greater social awareness of food waste will be a gradual process that cannot be instantaneously solved with policy-driven or institutional changes. Individuals can reduce their food waste contribution through simple adjustments to consumption habits, which in the aggregate will impact the volume of waste generated. Consciously trying to eat all food in the house before it goes bad is a simple suggestion that relies on individual actions, such as mindful cooking and meal planning. Vowing to finish all the food that you put on a plate and save leftovers are also important habitual adjustments. While the food waste system is large and complex, the consumer ultimately has control over his or her own food consumption. Simple steps toward waste reduction may hold significant promise if enough consumers adopt more sustainable, conscientious practices.

Because inedible food waste is foreseeable, institutions and cities must continue to implement processing methods. Developing alternative infrastructure will position landfills not as a fundamental element of waste disposal, but as a fragmented option with

clearly defined consequences. Although the consumption patterns that have emerged from the cultural and historical context of this country have encouraged ignorance of waste issues, landfills serve as the primary culprit in garbage's invisibility. Perhaps growing friction over the siting of facilities will spur recognition of landfills' existence. Ultimately, this and other environmental considerations might expand public awareness of issues related to the initial resource extraction and production.

Although landfills provide a well-established service, and it may be unreasonable to question their continued existence, we do have control over what items and materials we choose to put into them. Because for decades landfills have allowed us to ignore our waste, we have had little incentive to establish or prioritize development of other waste management strategies, even though detrimental impacts are now clear. Mainstream recycling only recently became socially commonplace after decades of initiatives that sought to demonstrate the value of these materials and their potential to be recycled into new products. Recycling programs and facilities have steadily gained ground, but the success of these initiatives relies upon consumer taking the time and energy to properly sort and dispose of their waste. Many potentially recyclable materials continue to be thrown in the landfill because there is little incentive to discard responsibly.

This situation is, and will likely continue to be, evident with food waste as well. An individual may judge that collecting and disposing of food waste in a different bin is not worth the extra effort. Yet this individual action has repercussions on the broader landscape of waste. Like recycling, composting and other processing methods will take time, perhaps decades to become widely normalized because the implications of food

waste have only recently become evident. Despite its invisibility, I believe that the multifaceted issue of food waste must be addressed.

Garbage has become a geographic feature of our society—though we don't see its massive presence everyday, its collective existence surrounds us. But this reality is not inherent in our world. Only humans have created waste that cannot be reabsorbed into our communities; all other organisms and ecosystems manage waste products through systems that do not accommodate the existence of waste. Redefining the landscape of waste will necessitate accepting that food waste does not have to become garbage. Garbage is not intrinsic; we do not require its existence to survive. We do, however, need food. Food waste must be valued for its potential to be recycled and repurposed into a resource, but moreover, it must be valued for its ability to serve as nourishment for our bodies. Despite the factors that shelter it from our critical consideration, it has become necessary to prioritize food waste as a legitimate environmental, social, and economic concern.

Bibliography

Alexander, Ron. 2013. "State Fertilizer and Soil Amendment Rules." *BioCycle* 54 (3): 44–46.

Allen, Patricia. 2004. *Together at the Table: Sustainability and Sustenance in the American Agrifood System*. University Park, PA: Pennsylvania State University Press.

Bauman, Zygmunt. 2007. *Consuming Life*. Malden, MA: Polity Press.

Bloom, Jonathan. 2010. *American Wasteland: How America Throws Away Nearly Half of Its Food*. Philadelphia: Da Capo Press.

Blumberg, Louis. 1989. *War on Waste: Can America Win Its Battle with Garbage?* Washington, D.C: Island Press.

Buzby, Jean C., and Jeffrey Hyman. 2012. "Total and Per Capita Value of Food Loss in the United States." *Food Policy* 37 (5): 561–570.

Buzby, Jean C., Jeffrey Hyman, Hayden Stewart, and Hodan F. Wells. 2011. "The Value of Retail- and Consumer-Level Fruit and Vegetable Losses in the United States." *Journal of Consumer Affairs* 45 (3): 492–515.

Campbell, Hugh. 2011. "Let Us Eat Cake? Historically Reframing the Problem of World Hunger and Its Purported Solutions." In *Food Systems Failure: The Global Food Crisis and the Future of Agriculture,* edited by Christopher Rosin, Paul Stock, and Hugh Campbell, 30-45. New York: Routledge.

Chen, Chao-Jung. 2008. "College and University Dining Services Administrators' Intention to Adopt Sustainable Practices: An Application of the Theory of Planned Behavior." PhD. diss., Iowa State University.

Clapp, Jennifer. 2002. "The Distancing of Waste: Overconsumption in a Global Economy." In *Confronting Consumption*, edited by Thomas Princen, Michael Maniates, and Ken Conca, 155–176. Cambridge: The MIT Press.

———. 2012a. "The Rising Tide Against Plastic Waste: Unpacking Industry Attempts to Influence the Debate." In *Histories of the Dustheap*, edited by Stephanie Foote and Elizabeth Mazzolini, 202–225. Cambridge: The MIT Press.

———. 2012b. *Food*. Cambridge: Polity Press.

Dominguez, Sarah, and Laura Moreno. 2012. “Tightening the Belt by Reducing Food Waste.” *BioCycle* 53 (11): 29–31.

Dunn, Robert G. 2008. *Identifying Consumption: Subjects and Objects in Consumer Society*. Philadelphia: Temple University Press.

Environmental Protection Agency. 2009. “Municipal Solid Waste in the United States: 2009 Facts and Figures.” http://www.epa.gov/osw/nonhaz/municipal/pubs/msw2009rpt.pdf.

———. 2010. “Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2010.” http://www.epa.gov/osw/nonhaz/municipal/pubs/msw_2010_rev_factsheet.pdf.

———. 2012. “Putting Surplus Food to Good Use.” http://www.epa.gov/wastes/conserve/pubs/food-guide.pdf.

Featherstone, Mike. 2011. “Forward” In *Ethical Consumption: a Critical Introduction*, edited by Tania Lewis and Emily Potter, xvii-1. London; New York, NY: Routledge.

Gunders, Dana. 2012. “Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill.” http://www.nrdc.org/food/files/wasted-food-IP.pdf.

Gustavsson, Jenny, Christel Cederberg, Ulf Sonesson, Robert van Otterdijk, and Alexandre Meybeck. 2011. “Global Food Losses and Food Waste: Extent, Causes and Prevention.” Rome: Food and Agriculture Organization of the United Nations.

Hall, Kevin D., Juen Gao, Michael Dore, and Carson C. Chow. 2009. “The Progressive Increase of Food Waste in America and Its Environmental Impact.” *PLoS ONE* 4 (11): 1–6.

Hawken, Paul. 1997. “Resource Waste.” *Mother Jones* 22 (2): 44.

Hengeveld, Rob. 2012. *Wasted World: How Our Consumption Challenges the Planet*. Chicago: University of Chicago Press.

Humes, Edward. 2012. *Garbology: Our Dirty Love Affair with Trash*. New York: Penguin Group.

Institution of Mechanical Engineers. 2013. “Global Food: Waste Not, Want Not.” (4): 29. http://www.imeche.org/docs/defaultsource/reports/Global_Food_Report.pdf?sfvrsn=0

Jones, Timothy W. 2006. “Preventing Food Loss with a National Center.” *In Business* 28.

Kantor, Linda Scott, Kathryn Lipton, Alden Manchester, and Victor Oliveira. 1997. “Estimating and Addressing America’s Food Loss.” *FoodReview* 20 (1): 2–12.

Kellenberg, Derek. 2012. “Trading Wastes.” *Journal of Environmental Economics and Management* 64 (1): 68–87.

Khalid, Azeem, Muhammad Arshad, Muzammil Anjum, Tariq Mahmood, and Lorna Dawson. 2011. “The Anaerobic Digestion of Solid Organic Waste.” *Waste Management* 31 (8): 1737–1744.

Kollikkathara, Naushad, Huan Feng, and Eric Stern. 2009. “A Purview of Waste Management Evolution: Special Emphasis on USA.” *Waste Management* 29 (2): 974–985.

Kummu, M., H. de Moel, M. Porkka, S. Siebert, O. Varis, and PJ Ward. 2012. “Lost Food, Wasted Resources: Global Food Supply Chain Losses and Their Impacts on Freshwater, Cropland, and Fertiliser Use.” *Science of the Total Environment* 438: 477–489.

Kwon, Sockju. 2009. “Investigating Food Waste Management in College and University Foodservice Operations.” M.S., Texas Woman’s University.

LaPrade, Carolyn. 2010. “Food Waste as a Resource: Rethinking Our Waste Infrastructure.” M.S., California State Polytechnic University, Pomona.

Levis, JW, MA Barlaz, NJ Themelis, and P. Ulloa. 2010. “Assessment of the State of Food Waste Treatment in the United States and Canada.” *Waste Management* 30 (8/9): 1486–1494.

Louis, GE. 2004. “A Historical Context of Municipal Solid Waste Management in the United States.” *Waste Management & Research* 22 (4): 306–322.

Lynch, Kevin. 1990. *Wasting Away*. San Francisco: Sierra Club Books.

Mark, Jason. 2012. “Cash for Trash.” *Earth Island Journal* 27 (3): 36–37.

McDonough, William and Michael Braungart. 2002. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press.

Melosi, Martin V. 2005. *Garbage in the Cities: Refuse, Reform, and the Environment*. Pittsburgh: University of Pittsburgh Press.

Miller, Chaz. 2012. “Passing Time (and Little Else).” *Waste Age* 43 (12): 17.

Morgan, Kevin, Terry Marsden, and Jonathan Murdoch. 2006. *Worlds of Food: Place, Power, and Provenance in the Food Chain*. New York: Oxford University Press.

Mortensen, Caroll. 2013. "Next Frontier of Organics Recycling in California." In *BioCycle*, 54 (3):29–32.

Neale, Zoë. 2013. "The Massachusetts Waste Conundrum." *BioCycle* 54 (2): 35–38.

Oosterveer, Peter, and David Sonnenfeld. 2011. *Food, Globalization and Sustainability*. London: Routledge.

Pretty, Jules. 2011. "Agriculture and Food Systems: Our Current Challenge." In *Food Systems Failure: The Global Food Crisis and the Future of Agriculture,* edited by Christopher Rosin, Paul Stock, and Hugh Campbell, 17-29. New York: Routledge.

Rogers, Heather. 2005. *Gone Tomorrow: The Hidden Life of Garbage*. New York: The New Press.

Rominger, Craig, Stan Emert, and Kenji Ushimaru. 2012. "Development of a Sustainable Food Supply Chain by Post Harvest Program - An Approach to a Sustainable Solution to Food Delivery and Waste Problems." In *2012 IEEE Global Humanitarian Technology Conference*, 230 –236.

Royte, Elizabeth. 2005. *Garbage Land: On the Secret Trail of Trash*. New York: Little, Brown and Company.

Sage, Colin. 2012. *Environment and Food*. New York: Routledge.

Strasser, Susan. 1999. *Waste and Want: A Social History of Trash*. New York: Metropolitan Books.

Stuart, Tristram. 2009. *Waste: Uncovering the Global Food Scandal*. New York: W.W. Norton and Company.

Thomson, Vivian E. 2009. *Garbage in, Garbage Out: Solving the Problems with Long-Distance Trash Transport*. Charlottesville: University of Virginia Press.

Van Haaren, Rob, Nickolas Themelis, and Nora Goldstein. 2010. "The State of Garbage in America." *BioCycle* 51 (10): 16–23.

Venkat, Kumar. 2011. "The Climate Change and Economic Impacts of Food Waste in the United States." *International Journal on Food System Dynamics* 2 (4): 431–446.

Wallach, Jennifer Jensen. 2013. *How America Eats: a Social History of U.S. Food and Culture*. Lanham, MD: Rowman & Littlefield Publishers, Inc.

Ward, Alastair J., Phil J. Hobbs, Peter J. Holliman, and David L. Jones. 2008. "Optimisation of the Anaerobic Digestion of Agricultural Resources." *Bioresource Technology* 99 (17): 7928–7940.

Yepsen, Rhodes. 2012. "Residential Food Waste Collection in the U.S." *BioCycle* 53 (1): 23.

———. 2013. "Residential Food Waste Collection in the U.S." *BioCycle* 54 (3): 23–28.