A thesis submitted to the Department of Environmental Science and Policy of Central European University in partial fulfillment of the Degree of Master of Science.

Barriers and Incentives for Food Waste Reduction: A Case Study of NYC Restaurants

Eden Merkle

July 2021

Vienna

CEU eTD Collection

Notes of copyright and the ownership of intellectual property rights:

(1) Copyright in text of this thesis rests with the Author. Copies (by any process) either in full, or of extracts, may be made only in accordance with instructions given by the Author and lodged in the Central European University Library. Details may be obtained from the Librarian. This page must form part of any such copies made. Further copies (by any process) of copies made in accordance with such instructions may not be made without the permission (in writing) of the Author.

(2) The ownership of any intellectual property rights which may be described in this thesis is vested in the Central European University, subject to any prior agreement to the contrary, and may not be made available for use by third parties without the written permission of the University, which will prescribe the terms and conditions of any such agreement.

(3) For bibliographic and reference purposes this thesis should be referred to as:

Merkle, E. 2021. *Barriers and Incentives for Food Waste Reduction: A Case Study of NYC Restaurants*. Master of Science thesis, Central European University, Vienna.

Further information on the conditions under which disclosures and exploitation may take place is available from the Head of the Department of Environmental Sciences and Policy, Central European University.

Author's declaration

No portion of the work referred in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Eden MERKLE

CEU eTD Collection

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by**:**

Eden MERKLE

for the degree of Master of Science and entitled: Barriers and Incentives for Food Waste Reduction: A Case Study of NYC Restaurants

Month and year of submission: July 2021

ABSTRACT

A third of the food that is produced ends up in landfills around the world. In the United States, that number is 40% of the annual food supply (Feeding America 2021). In the face of rising food insecurity after the COVID-19 pandemic, food waste is a symptom of a flawed food system. Working towards solutions including source reduction and redistribution of excess food can develop pillars of food justice, food security, and access. As the largest sector producer of food waste, the restaurant and food service industry are of particular interest in investigating food waste efforts. Surveys and anecdotal evidence from 51 restaurants around New York City revealed barriers and incentives for both reducing restaurant food waste and taking part in food donation practices. Main barriers identified included restaurant liability concerns, financial barriers, lack of information and awareness. Lessons for city food policies include: scaling solutions by establishing cross-agency information sharing, reexamining city food donation models, prioritizing donation laws, and targeted education within the food industry on financial incentives and legal liability protections.

CEU eTD Collection

CEU eTD Collection

CEU eTD Collection

INTRODUCTION

1.1 Definition and Significance

Food waste is an issue linked to climate change, sustainability, and global food security. It is a phenomenon that ties to major economic, social, nutritional, and environmental challenges, and is responsible for 11% of global greenhouse gas emissions (Poore and Nemecek 2018; WWF 2020). Organic waste materials from food waste places a significant burden on landfills while also releasing significant amounts of methane, a potent greenhouse gas, during their decomposition.

While around 7 million globally suffer from food insecurity, nearly one-third of all the food produced in the world is wasted along with the resources used in the foods' production. The recently established 2030 Agenda for Sustainable Development reflects the importance of this resource inefficiency: Target 12.3 of the SDG's calls for halving per capita global food waste at the retail and consumer level by 2030 (UN 2021; FAO 2019).

In high-income countries, food waste typically occurs at the consumer end, while in low-income countries waste tends to occur more often in earlier stages of production (Gustavsson et al 2011). This is denoted by a difference in terminology: food loss refers to food that is discarded in the earlier stages of harvest, storage, and transportation. Food waste, on the other hand, refers to food that is fit for human consumption but is discarded by consumers or retail industries. In the United States, food waste is of the most concern. This can partially be attributed to a strong extra-consumption culture, and the presence of "more is better" shopping principles. The

CEU eTD Collection

generation of food waste ties to cultural, personal, geographic, economic, and political forces that influence food behavior and treatment (Thyberg et al 2020). In effect, behaviors vary drastically from person to person and change rapidly throughout time. In the U.S., the leading cause for high levels of waste is perceived food spoilage. Either real or imagined, this is often due to confusing and misleading expiration, “best by”, and “sell by" food labels (Neff et al 2019).

The United States discards more food than any other country in the world. It is estimated that between 30-40 percent of the food supply in the nation is wasted (USDA 2020). In terms of successful efforts to address the issue, they lag behind other countries (Neff et al. 2015). Consequently, food takes up more space in US landfills than anything else (USDA 2020). The Environmental Protection Agency has recently given food waste national attention by establishing a goal to halve total food waste by 2030.

Since the COVID-19 pandemic in March 2021, food insecurity has been on the rise across the nation. It has been estimated that the number of individuals defined as food insecure is expected to increase from 35 million across the United States to 50 million in 2021(Feeding America 2021). As an effect of the crisis, the country has seen a national strain on food banks and an increased need for food inputs to feed those in need, often to those who have suffered from job loss and increased economic difficulties.

Food rescue is the collecting of safe and edible food that would otherwise be discarded. It is an incremental part in decreasing food waste locally while helping to address the needs of

CEU eTD Collection

charitable organizations and food insecure individuals. Food banks are the most important of these, defined as "voluntary community organizations that solicit food and financial donations from the public and corporate sectors to distribute local food assistance" (Tarasuk et al. 2014). Food banks are reliant on the assistance of donors, retailers, restaurants, and farmer operations to supply food that will be distributed through hunger alleviation programs.

Relevant food policy which addresses waste typically follows the model presented in the Environmental Protection Agencies' "Food Waste Hierarchy", which exhibits the priority chain of what local agencies, businesses, and city programs should be addressing regarding food waste measures. The most preferred option is source reduction with the last resort being landfill or incineration of food waste. Source reduction includes taking measures like better shopping practices, tracking, and efficiently monitoring available foods to avoid waste entirely. Feeding the hungry is the second objective through donation of food. Feeding animals, industrial uses, composting and landfill or incineration follow as the least preferred method (EPA 2021).

The three approaches to food waste policy: prevention, recovery, and recycling, all compete with one another through different environmental, social, and economic interests (Mourad 2016). These competing factors occur through the interaction of multiple stakeholders including producers, consumers, composting facilities, farmers, businesses, municipality waste removal services, non-profits, and food banks. The second most preferred option for the commercial sector in line with the EPA hierarchy, to feed those in need, can be achieved through

CEU eTD Collection

food bank donations through an intermediary group or directly from the business to the food bank.

Outside of domestic food waste from U.S. households, 52 billion pounds of food from manufacturers, grocery stores, and restaurants go to landfills each year (Feeding America 2021). A USDA study showed that 21% of food in restaurants is never eaten (Buzby et al., 2014). In financial terms, this is at a tremendous cost for the industry. It has been estimated that somewhere between 9 and 23 billion USD is wasted annually in the restaurant industry (LeanPath 2016).

Restaurants have the potential to divert 320,000 tons of food, equivalent to about 643 million meals annually (ReFED 2018). At the same time, restaurants stand to save money and resources by taking actions to reduce food waste and act more sustainably. If implemented widely, source reduction of waste is estimated to save about $1.3 billion annually for food businesses (ReFED 2016). It is a compelling initiative for restaurants: for every dollar focused on food waste reduction, restaurants can realize $8 of cost savings (ReFED 2018).

The topic of food waste has also been gaining public attention in recent years, providing restaurants with a second incentive to leverage waste-reducing efforts as a chance to enhance their reputation with customers, employees, and potential investors. A 2017 survey conducted by the National Restaurant Association of 1,300 chefs found that “food waste reduction” was a Top 10 Concept Trend (NRA 2017). There is no better time for restaurants and foodservice businesses to initiate more sustainable, less wasteful practices.

CEU eTD Collection

1.2 New York City

In New York City, one in three individuals is defined as food insecure (Feeding America 2020). As a result of the COVID-19 pandemic, since March 2020 the demand for food banks has experienced a dramatic increase. At the same time, food waste in New York City remains a pressing concern for the waste infrastructure. In the state of New York, food waste makes up about 18 percent of the total waste stream (Brown 2017).

New York City is home to a bustling, diverse, and highly concentrated foodscape. Fostering around 26,000 restaurants within the bounds of the city limits, the world of restaurateurs, food markets, and grocery stores are plentiful. The resulting waste they produce is observable by city dwellers, restaurant owners, and municipal waste departments.

During the COVID-19 pandemic, New York City experienced a dramatic increase in garbage produced under the lockdown. City budget cuts due to the pandemic resulted in a $106 million decrease in the Department of Sanitation's budget, creating a waste crisis throughout the city. The first program to experience a budget cut was the organic composting program. The program went from a $7 million USD annual budget to a $2.8 million annual budget.

Along with city budget cuts, the COVID-19 pandemic also brought new challenges to restaurants and the commercial food industry. After the month of March 2020, food consumption patterns were dramatically altered. Following the World Health Organizations announcement on COVID-19 on March 11th, waves of panic buying of food and other goods occurred around the world, including in the United States. For a significant period of time many restaurants were

CEU eTD Collection

either fully closed down or ran at a limited take-out only capacity due to city restrictions and social distancing measures. This event and the adaptations that have been adopted by restaurant owners and businesses offers an opportunity to examine the resilience of the urban foodscape through a new lens.

The current city laws on food waste generation target commercial industry through a few critical legislation developments. The Commercial Organics Law (Local Law 146), developed in 2016, requires food service establishments of 7,000 to 14,999 square feet, chain food service establishments with more than one operation, and hotels to separate their organic waste materials and send them to compost. After the COVID-19 pandemic, the city decided to permit a warning period and stop enforcement of the law until July 31st, 2022, without any violation fines or compliance requirements.

Meanwhile, the state of New York is separately undergoing reformative legislation for the food industry and food waste practices more in line with the EPA's Waste Hierarchy. The Food Donation and Food Scraps Law, passed in 2019, officially will go into effect January 1, 2022, throughout the state of New York, with the exception of New York City. Because of the preexisting Commercial Organics Law, NYC is excluded from the state law. Since the COVID-19 pandemic, enforcement of the Commercial Organics Law has been put on hold, leaving a gap for food waste management practices until the anticipated reinforcement of the Commercial Organics Law on July 31st, 2022.

CEU eTD Collection

A first of its kind study by the Natural Resources Defense Council determined restaurants in New York City are responsible for 262,226 tons of food waste annually, equivalent to 20 percent of the total food waste generation, which is higher than the nationally estimated average for restaurant food waste. The report also found that those participating in composting or organics collection were more likely to produce greater quantities of wasted food in total than those that were not participating in composting in NYC. This was tied to reduced guilt attributed to composting food waste rather than landfilling (Hoover 2017).

In relation to NYC's waste management system, the city sponsors a compost collection program in select neighborhoods throughout the city. The budget for this program was slashed from $7 million annually to $2 million due to the COVID-19 pandemic. The program now has limited services to mid-scale compost education facilities, and a select few local food scrap drop-off sites throughout the five boroughs, with limited hours of operation (GrowNYC 2021).

Out of the 70 drop off sites operated by GrowNYC, 23 of them remain open and with hours of operation mostly limited to Saturday mornings, 8 AM-12PM. The drop-off sites are processed by four main organizations: Big Reuse, Earth Matter, Department of Sanitation, and LESEC (DSNY 2021). State-wide, there are dozens of composting facilities which are owned by colleges, Cornell Cooperative, private owners, government, farms, and nonprofits (Figure 1).

CEU eTD Collection

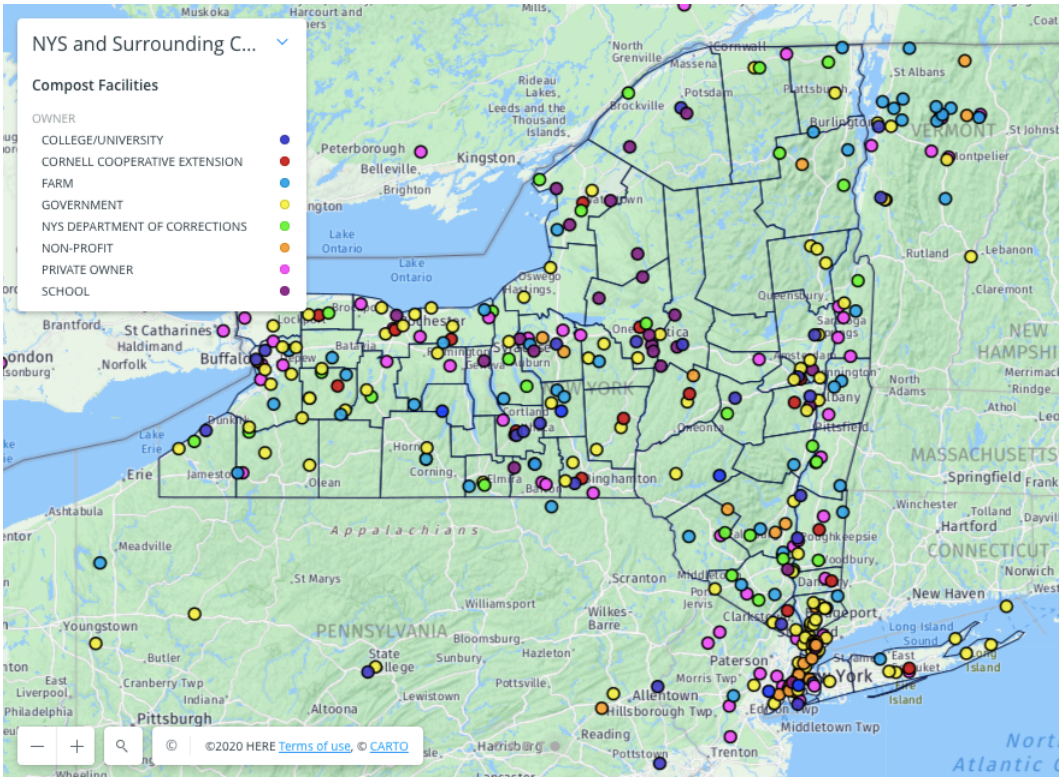

Figure 1

Composting Facilities in NYS, Location and Owner

Image Source: Cornell Waste Management Institute

New York City's food donation network is equally as diverse, decentralized, and expansive (Figure 2). There are several organizations present throughout the five boroughs of the city: Food Bank for NYC with city-wide service, City Harvest, The Bowery Mission, Rescuing Leftover Cuisine, Hunger Free America all have a presence in the city and partner with food businesses to rescue food and get it to those in need. In line with best practice recommendations provided by

CEU eTD Collection

ReFED, most of these food rescue organizations provide transportation free of charge, flexible pickup times, and no minimum donation amount.

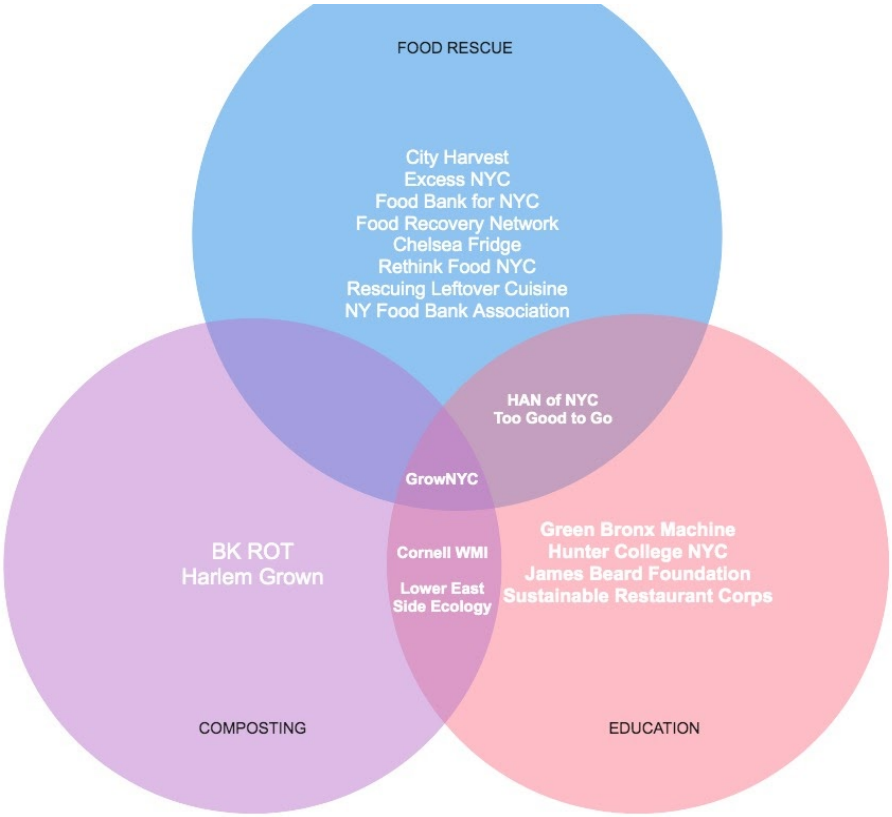

Figure 2

Composition of New York City Food Organizations

Educational organizations also have a strong presence throughout the boroughs. Specializing in raising awareness through educational programs in public schools, these work to promote sustainable practices and knowledge surrounding composting, how to practice food waste reduction, and improve recycling programs. GrowNYC, for example, helps 130 NYC

CEU eTD Collection

public schools develop effective recycling programs through the Zero Waste Schools Program. Each of these schools uses the Department of Sanitation Organics Collection, while GrowNYC programs provide “waste related educational programming to all members of a school community including teachers, administrators, students, and custodial and cafeteria staff” (GrowNYC 2021). They also provide Zero Waste and Food & Nutrition programs for schools, garden workshops, and greenmarket tours.

Online tools like mobile apps are utilized throughout the city in the fight against food waste. A platform sponsored by the city, the donateNYC portal, was created with the intention of enabling businesses and organizations to connect and donate their excess food to local food bank locations. The donateNYC portal utilizes an algorithm to connect to the closest nearby food bank and connects the donator to the individual responsible for pickup (DSNY 2021). Also present are mobile apps including Too Good to Go, OLIO, GoMKT, Food Cowboy, and Food for All. These work to connect consumers to restaurant or residential leftover food fit for consumption in danger of being discarded.

CEU eTD Collection

2. LITERATURE REVIEW

Food waste has become an area of concern and research interest over the last decade. As an issue of national concern, it has drawn attention from policymakers, academics, and private stakeholders. From all along the waste spectrum, research has focused on both consumer end and pre-consumer intervention methods. From food loss during farming, food processing and manufacturing, to supermarkets, hospitals, homes, and businesses, public consensus and awareness has been growing to motivate local governments, states, countries, and citizens to take measures.

The operating definition provided by EU FUSIONS of food waste is "any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)" (EU FUSIONS 2021) While the Food and Agriculture Organization of the United Nations definition differs: "Food waste refers to the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food service providers and consumers" (FAO 2021). FAO defines food waste occurring within five stages: agriculture production, post-harvest handling and storage, processing, distribution, and consumption. Research shows that among those five stages, about one-third of the food waste occurs in the consumption stage- both residential and food services (FAO 2021).

CEU eTD Collection

Most focus on food waste intervention research has been on the household intervention level (Shanes et al 2018; Hebrok 2017; Kanyama et al 2017). This is due to the higher proportion, which is the majority of food waste, occurring in households in developed countries (Parfitt et al 2010). Around 50% of all the food waste in developed countries stems from households (Stenmark et al 2016). Compared to the available literature on food waste intervention strategies in restaurants and commercial businesses, the information pool is narrower and food waste prevention is under-addressed (Betz et al., 2015). Due to rising food costs, food insecurity, and increasing food shortages, prevention of food waste in the restaurant and commercial industry should not be neglected. Several studies have shown that reducing food waste could significantly improve food security (Ingram et al 2013; Priefer et al 2016). Optimization of the donation process requires the involvement of all stakeholders: retail and processing business, regulating bodies, food banks, charity and food rescue organizations.

Silvennoinen et al (2015) determined around 20% of the food handled in restaurants goes to waste. As such, there is a significant role for the restaurant industry to play in food waste reduction, especially considering different food service types with a strong potential for donating food.

Existing research with a focus on restaurant and commercial food waste has mostly aimed to quantify the amount of food waste which occurs in the sector. Out of the restaurant interventions that have been previously studied, a main point of concern has been communication campaigns targeted more toward the customer, rather than management and staff,

CEU eTD Collection

due to increased portion sizes and leftover food on customer plates (Gunders 2012). Low monetary incentives and low autonomy in restaurant settings have been linked to higher amounts of food waste (Matzembacher 2020). Food waste differs between the restaurant type, meal purpose, and consumer groups, showing the need for an improved understanding in barriers and incentives to waste intervention strategies.

Federal legal protections exist in the United States for food donors. Through the establishment of The Federal Bill Emerson Good Samaritan Food Donation Act in 1996, protections for restaurants and well-intended donors from legal and criminal liability are provided. The Act also standardized donor liability exposure and set a floor of gross negligence for intentional misconduct in violation of well-intended food donation to nonprofit organizations (Feeding America 2021). Outside of legal protections for food businesses, there are financial tax incentives for restaurants to donate, rather than send their excess quality food to landfill. Under the Protecting Americans from Tax Hikes Act established in 2015, any food business that donates to a nonprofit organization is able to perform a tax write-off of up to 15% of their taxable income.

The concept of corporate social responsibility (CSR) is another dimension that recently has been added to companies' agendas as they face informed consumers who want to make informed purchasing choices. Restaurants adopting CSR measures and communicating them to customers have been shown to improve customer attitudes and a willingness to pay more for sustainability measures taken by the restaurant (Shubert 2010). Sustainable practices which are

CEU eTD Collection

most frequently adopted by restaurants and food service operations include locally raised and grown food sourcing, using organic produce, composting and recycling restaurant waste (Jang and Zheng 2020). In emissions-reducing potential, prevention of food waste reduces emissions by around eight times more than diverting waste from landfill to composting (Quested et al 2011). This is reflected in the EPA Hierarchy guidelines on appropriate food waste policy and reduction strategies: priorities for food waste are source reduction and feeding the hungry (EPA 2021).

CEU eTD Collection

3. STUDY AIMS AND RESEARCH QUESTIONS

In the wake of the COVID-19 pandemics' shock to urban foodscapes, this exploratory study aims to determine the food waste practices in the restaurant industry of New York City. In line with the EPA's hierarchy of food waste measures, the focus of the study included attitudes and restaurant practices of organic waste composting and food donation measures. The study was one of the first to investigate food waste practices from the perspective of stakeholders in the commercial and independent restaurant industry, filling a needed gap for qualitative knowledge on attitudes, perceived barriers, and level of awareness in the industry. More specifically, this research aims to answer the following questions:

1. What barriers do NYC restaurants face in regard to food waste reduction practices?
2. What are the implications of identified barriers on city policy and the city food donation network?

As the city looks to revisit allocating funding for waste infrastructure, organic waste composting programs, and stakeholders involved in food security and food rescue, understanding impacts from the COVID-19 pandemic on the urban food system is a helpful component in promoting a resilient food system. Incorporating and gaining an understanding of perspectives of different stakeholders is also a critical dimension in developing effective food policy and incentives.

CEU eTD Collection

4. FRAMEWORK

To properly understand the current state of food waste practices and moving towards more efficient practices, two complementary frameworks will be used in the analysis for determining effectiveness of food waste policy and the priorities of food waste reduction.

4.1 Food Rescue Network Models

Food waste has recently been put on political agendas throughout the country, both at the city and state level. The growing interest by political institutions, corporations, and organizations is attributed to reasons stemming from financial costs, environmental and resource conservation, and food security.

Food waste policy in the United States typically falls within two different categories: prevention and recovery methods. Recovery programs include incineration energy recapturing technologies or composting programs, while prevention measures aim to reduce the amount of food waste generated through donation of food and feeding animals. In the U.S., very little food waste is recovered, although this number is growing due to a rise in composting initiatives (US PIRG 2019). Efforts tend to be more heavily directed toward prevention methods with the priority being redirection of excess food for donation.

In the United States, food donation is recognized as the second most preferred method for food waste reduction, second to source reduction of excess food (EPA 2021). Food banks are a key stakeholder in these efforts. Efficient delivery systems, organization, and clear governance are important factors in making these efforts run smoothly. Bierma (2019) identifies different

CEU eTD Collection

models of food donation which are used in city networks. The Hands-Off Kitchen Model, where local health authorities are not involved in food regulation and inspection, is considered the most widely used model in the United States. The most decentralized, this network model requires restaurants and kitchens to develop and follow their own standards for food requirements (expiration dates, best by dates, visual standards of produce, etc). There is an increased responsibility placed on restaurants in maintaining health and quality standards.

A model which lies in between two extremes of highly centralized and decentralized regulation is the Coordinating Council model, which involves the development of a separate organization with the sole purpose of mending problems involved in highly decentralized food networks. This model typically includes the establishment of an entity with representatives from food rescue organizations, government officials, and food businesses. Examples of this model are seen in institutions like Waste Not OC Coalition and the Food Rescue Partnership in the Quad Cities based in Illinois, both which were created as local health department initiatives.

The Small Load Logistics Model typically involves the use of agencies and volunteers using their own means of transportation in order to distribute food donations**.** A drawback in such a highly decentralized model includes a lack of reliability and a lack of resources to maintain food safety and regulation (Food Shift, 2015; Natural Resources Defense Council, 2017). At the same time, costs in this model are low and put little strain on financial resources of city government and nonprofits.

CEU eTD Collection

The most centralized means of regulation is a Universal Inspection model, requiring the local health department to take a leading and omni-present role in food donation inspections. The main draw and idea of the model is to improve safety and quality of food donation, although logistical issues involved in maintaining one agency as the responsible party are increased. This approach puts intense strain on city funding. It also has the potential to take away from the legitimacy of existing networks which have previously been established throughout the city.

New York City rescues over 83,000 pounds of food to be donated every day (GrowNYC 2021). While over 2.6 million New Yorkers are at risk for food insecurity, this is an important part of the incoming food for food banks and shelters. Organizations throughout the city that specialize in food rescue depend on funding mostly from city, federal, corporate, and individual donors. There is a plethora of organizations that work in the area of food rescue throughout the city. In total, there are 27 organizations that specialize in food waste: specialization areas lie between food rescue, composting, and education on food waste. The network of organizations which take part in food waste-saving efforts are multi-purpose, community based and often volunteer-run in the city of New York. There is a mix of organizations which specialize in only food banks, food composting programs, and food donation transportation and organization.

The most dominant food rescue organization operating in New York City is City Harvest, a not-for-profit group that delivers, free of charge, to community programs and food banks. They partner with restaurants and other commercial entities in order to receive excess food and transport it to those in need. With a public support revenue and net assets of $143,325,311, they

CEU eTD Collection

are almost entirely funded by private corporations and individuals, while government grants account for around 0.7% of the program's funding. City Harvest is self-defined as “founded on the visionary concept that excess food should feed someone who is hungry rather than be thrown away” (City Harvest 2021). The organization delivers food with a fleet of 22 trucks from established partners free of charge to community programs that feed New Yorkers in need. Their partners and donors include farms, grocery stores, restaurants, and manufacturers.

4.2 The United States EPA Food Waste Hierarchy

Relevant food policy typically follows the model presented in the Environmental Protection Agencies’ “Food Waste Hierarchy” (Figure 3), which exhibits the priority chain of what local agencies, business, and city programs should be addressing regarding food waste measures.

CEU eTD Collection

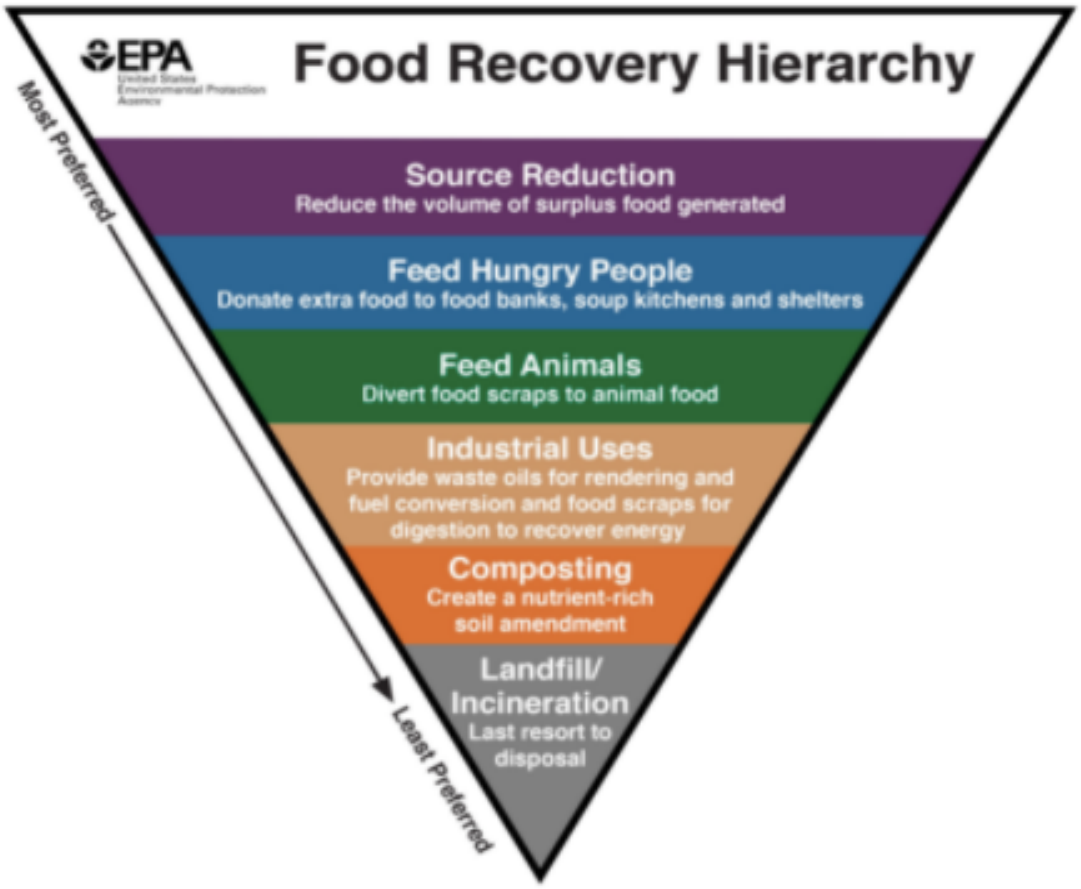

Figure 3

The EPA Hierarchy of Food Reduction Strategies

Source: US EPA 2021

The highest preference option is source reduction, with the last resort being landfill or incineration of food waste. Source reduction includes taking measures like better shopping practices, tracking and efficiently monitoring available foods to avoid waste entirely.

CEU eTD Collection

Feeding the hungry through donation efforts is the second objective. Feeding animals, industrial uses, composting and landfill/incineration follow as the least preferred method (EPA 2021).

The three dimensions in approaches to food waste policy: prevention, recovery, and recycling, all compete with one another through different environmental, social, and economic interests (Mourad 2016). These competing factors occur through the interaction of multiple stakeholders including producers, consumers, composting facilities, farmers, businesses, municipality waste removal services, non-profits, and food banks. The second most preferable option for the commercial sector in line with the EPA hierarchy, to feed those in need, can be done through food bank donations through an intermediary group or directly from the business to the food bank.

In moving toward the ambitious goals that have been set out by the cities' local government, the OneNYC Plan has set out to reduce the food waste produced in the city by 90 percent by the year 2030. This target requires a reimagination of the city's food network and waste management system. In this reimagination process, the Environmental Protection Agency's Food Recovery Hierarchy should be at the forefront of future programs and policy developments. The hierarchy highlights the preference of feeding and resourcing extra food over the practice of composting, one which has recently been commonplace in New York City through city-sponsored food scrap and composting programs. This program, the NYC Compost Project, is carried out through the following partner organizations: Big Reuse, Brooklyn Botanic Garden,

CEU eTD Collection

Earth Matter NY, LES Ecology Center, The New York Botanical Garden, Queens Botanical Garden, and Snug Harbor Cultural Center & Botanical Garden. At a time when funding for city compost programs in New York City have been non-existent or significantly limited for more than a year, the access and use of the food scrap drop-off spots and collection has been reduced since March of 2020.

The information collected from NYC restaurants will be analyzed with these two frameworks in mind. First, the EPA Hierarchy will be considered in determining where NYC restaurant priorities currently stand in reference to national priorities. Second, food donation network models will be examined to determine the current status quo of the NYC network. The models will be examined to identify the most critical applications to address the barriers identified in restaurant data.

CEU eTD Collection

5. METHODS

For the purposes of defining current restaurant food waste practices, barriers and incentives for reducing food waste, this study used survey questionnaires (Appendix A), which received 51 respondents. Restaurants were selected based on concentration of businesses in Manhattan and Brooklyn: neighborhoods were selected, and businesses were approached in person by the researcher with a brief introduction and a brief explanation of the research project. The first point of contact was asked if there was either a manager, owner, chef, or somebody knowledgeable about the restaurant's food waste practices that would be able to answer the survey questions. The responses to the surveys were logged by the researcher into a Google Forms survey in order to summarize results. Upon completion of the surveys, nine participants were available for more in-depth discussion about their restaurant's food waste practices. Of these discussants, four participants were comfortable with having themselves recorded, which were then transcribed by the researcher. These were divided into six different categories: source reduction activity, donation barriers or incentives, composting, measuring of waste, and COVID-19 restaurant experience.

Upon discussions with restaurant participants without being recorded, written field notes were taken on any information that was related to the same six categories: reduction activity, donation activity, composting, measuring of food waste, barriers and incentives to food donation, and COVID-19 experiences. Differences in food waste practices and quantities experienced were a key part in COVID-19 experience.

CEU eTD Collection

The area of study was the Lower Manhattan and Brooklyn neighborhoods of New York City: the neighborhoods of Chelsea, West Village, Greenwich Village, Soho, and Williamsburg were of main focus. The selection of the study was based solely on a high concentration of restaurants in these areas. Distribution of surveys and discussions were completed in a one-week period between May 17th, 2021 - May 23rd, 2021. The surveys were completed in person by going door to door of food businesses in selected neighborhoods. Managers and restaurant owners were typically the point of contact for restaurant compliance reasons. Servers, hosts, chefs, and cashiers were also asked to fill out the survey if they were aware of the waste management practices with the consent of management. In total, the survey was completed by 51 respondents to the survey questionnaire from 51 different restaurants regarding food waste practices and the impact of the COVID-19 pandemic on food waste. The survey (Appendix A), prompted information about current food waste practices, tracking methods, food donation practices and barriers.

Restaurants ranged in size and food service type from cafe style, full service sit down, a la carte, and fast-food operations. There was a mix of corporate chain, franchise, cafes, and independently owned restaurants: 31% of the participating restaurants were corporate chain restaurants. They were composed of ten different chains, each with one to three different locations participating in the survey. There were 28 participating restaurants that were independently owned. Follow-up discussions spanning between five to ten minutes were

CEU eTD Collection

completed with two different chain restaurants while the remaining seven discussants were independently owned restaurant managers.

5.1 Study Limitations

The restaurant surveys and discussions were limited in their geographic scope to a select group of neighborhoods of New York City, and as such should not be assumed as representative of the entire city and the food industry practices. Because the area of study was based on concentration of food businesses alone, it should also be noted that there is limited diversity in the demographic population of the area selected. Time constraints placed a significant limitation on the study and the number of participants able to be reached, as well as the type of data able to be gathered. Survey questionnaires and reporting on food waste practices also leave room for participant error or misleading answers.

6. RESULTS

6.1 Food waste accounting methods employed

As shown in Figure 4, tracking of food waste was reported by 67% of respondents, with visual estimates being the most popular method of tracking. Measuring food waste by counting bags or containers was the next most common method with 25% of restaurants. Two restaurants reported weighing their food waste by using a software system through an external company, LeanPath, that tracks food types, exact weights, and reasons for disposal with an aim to significantly cut back a restaurant's food waste. One restaurant reported using a "waste log" to track food waste, which upon follow up was described as a "self-designed form using a

CEU eTD Collection

combination of photos and text" (Participant #15). The Environmental Protection Agency's "Food Waste Logbook" was regarded as an exemplary model of a waste log. According to this model, pre-consumer and post-consumer waste is to be measured by food type, loss reason, and either number of portions, quarts, or pounds (EPA 2021).

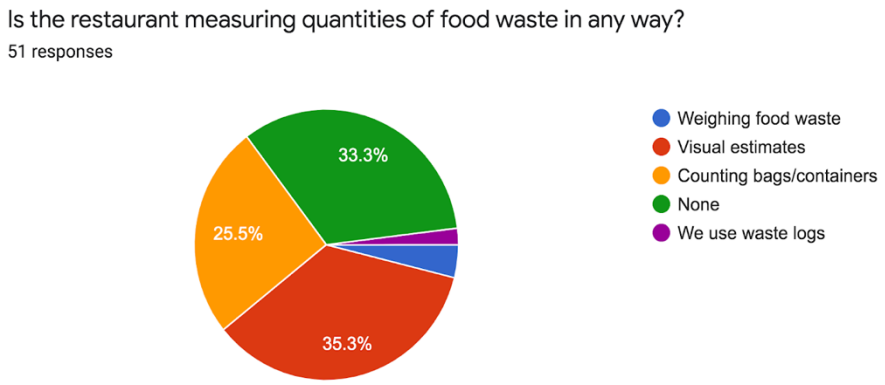

Figure 4

Responses to Question #1: Measurement methods of food waste

6.2 Methods of Disposal of Edible Food

The most widely used food waste methods reported by respondents was "dispose of in garbage". Out of all 51 respondents, 38 restaurants reported they dispose of edible food in the trash bin, while many also reported a combination of both discarding in the trash bin and sending food home with employees.

Mobile phone apps, which have recently become popular as intermediaries between customers and food businesses to sell discounted leftover food in urban centers, were also reported to be used by nine survey participants (Question #3). The Too Good to Go app was the

CEU eTD Collection

leader in usage by restaurants, which were reported mostly by independently owned operations and one chain operation.

6.3 COVID-19's Impact on Food Waste Quantities

An increase in food waste since the beginning of the COVID-19 pandemic, March 2020, was reported by 59% of respondents (Figure 5). The rest of responses stated they experienced a decrease in food waste (13%), or neither increased nor decreased (29%), while three respondents noted that they were unsure of any difference. Responses to this question were limited to the restaurants that had been open both before and after the COVID-19 shut down, which included all except

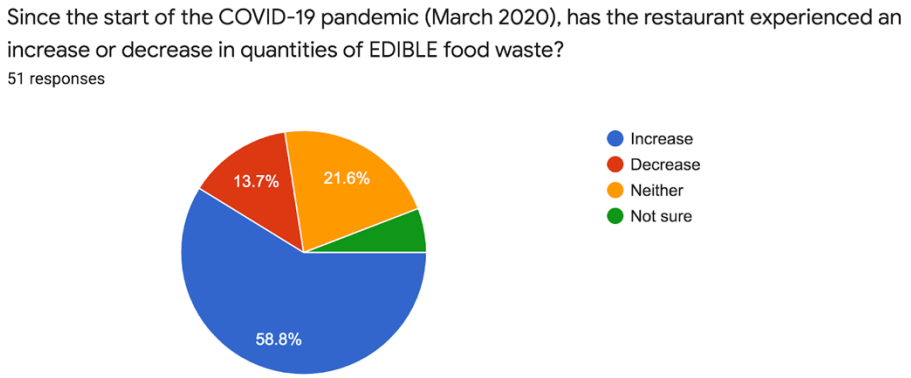

Figure 5

Responses to Question #2: Changes in quantity of food waste

one restaurant that upon follow-up stated that they only opened after the COVID-19 lockdowns. Reasoning for an increase in food waste included a shift to take-out only operations that are more

CEU eTD Collection

wasteful per meal by ten participants, while five participants identified a plummet in sales as a leading cause in their increase in total food waste. Four participants regarded the fluctuation in COVID-19 regulations as posing a challenge to restaurant food inventory and demand.

One owner from an independent operation in the West Village, noted the following in regard to the drastic decrease in restaurant sales: “We would try to adjust to demands..it was difficult to anticipate what our orders would look like for the next week, and adjust accordingly to whatever that might be” (Participant #34). During the period of lock-down throughout the city, five participants mentioned they were running on slimmer margins of profit or even running into the red while running a take-out only restaurant.

Upon follow-up on this period of struggle for the restaurant industry, one independent restaurant owner explained the issue of increasingly popular third-party delivery services: UberEats, GrubHub, DoorDash, all being noted as a difficult but also necessary part of the business now. “During the pandemic, delivery apps are charging 20-30% commission on each order, so we were losing a big chunk of our profit on what’s already a slim margin. (Participant #40).

Although it seems it was just part of operating and staying afloat during the pandemic, as city and state regulations did not allow restaurant dining from the period between Early March until June 22, 2020, when outdoor dining was reopened through the launch of NYC Open Restaurants program. Outdoor dining was permitted, while indoor dining was banned until October 30th, when 25% capacity was permitted. On December 11, 2020, a second ban on

CEU eTD Collection

indoor dining occurred until March 2021, when 35% capacity was permitted, and finally 50% capacity by late March. Only upon New York City's full reopening on May 19, 2021, restaurants were permitted to full capacity as long as tables remained six feet apart.

Five participants identified in follow-ups regarding an increase in food waste, expressed that anticipating needs and food quantities based on city regulations was a major factor in increasing food waste levels. It is helpful to regard the restaurant and social distancing timeline to explain the anecdotal evidence provided by restaurants that were able to remain in business: anticipating the next wave of demand and whether they would be opening their doors remained uncertain for many restaurant and food businesses.

6.4 Perceived Barriers to Food Donation

The uncertainties related to liability of food donation was the most consistent theme in written survey questionnaire responses and follow-up discussions with restaurant participants. Concerns were present across all restaurant and food service types, both chain-style restaurants and independently owned operations, and concerns about restaurant liability were the most cited reason for being hesitant to donate excess edible food.

Concerns were present across both chain-style and independently owned restaurants. Although, concerns were more likely to be identified as financial liability more by independent owners, while chain operations were more likely to note things like management protocol and corporate policies as the most significant barriers to improving food donation practices.

CEU eTD Collection

At one independent restaurant, there was a focus on alternative methods to reduce their edible food waste by as much as possible because of their concern for perceived liability of donations:

"As a restaurant, we are liable if somebody gets sick or even chokes on our food...so we instead focus on mitigating all food waste..for example, even with the parts of food that most people don't think of as edible, we will take avocado pits and grind them into a syrup..we will use the entire lemon peel in different dishes..."

The same restaurant used "family style meals" at the restaurant for the employees to use up any food that might be on the end of its life. Although this was the only occurrence of the mention of a "family style meal", there were twenty participants that claimed they would send excess food home with employees at the end of the day in order to divert waste.

Liability remained a concern for several independent restaurants. A Brooklyn independent restaurant owner stated: *"*I would love to donate our food, but I worry about the liabilities if somebody were to get sick for some reason (Participant #29).*"* Several respondents resonated with a similar worry on the survey questionnaire, citing either lawsuits or being sued when prompted about uncertainties regarding liability:

"How to avoid alleged food poisoning lawsuits?" (Participant #1)

"Yes, food might go bad or make somebody sick" (Participant #5)

"Lawsuit over food donations" (Participant #10)

CEU eTD Collection

"Concerns over being sued" (Participant #14)

"Expiration dates can play a huge factor when it comes to liability" (Participant #15)

"Yes, concerned about being sued for bad food" (Participant #19)

The perceived barriers identified toward practicing restaurant donation were in direct contradiction with the national standards and best practices laid out in the EPA Hierarchy framework. The top priority with unavoidable food waste is to redirect food to those in need, showing a significant awareness gap in food waste practices.

6.5 Perceived Barriers to Composting Practices

Space restrictions and costs were the most identified barriers to organic scraps composting. Fourteen participants identified space restrictions as a reason to not compost, while costs were identified as the second major barrier. Upon follow-up with participants, these were due to limited restaurant space which made the practice of composting organic scraps difficult. They consisted of independently operated, smaller restaurant operations in the Lower East Side or Brooklyn.

A second major barrier identified by four restaurants was costs of composting services. High costs were limited to their association with composting services or time and resources of employees, both through external organizations as well as on-site composting.

An independent full-service restaurant manager in Brooklyn stated:

CEU eTD Collection

"Having a composting service is..expensive..we're not in a position where we can take on those additional costs as of right now on top of stuff like insurance, equipment we needed to purchase cuz' of the pandemic..it's just not in the budget." (Participant #38)

Out of the total survey responses, 16 surveys were completed by a restaurant that is classified as a chain or franchise. In regard to the NYC Organics Law, they would have been expected to participate in organic composting practices, either on-site or through a separate organization. According to the survey responses, none reported currently using an on-site compost or an external organization for removing organic waste materials.

Another recognized barrier that appeared in two separate discussions with restaurant managers from both corporate chain and independent restaurant full-service restaurants was the mention of employee turnover. One corporate manager commented on annual employee turnover being above 150%, so training efforts in the restaurant should be kept to a minimum.

Not only do composting operations require back-of-house training on waste division, sorting, and transportation or drop-off of compost materials, but they also require time, effort, and resources of restaurant management to be spent on more detailed waste separation. That time could be otherwise spent on customer service and other tasks which keep the businesses running, so some management took issue with a perceived cost-benefit imbalance.

CEU eTD Collection

6.6 Restaurant Food Donation Practices

The responses as well as follow-up discussion about food donation varied between restaurant type, size, and chain. Out of the nine restaurants that did participate in donation

activity, the use of outside organizations included City Harvest (7), Food Bank for NYC (1), and Chelsea Fridge Volunteers (1). Out of the restaurants that reported donation activity, seven of the businesses were chain style businesses or franchises.

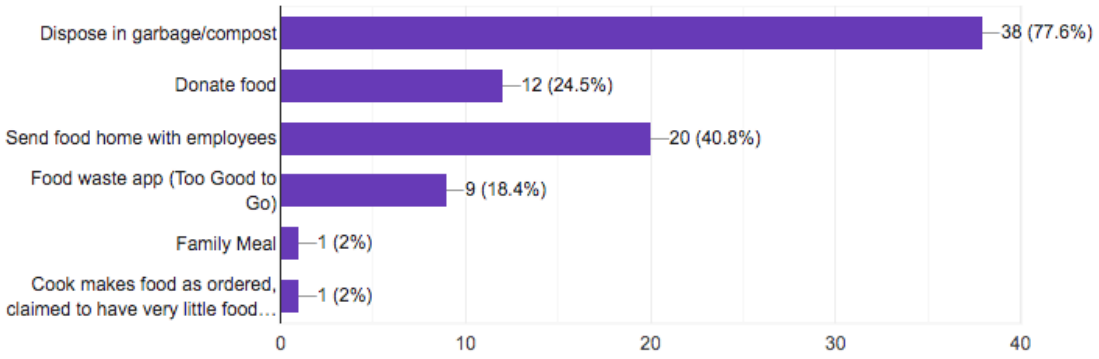

Figure 6

Responses to Question #4: Methods of Edible Food Disposal

Chain restaurants still varied between locations in their responses to food donation. Between the same franchise, different locations reported different methods- one which donated through City Harvest, one which did not donate through any organizations at all, suggesting that each franchise had freedom in choice to donate or not to donate.

A separate franchise reported consistently donating through City Harvest. Upon follow-up, the restaurant claimed to have city-wide partnership with the organization. With 64 franchises of the chain in the city, they all presumably partner with the City Harvest group for excess food donation.

CEU eTD Collection

A deli owner in Chelsea claimed "...they had very little food waste, we make our food as it's ordered." (Participant #22), also stating that if someone comes in at the end of the day asking for food, he gives it to them if they have extra. He stated he would also give food free-of-charge at the end of the day directly to those in need outside of his shop, usually to those that were homeless. The value of alternative and simpler means of donation such as this can often be overlooked in food network models.

Regarding smaller independently owned businesses, costs of composting as well as donating food were noted in three separate conversations with restaurant managers. Upon further discussion on the topic of cost, one Brooklyn owner stated that they must pay for things like compost pick-up services, storage space, and insurance coverage for liability protections if they wanted to donate their excess food, noting that as the main barrier for not donating their excess food.

One franchise operation claimed they donated to a volunteer-pickup service, Chelsea Fridge, at the end of each day (Participant #16). Upon visiting the Chelsea Fridge operation, this appeared to be a hyper-local way of addressing food security in the community. The Chelsea Fridge is located in the heart of the neighborhood of Chelsea and is available at any time for donors to leave food (following provided guidelines), and for those in need to take what food they need.

CEU eTD Collection

6.7 Distinctions Between Chain and Independent Restaurants

Between chain and non-chain restaurant types, chain restaurants reported a higher usage of food rescue organizations. Out of the sixteen surveyed chain restaurants, five reported partnering with a food rescue organization (Figure 7).

Compared to chain restaurants, the percentage of independently owned businesses that participated in donation was smaller: out of 35 businesses surveyed, three reported using a local food rescue organization to donate excess food (Figure 8). This was equivalent to 8% of non-chain restaurants participating in donation, compared to 31% of chain restaurants reporting participating in food donation.

Additionally, concerns over liability were only mentioned once by a chain restaurant manager, who claimed that liability concerns were due to corporate policy. All other mentions of liability over donated food were from independently operated businesses.

CEU eTD Collection

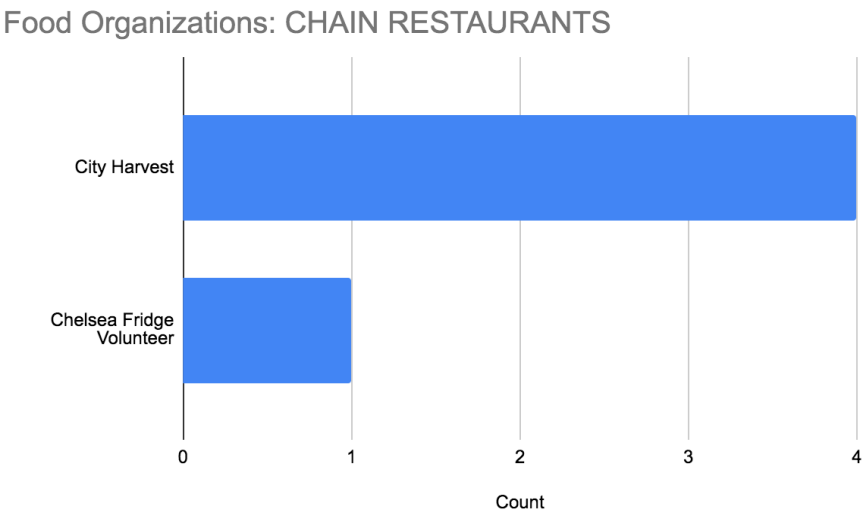

Figure 7

Food Rescue Organizations Used by Chain Restaurants

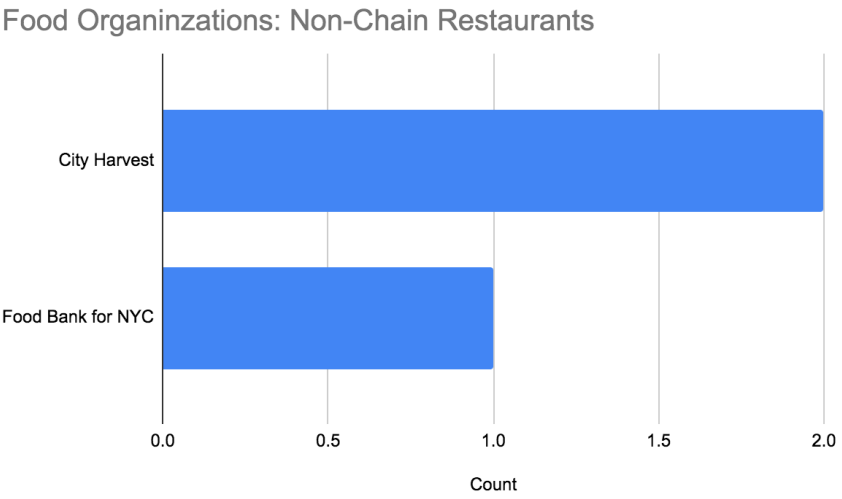

Figure 8

Food Rescue Organizations Used by Non-Chain Restaurants

CEU eTD Collection

One of the most significant differences was apparent in reporting on Question #4 (Figure 7 & 8), “What does the restaurant do with EDIBLE excess food?” Between chain and independent restaurants, usage of food waste apps was mostly limited to independent restaurants, with six restaurants reporting the use of a food waste app. Comparatively, only one chain cafe-style business which sold baked goods and pre-made dishes reported the use of a food waste app. In both cases, they all reported the use of Too Good to Go as the app of choice.

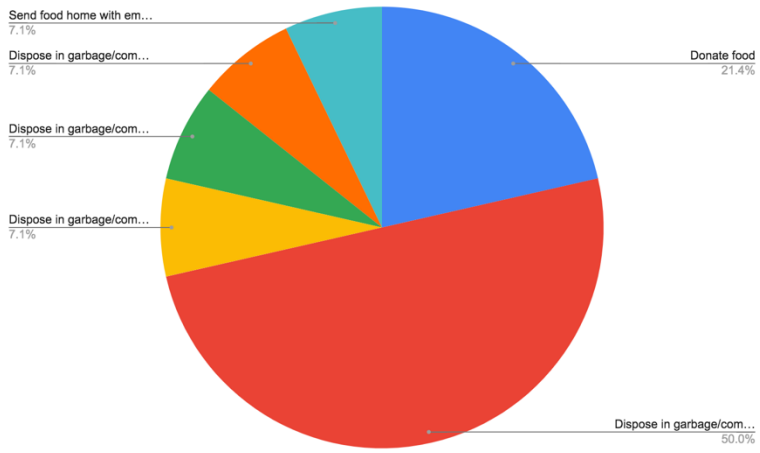

Figure 9.

Responses to Question #4: Methods of Edible Food Disposal in Chain Restaurants

CEU eTD Collection

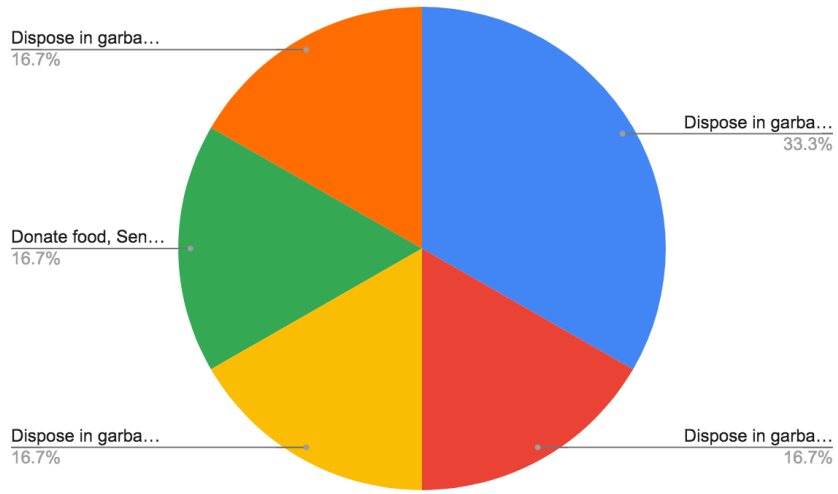

Figure 10.

Responses to Question #4: Methods of Edible Food Disposal in Independent Restaurants

CEU eTD Collection

7. DISCUSSION

Reflecting upon the data, a few main policy recommendations will be offered. Specific to New York City, this analysis offers lessons for broader food waste mitigation, food networks, and security. The main barriers identified included liability concern, lack of awareness, and financial costs. Implications of these barriers on food rescue networks will be further defined.

7.1 EPA Hierarchy Applications

Level 1. Source Reduction

Source reduction as the most preferred food waste reduction method within the EPA Hierarchy appeared in several examples within restaurants that were practicing sustainable initiatives and innovative food preparation. From both West Village and Tribeca neighborhoods, evidence of waste log tracking, software tracking, and family style meals which took advantage of any near-expiration foods, and innovative use of food parts showed practices aimed to achieve source reduction of food waste. These practices were the exception rather than the rule, as 34% did not track waste in any way, while another 35% claimed to use visual estimates of waste, which shows the least accuracy and informative data for restaurants to be able to improve their efficiency (Hanks et al 2014).

Level 2. Feeding the Hungry

Secondary to source reduction, feeding hungry people was not as widely practiced in line with hierarchy standards. Only nine out of the 51 participating restaurants claimed to donate excess edible food, which leaves a significant gap for food waste diversion. Corporate chain restaurants were more likely to prioritize food donation of excess edible food.

CEU eTD Collection

Level 3 & 4. Feeding Animals and Industrial Uses

After donating excess food, feeding animals and using organic materials for industrial use is next in priority. There was no mention of this being practiced by any of the participating restaurants, so no conclusions about the status of this level can be drawn here.

Level 5. Composting

The presence of the Commercial Organics Recycling mandate flips the hierarchy of priorities in terms of food waste reduction. The city appears to follow more of an upside-down structure, placing priority in composting incentives while no policy support for food donation is present in the city.

Within the EPA Hierarchy, composting is considered a last resort option for food waste. In the absence of policy which promotes food donation, source reduction, and feeding animals, the city composting requirements place city efforts in Tier 5 of the EPA Hierarchy. While the city policy is stuck in Tier 5, it is worth considering incentives and ways in which the food industry might be able to move up to the preferable top two tiers: source reduction and food donation.

The actual data from NYC restaurants tell a bit of a different story. There was an observed absence of composting efforts which suggests a disconnect in Law 146, the Commercial Organics Act. All but one chain restaurant located in Chelsea reported disposing of their food scraps in the garbage bin. The Chelsea chain restaurant reported using both the garbage bin and an external organization to remove their organic compost materials. Although there are explanations for this current disconnect: the most important being the pause on enforcement of the Commercial Organics Act due to the COVID-19 pandemic.

CEU eTD Collection

Level 6. Landfill

Although city policy finds itself in the above composting tier, actual restaurant practices were observed mainly as sending food waste to landfill. Out of the total 51 participating businesses, the majority used only garbage bins for disposal.

7.2 Implications for Food Donation

Practicing the donation of excess food was the exception rather than the rule for the participating restaurants. Although the food donation practices tended to be performed more by chain style restaurants and food service operations, it was frequently expressed that they wished it was a safer process. Instead, the concerns over food donation, safety, and liability remained a major concern for smaller business owners.

At the same time, anecdotal evidence received in both surveys and follow-up discussion suggested that restaurants, especially independently owned and operated, hold the conception that food donation is a risky behavior for a business to take part in. The responses suggest an attitude which has previously been noted in other research on restaurants food donation misconceptions and worries (ReFED 2018; Sakaguchi et al 2018; Rack 2018). Restaurant owners have a pressing concern for the liabilities they have over consumers of their food. Several restaurant entrepreneurs had invested most of their livelihood and resources into their business, so it is rational for them to be wary of total financial responsibility.

Although, the apparent beliefs on restaurant liability reveal a knowledge gap where there is significant room for targeted educational campaigns, training, and awareness-raising efforts. Previously recognized, there is a presence of organizations with a focus on educating and raising

CEU eTD Collection

awareness in NYC about food waste. They are mostly limited to youth programs, elementary and primary school education programs. Connections to the commercial and food business sector seem to be untapped in terms of local outreach and educational initiatives.

The James Beard Foundation is exemplary in targeting educational initiatives toward the restaurant industry. As a national initiative, the foundation has developed a curriculum for chefs and restaurant workers around the country (JBF 2021). Scalability and effectiveness of education and outreach programs rely on accessibility across a variety of restaurant types- including chain-style, franchise, and independently operated. A focus on targeting independent restaurants might also work to address the misconceptions around liability, as the main category of respondents which held liability misconceptions were those in independent businesses. Effective curriculum and chef outreach should emphasize a focus on liability protections, like Bill Emerson and local NYC guidelines.

7.3 Food Donation Network Models: Decentralized to Centralized

The city of New York remains highly decentralized as a food donation network. With a presence of multiple different food rescue organizations, there are a plethora of stakeholders and actors that contribute to rescue from business operations which keep many of the boroughs decentralized as their own food rescue networks.

Several restaurants showed more local initiatives in their own businesses: waste tracking, restaurant employee meals, and donating directly to those in need without intermediary parties are examples of such efforts. Evidence from the NYC restaurant participants suggests that City

CEU eTD Collection

Harvest was the most widely used food rescue organizations which crosscut all neighborhoods and restaurant types. This held especially true for corporate chain restaurants, serving City Harvest best as a scalable and dependable input of food. Partnerships with the City Harvest organization were present in different boroughs of the city and mostly concentrated in the West Village and Chelsea neighborhoods.

At the same time, examples like Chelsea Fridge follow an open-door community fridge model like others throughout the city: Overthrow Community Fridge, Queens Village Community Fridge, The Uptown Fridge, and The Living Gallery, show a hyper-localized effort to rescue food and get it to those in need. These kinds of solutions highlight ways in which a centralized system might not be able to recognize value in: regulation is virtually non-existent and relies on trust in the good intentions, awareness and knowledge of all parties. Nonetheless, there is extreme value in initiatives like community fridges in their ability to fill needed gaps, create a sense of community effort, and minimize the logistics behind transportation and planning of food delivery.

Similarly, filling needed gaps through a decentralized system was reported by several independent restaurants using mobile apps, like Too Good to Go, which sell leftover food at a significantly reduced price. The benefits in using technological solutions like these have the potential to ease stressors on organizations, often volunteers, who are typically required to mobilize leftover food from businesses. By removing the coordination of transportation, these tools can connect the consumer directly with their food. Although Too Good to Go is for-profit,

CEU eTD Collection

this same model can be used as a lesson in bridging gaps in the food donation network. Concentrated urban environments with bustling food businesses, like NYC, have great potential to capitalize on this model.

The presence of the food donation networks and tools did not appear to be fully employed, or known of, by survey participants. Several of the organizations that have a presence in the city were unheard of, while City Harvest was the only organization which had name recognition across most of the survey participants. Understanding this, awareness about the different options for food donation should be targeted as a way to increase partnerships and usage of a plethora of food donation services and tools.

7.4 Implications for Composting Services

Regarding composting practices, the 16 chain style restaurant responses suggest that organic waste composting is not practiced by the restaurants the Organic Waste Law (Local Law 146) targeted. Since NYC has a halt on the enforcement of the law because of the COVID-19 pandemic, this is not necessarily a surprise. Restaurants typically run at slim profit margins, so while several restaurant managers have noted costs as barriers for composting, taking on additional costs to participate in composting services might not be expected voluntarily. Especially considering the current economic state of the restaurant industry post-COVID-19 measures, many restaurants merely try to stay afloat after a significant period of decreased profits.

CEU eTD Collection

Besides the lack of enforcement of previously established ordinances, a major barrier to composting organic scraps that was identified in survey and participant follow-up was costs of external composting services. Based on data from a CoRR analysis, the average cost of collecting and disposing of commercial waste was $103 to $160/ton, while city curbside food waste collection ranged from $113 to $233/ton (De la Houssaye and White 2008; BioCycle 2021). The crucial factor in high compost service costs is proximity, as facilities used for commercial organic waste are 80 to 130 miles away from the city.

Referencing the CoRR cost analysis, it is not surprising restaurant participants often regarded costs as the most dominant barrier. Composting services in the city are performed by private companies, which remain cost-competitive but are supposed to follow a city regulated cost ceiling of $208/ton. Current estimates put the current upper range above that cost cap, at $233/ton. Reducing transport distance is one efficient way to reduce costs of organic composting services.

Composting programs rely on proper staff training on a multi-bin system. Customer education for front-of-house organics bin separation is typically communicated through clear signage. As several independent restaurants had noted resource inputs and employee turnover as a significant barrier, easing these stressors on restaurants by providing toolkits, clear signage, and educational programs, which aim to provide the best options for composting in house. There is also potential for city-backed or private corporate sponsored programs, grants, and funding to

CEU eTD Collection

support sustainable composting measures and waste reducing strategies in restaurants, especially for independent and small businesses.

7.5 Policy, Incentives, and Education

In moving from Level 5 up to Level 2 of the EPA Hierarchy, the efforts of targeted restaurant outreach inform restaurants of potential benefits of food donation practices. This can be utilized in motivating stakeholders in the food industry to prioritize donation over disposal and composting of edible food.

The primary financial incentives for restaurants are federal tax deductions. Federal regulations in the United States currently allow restaurants, grocery stores, and businesses to use a tax write-off system based on the amount of food donated to local nonprofits, food banks, or other organizations. The regulation is based on the Protecting Americans from Tax Hikes (PATH) Act, which expanded incentives in 2015 to include all C-corporations, S-corporations, limited liability corporations (LLCs), partnerships, and sole proprietorships (ReFED 2021). The tax incentives include general (non-enhanced) deductions, which allow for businesses to deduct "the amount of the property's basis". A second extra incentive option allows a business to "deduct the lesser between either twice the basis value of their donated food or the basis value of the donated food plus one-half of the food's expected profit margin" (ReFED 2021). This is known as the enhanced deduction option. Based on low donation rates of the survey participants, it can be assumed that most non-donating restaurants also do not participate in the tax incentive programs provided upon food donation to local charities and non-profit organizations.

CEU eTD Collection

Upon follow-up discussions, a majority of participants also were not aware of the existence of tax deduction opportunities for their excess foods, while there were three participants who were aware of tax write off programs but claimed they did not have sufficient amounts of waste to donate (Participant #24, #29, #46).

The Nashville Food Waste Initiative, established in 2015, serves as a successful educational model for city-level food waste programs. Their goal is "to engage governments, consumers, restaurants, community institutions, and retailers to prevent food waste, rescue surplus food to direct to people in need, and compost and digest what's left to help build healthy soil" (NRDC 2020). Resources that they provide through their website include landscape analysis of composting and food rescue, "A Donor's Guide to the Enhanced Federal Tax Deduction for Food Donation", "Legal Fact Sheet for Food Donation in Tennessee: Liability Protections", and "Packaging Best Practices for Prepared Food Donation" (Urban Green Lab 2021). They began the Mayor's Food Saver Challenge, which currently has 40 participating restaurants pledged to adopt food waste reduction strategies. Key to their programming is providing resources which educate local businesses on their liability protections, and incentives to donate through federal tax incentives.

The Food Rescue Partnership can be regarded as an exemplary program for education and outreach. Included in their outreach is a fifteen-minute presentation on food donation which is taken as part of the food safety course for restaurant managers (FRP 2021). The incorporation of major food distributors within the partnership also acts as an important factor for accessing

CEU eTD Collection

untapped resources across the operation chain. Distributors, large chain operations, and food businesses are often aware of resources with potential for easing stressors on the nonprofit organizations and food banks.

Financial and tax incentives for businesses have an additional potential for motivating food service operations to participate in food donation. Using federal tax deductions through the Enhanced Federal Tax Deduction for Food Donation, businesses can additionally find financial incentive to donate, rather than send excess decent food into landfill or compost. All sole proprietorships, LLCs, S corporations, and partnerships can all benefit from using these. Calculation of these enhanced deductions follow the lesser of either twice the market value, or the fair market value minus the tax basis (NFWI 2020). To apply for them, the businesses must generate taxable income and retain a record of donation from a charitable organization, which are plentiful throughout the city's five boroughs.

7.6 Liability and Protections

Understanding the barriers and potential inhibitors that restaurants and businesses faced, Congress passed the Bill Emerson Samaritan Act in 1996 with an aim to address some of the concerns in terms of business liability when donating food in good faith. The act absolves donors of potential civil or criminal liabilities for injuries that result from the use of a donated item, except in the case of gross negligence or intentional misconduct.

Historically, and still today, a major point of concern for businesses is the 51 different state liability laws which govern them. Businesses typically default to the statements provided by

CEU eTD Collection

their respective states' laws, while the federal Bill Emerson law loses its intended purpose. In relation to state protections, the state of New York follows the Bill Emerson law model:

> "New York law provides protection from civil and criminal liability to good-faith donors who donate any canned or perishable food, farm product, game or wild game to a charitable or nonprofit organization for free distribution. Good-faith donors include, but are not limited to, public food service establishments, meaning places where food is prepared, sold, or served for immediate consumption; ordered or taken out by customers; or prepared for delivery and consumption elsewhere. New York state law does not provide liability protection when the donor has actual or constructive knowledge that the donated food is adulterated, tainted, contaminated or harmful to health." (Harvard Food Law and Policy Clinic 2018)

A major critique of the Bill Emerson Law, as well as several state regulations, is the gap in protection left for food businesses that donate directly to the final recipient. An example of this gap was provided by a small business owner in Chelsea, who gave leftover food to those that needed it outside of the shop. According to the Bill Emerson Law, his efforts would not be protected due to the lack of an intermediary organization to regulate the movement of food between donor and recipient. As such, there is room for local policy to offer additional protections: to offer more inclusivity so restaurants can participate in a decentralized, less logistical effort, and zero transportation donation of quality and fresh food.

CEU eTD Collection

This is especially true for a sizable portion of the restaurants that are found throughout the city. For most cafe-style businesses, delis, or bakeries that had pre-made baked goods, small plates and to-go items, the coordination behind transporting different foods can become complicated. Daily, leftover foods at these businesses leave a lot of potential for food diversion and rescue, although minimizing the intermediaries in between is part of getting that food to those in a timely manner.

7.7 Knowledge Gaps

Upon follow-up with survey participants, there was a significant gap in knowledge of different food waste measurement options, awareness on food waste mitigation, and a low diversity in knowledge on the variety of local organizations that specialize in the area of food donation and composting services. This presents an opportunity for a discussion on the role of the food service industry, both chain and non-chain types, in food waste reduction. Although it has been previously recognized that restaurants do not see themselves as responsible for taking care of the issue, the unfortunate reality remains that restaurants are the largest business sector generators of food waste (Hoover 2017).

In terms of awareness of restaurant owners and managers, there are options to improve restaurant awareness and participation in food donation practices. Chef, employee, and owner training through food-waste focused programs funded through a city budget can help to raise awareness on partnership potential, the plethora of tools available to restaurants, and financial incentives to utilize them.

CEU eTD Collection

7.8 Accessibility and Cost

The presence of food organizations in New York City is strong, especially in comparison to other cities throughout the United States (Food Tank 2021; Berkenkamp 2017). The thirty different organizations which specialize in mobilizing food, connecting those in need, composting organic food scraps, and education on food waste, all work together to move toward improved food practices. They aim to achieve less food waste, increase quantities of donated food, and form the logistics between the thousands of restaurants, grocers, and food service spots throughout the city.

With the aim of treating the issue of hunger as one of logistics rather than scarcity, recent technology developments are starting to become more popular and mainstream. Mobile apps which forge these connections, such as Too Good to Go, Olio, Food For All, and GoMkt all have a strong presence throughout the city. Technology and instant user-to-user connection is of critical importance in the context of food donation: for one, much of the food that ends up being wasted in a restaurant and foodservice industry is fresh, pre-made, and has a short time window for delivery and consumption. By nature, food waste is unpredictable for many food service businesses. It can be difficult for businesses to accurately estimate their food orders and demand each day. Even after using precise measurement tools like logbooks, weighing, LeanPath, and others, some food businesses will still have leftovers. Understanding this, it is the role for technology developments to be able to fill in the gaps for food rescue networks.

CEU eTD Collection

The Department of Sanitation of NYC has understood this move towards technology as a helpful tool in fighting against hunger and food waste at the same time: the donateNYC portal serves as an online tool to connect organizations with any food business that has any amount of food to donate. Investing into these simple and logistical problem-solvers is a key pillar in diverting waste in a highly decentralized network.

7.9 Food Donation Network Analysis and Donation Law

The models of food donation networks can be regarded to improve the safety and health concerns that are related to liability of restaurants. One consistent marker of increasing safety, health, and reliability of food donation networks is the involvement of a responsible party to regulate quality (Bierma et al 2019). The involvement of local health authorities, for example, play a vital role in maintaining an elevated level of food standards for food donation. The safety and liability concerns identified in independent restaurants can potentially be eased through the existence of external organizations, such as a third-party monitoring system which follows the model of universal inspection. This requires increased funding for the local health department authorities in requiring them to take on a leadership role in inspection and passing of health requirements.

Although the regulating party is typically local health authorities, in NYC's case it is more relevant to discuss the role of larger organizations that have a well-established presence in the city. For example, The City Harvest organization is the most well-known, largest funded entity in the city for food rescue. The scale at which they operate is also largely due to

CEU eTD Collection

established corporate partnerships. This is one way in which food waste reduction can be easily scaled: corporate and chain participation mean dozens of locations with leftover food to rescue. This type of centralized solution requires increasing capacity, funding, and resources of food rescue organizations.

From the approach of the Hands-off or Kitchen Only Model, capitalizing on decentralized solutions to food rescue and waste reduction can help to also fill in the logistical gaps in food rescue and donation networks. Decentralized options include micro-haulers, which can help promote local job production (Babbitt et al 2019). Establishing on-site technology systems like food waste measuring and software can provide source reduction solutions.

The Coordinating Council model serves as one example for city food donation. This requires the incorporation of stakeholders from each sector: the food industry, city government, and health authorities collaborating within a separate organization responsible for information sharing, education, and outreach efforts.

In the context of New York City, the Coordinating Council model has the greatest potential to address concerns identified in NYC restaurants in this survey pool, which were based on misconceptions and lack of awareness. Part of the objectives of a council include improving restaurant access to knowledge, tools, awareness, and efficiencies all across the food supply chain. Convening an array of stakeholders requires initial leadership by city governance. Once established, a council functions independently as an entity and has an allocated budget to mobilize efforts determined by the council. The main goals of the council should revolve around

CEU eTD Collection

building strategic partnerships, working with community stakeholders to identify issues and opportunities for efficiency improvement, research and developing strategies, recommendation of policy to local government, facilitate the communication and collaboration across sectors, and prioritize systemic, social justice, and racial equity.

Around the world, countries have started to put food waste mitigation higher on political agendas. There are initiatives in waste-saving policy and laws that have been developed to reduce the amount of food that would otherwise be discarded (Table 1). As global initiatives and policy on food waste mitigation evolve and become more encompassing, the state of New York is moving to require donation of excess food in January 2022. The New York State Food Donation and Food Scraps Recycling Law states that "businesses and institutions which generate an annual average of two tons of wasted food per week or more" are required to donate excess edible foods and recycle all remaining scraps if they are within 25 miles of an organics recycle facility (DEC NY 2021).

Table 1.

Global Food Donation Law

Location	Law	Impact
Colombia	Law 1990	Establish public-private partnerships to improve food rescue
Argentina	Decree 246/2019	Encourages donation of non-commercial success food items
France	Gaspillage alimentaire	Increased quality food donations

CEU eTD Collection

Italy	Directive 2008/98/EC	Increased types of food donated, allowed for tax benefits
New York State	Food Donation and Food Scraps Recycling Law (2022)	Requires food fit for consumption to be donated by all food businesses

Source: Global Food Donation Atlas

The New York State Food Donation and Food Scraps Recycling Law will not apply to New York City, "due to the existence of the Organic Scraps Law" (DEC NY 2021). The Organic Scraps Law instead applies to chain restaurants with two or more locations, or a food establishment with more than 8,000 square feet. The Organic Scraps Law requires these establishments to provide separate bins for organic waste and ensure their own transportation or processing of organic materials.

The New York State law mirrors acts passed by European governments, including the French law on food donation passed in 2016 (Condamine 2020). France's act helped to fight food waste and enforced supermarkets are forbidden to destroy unsold food products and are instead required to donate their edible food. The law helped to facilitate an increase in food donation to local banks and organizations.

The gaps apparent between the NYC Organic Scraps Law and the NYS contradict the EPA Hierarchy for food waste reduction. As policy in New York City currently prioritizes organic waste composting, it is worth considering the argument that New York City should move to adopt the donation requirements which are laid out in the New York State Food Donation and

CEU eTD Collection

Food Scraps Recycling Law. From examples of best practices in legislation around the world, it can be established that legislation creates a movement toward systemic change, improving quality food donation quantities and limiting businesses' waste.

CEU eTD Collection

8. FUTURE RESEARCH

An in-depth examination into the physical quantities of waste throughout time, as well as changes in restaurant practices throughout time, might provide clearer insight into impacts on the food service industry. Longitudinal studies will have a high value added in this regard.

Physical measurements using quantitative research methods, such as commercial and restaurant bin digs, also should be of focus to provide more baseline data and a means to gage effectiveness of future food waste policy for city and local initiatives.

Future research should work to address the impacts of centralized versus decentralized models of food donation networks and their scalability in food waste reduction. Looking into solutions in line with the EPA Hierarchy guidelines, research should also investigate the causal relationship between food donation law, policy, and reality of food waste reduction.

CEU eTD Collection

9. CONCLUSION

In moving towards the achievement of the UN Sustainable Development Goals of halving food waste by 2030, feeding the hungry and decreasing food insecurity, food waste within the commercial food, restaurant, and corporate sector must be addressed through targeted and focused efforts.

New York City provides an example of an urbanscape with an existing infrastructure of food rescue organizations and the presence of technological tools. Therefore, the focus of the results was not on the quantitative capacity of restaurants and food rescuing, but rather on barriers that included misguided attitudes about restaurant liability, lack of awareness, and financial concerns.

Identified through the survey data in this New York City case study, the following recommendations include:

1. Restaurant Education and Outreach

Awareness and education efforts targeted to restaurants about liability protections, federal tax incentive availability. Outreach targeted to independent, corporate, and franchise restaurants should be performed by a dedicated external organization which adopts knowledge from multiple stakeholder groups: including food service, local health authorities, and government. Educational materials and outreach should be focused on providing restaurants with tools on how to perform

CEU eTD Collection

tax deductions (Harvard Policy and Law). In addition, materials or seminars should be provided to businesses, especially independent restaurants whose main concern over donation was liability protections, in this case on the Bill Emerson Samaritan Act and New York State liability protections (Harvard Food Law and Policy Clinic 2018). Legal fact sheets and tax deduction calculation sheets are ideal examples and can be simply adapted from previous materials (i.e. NFWI, NRDC, Harvard Food Law) to be provided to restaurant managers and owners. For NYC, this will require investment and commitment to a systems approach by dedicating a staff or office to food waste issues, designating funding specific to food waste, and putting a focus on incorporating equity, inclusivity and convening key stakeholders.

2. Prioritizing Food Donation and Source Reduction

Food businesses are not currently required to donate food that is fit for consumption in New York City. Upon New York State's adoption of the Food Donation Act that excludes the city-commercial, corporate, franchise, and independent restaurant and food businesses should still look to establish best practices of food donation. Moving to adopt a similar legislation, the city might benefit to increase quantities of food donation and improve support for food banks and those in need. Looking to both centralized and decentralized solutions to food waste mitigation, the city can look to examine and reestablish their food donation model. Establishing corporate and independent restaurant partnerships with food rescue organizations, while marketing and promoting the use of mobile app tools like donateNYC, OLIO, Too Good to Go, Food Cowboy, etc. can help to fill in some logistical gaps for transportation and planning.

CEU eTD Collection

3. Convening Stakeholders

Following the model of the Coordinating Council donation network, the city can look in between a centralized and decentralized food waste network. Stakeholders from all sectors involved in food waste, rescue, education, policy, and governance, can benefit from organizing to weigh private and public interests in each sector. Cross-agency collaboration should include representatives from waste management departments, food rescue organizations, businesses, city planners, food entrepreneurs and chefs. These connections can help to foster collaboration, support (complementary with recommendation #2) effective training for sustainable waste practices and gaining access to stakeholders in the food industry, as well as identifying untapped resources throughout the city. A principal goal of collaboration should be to influence greater awareness throughout food industry businesses, both independent and corporate chains.

4. Lessons from Lockdown

The COVID-19 changed a lot about how people operate, consume, and engage with the public. In terms of the food system, the pandemic exposed critical faults in not only global food supply and markets, but also in local food networks. Redistribution of excess food is not the one cure-all solution: evidence from the last year suggests that nationally, food banks were severely short on transportation, storage capacity, and labor even before the pandemic. This will require holistically addressing funding by both public and private entities for ensuring the resiliency of food systems and food access for all. Future policy and funding should emphasize the value of the work of those who distribute food by supporting fair wages. Financial support to those who

CEU eTD Collection

are typically unpaid workers and volunteers redistributing food can help to strengthen support for food rescue operations. At the same time, local food programs should emphasize purchasing power and access to fresh and nutritious food for all that need it.

As the previous year and the shocks of COVID-19 magnified, the food supply chain in the U.S. is a delicate and complicated system. From producer to retailer, countless intermediaries along the way remain highly interdependent on one another and involve long travel distances. As the demand for food from food banks and pantries increased by as much as 100% (Balkan 2020), the time for improving inefficiencies along every step of the supply chain is more pressing than ever.

While there are countless intervention points with high impact potential that should be addressed- from gleaning during harvest, addressing cosmetic standards of produce, or confusing packaging and expiration dates, this research focused on the retail and commercial end. The food service industry has a large waste reduction potential, beginning with source reduction (accurate measuring systems, product purchasing, waste logs), all the way to donation of excess food to charitable organizations.

Innovation and individual restaurant initiatives that are taking place throughout the industry are regarded as hopeful examples and can serve as role models for the future. Evidence of New York City restaurants using tools like restaurant family meals, repurposing of food scraps, use of waste logs, and establishing scalable relationships with food rescue organizations across entire restaurant chains showed a presence of innovators in waste reduction. These

CEU eTD Collection

practices shed an optimistic light on a heightened awareness and sense of responsibility by some restaurants and their employees.

In scaling these lessons from New York City restaurant data, as the United States experiences higher rates of food insecurity, improving efficiencies throughout the food supply chain is critical. Business operations in the food industry can be actors of positive change, mitigate food waste through both source reduction and food donation to promote local food security. Understanding their rights and feeling confident about donating nutritious food to organizations is an important part in that.

Developing out of the identification of low diversity of organizations which were reported by NYC restaurants as well as a general lack of awareness about food rescue and waste, one solution to achieving greater efficiency is through applying the Coordinating Council model. The convening of stakeholders and cutting across agency and sector lines increases information and knowledge sharing, bridge resource gaps, and develop highly informed policy, incentives, and funding for restaurants and food rescue organizations.

Systemic change is required for tackling the issue of food waste. Bringing all sectors together to work towards this common goal is required: schools, policymakers, consumers, businesses, governments, and legislation are critical aspects in ensuring that national and global targets for food waste are taken seriously. Sharing best practices between nations, such as legislation efforts in donation and outlawing edible food waste. Technology solutions such as software programs like LeanPath, food donation and food saving mobile apps, offer simple and

CEU eTD Collection

immediate actions to take in tackling one of the most unjust issues of our time. Tackling climate change, food insecurity, and resource loss, developing strategies to mitigate food waste means the fight for a world where food is made to be eaten.

CEU eTD Collection

Works Cited

Å. Stenmarck, C. Jensen, Quested, T., Moates, G. 2016. Estimates of European food waste levels I*VL*-report *C*, 186.

Berkenkamp, J., Phillips, C. 2017. NRDC: Modeling the Potential to Increase Food Rescue- Denver, New York City, and Nashville.

Betz, A., Buchli, J., Göbel, C., & Müller, C. 2015. Food waste in the Swiss food service industry–Magnitude and potential for reduction. *Waste Management* 35: 218–226.

Bierma, T., Jin, G., Bazan, C. 2019. Food Donation and Food Safety: Challenges, Current Practices, and the Road Ahead. *Journal of Environmental Health* 81, 10.

Buzby, J. Wells, H., Hyman, J. 2014. The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States. EIB-121, U.S. Department of Agriculture, Economic Research Service.

Bill Emerson Good Samaritan Food Donation Act. 1996. Pub. L. No. 104-210, 110 Stat. 3011, 3011.

Brown, Margaret. 2017. How to Feed Hungry New Yorkers and Fight Climate Change. NRDC. https://www.nrdc.org/experts/margaret-brown/how-feed-hungry-new-yorkers.

Buzby, J.C., Farah-Wells, H. and Hyman, J., 2014. The estimated amount, value, and calories of postharvest food losses at the retail and consumer levels in the United States. *USDA-ERS Economic Information Bulletin*,

Chen, H. Jiang, W., Yang, Y., Man, X. 2015. State of the art on food waste research: a bibliometrics study from 1997 to 2014. *J. Clean. Prod* 140 :840-846.

Citizens Budget Commission of New York. 2016. Can We Have Our Cake and Compost it too? An Analysis of Organic Waste Diversion in New York City.

City Harvest. 2014. Rescuing Food for New York's Hungry. http://www.cityharvest.org/restaurant-partners/the-food-council

Condamine, P. 2020. France's law for fighting food waste Food Waste Prevention Legislation. Zero Waste Europe. https://zerowasteeurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_france_en.pdf

Condamine, P. 2020. Italy's law for donation and distribution of food and pharmaceuticals to limit food waste. Zero Waste Europe.

Cornell Waste Management Institute. NYS Compost Facilities Map (and surrounding states). http://compost.css.cornell.edu/maps.html (Figure 1).

CEU eTD Collection

De la Houssaye, M. White, A. 2008. Economics of New York City Commercial MSW Collection & Disposal and Source-Separated Food Waste Collection & Composting: Opportunities to Reduce Costs of Food Waste Collection & Recovery. New York City Department of Sanitation.

Department of Environmental Conservation New York (DEC NY). 2021. Food Donation and Food Scraps Recycling Law. https://www.dec.ny.gov/chemical/114499.html

Department of Sanitation New York City (DSNYC). 2021. Drop-off Composting. https://www1.nyc.gov/assets/dsny/site/services/food-scraps-and-yard-waste-page/nyc-food-scrap-drop-off-locations

Environmental Protection Agency (EPA). 2021. EPA Food Waste Hierarchy. https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy

Environmental Protection Agency (EPA). 2021. EPA Food Waste Logbook. (https://www.epa.gov/sites/production/files/2015-08/documents/food-waste-log.pdf).

EU FUSIONS. 2021. FOOD WASTE DEFINITION. https://www.eu-fusions.org/index.php/about-food-waste/280-food-waste-definition

Food and Agriculture Organization (FAO). 2019. Food Loss and Food Waste. http://www.fao.org/platform-food-loss-waste/en/

Feeding America. 2021. The Impact of the Coronavirus on Food Insecurity in 2020 & 20219.

Food Shift. 2015. Food rescue services, barriers, and recommendations in Santa Clara County. https://www.sccgov.org/sites/rwr/rwrc/Documents/FoodShiftFinalReport.pdf

Global Food Donation Atlas. 2021. https://atlas.foodbanking.org/

Good Samaritan Food Donation Act. 1996. Hearing on H.R. 2428 Before the Subcomm. on Postsecondary Educ., Training, and Lifelong Learning of the H. Comm. Educ. and Econ. Opportunities, 104th Cong.

GrowNYC. 2021. GrowNYC's Environmental Education Programs. https://www.grownyc.org/education

Gunders, D. 2012. Wasted: How America is losing up to 40 percent of its food from farm to fork to landfill. Natural Resources Defense Council.

Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., Meybeck, A. 2011. Global food losses and food waste.

Harvard Food Law and Policy Clinic. 2018. Legal Fact Sheet New York Food Donation: Liability Protections. https://www.dec.ny.gov/docs/materials_minerals_pdf/donationhlfs.pdf

Hebrok, M., Boks, C. 2017. Household food waste: drivers and potential intervention points for design – an extensive review. *Journal of Cleaner Production* 151: 380-392.

Hermsdorf, D., Rombach, M., & Bitsch, V. 2017. Food waste reduction practices in German food retail. *British Food Journal.*

Hodge, Keith L. 2016. "Systematic evaluation of industrial, commercial, and institutional food waste management strategies in the United States." *Journal of Environmental science & technology* 50: 6.

CEU eTD Collection

Hoover, D. 2017. Estimating Quantities and Types of Food Waste at the City Level. Natural Resources Defense Council. https://www.nrdc.org/sites/default/files/food-waste-city-level-report.pdf

Hunger Free America. 2018. "The Uneaten Big Apple: Hunger's High Cost in NYC."https://www.hungerfreeamerica.org/sites/default/files/atoms/files/NYC%20and%20NYS%20Hunger%20Report%202018_0.pdf.

Ingram, J.S., Wright, H.L., Foster, L., Aldred, T., Barling, D., Benton, T.G., Berryman, P.M., Bestwick, C.S., Bows-Larkin, A., Brocklehurst, T.F. and Buttriss, J., 2013. Priority research questions for the UK food system. *Food Security 5*(5): 617-636.

Jang, Y., Zheng, T. 2020. Assessment of the environmental sustainability of restaurants in the U.S.: The effects of restaurant characteristics on environmental sustainability performance, *Journal of Foodservice Business Research,* 23:2, 133-148.

Kanyama, C., Katzeff, A., C., Svenfelt, Å., 2017. Rädda Maten: Åtgärder För Svinnminskande Beteendeförändringar Hos Konsument (Save The Food: Measures Pleasant Between Changes To Consumer).

LeanPath. 2016. The Power of Automation: Using Systems to Slash Food Waste.

Matzembacher, D., Brancoli, P., Moltene, L., Eriksson M.Consumer's food waste in different restaurant configuration: A comparison between different levels of incentive and interaction, *Waste Management*, 114.

Morenoff, D.L., 2002. Lost food and liability: The Good Samaritan Food Donation Law Story. *Food & Drug LJ* 57: 107.

Mourad, M. 2016. Recycling, recovering and preventing "food waste": Competing solutions for food systems sustainability in the United States and France. *Journal of Cleaner Production* 126, 461-477.

National Restaurant Association. 2017. Chefs Predict "What's Hot" for Menu Trends in 2017. http://www.restaurant.org/Pressroom/Press-Releases/What-s-Hot-2017

Natural Resources Defense Council. 2017. Food matters: What food we waste and how we can expand the amount of food we rescue. Retrieved from https://www.nrdc.org/sites/default/fi les/foodmatters-ib.pdf

Neff, R., Spiker, M., Rice, C., Schklair, A., Greenberg, S., Leib., EB. 2019. Misunderstood food date labels and reported food discards: A survey of U.S. consumer attitudes and behaviors, Waste Management, Volume 86.

New York State Department of Environmental Conservation. 2021. Food Donation and Food Scraps Recycling Law. https://www.dec.ny.gov/chemical/114499.html.

New York State Department of Environmental Conservation. 2018. "New York State Announces $4 Million in Grants to Expand Food Waste Recycling." https://www.dec.ny.gov/press/113919.html.

New York City Department of Sanitation. 2008. Commercial Food Waste Disposal. www.nyc.gov/html/dep/pdf/dep_commercial_food_waste_disposal_study_12312008.pdf

CEU eTD Collection

Otten, J. Diedrich, D., Getts, S., Benson, C. 2018. Commercial and anti-hunger sector views on local government strategies for helping to manage food waste. *Journal of Agriculture, Food Systems, and Community Development*, 8, 55-72.

Parfitt, J. Barthel, M. MacNaughton, S. 2010. Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society* 365: 3065-3081.

Pearson, D., Minehan, M., Wakefield-Rann, R. 2013. Food waste in Australian households: why does it occur? *Australian Pacific Journal of Regional Food Studies* 3, 118-132.

Poore, J., & Nemecek, T. 2018. Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987-992.

Porpino, G. 2016. Household food waste behavior: avenues for future research. *J. Assoc. Consum. Res* 1 41-51.

Priefer, C., Jörissen, J., Bräutigam, K. 2016. Food waste prevention in Europe–A cause-driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling* 109*:*155-165.

Neff, R., Spiker, M., Truant, P. 2015. Wasted food: U.S. Consumers' reported awareness, attitudes, and behaviors. PloS One, 10 (6).

Rack, Petra. 2018. "Contributors to food waste in local restaurants and obstacles to food donation."

ReFED. 2016. A Roadmap to Reduce U.S. Food Waste by 20 Percent. http://www.refed.com/downloads/ReFED_Report_2016.pdf

ReFED. 2018. Restaurant Food Waste Action Guide. https://refed.com/downloads/Restaurant_Guide_Web.pdf

Sakaguchi, Leo, Nina Pak, and Matthew D. Potts. "Tackling the issue of food waste in restaurants: Options for measurement method, reduction and behavioral change." *Journal of Cleaner Production,* 180, 430-436.

Schubert, F., Kandampully, J., Solnet, D., & Kralj, A. 2010. Exploring consumer perceptions of green restaurants in the US. Tourism and Hospitality Research, 10(4), 286–300.

Schanes, K. Doberning, K. B. Gözet. 2018. Food waste matters - a systematic review of households' food waste practices and their policy implications. *J. Clean. Production* 182, 978-991.

Silvennoinen, K., Heikkilä, L., Katajajuuri, J. M., Reinikainen, A. 2015. Food waste volume and origin: Case studies in the Finnish food service sector. *Waste management* 46*:*140-145.

Tarasuk, V., Dachner, N., Hamelin, AM. 2014. A survey of food bank operations in five Canadian cities. *BMC Public Health* 14: 1234.

T.E. Quested, E. Marsh, D. Stunell, A.D. Parry. 2013. Spaghetti soup: the complex world of food waste behaviours. *Resour. Conservation Recycling* 79: 43-51.

Thyberg, K.L., Tonjes, D. Gurevitch, J. 2015. Quantification of food waste disposal in the United States: a meta-analysis. *Environ. Sci. Technology* 49: 13946-13953.

CEU eTD Collection

Thyberg, K., Tonjes, D., Gurevitch, J. 2020. Solid Waste, PlaNYC Report, http://s-media.nyc.gov/agencies/planyc2030/pdf/planyc_2011_solid_waste.pdf.

U.S. PIRG EDUCATION FUND. 2019. Composting in America: A Path to Eliminate Waste, Revitalize Soil and Tackle Global Warming.

USDA. 2014. Food: Material-Specific Data. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/food-material-specific-data

United Nations Environment Programme (UNEP). 2021. Worldwide food waste. https://www.unep.org/thinkeatsave/get-informed/worldwide-food-waste

World Resources Institute. 2017. Champions 12.3; The Business Case for Reducing Food Loss and Waste (Table 3, pg. 15). World Resources Institute.Web. https://champions123. org/the-business-case-for-reducing-food-loss-and-waste/

WRAP. 2013. Overview of Waste in the UK Hospitality and Food Service Sector.

World Wildlife Fund (WWF). 2020. https://www.worldwildlife.org/initiatives/food

CEU eTD Collection

Appendices.

1. Survey Questionnaire

Question Number	Questions	Responses
1	Restaurant Name	Open ended
2	Is the restaurant measuring quantities of food waste in any way?	Weighing food waste/Visual estimates/Counting bags, containers/None/Other:__
3	Since the start of the COVID-19 pandemic, has the restaurant experienced an increase or decrease in quantities of food waste?	Increase/Decrease/Neither/ Not sure
4	How does the restaurant deal with EDIBLE food waste?	Dispose in garbage/Compost/ Donate food/Send food home with employees/Food waste app (Too Good to Go, others)
5	How is INEDIBLE food waste disposed of?	Garbage bin/Compost bin onsite/Compost through a separate organization
6	Are there reasons not to compost?	No/Not a sufficient amount of waste/Space restrictions/ Other:__
7	Is there collaboration with any food rescue organization? Check all that apply.	Food Bank for NYC/ donateNYC Food Portal/City Harvest/Citymeals on Wheels/ GrowNYC/Rethink/Other:__
8	Are there any liability uncertainties related to food donation? If yes, please explain.	Open ended

CEU eTD Collection

9	If you are willing to receive a follow up by a researcher, please leave an email or phone number you can be reached at.	Email: Phone:

CEU eTD Collection