Wasting Food is Rubbish: Barriers and Opportunities for Food Waste Diversion in Guelph, Ontario

by

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ABSTRACT

WASTING FOOD IS RUBBISH: BARRIERS AND OPPORTUNITIES FOR FOOD WASTE DIVERSION IN GUELPH, ONTARIO

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Food waste is a serious global issue that has significant environmental, economic, and social impacts. While increasing attention is being paid to this problem, little region specific research exists on food waste in Canada, and Southwestern Ontario in specific. This research investigates the flow of food waste along the food waste hierarchy in Guelph, ON in order to identify barriers, motivations, and opportunities to increase food waste diversion. 33 respondents along the food value chain participated in semi-structured interviews to provide insight for this research. An actor-network approach was employed to examine the socio-material aspects of food waste and the paths it takes, which revealed that many of the findings relate to the materiality of food/waste. This research contributes to a greater understanding of how we relate to both food and waste systems, and provides recommendations for food waste solutions across the value chain.
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1.0 Food Waste

Food waste is a serious issue that carries significant environmental, social, and economic consequences (FAO, 2011; Lipinski, Hanson, Lomax, Kitinoja, Waite & Searchinger, 2013). Due to an abundance of food in the Western world, food waste has been rendered largely invisible until recently (Evans, Campbell & Murcott, 2013; Halloran, Clement, Kornum, Bucatariu & Magid, 2014). According to Evans et al. (2013), the global food crisis in 2008 and the subsequent rise in food prices during the following few years brought food waste to the forefront.

Many varying definitions exist for food waste and loss, with no one universal definition (see, for example, Parfitt, Barthel, & Macnaughton, 2010; Thyberg & Tonjes, 2016; Lebersorger & Schneider, 2011; Buzby & Hyman, 2012). One common definition of food loss and waste is that food loss is the unintended loss of food due to inefficiencies in the supply chain, such as poor infrastructure for the storing and transportation of foods and food that is damaged in processing stages. This is much more common in developing countries. Food waste, on the other hand, refers to food that is fit for human consumption, but has not been eaten for a number of reasons, such as appearance standards, misunderstood best before dates, and over supply, just to name a few (FAO, 2011; Lipinski et al., 2013; Stuart, 2009). This is much more common in developed countries, and for the purposes of this paper, is the definition I will use. In 2011, the FAO reported that about one third, or 1.3 billion tonnes of food produced globally for human consumption, is lost or wasted, while 870 million people go hungry each year. Economically, this equals about $750 billion per year in wasted food (FAO, 2013). Significant amounts of food are lost all along the food supply chain; in developed countries, about fifty percent of wasted
food happens along the food supply chain, before even reaching households (Parfitt et al., 2010; FAO, 2011). In many developed countries, the majority of food waste is largely avoidable, which means that the food was edible prior to being thrown away (Quested, Parry, Easteal, & Swannell, 2011; Lipinski et al., 2013). Avoidable food waste is largely due to the fact that food is relatively cheap and plentiful in developed countries, and wasting food is a socially acceptable behaviour. This means that it is easier to throw out food and buy more than trying to reuse it or reduce the amount of waste by changing our behaviours around food procurement and preparation (Hodges, Buzby & Bennett, 2011; Griffin, Sobal & Lyson, 2008; Rutten, 2013).

At the national level, almost 40% of food produced in Canada is wasted, and half of this is completely unnecessary and could have been eaten by people. Economically, this equals $31 billion in wasted food (Gooch, Felfel & Marenick, 2010; Gooch & Felfel, 2014). In addition, approximately four million Canadians are food insecure, which equals about thirteen percent of households (Tarasuk & Dachner, 2014). This correlation between food waste and food insecurity is made frequently; however, it should be noted that this does not mean food waste should be redirected to food insecure people, I only mention it in order to exemplify that the reduction of food waste allows for more nutrients to be made available to people.

Furthermore, food that is wasted results in not only the loss of food that is needed to feed an ever-growing population, but squanders all of the resources used in its production. For example, more than half the water used in food production goes to waste, farmland is inefficiently used, and nutrients in the soil are lost – especially if food waste is not composted (Fehr, Calçado & Romão, 2002). Other resources lost include energy, transport fuel, packaging, human labour, and fertilizers (FAO, 2011, 2013; Kummu, Moel, Porkka, Siebert, Varis, Ward, 2012; Lipinski et al, 2013). Additionally, food waste represents a major source of nutrient loss
in the food system when it ends up in the landfill, where any chance to redirect the nutrients back into the system via reuse or composting, effectively ‘closing the loop’, is lost (Fehr et al., 2002; Halloran et al., 2014). Food waste is common in landfills; in the United States, food waste is the second most prevalent item in landfills (FAO, 2011; Gunders, 2012; Bagherzadeh, Inamura & Jeong, 2014).

1.1 Research Aims and Objectives

This research seeks to investigate the flow of food waste within the city of Guelph, ON, and the barriers to, and opportunities for, increased food waste diversion along the food waste hierarchy. To that end, the objectives of this research are as follows:

1) Map the network of food waste flows in Guelph;

2) Identify the barriers to increased food waste diversion;

3) Identify the motivations for those who do engage in redirection activities and what potential opportunities exist for further food waste diversion; and

4) Use an Actor-Network Theory methodology and framework to interpret the flow of food waste within the City of Guelph.

Thirty-three respondents along the food value chain were interviewed to provide insight for the barriers they face, as well as potential opportunities that exist within and across each sector for increased food waste diversion. The remainder of this chapter reviews the pertinent literature in order to provide the context surrounding food waste diversion along the food waste hierarchy. The following chapter explains the methods used to collect and analyze the data, including an in depth discussion of the research approach taken. Chapter 3 provides the findings to this study in three sections: the first maps the network of food waste flows within the City of Guelph; the second examines the barriers to increasing food waste diversion; and the third examines the motivations and opportunities for the increased diversion of food waste along the
Chapter 4 applies a theoretical lens to these findings, exploring the materiality of food waste, and what this means for how we relate and interact with our food and waste systems. The concluding chapter summarizes the main findings and provides recommendations for future research.

1.2 Food Waste and the Food Value Chain

In light of the startling problem that food waste presents, increasing academic attention is being paid to this topic. Since the numbers indicate that approximately half of avoidable food waste occurs at the household level, research has appropriately begun to investigate this consumer phenomenon, and to date, the largest existing body of knowledge on food waste is at the household level (Halloran et al., 2014). The majority of these studies have been carried out in the UK and EU (see, for example Abeliotis, Lasaridi & Chroni, 2014; Evans, 2011 and 2012; Koivupuro et al., 2012; Quested et al., 2011; Refsgaard & Magnussen, 2009; Stefan, van Herpen, Tudoran & Lähteenmäki, 2013), with the notable exception of Neff, Spiker & Truant (2015) in the United States, and Parizeau, von Massow & Martin (2015) in Canada. While understanding consumer behaviours and attitudes toward wasting food is necessary to develop awareness campaigns to reduce the amount of food wasted in the home (for example, the Waste & Resources Action Programme’s (WRAP) work in the UK has been largely successful in raising awareness and reducing consumer waste), it is important to note that the remaining fifty percent of waste occurs along the rest of the food value chain. Also, some household waste is due to issues along the food value chain, and only ends up as household waste (Evans, 2011; 2012). As Halloran et al. (2014) note, consumers can only buy and eat what is made available to them by retailers. In addition, factors and decisions affecting food waste at various levels of the value chain impact waste at different levels. For example, appearance standards are set at the
processing stage, but affect waste at both the production and retail levels (Beretta, Stoessel, Baier & Hellweg, 2013; Goebel, Langen, Blumenthal, Teitscheid & Ritter, 2015; Halloran et al., 2014). This is why it is important to consider all levels of the value chain in food systems research. To that end, a number of studies have begun to examine waste along the food value chain (again, mostly in the EU - see Beretta et al., 2013; Goebel et al., 2015; Halloran et al., 2014, Katajajuuri, Silvennoinen, Hartikainen, Heikkilä & Reinikainen, 2014 - with the exception of South African studies, see Nahman & de Lange, 2013 and Oelofse & Nahman, 2012). These studies have largely focused on attempts to both quantify the amount of and determine the causes of food waste. Rutten (2013) notes that the study published by the FAO in 2011 was the first effort to provide food waste data across the food value chain for all regions of the world. A Canadian example includes Abdullah, Martin, Gooch & Jovel (2013), who outline the importance of quantifying food waste. That noted, it is extremely difficult to quantify food waste: as mentioned above, no universally agreed upon definition of food waste exists, and various methodologies are used to quantify food waste (waste audits, qualitative interviews, etc.) (Halloran et al., 2014; Thyberg & Tonjes 2016; Lebersorger & Schneider, 2011; Buzby & Hyman, 2012). Many value chain studies have thus relied on estimations.

Researchers that have focused on waste along the value chain have come to the conclusion that partnerships and collaboration among stakeholders at different stages of the value chain are necessary and encourage further studies in this area. For example, studies conducted along food value chains in Switzerland (Beretta et al., 2013), Germany (Goebel et al., 2015) and Denmark (Halloran et al., 2014) concluded that all points along the food value chain must be taken into consideration, and all actors must be connected in order to increase food waste reduction and diversion. Katajajuuri et al. (2014) examines the volume of avoidable food waste
amongst all the various stages of the Finnish food chain, and note that most food waste research has been carried out in Western countries and especially in households, with few studies including the whole value chain and system. Nahman et al. (2013) (as well as Oelofse & Nahman, 2012) examined food waste, focusing on edible waste that occurs both before reaching the consumer and consumer waste, in South Africa. The authors note that food waste occurs all throughout the food value chain, and concludes that research is therefore needed throughout the value chain. Parfitt et al. (2010) examined food waste along the international food supply chain, examining various definitions of food waste, and comparing driving factors between developing, transitional, and developed countries. In terms of developed countries, Parfitt et al. (2010) found that the “greatest potential for the reduction of food waste in the developed world lies with retailers, food services and consumers” (p. 3079).

Griffin et al. (2008) examined a community waste stream, including all stages of the value chain. This involved estimating quantities of food waste amongst producers, processors, distributors and retailers, through to consumers. This whole systems approach provided a precedent for studying food systems, which uncovers the interconnectedness among activities within the food system and stakeholders that contribute to food waste and recovery that would remain unknown if only one sector/stage of the system were investigated. Bagherzadeh et al. (2014) completed a study of food waste along the value chain amongst OECD countries, to examine the existing food waste statistics and policies related to food waste in order to reduce food waste.

The two main strategies discussed by researchers to combat the issue of food waste are reduction and diversion. Reducing food waste is important, and the most sustainable practice to deal with this practice. However, it is also important to acknowledge that there will always be
some form of inedible food waste (e.g. peels, bones, etc.) that will require diversion options.

Halloran et al.’s (2014) study of food waste along the food value chain in Denmark included a brief examination of food waste processors, such as biological treatments, which was found to only be available in a few locations, leaving the rest to be sent for incineration. Diverting food waste away from landfill remains a difficult task.

In terms of diversion rates, Griffin et al. (2008) in their community food waste stream analysis discovered that of the food waste generated (20% in production, 1% in processing; 19% in distribution, and 60% in consumption) only 27% was recovered. According to Levis, Barlaz, Themelis & Ulloa (2010), over 97% of food waste is buried in landfills in the US, and Thyberg & Tonjes (2016) notes that this remains the case today. While multiple options exist for diversion, implementation depends on specific factors unique to particular locations (Evans-Cowley & Arroyo-Rodriguez, 2013), which is why it is important to study localized food and waste systems. For example, Evans-Cowley and Arroyo-Rodriguez (2013) examine the food system planning process in the Mississippi Gulf Coast that incorporates food waste management more sustainably, noting that food waste is often not considered in food systems planning.

Focusing on diversion for major generators of food waste (i.e., processors, retailers, food service, etc.) will likely result in successful diversion results (Evans-Cowley & Arroyo-Rodriguez, 2013). Incorporating food waste prevention, reuse, and diversion tactics into food systems makes for a more efficient and sustainable food system (Evans-Cowley & Arroyo-Rodriguez, 2013). The food waste hierarchy provides prioritized options for diverting food waste (see Figure 1), and will be discussed in the following section.
1.3 Food Waste Hierarchy

As mentioned previously, when food is discarded into the landfill, not only are valuable nutrients lost, but it also becomes a threat to the biophysical environment through air pollution, and water pollution due to runoff and leaching. Landfills are also reaching capacity in many locations. Organic matter does not decay in landfills due to the anaerobic conditions (Griffin et al., 2008). As such, waste diversion has become a topic of increasing importance, and waste is beginning to be considered a resource (Fehr et al., 2002; Halloran et al., 2014).

According to the food waste hierarchy, the most preferred option is to decrease edible food waste by reducing it at the source, and by distributing it to ‘hungry people’. Although many versions of the food waste hierarchy, including the one used by the Environmental Protection Agency in the US, identifies distributing surplus food to people in need, this food should just be eaten by people, regardless of whether they are food insecure or not. The next preferred option according to the food waste hierarchy, once food waste becomes inedible to humans, is to use it as animal feed. Following that, food waste should be used for industrial uses, such as used oils for fuel.
conversion and food scraps for anaerobic digestion to recover energy. Composting is the next preferred option, in order to create a nutrient rich soil amendment in order to return nutrients to the food system. Only after all other options have been exhausted should food waste be sent to the landfill and/or incinerated (Papargyropoulou, Lozano, Steinberger, Wright & Ujang, 2014; EPA, 2014). While the food waste hierarchy provides sustainable alternatives to landflling food waste, there are nuances within each option that requires a closer examination. An in-depth discussion of these options follows in the next section.

### 1.4 Food (In)security and Redistribution of Edible Surplus Food

One of the most common practices of revaluing food and directing it away from the waste stream is through charitable donation, which seemingly reflects principles of social and environmental sustainability (Schneider, 2013). Donating food “waste” or surplus food to those in need is a well-established practice; in Ontario, the Donation of Food Act (1994) was implemented to remove any liability for those donating food “in good faith”. Regulations like these (or the similar Bill Emerson Act in the US) can provide incentives for the donation of edible surplus food by retailers (Evans-Cowley & Arroyo-Rodriguez, 2013); however, the wording of these Acts are often vague and there is no direct mention of food past best before dates, which leads to retailer interpretation of the edibility of these foods (Donation of Food Act, 1994; Schneider, 2013). In addition, there is often a lack of fresh and quality food donated for a variety of reasons, such as distribution logistics, storage issues, and concern over food safety, as well as institutional standards that regulate what food can be accepted for donation (Alexander & Smaje, 2008; Stuart, 2009; Schneider, 2013; Uzea, Gooch & Sparling, 2013). Barriers to donating surplus food are well documented (see, for example, Tielens & Candel, 2014; Schneider, 2013; Thyberg & Tonjes, 2016; Uzea et al., 2013). Other barriers for the donation of
food are related to property rights and protection of branded goods, as well as economics. It is often cheaper to dispose of food than redirect it (Uzea et al., 2013). Moreover, food waste is not always a high priority for all retailers. Some are simply not aware of the extent of food waste and do not connect food waste to production costs and resource use, and others think that change is not possible (Midgley, 2013; Uzea et al., 2013). In addition, a notable social barrier is the stigmatization around food donation and “second class products for second class people” (Schneider, 2013, p. 761). This practice has also been heavily criticized as providing a channel for the disposal of excess food while fostering an image of “corporate goodwill” (Tarasuk, 2001, p. 489), as well as lessening pressure on governments to address structural poverty (Midgley, 2013). However, since food insecurity is rooted in the deep structural problem of poverty and cannot be solved by the donation of surplus food alone, and the redirection of food appears to be one of the only ways currently to recover food for human consumption, donation remains a worthwhile endeavor (Tarasuk, 2001; Schneider, 2013). As Papargyropoulou et al., (2014) notes, terminology here is extremely important (referring to surplus food, not food waste). While we work on reducing food waste at the source, excess food should really be redirected to all people – not specifically for those in need – which only exacerbates the existing stigma of ‘second class food for second class people’ (Schneider, 2013, p. 761). Redirecting edible food waste has the possibility of working toward closing the food waste/insecurity gap, and the revaluation of food in our society. While surplus food should be eaten by people, the remaining inedible food waste also needs to be diverted away from landfill, and that the other options presented along the food waste hierarchy are needed (Halloran et al., 2014; Evans-Cowley & Arroyo-Rodriguez, 2013). The following section discusses diversion options for inedible food waste.
1.5 Inedible Food Waste Diversion

There are a number of diversion options before relegating food waste to landfills. However, many diversion options are met with obstacles. This section outlines these diversion options, as well as notable barriers.

Feeding animals is the next most sustainable option according to the food waste hierarchy; however this requires that there are farms that accept food waste for animal feed in an area, and that food manufacturers and retailers to have relationships with farms that will accept food waste for this purpose, or know of animal feed producers, which is often not the case (Uzea et al., 2013). This suggests that there is a need for increased communication and collaboration between stakeholders across the value chain (Evans-Cowley & Arroyo-Rodriguez, 2013).

Next on the food waste hierarchy is industrial uses (including rendering and anaerobic digestion), followed by composting. Several studies have examined the viability of anaerobic digestion and composting for food waste diversion. Studies that compare food waste management options have been carried out in Singapore (Khoo, Lim & Tan, 2009), Taiwan (Lai, Ke & Chung, 2008), and Sweden (Eriksson, Strid & Hansson, 2015). The most environmentally favourable outcome in these cases were found to be anaerobic digestion. Khoo et al. (2009) suggested that small-scale composting followed by anaerobic digestion, and finally incineration for waste-to-energy purposes, for environmentally sound options.

However, industrial composting currently remains one of the most common methods for dealing with food waste, and despite the high environmental impact of the processing stage from fuel combustion and emissions from microbial decomposition, when the finished product (nutrient rich soil enhancement) was considered, composting had a net positive gain in using composting for food waste management (Saer, Lansing, Davitt & Graves, 2013). Yet the benefits
of anaerobic digestion may prove to be even greater, as they include creating a commodity and a renewable fuel (biogas) as well as fertilizer. This means the anaerobic digestion of food waste has the potential to also address both the waste problem as well aiding with energy security (Vaz, 2015; Dahl, 2015, Lai et al., 2008; Pham, Kaushik, Parshetti, Mahmood & Balasubramanian, 2014). Zhang, El-Mashad, Hartman, Wang, Liu, Choate & Gamble (2007) found that food waste made for an ideal feedstock for anaerobic digestion due to its high content of organic material.

While these diversion options do exist, they are often not implemented due to limited infrastructure for anaerobic digestion in many areas, as well as the capital costs of building this infrastructure, and feedstock purity (Levis et al., 2010; Uzea et al., 2013; Evans-Cowley & Arroyo-Rodriguez, 2013). In light of these barriers, researchers suggest that policy and regulations (such as landfill organics bans and climate change mitigation policies) will be the driving force behind implementing these diversion practices (Levis et al., 2010).

Practical studies such as those reviewed above are vital in determining appropriate food waste management options. However, the way in which waste is conceptualized is an important consideration in the study of food waste. Understanding the way we relate to both food and waste in a social sense is equally significant, and aids in how food waste is managed. The following section will examine the theoretical implications of food and waste research by exploring Actor-Network Theory.

1.6 Waste Studies and Actor-Network Theory

Actor-Network Theory (ANT) is a sociological theory that was developed by Bruno Latour, Michael Callon, and John Law (Roy, 2015). This theory posits that both human (any conscious being, referred to as “actors”) and non-human (objects, referred to as “actants”) can have agency, and be understood in a heterogeneous, relational network (Latour, 1987, 2005; Holifield, 2009;
This means that the networks created are made up of a multitude of people and objects, and that their identity, and any power or capacity to act is related to its connections. If any of the connections are lost, the importance or power of the actor/actant is also lost (Roy, 2015). Alexander, Gregson & Gille (2013) posit that ‘edible matter’ – food - has agency. Humans partly dictate what becomes food waste, but food also rots on its own – no action is required by humans to do anything to turn ‘food’ into ‘waste’, other than letting it happen. In order to delay the natural occurrence of decaying food, technologies (such as refrigeration) are employed. Food elicits a response from us: we need to store it in an appropriate way. Food waste elicits a response from us as well: we want to get rid of it quickly because of its odour, it attracts pests, and it is ‘gross’. From here, we have to deal with it via various waste management options and technologies. This is an example of the network food/waste creates, and exemplifies how it is a socio-natural relation (Gille, 2010; Moore, 2012).

ANT breaks down dualisms (such as nature/culture) through the concept of a ‘flat ontology’, where all actors/actants are on the same plane. In this way, we see that the way that humans (social) interact with the natural, such as in cities, or with the food system, become hybrid networks: combinations of social, material, and natural aspects (Law, 1999; Murdoch, 1997, 1998, 2001; Holifield, 2009; Johannesson & Baerenholdt, 2009; Moore, 2012; Gray & Gibson, 2013). Although critiques of ANT suggest that power dynamics may be lost in this flat ontology (Holifield, 2009), the relational approach it offers allows for exploring numerous and conflicting explanations of what creates inequalities and hierarchies, questioning how knowledge and power are developed and maintained (Holifield, 2009; Gray & Gibson, 2013).

The use of this theory as a methodology will be discussed in the next chapter. This theoretical framework has become increasingly popular with human geographers in recent years.
because of its potential to reveal previously invisible actors/actants in the creation of heterogeneous networks, where importance is placed on describing the network and the following of an actor/actant (Roy, 2015; Ruming, 2009).

For example, water researchers have found this theory particularly useful due to the unfixed nature of water (see for example, Roy, 2015; Swyngedouw, 2006). The unfixed nature of water means that it is mutable and is difficult to govern; it crosses borders and acts in unexpected ways (Bakker, 2005; Bakker & Bridge, 2006). For example, by ‘following the actor’ (water) in water governance research reveals the identity of more actors, actants, and processes than would normally be considered, and then can be included in management plans. In Roy’s (2015) study of the waterscape in Delhi, it was found that water flows through the city creating a network that includes other things and people the water comes into contact with; this illustrates that more departments than just those that deal with water (public works, department of urban development) should be included to help with better policy creation.

Similarly, ANT can be applied to food waste in order to illuminate various actants, as well as reveal that many of the challenges in food waste management are the result of not considering the interactions between human and non-human actors. ANT has also been used by a number of waste researchers for a similar purpose (for example, see Gille, 2010; Gregson & Crang, 2010; Lepawsky & Mather, 2011; Magnani, 2012; Marshak, 2012; Moore, 2012; Evans et al., 2013). Gille (2010) argues that waste, and its “production, circulation, and transformation” (p. 1056) is a significant element of what makes up society (see also Moore, 2012). Waste is part of society, as much as we try to pretend it does not exist, and distance ourselves from it.

For example, Gregson and Crang (2010) argue that waste can be seen in numerous ways: it is regarded as both a physical item (material), as well extraneous (immaterial), where it is hidden
and distanced from society. From there, waste is transformed via ‘treatment technologies’ into a resource, and thusly is no longer identified as ‘waste’. This exemplifies the relational character of waste. Gregson and Crang (2010) also note that waste treatments are not only coping strategies for garbage (“leftover matter”), but are political actions that standardize disposal practices (at a variety of scales – households, regions, etc.). An example here is the waste hierarchy, which has now largely been recognized as the prevalent way of considering disposal options and methods. Waste policies may act to divert waste from landfills through recycling and reuse activities, but this is merely performing what Gregson & Crang (2010) refer to as a “vanishing trick” (p. 1029). According to the second law of thermodynamics, matter can only be transformed into something else; it never disappears or is destroyed (Gregson, Watkins & Calestani, 2010b). This means that waste is never 'gone'; when food waste is converted into a resource (e.g. fertilizer or biogas), it is still the same nutrients from the food itself. These so-called ‘disposal’ technologies are not really disposing of anything, they are merely transforming waste into something else. While it is better to create something useful out of waste than sending it to landfill, it is important to note that these nutrients would be better served being eaten by people, or never had gone into producing food in the first place (Gregson & Crang, 2010; Gregson, Crang, Ahamed, Akhter & Ferdous, 2010a).

As suggested by these transformative technologies, waste is a mutable material – not fixed, historically changing, and indicative of social values (Gregson & Crang, 2010). From here, we can see waste is socially constructed: what one society may define as waste may not be considered waste by another society, or even in a different time period, or place (waste is also geographically situated). Consider food waste: while some may think moldy cheese or potato
peels are inedible substances, others might not (Alexander et al., 2013). Gregson and Crang (2010) postulate that these classifications are identified by society, not by the material itself.

Food is also fluid (i.e. does not have fixed properties or qualities) (Evans et al., 2013). Food is prone to rotting and growing mold, thereby quickly altering it from edible sustenance to ‘waste’ (Evans et al., 2013). In this way, ANT and its examination of fluidity and nonhuman actants fits well with food waste research, where a variety of nonhuman actors play roles (Evans et al., 2013; Moore, 2012). For example, Evans et al. (2013) suggests “microbial life, packaging, preservation technologies, containers and domestic appliances alongside scientific methods of treatment, disposal, and management” (p. 11) are all part of the nonhuman network existing in relation to food waste. Murdoch, Marsden & Bank (2000) examines food systems with an ANT framework, suggesting that the food system lends itself well to this hybrid theory, as food is a result of the natural, social, and technical; food is a mix of the “organic” and “inorganic” (Fine, 2005; Murdoch, 1994; Goodman, 1999; see also Goodman, 2009).

Furthermore, ANT is a relational theory where the capacity to act or effect change is dependent on the connections an actor or actant has, whereby power is held in the complex networks rather than with any one actor/actant (Murdoch, 1998; Law, 1999; Latour, 2005; Holifield, 2009; Ruming, 2009; Moore, 2012; Gray & Gibson, 2013). Bosco (2006) provides an excellent example of this relational network: “I would no longer be a geographer with the ability to write papers and produce knowledge if my computer, my colleagues, my books, my job, my professional network, and everything else in my life that allows me to act as what I am were taken away from me” (p. 2). Where things are located in a given network defines their identity and makes them what they are; actors/actants are not fixed in one place. Murdoch et al. (2000) suggests that these heterogeneous actors and actants that make up networks then continually
change and sometimes even fall apart – so that is to say if any of the actors/actants change, the whole network changes. For example, if a landfill organics ban is implemented, the food waste network changes drastically, since landfills would be removed from the network, and other disposal technologies would become more prominent.

As Roy (2015) notes, “phenomena do not come into existence by themselves, but are made by actors in the process of continuing associations” (p. 326). In the context of food waste then, this means that the phenomena of food waste is not a problem in and of itself; the various actors and actants involved – microbial life, fear of food poisoning, methane released from anaerobic conditions in landfills, abundance of food in the West, the lack of space for compost bins, the social avoidance of waste, and so on - make it the problem it is (and food is dependent on these relations to make it waste, and then a problem).

It has been shown that waste, and in particular, food waste, is not inherent in and of itself, it becomes waste due to both the natural properties of food, as well as society’s construction of what constitutes edible/inedible (Gregson & Crang, 2010).

1.7 Materiality

Accepting that food has transformative abilities, whereby it can switch from healthy sustenance to moldy decaying ‘waste’ exemplifies its agency and materialism. Therefore, the characteristics of food are an important consideration when thinking about the management and diversion of food waste. How food is processed, stored, and handled is relational to its matter. As Mena, Adenso-Diaz & Yurt (2011) note, the characteristics of food directly result in the generation of food waste. For example, shelf-life of products and health and safety concerns that govern such things as temperature guidelines directly affect when food becomes waste. Goebel et al. (2015) note that the food value chain is distinct from other value chains because of the
intricacies of the materiality of food, and concerns about its safety, quality, etc. (how it’s handled, transported, processed, distributed, consumed, retailed). Halloran et al. (2014) note that considering food within a circular economy thinking (i.e. the food waste hierarchy, where waste is re-used and repurposed into another product, such as biogas) is more complicated that other sectors because of how food is transformed after use (or even if not used, but has a time limit on it/value considerations). It cannot be broken down into components (i.e. like a car) and recycled. There is still much research to be done of food waste, both at a practical level of the study of food waste within the food value chain, as well as on a theoretical level, and using ANT to trace how food waste circulates through society and to illuminate the materiality of food/waste. The following section outlines the opportunities for further research within this context.

1.8 Opportunities for research

In general, studies on food waste are still few and far between (Evans et al., 2013; Katajajuuri et al., 2014), especially in a Canadian context (Abdulla et al., 2013; Parizeau et al., 2015). Since food systems are localized and place-based, local context is an important factor in food waste studies (Parizeau et al., 2015; Eriksson et al., 2015) and therefore the study of other regions is encouraged (Mena et al., 2011). Evans et al. (2013) notes that there is a common inclination to situate food waste as a consumer concern; however, the FAO recognizes that waste occurs along the food chain, and calls for additional research across the value chain. Bagherzadeh et al. (2014) also note that food waste at the household level is relatively well covered, whereas little is known about food waste at the primary, manufacturing, and food service sectors. Parfitt et al. (2010) and Katajajuuri et al. (2014) note that there is a great potential for food waste reduction by retailers, the food service sector, and consumers, however the majority of research has focused on households. Studies that do examine retailers and other
sectors have concentrated on quantification (Gregson & Crang, 2010). While numbers provide data on how much is being wasted (even though many of these studies rely on estimates), this does little to uncover the social practices surrounding food disposal and waste management (Stoddart, 2013).

Numerous researchers have indicated that further research is needed on the entirety of the food value chain, and looking toward collaboration amongst stakeholders across the value chain as solutions to this problem and as steps toward a sustainable food system (see, for example, Nahman & de Lange, 2012; Goebel et al., 2015; Halloran et al., 2014; Katajajuuri et al., 2014; Aschemann-Witzel, de Hooge, Amani, Bech-Larsen & Oostindjer, 2015). Furthermore, theoretical framings of food waste in more-than-human (ANT) perspectives are lacking (Alexander et al., 2013). Magnani (2012) (among others, see also Gille, 2010; Gregson & Crang, 2010; Hawkins, 2009; Khoo & Rau, 2009) points out that further research is needed in the social sciences to consider the materiality of waste and how it interrelates with social factors.

Finally, Thyberg & Tonjes (2016) note that very little food waste is recovered, and that prevention initiatives are limited. Therefore, it is necessary to examine why this is the case, and what the barriers to food waste recovery are. A place-based analysis of how food waste flows across the food waste hierarchy is needed, which is the purpose of this study.
Chapter 2: Methods and Research Approach

2.1 Research Approach: Actor-Network Theory

Actor-Network Theory (ANT) is a suitable framework to use for this topic, and it has been used by a number of waste researchers (for example, see Gille, 2010; Gregson & Crang, 2010; Magnani, 2012; Marshak, 2012; Moore, 2012; Evans et al., 2013).

This theory identifies the significance of numerous actors and actants (Ruming, 2009; Stoddart, 2013). For this particular food waste study, these could include things such as the people involved, the “actors”: retailers, social justice organizations, and producers, to the waste itself, the “actants”: bacteria, nutrients, storage technologies, food safety regulation and best before dating systems, waste disposal systems, the elements of the food recovery hierarchy, policies, methane from rotting food, and so on (Evans et al., 2013; Stoddart, 2013). Using such an approach implies the diverse and heterogeneous relationship a variety of actants have on the food/waste network. This means that any of these actors/actants listed above can affect food waste and how it is management, but are not stringently held in their place in the network (microbial decay may cause food to rot, but if refrigeration technology is introduced, this changes the network and will slow the transformation of food to waste).

This is an emergent and constructionist theory (Murdoch, 1997, 2001; Ruming, 2009; Moore, 2012), meaning that data or findings are not made to fit into a pre-existing theory; the actors/actants must be allowed to make their own way, and researchers must “follow the actor” (Murdoch, 1998; O’Neill & Whatmore, 2000; Holifield, 2009; Ruming, 2009; Johannesson & Baerenholdt, 2009). With that, I spent my data collection period following food waste and the complex network it creates in Guelph.
2.2 Study Site

I conducted my research in the city of Guelph, Ontario. It is a mid-sized city in Southwestern Ontario, with a population of approximately 120,000 people (City of Guelph, 2012). Guelph is a suitable study site because it is an epicenter for food research, yet (as with most municipalities in the Global North) there is little research on food waste in this community (Parizeau et al., 2015). Guelph also has a notably high amount of agri-food and community food initiatives (Nelson, Knezevic & Landman, 2013). This could potentially mean that the local population would be more responsive to discussing this issue. In addition, Guelph has had the highest residential waste diversion rate among Ontario municipalities (City of Guelph, 2012; KW Pages, 2015). Furthermore, food insecurity rates in Guelph have increased considerably since 2007-2008 from 10.8% to 16.4% in 2011-2012 (Tarasuk & Dachner, 2014; Guelph Wellbeing, 2014). Considering the high level of community food initiatives and food redistribution initiatives in Guelph, the contradiction between high amounts of food waste and food insecurity is notable (Nelson et al., 2013).

2.3 Data Collection

2.3.1 Phase 1: Document Analysis

Actor-Network theory as a method uses a variety of qualitative data collection techniques (Ruming, 2009). For this research, I employed document analysis, semi-structured interviews, and key informant interviews. I began my data collection by addressing my first objective: identifying pre-existent connections for the redistribution of food among stakeholders (social justice organizations and food retailers/producers, initially). In this case, I chose major food retailers and social justice organizations as the beginning nodes in the food/waste network because this connection is already well known (see, for example, Midgley, 2013; Schneider, 2013; Uzea et al., 2013; Thang, 2008), and because food redistribution to address food insecurity
is identified in the food waste hierarchy as the best possible option for the redirection of food “waste” (Papargyropoulou et al., 2014; EPA, 2014). I spent April and May collecting and analyzing the content of corporate social responsibility and sustainability reports for retail businesses (Bowen, 2009). I also examined social justice organization mandates in order to identify as much as possible of the existing network around food waste in Guelph, as well as attitudes towards food waste redistribution within these nodes.

Document analysis allows for systematic evaluation of both printed and electronic sources (Bowen, 2009). It provides empirical data that can help uncover meaning and develop understanding relevant to the research problem, providing context and background information, as well as triangulation (Bowen, 2009). All of my document analysis was of electronic documents. This process helped to elucidate retailers’ policies on food waste donation and diversion strategies, as well as social justice organizations’ mandates and acceptance of “waste” foods, and connections that already existed among these stakeholders.

Using purposive sampling, I selected all major Canadian food retailers from those listed in the Guelph Yellow Pages (e.g., Zehrs, Metro, Food Basics, Fresh Co., Costco). Through this Yellow Pages search, I also identified smaller/independent food retailers (e.g., Paisley Fine Foods, Market Fresh, Goodness Me). Similarly, by conducting a Google search using the terms “Guelph community food security”, I compiled a list of key social justice organizations that are involved in emergency food services and food redistribution in Guelph (Guelph Food Bank, Guelph Poverty Elimination Task Force, Guelph Wellington Food Roundtable, The Seed).

Purposive sampling is a method of non-probability sampling where the researcher chooses the sample members based on defined criteria, usually based on experience related to the research being conducted (Parfitt, 1997; Longhurst, 2010). The aim of purposive sampling is to
choose an illustrative sample rather than a representative one (Valentine, 1997). This was an appropriate choice for this study because through my preliminary research I gained adequate knowledge of the major and independent retailers in the area, as well as the organizations that deal with food redistribution in Guelph so that I could select the appropriate businesses and organizations to recruit. In addition, because of the time constraints on this study (I only had a certain number of months to collect my data), this was a suitable choice as I was able to target these retailers/organizations directly.

From these starting nodes, I identified further stakeholders along the food value chain (and food waste hierarchy) to expand the network to include those involved in creating food waste (e.g., retailers, producers, food service (restaurants and caterers), distributors) and those accepting edible or inedible waste (e.g., emergency food providers, composters, producers, anaerobic digesters, waste management companies) in order to identify other existing and potential connections in the city, using snowball sampling and further purposive sampling.

2.3.2 Phase 2: Semi-structured Interviews

Through the document analysis, I identified initial interviewees for semi-structured interviews. I recruited interviewees by sending emails that explained the purpose of my research, my affiliations and qualifications, and the expectations of the study (for example, length of interview) in order to explore the networks of food redistribution along the food recovery hierarchy (Valentine, 1997; Ruming, 2009) (see Appendix A for information letter and consent form). For those who agreed to participate in an interview, I obtained informed consent and scheduled a time to meet that was mutually convenient.

I chose a semi-structured interview format because this method offers a “conversation with a purpose” that consisted of me asking guiding, open-ended questions that allowed the
interviewee to talk about the subject in an unrestricted manner (Valentine, 1997, p. 111; Longhurst, 2010). This is useful as the material collected is generally comprehensive and “rich” (Valentine, 1997, p. 111), thereby creating a meaningful and multifaceted representation and understanding of the situation. It is important to note that the aim of the interviews was to be descriptive and expressive rather than representative, and to gain an understanding of how the situation is perceived by the respondents (Valentine, 1997). Using this technique, the data I collected within these interviews allowed me to address my second objective as well, which is to identify barriers and opportunities for expanding the flow of edible food to social justice organizations, and non-edible food waste along the food waste hierarchy.

By employing a snowball sampling technique (Valentine, 1997; Longhurst, 2010), other actors and key informants became apparent as the interviews progressed. I started with social justice organizations, who identified other organizations involved in food waste reclamation, key informants in that sector, as well as retailers and producers from whom they received donations. Retailers identified other retailers, as well as the waste management companies they used. The waste hauler identified the anaerobic digestion facilities where they drop off organic waste, and the anaerobic digester identified key informants in the waste and organics diversion sectors. Producers identified people from whom they receive compost/animal feed and to whom they donate food; restaurants/caterers identified producers (farms) where they dropped off compost, and to whom they donate food.

As these further nodes became apparent, I continued to use purposive sampling to identify additional respondents and key informants. In total, I conducted 33 interviews with key players in the Guelph food/waste network (26 respondents and 7 key informants). In speaking with these interviewees, and mobilizing the food waste hierarchy, I was able to trace other
human actors, as well as other non-human actants that are central to the food/waste network (see Appendix B for a sample of the questions I asked; these questions were tailored accordingly for each sector).

Key informant interviews were conducted with experts in the emergency food provider sector in Guelph, and experts in the waste management sector in both Guelph and the broader Ontario context. These questions were aimed at verifying the food waste network I had created in Guelph, as well as identifying barriers and opportunities within these sectors.

The questions were detailed to suit the specifics of each sector, but were generally designed in order to elucidate the food waste flows (where food comes from, how waste is managed) as well as identify current challenges to diverting food waste, current motivations for diversion, and potential opportunities and further connections respondents would like to see across the food system.

ANT suggests that the more interviews, the better, as it creates a wider network to trace (Latour, 2005; Ruming, 2009). Because ANT methodology is about “following the actors”, I followed the network until interviewees provide similar information, or data saturation. Data saturation occurs when a multitude of statements coincide with one another, which reinforces the reliability and legitimacy of the gathered information (Moore, Lapan & Quartaroli, 2012).

In addition to providing data for analysis, interviews can also contribute insights to the development of the actor-network method through which to follow the ‘actants’ (Ruming, 2009). The greater the number of interviews, the greater the capability to trace network links, and therefore to identify barriers and opportunities that exist outside our preconceived ideas of the research field or key informants (Ruming, 2009). By recognizing the actors and actants that emerge through interviews, it is apparent that barriers and opportunities include not only
people’s perceptions of waste, but also policies and elements of the food recovery hierarchy. The fourth objective of my study is to use ANT methodology and framework to interpret the flows of food waste in Guelph, achieved by “unearthing the complex web of associations” (Ruming, 2009, p. 453).

2.4 Data Analysis

2.4.1 Coding

I recorded each interview using a voice recorder, and transcribed them into readable form as soon as the individual interviews were completed in order to ensure that any unclear sections were clarified while still fresh in my memory (Crang, 1997). Once the interviews were complete, I coded the transcripts using NVIVO, a qualitative software program, in order to identify key themes and patterns (Valentine, 1997).

I completed two readings of my transcripts: the first was a descriptive coding, which is “open” and unrestrictive, where I was able to identify broad categories and themes (i.e., barriers, opportunities, elements of the food waste hierarchy). I then read through the transcripts again, using second-level, analytic coding in order to trace these broad categories in order to find deeper meanings and nuances (i.e., barriers and opportunities specific to sectors, theoretical implications). These analytic codes helped to gauge the broader categories’ significance to my research questions and objectives, as well as identify emergent theoretical themes (Cope, 2010; Silver, 2015).

During each interview, I also made note of my own actions and thoughts. As Crang (1997) notes, it is important to document this in order to consider how the researcher’s actions influence the data collection and subsequent interpretation of the data. It is important to note, especially with using the ANT method, that I (the researcher) became part of the network, and
the research findings are a particular interpretation (or translation) of my perspective, level of access to research informants, and positionality (Latour, 1987; Law, 1999; Ruming, 2009).

2.5 Grouping Sectors and Terminology

I aggregated the actors I interviewed by sector of the food value chain in order to better analyze the results according to the food waste hierarchy. Producers were considered as one sector, distributors and retailers were grouped together since they both deal with distributing and selling food. Restaurants and caterers were grouped together since they both deal with food preparation and service. Emergency food providers (i.e. food banks, food pantries) and food rescue organizations (i.e. gleaners, dumpster divers) were grouped together since they both have similar mandates and share the same level of the food waste hierarchy, receiving surplus food to redirect to people, although emergency food providers are typically primarily concerned with providing food to hungry people. Food rescue organizations are more concerned with preventing food waste and finding appropriate audiences to do so. It is also important to note that the term “emergency food providers” is how these services self-identify in Guelph, and is why I continue to refer to them as such. This is a contested term because of the on-going nature of these services. Although these services were initially meant to genuinely be a short-term “emergency” way to access food, over the last thirty years it has become clear that these services are not temporary (Tarasuk, 2001; Riches, 2002). Others involved in this area of food provisioning prefer to call it simply “food provision”.

I also grouped together private waste haulers, anaerobic digesters, and two key informants, a biogas industry representative and a waste management expert, and titled this sector ‘waste management’, as they all deal with end-of-pipe, in accepting organics waste. They fit under the “waste management” definition, which involves the collection, transportation, and
processes related to waste handling (Conserve Energy Future, 2016). However, despite these similarities, the private waste hauler and anaerobic digester provide distinct services. Also, missing from this section is the City of Guelph waste representative who was interviewed. Although the City does compost organic waste, this is mainly a residential service; they only collect organic waste for businesses in the downtown core. Further, it is important to note that the City of Guelph is currently solely focused on examining food waste at the household level. Therefore, the waste management section is lacking input from the municipal sector. I did not interview consumers in this study because this is already where much of the research to date has focused, and it is important to examine waste at the various other levels of the food value chain, since waste happens in each sector. This is important because change at the policy and retail levels have the potential to reduce the amount of food wasted at a larger scale (Parfitt et al., 2010). However, it should be noted that interactions between some sectors of the value chain (i.e., retailers, small-scale producers who sell directly to consumers) and consumers are important and can impact one another. For example, food waste can be addressed in part by retailers changing their selling policies (i.e., buy one get one later options), as well as by consumer demand for this type of change. For this reason, some respondents spoke about consumers and they generally represented them as passive actors. They are therefore referred to as such in this study, since they were not interviewed directly (as this was outside the scope of this research). However, food waste literature indicates that consumers do have agency in the food/waste network (see, for example, Gooch & Felfel, 2014; Beretta et al., 2013). Future research is required to learn more about how consumer agency influences the institutional flows of food waste discussed in this study.
2.6 Research challenges and limitations

Waste is often considered a private and sensitive subject (Mena et al., 2011; Marshak, 2012; Bagherzadeh et al., 2014). I expected reluctance from businesses and producers to discuss their food waste management practices, and many potential respondents declined to participate in an interview. Gooch and Felfel (2014) noted similar challenges in their research. In addition, social justice organizations are often volunteer-run or have only minimal staff, and so there was often no one able to participate (although they were more willing to try to accommodate my requests). The only producers that agreed to an interview (or were identified via snowball sampling) were small-scale producers.

Some participants agreed to an interview, but were reluctant to speak about their waste management practices. I addressed this by using the food waste hierarchy to provide alternative diversion options; for example, if a retailer or producer did not want to discuss one aspect of the food waste hierarchy, they were often willing to speak about another (i.e., compost vs. donation). This challenge was also addressed by network saturation. By interviewing a multiplicity of actors enrolled in the network, if one respondent refused to speak about donation or waste diversion, another actor was able to provide reasons why, or provide further insight to that node (e.g., if a retailer declined participation, a social justice organization that receives donations from that particular retailer could fill in information). This saturated network also resulted in the triangulation of data by using various perspectives and sources of information to increase the validity and understandings of the data collected (Valentine, 1997; Cope, 2010).

A further research challenge was the nebulous nature of ANT as a research process (Ruming, 2009). It was difficult to know when I had gathered enough data and had mapped enough of the food waste network in Guelph. Since network formulation within ANT methodology could continually expand, I initially planned on addressing this by temporally
bounding the network expansion. However, one challenge I did not account for was the timing of recruitment and interview scheduling, which took longer than I had planned for (initially I had planned for 4 months of data collection). Because of this, I allowed this period to continue until I had gathered data from a variety of nodes and began experiencing data saturation.

A final anticipated research challenge was the snowball sampling technique I used to recruit interviews. Although this is a requirement of the ANT method in order to “follow the actor” and trace the network (Murdoch, 1998; O’Neill & Whatmore, 2000; Ruming, 2009; Johannesson & Baerenholdt, 2009), it is often critiqued as leading to a biased sample. I addressed this by contacting a multiplicity of initial informants (retailers, producers, and social justice organizations) in order to being the mapping from multiple nodes (Valentine, 1997). Further, because of the secrecy surrounding waste management practices, snowball sampling did not provide me with all of the contacts I was expecting, and so I continued to use purposive sampling to identify further respondents. Snowball sampling was most successful within sectors, and not between.

2.7 Ethical considerations

Positionality, or the recognition of power relations and dynamics, and reflexivity are important considerations in conducting qualitative research, and how this affects communications with others (Valentine, 1997; Longhurst, 2010). This includes the power I may hold as the researcher and interviewer, as well as the potential power that businesses hold in what information and knowledge they are willing to provide (Valentine, 1997). Recognizing these dynamics and my position as a junior, female, student (perceived as non-threatening) through reflexive practices influenced the interview process and results (Ruming, 1999; Ley & Mountz, 2001; Valentine, 1997). In some cases, this made respondents feel at ease, and they
shared valuable information with me. For example, one respondent said he wanted me to do well on my project, and so talked openly about food waste in his business. In other cases, respondents were wary of my research and did not talk openly about their practices for fear of being exposed. Finally, it is possible that some respondents answered questions with what they thought I wanted to hear (social desirability bias). I addressed these considerations by recognizing these power dynamics, and by considering my position as a researcher through reflexive practices. I tried to establish trust and rapport with the respondents by presenting myself as a student (Silverman, 2006) interested in learning about these processes, and not there to expose any of their practices or to pass judgment.

Because waste is such a sensitive subject, and a great deal of stigmatization exists around poverty and donating/reclaiming food (waste), I have kept informants anonymous (Marshak, 2012; Schneider, 2013; Riches, 2002; Nelson, Aberdeen, Dietrich-O’Conner & Shantz, 2011; Thang, 2008). I therefore ensured all data collected was secure and inaccessible to others (Longhurst, 2010).
Chapter 3: Results

This chapter outlines the findings of my research. It is separated into three main sections; the first section addresses my first objective, to map the network of food waste flows in Guelph. This helped to determine what connections already exist among stakeholders to divert surplus food and food waste away from landfill in the City of Guelph. The second section addresses my second objective, which is to identify the barriers to increased food waste diversion. The third section addresses my third objective, to identify the motivations for those who do engage in redirection activities, and what potential opportunities exist for further food waste diversion. My fourth objective, to use ANT methodology and framework to interpret the flows of food waste, is connected to these three sections, and will be further analyzed as a theoretical lens in chapter 4.

3.1 Objective 1: Map the network of food waste flows in Guelph

The connections that exist for the redirection of the flow of food waste among sectors are mostly private, with few policy or company mandates for the redirection of food waste (with the exception of one corporate retailer). This section uses the food waste hierarchy as a framework to determine which sectors are aiming to reduce food waste, which are feeding people (either by donation or by giving it to friends/family) with surplus food, and which redirect their food waste for animal feed, compost, or anaerobic digestion. Therefore, the major themes that emerged in this section are reducing waste, food security, and environmental concern. The various sectors interviewed for this study reduce food waste where possible along the food value chain, especially since waste often equates to money lost for businesses. This is often dealt with by planning accordingly so that an excess of food (that can easily become waste) is not an issue. Food security (feeding people) is evidenced by the donation of food and the role food redistribution organizations play. Concern for the environment is another theme evidenced by the
remaining diversion options, where food waste is either composted, used as animal feed, or sent to an anaerobic digestion facility.

In creating this actor-network and ‘following’ food waste within the City of Guelph, respondents fell into categories of either being food waste creators (who needed to redirect food waste), or as those accepting food waste (as components of the food waste hierarchy). Actors who created food waste were producers, distributors/retailers, and the food service sector (caterers, restaurants). Actors involved in food waste diversion were emergency food providers and food rescue organizations, and the waste management sector (private waste haulers and anaerobic digesters). Some actors fell into both categories. For example, producers created food waste, but also could act as composters as well, and emergency food providers primarily acted as accepters of surplus food, but also had food waste that needed disposal at times. Figure 2 is a visual representation of this network. The left-hand column represents the food value chain, and the right-hand column represents the food waste hierarchy. ‘Source reduction’ is not included in this representation of the food waste hierarchy (although discussed below) since this is not able to be mapped. Arrows show where food waste flows, and are colour-coded to indicate where the food waste ultimately ends up (for example, the landfill disposal option is grey, and grey arrows represent food waste going to landfill). Private waste haulers are intermediaries that are neither part of the food value chain or the food waste hierarchy, but play an important role in food waste diversion. They are represented in their own box between the two columns.
3.1.1 Source Reduction

Caterers in the food service sector note that since they usually know the amount of people for whom they are preparing food and have a specific menu plan, they are able to plan accordingly, with only a buffer of excess food that they would then likely pass on to the client or take home themselves (or perhaps donate; more on that below). As one caterer noted:

I’m often buying food for each event, and only…enough food to satisfy that event at a time (Caterer 2)

Restaurants aim to order based on volume, so once the chef (head of kitchen) learns the patterns and volume of customers, they order accordingly. As one restaurant manager noted:

Because we order based upon sales volumes, it will always be usable, until, for lack of a better word, expiry (Restaurant 1)
Retailers note a similar system, and some use a computerized tracking system to help them track sales so they know what amounts of food to order. Also, proper rotation of product and recording a date on all products helps to reduce waste by keeping track of what is on hand and when it arrived.

Producers noted that Community Supported Agriculture schemes (CSAs) are a great way to produce food and reduce waste, as they know how many customers they are growing for. As one small producer noted:

You can do a lot to reduce waste in terms of planning, like we’re always getting better at growing the amount of food we need and not more (Producer 5)

The small-scale producers I spoke with also only harvest what they need, and leave excess vegetables in the ground until they need them, where possible. They also know how best to store produce, which helps keep produce fresh if not sold when harvested. The CSA model was described as superior to markets by the small-scale producers I spoke with, since CSAs have guaranteed buyers. As one producer noted:

The structure of our business is that everything is pre-sold, so we don’t go to the market or have a contract that fails or go to the market and nobody shows, because we know how many members we have and we grow for that number of people (Producer 5)

The other actors involved in this actor-network, such as emergency food providers, found they rarely, if ever, have the need to reduce food waste since most food is given out. As one emergency food provider noted:

Produce comes in on Tuesdays and the eggs also come in on Tuesday, and by the end of Tuesday, everything is gone, except for, I’m going to say the three things that always stay back are potatoes, carrots, and onions, and those things can be stored (Emergency Food Provider 3)

As for the waste management sector – anaerobic digesters and private waste haulers – are in the business of picking up and accepting food waste, and therefore are not necessarily
concerned about reduction. When I asked if having processes like anaerobic digestion could encourage food waste since it is used as a feedstock, a waste management expert noted:

I don’t think we’ll ever, as a society, get to a point where there is zero organic waste…our encouraging message is yes, by all means, look at ways in which you can…help to reduce [it] in the first place, but at the end of the day, you are always going to have some component …of waste material, and it’s a question of what are your options in how you utilize that material, and we would like to present them with the option of diverting that material to an anaerobic digester (Key Informant 3)

3.1.2 Feeding People

Following source reduction, feeding people is ranked as the highest form of diversion for edible food waste according to the food waste hierarchy. Emergency food providers in Guelph have partnerships with both large and independent retailers, distributors, as well as a few local, organic farms. Door to door food drives also collect donations, whereby people “clean out their cupboards” (Emergency Food Provider 4). Most of the Emergency Food Providers also share among one another if they have excess. Food rescue organizations pick up surplus food from farms close in proximity, grocery distributors, as well as from dumpster diving, and also share food with (some) emergency food providers. A community food organization gleans excess fruit from fruit trees, processes it, and donates a portion of the processed products to an emergency food provider as well.

Caterers donate prepared food – as long as it has not been served to the public or reheated – to some emergency food providers. One caterer drops off surplus prepared food for the staff at an emergency food provider, due to perceived legality issues to passing it on to clients.

One producer sources extra/surplus food from other producers in order to aggregate enough food to offer a winter CSA, when overall supplies are low.
Retailers often use a reclamation service that comes in and takes away all “damages” (food waste), and provides credit to the store. The reclamation service has relationships with emergency food providers for any food that is still considered edible.

In addition to using surplus or excess food to address food security issues, some producers and food service providers simply eat unsalable/excess food themselves, or give it to friends and family. Most producers reported that they ate the unsalable produce themselves. Also, both of these sectors report that they will repurpose or process food in order to make excess last longer, or to hide imperfect produce. Caterers will offer surplus prepared foods to the client before donating it or eating it themselves. One independent retailer stated they put items out for customers to sample if they are coming up on their best before date, or reduce prices for quicker sales.

3.1.3 Feeding Animals

Some food service providers (caterers, restaurants) have relationships with farms to pick up their organic scraps to feed to their animals. As one restaurant recounted, they used to have a partnership with a farmer, although this arrangement had stopped (they did not know why):

We had a uh, bucket for…kitchen food scraps, vegetables peelings and such that a farmer picked up each week and took to his pig farm (Restaurant 1)

One caterer noted they actively partake in this activity:

I know of a farm that willingly accepts…untouched food and they’ll feed it to their animals (Caterer 2)

Producers, if they have animals on their farm, will regularly feed animals with food items that are not turned into the soil. If they do not have animals on the farm itself, they usually know of people who have animals and will take scraps.
One retailer who has a relationship with a few local farms sends their organic scraps to them for animal feed, or compost. This retailer also allows customers or staff who have chickens to take organics waste as well. Another retailer noted that their ‘bone bins’ that collect all meat waste are picked up by a company and rendered for industrial uses. The other retailers/distributors in this sector did not partner with any farms or give any food waste for animal feed, although one retailer used an organics waste management service that picks up food waste and transforms it into compost, biogas, or animal feed (according to the waste management company’s website).

An emergency food provider also has a partnership with a farmer to pick up food scraps for animal feed.

The waste management sector will be discussed in the following subheading, since anaerobic digesters accept food waste as a feedstock, and therefore do not redirect any food waste for animal feed (and have been referred to as “bio-machinic scavengers” (Alexander et al., 2013), and the private waste hauler I interviewed offers an organics service in which they partner with anaerobic digestion facilities.

3.1.4 Industrial uses (Anaerobic Digestion and Rendering)

Food waste is redirected to an anaerobic digestion facility in Southern Ontario from all over Ontario, and because waste haulers aggregate much of what they pick up, it is hard to identify where exactly the waste comes from. However, they reported they used to get regular loads from Timmins, Sudbury, the Region of Peel, the Greater Toronto Area, as well as some food processors, and organics from a large grocery chain that had implemented a corporate mandate to divert food waste from landfills.
The private waste hauler respondent confirmed that they pick up organic waste from a large chain grocery store and take it to this anaerobic digestion facility. Retailers who do not have an organics program usually have at least a ‘bone bin’ that is picked up by a company that renders bones and fat for industrial uses, as noted above.

Inedible food waste that is redirected to anaerobic digestion facilities is processed into digestate, which is sold as fertilizer, and the methane is captured to power surrounding houses.

The other actors in this network do not divert food waste to anaerobic digesters. For example, producers, the City of Guelph’s residential waste management service, food service providers, and emergency food providers divert inedible food waste for compost, as discussed in the following sub-section.

3.1.5 Composting

For any businesses in the downtown core, including food service providers, the City of Guelph picks up organic waste as part of their municipal pick up for composting (see Figure 3).

![Figure 3: Map of downtown core waste pick-up, City of Guelph, 2016](http://guelph.ca/living/garbage-and-recycling/curbside-collection/downtownwastecollection/)
There are a variety of partnerships that connect food service providers (caterers, restaurants), independent retailers, and emergency food providers with local farmers to take their compost.

In addition, several emergency food providers have access to a green bin or community garden, and compost their inedible organic waste that way.

Local organic producers compost anything inedible/unsalable on their own farms, sometimes favouring this over donation because it provides nutrient cycling that benefits their soil and future crops.

3.1.6 Landfill

Some caterers reported that it is simply too difficult to compost when they are at on-site events, and therefore any scraps or plate scrapings end up in the garbage. Another caterer, who has a relationship with a farm for composting, will not put bones in the compost because they know farmers go through the compost by hand (and do not want to injure them). Many food items in the distribution sector simply get thrown away because of the high volume, especially if it is inedible. While some edible food is donated, inedible food gets thrown away (rather than composted).

Most emergency food providers will throw away expired food, or, depending on the provider, will also throw away foods past their best before dates. While some did state that they will compost fresh items (if they have easy access to a composter), any canned or packaged food is thrown in the garbage. Limited staff, time and availability make it impossible for these foods to be de-packaged in order to divert them.

Retailers landfill much of their organic material, often simply because they do not have an organics pick-up program. If they do have a diversion system in place, food still ends up
going to landfill: space for the amount of organics bins needed is often an issue, and so excess is thrown out, and packaged goods often get thrown away because no one has the time to de-package items. Even with a reclamation company dealing with “damages” (waste), some items are scanned in order to receive credit from the vendor so that the retailer does not have to pay for unsold items, and then are thrown out. It is also unknown what happens to the items once the reclamation service takes them, other than some viable edible items are donated (according to their website, which does not provide any information about inedible food waste disposal). The reclamation service declined an interview. Other reasons retailers landfilled food was if items had been recalled. Under these circumstances, they often have to be ‘destroyed’ so that they are not even recoverable from the dumpster (i.e. for dumpster divers).

3.1.7 Section Summary

This section has mapped the flow of food waste in the City of Guelph by tracing the paths food waste takes. In using the food waste hierarchy as a framework to trace these flows, the themes of reduction, food security, and environmental concern emerged. Reducing food waste was seen as an important piece in addressing food waste, and was largely linked to the fact that waste often equals economic loss for many sectors. Food security was the second theme, and was related to donation. Many respondents felt that donation was a good and helpful way to redirect surplus food. Finally, concern for the environment was the third theme. The remainder of the options of the food waste hierarchy fall within this category, although actual motivations for choosing some of these diversion options may be aligned more closely with other reasons, such as economics. These and other motivations will be explored in depth in the final section of this chapter. Tracing food waste flows is an important first step in examining food waste in a city because it creates a baseline in identifying what the different sectors along the food value chain
are currently doing to address food waste diversion. Mapping this flow also served to illuminate the barriers to, and motivations and potential opportunities for increased diversion, which will be discussed in depth in the following section.
3.2 Objective 2: Identify the barriers to increased food waste diversion

This section identifies and discusses barriers on a sector-by-sector basis. While there are similarities among these barriers, they also vary between sectors and show complexities within sectors. This is why it is important to examine and un-pack them by sector. First, however, I will provide a summary of the overall important points before delving into the sector results. Following is a table that identifies the barriers as identified by respondents.
<table>
<thead>
<tr>
<th>Barriers</th>
<th>Producers</th>
<th>Distributors/Retailers</th>
<th>Food Service</th>
<th>Emergency Food Providers</th>
<th>Waste Management</th>
<th>Illustrative Quotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>We can’t afford to harvest it and bring it somewhere…and I can’t afford to pay my staff to do that, and then give it away (Producer 5)</td>
</tr>
<tr>
<td>Stigma</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>I think it’s a stigma around who uses a food pantry, right? So there’s a willingness to give food that’s unappealing to people who need it because there’s a stigma around who’s using it (Emergency Food Provider 5)</td>
</tr>
<tr>
<td>Quality of Feedstock</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>The more contaminated your material is…it potentially impacts what your end product is (Key Informant 4)</td>
</tr>
<tr>
<td>Excess</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>If you don’t have a market for what you have to sell, then that’s an area of food waste (Producer 4)</td>
</tr>
<tr>
<td>Infrastructure/Logistics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>If they don’t have the right person, the right time, the right vehicle to be able to go there and step away from the other work that they’re doing, it’s a pretty major barrier (Key Informant 2)</td>
</tr>
<tr>
<td>Vendor Control</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It really depends on what vendor you’re dealing with, you have different contracts, with...different companies. Some of them will specifically tell you to donate items, some of them will tell you not to donate the items, for whatever reason, you kinda gotta respect those things (Retailer 1)</td>
</tr>
<tr>
<td>Education/Training</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>Regulating it at the start...getting people to change their routines...can be challenging (Restaurant 1)</td>
</tr>
<tr>
<td>Convenience</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It made life too easy...with compactors, everybody just threw everything in there for years (Retailer 2)</td>
</tr>
<tr>
<td>Odour</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>They worry too much about uh, smells in the parking lot...cuz you’re gonna get – it can smell pretty ripe (Retailer 2)</td>
</tr>
<tr>
<td>Health &amp; Liability</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>No, the problem with donating stuff is that you could end up with a health issue...If someone gets sick on it, or something that’s off code or poor quality, and someone gets sick then you could have a real issue, so we stay away from that (Retailer 3)</td>
</tr>
<tr>
<td>Regulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>It’s still very difficult to move forward with any type of waste facility, including facilities that are processing organic waste...nobody wants a plant that’s processing waste in their backyard (Key Informant 4)</td>
</tr>
</tbody>
</table>

Table 1: Barriers by Sector. The 'X' denotes which barrier is experienced by which sector. The right hand column provides illustrative quotations as an example of the barrier.
As evidenced by Table 1, the main themes in this section are cost, stigma, quality of feedstock, excess, infrastructure and logistics, education and training, convenience, odour, and health and liability. The most notable barriers across all sectors were a lack of adequate infrastructure and logistics. This is widely cited as a major impediment to increasing surplus food donations (consistent with the literature, see, for example, Nelson et al., 2011; Hanssen et al., 2014; Schneider, 2013) and relates to the fact that emergency food services were never meant to be a permanent solution to food insecurity (Tarasuk, 2001). Therefore, adequate storage spaces were not considered in the design of warehouses or businesses. Respondents stated they either lacked (cold) storage to store excess food until it could be picked up by an emergency food provider, or that storage was lacking on the service providers’ end, so there was no point in donating at all (see also Uzea et al. 2013).

Odour concerns were another barrier, and for some sectors, such as retailers, concern was about the smell of organics bins (see, for example, Schneider, 2008), but for the other sectors, this related to the lack of adequate storage – trying to hold food for donation would often begin to rot and smell. This also relates to the materiality of food and the societal distance from waste, which will be discussed in the following chapter.

Cost was also identified as a barrier by a majority of sectors, whereby the inability to pay staff for being involved in food waste diversion activities was a major concern, as well as paying for an organics pickup program (i.e., see Uzea et al., 2013). Stigma was another major barrier, but meant different things for different sectors. For example, how food is referred to makes a difference: calling it ‘waste’ immediately makes it seem inedible, whereas calling it ‘surplus’ (which is what it is) reduces the stigma (importantly noted by Papargyropoulou et al., 2014), and may affect what is donated or what is accepted as donation. This was commented on by most
sectors, however, only producers and emergency food providers commented on stigma relating to who uses these services, and expectations of what food looks like. For example, this notion around what clients of emergency food providers will eat may reduce food waste in that producers are not donating food that will not be eaten, according to what emergency food providers request, but is potentially also a barrier for donating those ‘weirder’ produce items (if a producer has an excess of these items and cannot donate them). This means that edible food is not being redirected to people and ends up being diverted lower on the food waste hierarchy. Society’s expectations around perfect looking produce is prevalent, so many people think there is something wrong with it if it is misshapen (most food waste literature comments on this, for example see FAO, 2011; Thyberg & Tonjes, 2016).

Education was another broad theme that meant things for different sectors. For example, for retailers, this meant staff training, whereas for emergency food providers, this related to donor awareness and knowledge of what programs exist that accept surplus food. For the waste management sector, awareness from other sectors of what options exist for food waste diversion was seen as a barrier. Health and liability was widely cited as barriers to donation (and this relates back to education and knowing about the Donor Act) (see, for example, Kantor, Lipton, Manchester & Oliveira, 1997; Uzea et al., 2013). This also relates to the materiality of food and the non-presence of bacteria – the mere threat of illness is enough to not divert food for human consumption – to be discussed in the next chapter.

Excess food was another main barrier, where having too much food makes it difficult to manage in a sustainable way. Quality of feedstock is related to concerns about providing and receiving contaminated items for compost, animal feed, or anaerobic digestion (see, for example, Gregson, Crang, Fuller & Holmes, 2015). Often, producers are unwilling to accept compost if
they cannot ensure it is not contaminated by any sort of pollutant, such as plastic packaging. Retailers and the food service sector cited convenience as a barrier because it is easy to throw everything in the garbage. This relates to cost (separating out organics can be a time consuming activity and staff have to be paid), and education/staff training (making sure staff know what can be composted). A unique barrier to the distribution/retail sector was vendor control. Some vendors retain control over products in order to keep control of brand protection, and that creates a barrier since distributors or retailers have no control over these items, despite any policies that may exist for the redirection of food waste (see, for example, Uzea et al., 2013). A unique barrier for the waste management sector was regulation. This included zoning requirements for anaerobic digestion facility citing and regulating end products such as digestate or compost. As appropriate for each sector, I will discuss the barriers identified in Table 1 by sector.

3.2.1 Producers

Producers (local, organic producers) experience many barriers, as they both produce food as well as act as a component of the food waste hierarchy in that they are able to accept and use food waste as compost.

Cost

Cost was one barrier, where the majority of producer respondents noted that it was not worth the cost of paying staff to pick edible but unsalable (‘ugly’ or misshapen) produce if they were not recouping costs from selling it. As one producer noted:

When we’re done harvesting a crop, there’s often lots of good quality, or certainly edible quality vegetables, left in the field, but we can’t afford to harvest it and bring it somewhere…you know, and I can’t afford to pay my staff to do that, and then give it away (Producer 5)
Infrastructure/Logistics

A lack of appropriate infrastructure and logistics was cited as a major barrier. As one producer noted, storage is an issue for both producers as well as those accepting donations:

Some people don’t have cold storage, really at all, so holding any kind of product for any amount of time is impossible (Producer 1)

Labour is also the main limiting factor on farms, so there is not sufficient time and coordination available to harvest, sort, and transport excess food for donation. As one producer noted:

The limiting factor on a farm is labour…we would never have the time to drop off something for [emergency food provider], even though they’re just in [nearby town] (Producer 1)

It is often easier for the producer to return un-harvested food to the soil for nutrient cycling. An extension of this is when an excess of food is grown or harvested without a market, it often ends up in the farm’s compost pile (rather than being donated). As a producer noted:

The other way that waste happens is that…we might have food that’s ready in the field, but we don’t have a market for it (Producer 4)

Stigma

Most producers said they did not donate any food that was inedible, or on the verge of inedibility, because of the dignity aspect associated with emergency food provision and donations. As one respondent stated:

No one wants to feel like they’re eating someone else’s garbage (Producer 1)

Most of the producers interviewed would rather compost anything beyond “B” grade produce because “people deserve good food” (Producer 4), and there exists already enough stigma in emergency food provision and “food bank culture”. Several producers commented on this:

I’m not interested in donating that stuff to folks, because I feel like it doesn’t…I want them to really feel like oh, I’m getting something really, like, that we’re treating them well, you know, like those people have enough stigma in their life, they don’t need to be you know, oh they get what nobody else wants (Producer 4)
I don’t think what I’m talking about is…sub-quality…I think that, in terms of like, let’s say, food bank culture, for example…there’s definitely a culture of extremely low quality being the norm, you know? Even when you see like, the grocery store drives like fill up a bag with the crappiest food around, for the poor people, like, I feel like that contributes to that kind of stigma, but like I’m talking about pretty much the highest quality produce available anywhere, just it has crossed legs of the carrots or…a little crack if it’s a tomato…if there’s a stigma like I think if people, like I would say you would have to ask the people who are receiving the food, but I would imagine the people who access our food at [emergency food provider], I don’t think they would feel like they’re getting the dregs, because that’s not what they’re getting (Producer 5)

It was also noted that it is very important how donated foods are referenced. As one producer noted:

I would say, if it’s referred to as food waste, then I feel like there would be stigma in it, but if it’s just referred to as food…I don’t know, I wouldn’t necessarily consider it food waste if I’m giving it…if I’m putting it in the compost, then it’s food waste. If I’m giving it to the food bank, I wouldn’t consider it food waste, I would just call it, you know, extras that I have that I can’t sell (Producer 2)

They also noted that stigma exists around what the food looks like. As one producer noted:

I don’t think people should be giving the dregs to food banks, but I think that on farms there’s tons of good quality produce that is just either aesthetically less pleasing, and our…modern food system has told us that everything has to be perfect (Producer 5)

They also note that they only typically donate ‘regular’ produce because that is what is requested, and that other, ‘weirder’ produce would not be taken/eaten. A producer commented on this:

They [emergency food providers] request very normative things, they request orange carrots…white or yellow potatoes, they request like very…quote unquote normal things, like we can’t give them blue potatoes, or anything like that, because their customers don’t take it (Producer 1)

Quality of Feedstock

In terms of producers accepting food waste for compost or animal feed, the quality of the feedstock was a concern. As one producer noted:
We’re a certified organic farm, so…it needs to meet certain regulations in terms of what the inputs are…we need to be able to monitor that, or at least have it composted to the degree that…like you’d need to make sure you’re not dealing with contaminants. So that’s the biggest thing, and…a lot of places can’t guarantee that for their inputs (Producer 4)

Similarly, some producers indicated they would like to take organic waste from retailers, but because most of it is packaged, they cannot accept it because they lack the ability (time) to sort it and de-package it themselves.

**Excess**

Respondents also noted that growing an excess of food creates food waste (and as labour and time on farms is a limiting factor, as discussed above, this excess is often not donated). For example, one producer noted:

> If you don’t have a market for what you have to sell, then that’s an area of food waste (Producer 4)

**3.2.2 Distributors/Retailers**

A unique barrier to this sector is that vendors often retain control over products even while they are being distributed or retailed. Distributors and retailers both noted that many decisions regarding what happens to food waste are not up to them:

> We don’t have control over what anyone does with their product, that’s entirely up to them (Distributor 1)

> It really depends on what vendor you’re dealing with, you have different contracts, with…different companies. Some of them will specifically tell you to donate items, some of them will tell you not to donate the items, for whatever reason, you kinda gotta respect those things (Retailer 1)

**Cost**

Cost was also a barrier for this sector. As one retailer noted:

> Labour is a restraint, it’s one of our biggest costs in most business…and as a corporation, they watch labour, so labour is a factor…but, that’s where people cut corners, and that’s where you can run into real waste problems…it was just labour restraints and things don’t get done (Retailer 2)
In addition, this retailer noted that staff are not paid enough to care about doing these extra tasks. This also relates to an education piece, as discussed below. Organics programs were also considered to be expensive, as one retailer noted:

It’s just not feasible…I’m sure it would be a very costly expense, in a city like Guelph, I’m sure it would probably be more apt to happen than you know, some other cities, but it would just…I don’t know how that could happen (Retailer 1)

_Education: Staff training_

Education, specifically staff training and knowledge, was another barrier for this sector, where knowing store patterns and required volumes are seen as a challenge for proper ordering.

For retailers that do have an organics program, knowing what can be composted was another challenge – and staff have to be trained on this. As one retailer noted:

That’s the part I have to educate my staff on a little better…like donuts and stuff, you can take them out of the plastic and dump them in there too and they can actually use that for compost (Retailer 2)

Food handling was cited as another barrier: retailers often have procedures for refreshing or trimming produce to allow it to last longer, but training is required and staff often do not care. As one retailer noted:

I have lettuce bags back there, and…every once in a while I have to go back there and show them…it goes back to the educating, we’ve got sixteen year old kids here, they don’t care what a head of lettuce looks like, so we’ve got to change the whole mind set, they’re too busy texting their friends, right…and you gotta try to teach them…[they’re] making minimum wage, and…it’s tough…cuz they don’t understand it (Retailer 2)

_Excess_

Excess food was also mentioned as a barrier to reducing or diverting food waste. Distributors and retailers (especially corporate/conventional stores) deal in such high quantities that they have very large waste margins, and therefore are unconcerned if one case of something
is thrown out. One retailer noted that they are expected to have so many varieties of products in stock, so this becomes hard to manage without ending up with waste.

Health and Liability

Health and Liability concerns were another major barrier noted by retailers. Those who do not donate surplus foods often stated this was due to health concerns. As one retailer stated when asked if they donated surplus food:

No, the problem with that – with donating stuff is that you could end up with a health issue…If someone gets sick on it, or something that’s off code or poor quality, and someone gets sick then you could have a real issue, so we stay away from that (Retailer 3)

Liability issues over the potential of illness caused by what was donated were another related concern raised by retailers. This is especially the case with redistributing fresh foods. As a retailer noted:

In this day and age, everyone’s scared of getting sick somewhere, or from something…It’s all about who’s going to be legally responsible should there be any sort of you know, complication of sickness, illness…it’s unfortunate, but that’s the way it is, people look at us as an opportunity to make an easy buck sometimes (Retailer 1)

Any customer returns are also not allowed to be sold because of these concerns:

Say someone returns a package of steaks, you know, you can’t put it back on the sales floor, even though the guy swears, ‘well, I took it home, it was in my fridge the entire time’, you know, because you don’t know if it’s been temperature abused or not (Retailer 1)

Recalled items (i.e. recalled from corporate headquarters for any number of reasons, such as mislabeled packaging) are destroyed to ensure that not even dumpster divers can reclaim the food in case it causes illness; this is despite the fact that items are often recalled due to products being mislabeled, rather than health and safety concerns. This is usually store policy. Two retailers commented on this:
Any perishable item that comes back into the building does not hit the shelves…it’s either destroyed or it’s put [aside] for the supplier to pick up, and the same with recalls, we have a really detailed recall program…we’ll get an email from recalls, we have 24 hours to respond electronically, we check the product, we follow the prompt of what to do, throw it out or what to do with it, and then we have to record it, we have actual physical documentation at the service desk, so if anyone from the government comes in, we can produce it for them (Retailer 2)

Anytime anything’s recalled there’s a reason it’s being pulled off the shelf, it shouldn’t be edible, and we actually go one step further and actually destroy it, because we do have people who dumpster dive here, and…I would hate for somebody to get sick because of something they took from our dumpsters, so we usually break it up, or put it in a separate bag and one of us will throw it in, something like that (Retailer 4)

Infrastructure and Logistics

Infrastructure and logistics was another barrier experienced by distributors and retailers. This includes not having enough space for the amount of bins needed to redirect food waste (i.e. organics bins, bone and meat bins, plus the compactor they already have). As one retailer noted:

We don’t have enough bins to do that…we could probably come up with a bin system, but we’d have a whole back room full of bins…logistic real estate is tough (Retailer 2)

In addition, they often lack space to store any excess food until an emergency food provider can pick it up. As a retailer noted:

For the most part it’s ‘Oh, we can’t get there now’ or it’s gonna be ‘can we come tomorrow morning?’ and you know…any supermarket or anywhere else like this, I mean, you’re fighting for space, every inch is considered real estate, and you can’t have stuff sitting there (Retailer 1)

They also often lack the time and staff to coordinate with emergency food providers. This relates to the following barrier of convenience.

Convenience

Convenience was another barrier cited by retailers. It was usually easy to throw everything into the garbage or compactor. Two retailers commented on this:
Really, what it comes down to is if the…time…if I don’t take the time to divide those things and if I don’t take the time to call these people, and see where they are, or see who can use it, if you’re not willing to do that…I would say that that would probably be a huge factor, because it’s a lot easier to just throw it in the garbage (Retailer 4)

It made life too easy…with compactors, everybody just threw everything in there for years (Retailer 2)

**Odour**

Another barrier noted by this sector was odour concerns. One retailer noted the reluctance that property management has with organics bins:

They worry too much about uh, smells in the parking lot…cuz you’re gonna get – it can smell pretty ripe (Retailer 2)

Another concern, although partly an infrastructural issue, is that retailers also lack the proper refrigerated space to hold food until it can be picked up by emergency food providers, because of odour concerns and pests. As one retailer noted:

You can’t have stuff sitting there, rotting, which in essence, it really does, when it’s past a certain point… I mean, you can’t have these hanging around because…they’re going to attract pests (Retailer 1)

### 3.2.3 Food Service (Caterers/Restaurants)

**Education: Staff Training**

Education was seen as a major barrier to food waste diversion, as staff are not always educated in proper food handling, do not know when something is about to go off, or how to process food or repurpose it to make it last longer. As a caterer noted:

Training is the biggest – or education, um, you know, truly, to be able to see something and you know, that spinach that is going bad and say that would make a great spinach dip…and the quality wouldn’t be compromised, so you know, there has to be an educational component of it (Caterer 1)

There is also the issue of clearing plates and cleanup. Staff may be unaware of what can be composted, or what types of waste need to be separated out. As another caterer noted:
That’s much more difficult to manage, absolutely, because if there’s like mixture on the plate from the person eating the food, that’s nearly impossible to separate, um, and…they’re…trying to be as efficient as possible, so I think inevitably some may, some may not, you would need some values and philosophy, I think, behind it to really support that (Caterer 2)

Changing people’s routines is another concern. If staff are used to quickly clearing plates into garbage bins, and then an organics bin is introduced, it can take a while to train them on separating food waste into different bins. As a restaurant manager noted:

Regulating it at the start…getting people to change their routines…can be challenging (Restaurant 1)

Health and Liability

Health and Liability was a concern for the food service sector as well. One restaurant noted that they do not donate any excess prepared foods since, from a health perspective, they believed they would need to also provide a full ingredient list, which was too cumbersome to prepare and provide. As a restaurant manager noted:

I’m sure there’s rules that they have to know how it’s prepared and all the ingredients, and that kind of thing (Restaurant 1)

This belief is not substantiated (i.e., from experience); it is merely the perspective of the manager. These kinds of unsubstantiated perspectives around the donation of food (as also seen in the distributor/retailer sector with liability concerns) are a significant barrier to the redistribution of edible food.

There was also concern around the donation of food, and if people on the receiving end know that prepared food needs to be reheated to a certain temperature. Two caterers noted that they believed emergency food providers simply did not accept pre-prepared foods due to liability and public health concerns:

The [emergency food provider] does not take foods that are prepared that have been you know, brought off site and places, they don’t want to run the risk of it…they have no idea in transport, if it’s maintained proper temperatures, and I don’t think
they want to assume the liability, um, of that, so yeah, they just say no to anything that’s pre-prepared (Caterer 1)

I also think that maybe it’s a concern for them, too, to serve prepared food…like from a public health perspective…[there are] liability issues there, with them then giving it to someone else (Caterer 2)

Excess

Excess food, especially in serve-yourself situations, proved to be a major source of food waste, and the inability of salvaging plate waste a barrier to donating edible food. A caterer noted that people “eat with their eyes” (Caterer 2), wanting to try everything, but then end up wasting much of it. This sector also recognized that “more looks appetizing” (Caterer 2) and so will serve big portions, although this leads to unsalvageable plate waste (see von Massow & McAdams’ 2015 study on food service plate waste). Some food service businesses do compost this waste, but serving large portion sizes that end up as plate waste represents a loss of edible food that could be redirected to people had it not been served onto plates.

Infrastructure and Logistics

As with the other sectors, a lack of appropriate infrastructure and logistics was identified as another barrier for the food service sector. Both a caterer and a restaurant manager commented on this:

Our space is limited…So we could do it [save scraps], but then we wouldn’t be able to store it…If, whenever the farmer or whoever is going to pick it up, we wouldn’t have the storage to keep it until they came” (Restaurant 1)

Just getting it to them becomes the difficult part, you know, there’s not enough storage in the restaurant to hold it even one more day, you know, it just gets thrown out unfortunately (Caterer 1)

Another concern for donating prepared foods was the perception that “proper containers” were needed to donate food, and question whether emergency food providers have the proper implements for accepting prepared food. As one caterer noted:
[Do they] hav[e] containers in order to accept it…I don’t know if their facility has like a thermometer to even test the temperature and hold it at a certain temperature, which are part of the food standards, like from a serving perspective (Caterer 2)

Caterers also noted that when they are on site at events, there is often too much waste for them to manage or transport (for example, it is difficult to take organics scraps with them, and there is often no waste management service to pick food waste up at the event).

*Convenience*

Convenience was also cited as a barrier to food waste diversion for this sector. Some caterers do take proper waste containers to events, and some events do have proper green bins, but if they are not efficient and easy to use, and in an accessible location to the prep/service area, they will not be used. One caterer stated that composting at events is an “impossibility” (Caterer 1) because of how difficult it is.

Also noted as a barrier for some caterers is the timing of events. They will donate excess food if the emergency food provider is open and they can easily get to it. If the event is in the evening, the organization is shut until the next day, and the caterers have no place to hold over food, it will be thrown out (or composted).

*Quality of Feedstock*

Quality of feedstock was also noted as a concern for redirecting food scraps to farmers for compost or animal feed, if restaurants/caterers cannot guarantee that it is not contaminated with items that should not be composted or fed to animals, such as plastic packaging. For example, a restaurant manager commented on the difficulty of collecting kitchen scraps for animal feed:

[You have to] make sure there’s no…crap in that bin…and just keep it proper, that’s gonna be pig food, so no like, egg shells, no…no paper or plastic that should have gone in the garbage as you’re doing stuff too fast and throw it in there, no, just keep
proper, cuz that’s going to a pig…So that’s going to affect the pig’s life (Restaurant 1)

Stigma

The only stigma concern for this sector was that excess prepared foods are seen as leftovers, which are not always desired. One caterer commented that the name “leftovers” implies they are second rate:

Socially there’s definitely stigma to leftovers…I know people who won’t eat leftovers, period…I think the word itself implies they’re second rate (Caterer 1)

3.2.4 Emergency Food Providers and Food Rescue Organizations

As receivers of surplus food, this sector spoke about the barriers to receiving surplus food as donation, as well as how they deal with any waste they may end up with, or concerns about creating waste.

Cost

Cost was a factor for the redirection of surplus food to emergency food providers. They often lack financing for food reclamation projects, and funding is not reliable or sustainable when they exist off of grants. As a key informant noted:

How do we sustain that financially, how do we pay for a full-time coordinator…this money has to come from somewhere, so how do we…how do we finance those kind of projects, building towards a sustainable model, it always comes down to money, doesn’t it? (Key informant 7)

Because of the lack of reliable funds, these organizations are usually volunteer run and therefore have a very low capacity to coordinate with donors and to pick up donations. As an emergency food provider noted:

I think the other thing too is that there’s just not enough…everybody’s got really low capacity…and I think this is reflective of the non-profit sector in general, and like a lack of public funding and like public services that would fill these gaps, but like, there’s a lot of volunteer based stuff, and I think like, it’s just kind of brutal that there’s not more money to pay people (Emergency Food Provider 1)
Lack of funding for staff also ends up creating waste: while many providers try to compost items when possible, this is usually only fresh produce. Items in cans or packages are not opened so that they can be composted. According to one emergency food provider:

The fresh stuff is composted and the canned stuff is yeah, thrown out (Emergency Food Provider 5)

**Education: Donors**

Donors are often unaware of what can or should be donated, and they will donate very old, dated, or moldy products, which relates to the dignity of the clients of emergency food providers. When these types of foods are donated, this creates waste for emergency food providers to deal with. Two emergency food providers commented on this:

When it comes to food drives and donation based things, people like to donate whatever is at the back of their cupboard that they haven’t eaten and then feel good about donating something, but we kind of function under this idea that if you wouldn’t eat it yourself we ask that you don’t donate it to the cupboard, but we’re also really careful around that cuz we don’t want to prevent people from donating (Emergency Food Provider 1)

I took three boxes, I probably threw out a quarter, only because they were, you know, they had mold, or starting to rot, and people won’t take them (Emergency Food Provider 4)

Corporate donors may perceive the emergency food system as an outlet for food they cannot sell. A key informant commented that it is often cheaper for retailers to donate rather than dispose of foods (Henderson (2004) offers a critical discussion of this topic), so anything old or weird may be donated. This key informant recalled their experience from working in emergency food provision:

You get it [donations] and you have to throw them all out, or you know, how it costs us (Key Informant 7)

Donors can also be unaware of what programs exist that accept surplus food, and there is a general lack of knowledge around the Donation of Food Act. As a key informant noted:
Yeah, I think the biggest hurdle to overcome is just knowledge that um, a program exists in the first place and knowing who is offering, or could offer food that could be reclaimed…I think that that misconception or the lack of understanding of that [Donation of Food] Act is…could sometimes act as a barrier (Key Informant 2)

An emergency food provider also noted this:

In terms of the food waste, like we would accept more…I just think…there’s something that either holds organizations back or maybe we haven’t been asking enough, but…getting over that barrier of legislation and that it’s okay to donate, and…you won’t be sued or anything, so, I think that’s the biggest thing to overcome first (Emergency Food Provider 3)

Education: Clients

Food literacy of the clients was cited as another concern, where a perception exists that clients of organizations lack food preparation skills or do not know how to properly store food or leftovers, which could create waste. Two emergency food providers commented on this:

Sometimes I’ll get a donation of bananas, they’re ripe, some people say, ‘oh my kids don’t like them so ripe’…you could bake with them, you could freeze them and bake with them later…There’s a whole education piece there. You could take it home, cut it [mold] off right away, cook it, and…but I know it won’t go, and it will sit there (Emergency Food Provider 4)

They didn’t have leftovers as a kid…some families won’t even eat their own leftovers, so…it’s just a matter of education. The food is perfectly fine, as long as you’re careful with how it’s washed and being stored and transported (Emergency Food Provider 6)

These quotes exemplify that food literacy skills are lacking. However, this also relates to stigma around who uses these types of services. Many people in our society lack food literacy skills, not only those using emergency food services (for example, see Beagan & Chapman, 2012).

Health and Liability

Health and liability (and safety) was seen as a very important concern. Specific to the Guelph context, the paid staff at one of the city’s main food access organizations works for Public Health, thereby creating a focus on the connection between food and health. Health and
liability overlaps with education and knowledge around expiry and best before dates, as well as dented cans and what is considered safe and what is not. As one emergency food provider noted:

They do, but like I tell them, just be careful, and if it’s dented, I don’t even recommend you taking this, because you could get something health-wise from it…they can definitely choose – I will just tell them I don’t recommend it, but if you would like to, please go through them [the cans], and then a lot of people do take them (Emergency Food Provider 3)

Several emergency food providers said they did not want to accept old (past best before dates) foods because they did not want to “take the chance”. As an emergency food provider noted:

We don’t want to take the chance of anything happening, because it’s an organization, and we don’t have any kind of insurance to take care of that if anything happens, we just won’t take the chance (Emergency Food Provider 2)

Some would accept these items simply for keeping the relationship open, but would throw the food away upon receipt, as noted by a key informant and an emergency food provider:

Well, I guess, you know, the quality and control piece, so we’ve actually had some food delivered from other places sometimes and it’s like, oh, that’s a little sketchy, but you take it, thinking oh…but no, you get it and you have to throw them all out (Key informant 7)

We would rather spend the manpower sorting it, and trying to…use it and recover it for clients than to not accept the donation at all (Emergency Food Provider 6)

As noted above, many donors do not donate because of liability issues. Also, certain foods, such as meat and dairy, are harder to accept because they are perishable, whereas bread products or canned goods are more readily donated and accepted because they are more shelf-stable. Two emergency food providers commented on this:

I think a lot more places would donate if they weren’t concerned about liability…So meat products are harder, dairy are also harder to get your hands on, um, breads don’t…there’s not as much liability or risk with breads because it’s a shelf stable type item, mostly (Emergency Food Provider 6)

Um, but like, the best before um, if it’s like best before September 2015, and it’s September, then I’ll put it out, if it’s best before August, then I’ll like see the can, if it’s chick peas or lentils or something, you can probably put it out, but if it’s meat then I mostly won’t take the risk (Emergency Food Provider 3)
Infrastructure and Logistics

Infrastructure and logistics is a major barrier in emergency food providers accepting donated food items, as alluded to above by donors. Most respondents in this sector noted that their spaces were small with a lack of storage space. They often cannot accept perishable items because of the lack of storage, as one emergency food provider noted:

Although we’ve had some offers for fresh produce, which we cannot accept, we don’t have any place to store anything fresh (Emergency Food Provider 2)

They also often lack transportation to be able to pick up donations, and even when they do have transportation, they do not necessarily have someone to drive. Both a key informant and an emergency food provider commented on this:

If they don’t have the right person, the right time, the right vehicle to be able to go there and step away from the other work that they’re doing, it’s a pretty major barrier (Key Informant 2)

We have vehicles to get to them, but we don’t always have drivers (Emergency Food Provider 6)

They note that reclaiming surplus food is labour intensive at both their end and for the donors, and also requires coordination on both ends as well, as noted by an emergency food provider:

It’s labour intensive, and I think that’s partly why some donors would rather throw it out...Because it is labour intensive to try and, they don’t want to give us food that’s not consumable, but it also takes manpower on their part, and our part, to sort it (Emergency Food Provider 6)

A food rescue organization commented that there is often no place to store (or prepare) reclaimed food:

We get all this food, and then we don’t really have spaces to store it because the ways in which um, like restaurants or like churches exist with like health codes, it’s hard for us to bring food in and find safe places to store food, so that’s our biggest concern about...getting food (Food Rescue 1)
Despite these infrastructure and logistical barriers experienced by many emergency food providers, it is important to note that some providers do have refrigeration and storage capabilities.

**Stigma**

Stigma exists on assumptions of what clients eat and general stigma around who uses these services. Three emergency food providers commented on this:

I think people...sometimes people think you’re poor so you’ll eat anything, there’s definitely that vibe there (Emergency Food Provider 4)

Some people would say...if you’re hungry, you should eat it (Emergency Food Provider 2)

I think it’s a stigma around who uses a food pantry, right? So there’s a willingness to give food that’s unappealing to people who need it because there’s a stigma around who’s using it (Emergency Food Provider 5)

A key informant also spoke to how the food is referred to makes a difference:

I guess the language around it too, you know, like I said if it’s called ‘waste’ food, or re-processed, people are going to feel sort of gross (Key Informant 7)

Some may argue that emergency food providers’ primary objective is to provide food for hungry people, regardless of the state of the food or its best before date. This line of thinking disregards the dignity that emergency food providers strive to offer when providing food. Although it could be construed that the throwing out of food beyond best before dates, or refusing to distribute food that is visually unappealing or moldy ultimately disrupts the diversion of surplus food, the value add of dignity that emergency food providers strive for ultimately negates this argument. One way emergency food providers have dealt with this is to have a ‘free’ table where people can choose whether or not to take these items. As one emergency food provider noted:

We get a lot of stuff that’s passed its best before…and we put that on a…I kind of call it a free table, and then anybody can take it…I can’t offer it as a food cupboard
item…it’ll still go out, it’s just a choice of taking it, not ‘here’s your food’
(Emergency Food Provider 4)

Odour

Odour was a consideration for this sector as well. One respondent noted that any perishable donations they receive must be distributed right away because they have no place to store it, or they will be thrown out because it will start to smell. The example given was squashes they had received from a retailer that were just about to turn. Small mold spots were on a few, and because of this, clients were reluctant to take it (which the respondent also linked to a lack of education and food skills: the mold could easily be cut off – it was just on the outside), which meant they ended up being disposed of.

3.2.5 Waste Management (Private Waste Haulers/Anaerobic Digestion)

Cost

Cost was seen as a barrier for both anaerobic digesters and private waste haulers. Initial costs to build an anaerobic digestion facility are quite expensive. As a biogas industry representative noted:

I think the price…or the capital cost for the [anaerobic digestion] systems is definitely something that, you know, could be a deterrent (Key Informant 3)

Costs for de-packaging items were also identified as a barrier. For facilities to be able to de-package adds significant cost to the process, as a waste management expert noted:

So the issue you’ve got with de-packing and everything is as soon as you start to process the material, you’re adding costs. So every time you touch the material, you’re adding costs, which make it more expensive than disposal (Key Informant 4)

The private waste hauler respondent also noted cost as a barrier for businesses wanting to use an organics pickup service, as it is expensive compared to the cheap tipping fees at landfills. While raising tipping fees have been suggested as way to mitigate this (see, for example, Uzea et
In terms of barriers, obviously we see that lots of organics still goes to the landfill, and... the open border that we have to Michigan, [with] some very, very low tip fees, in comparison to what we have here in Ontario, so the flow of material will move to the lowest common denominator, and so we see that is the case in Ontario, where there’s a lot of material being landfilled, and you just can’t beat less than ten dollars a tonne on disposal, when other options are obviously much more expensive than that (Key Informant 3).

*Education: Businesses*

Education was also cited as a barrier to the diversion of food waste for this sector. A waste management expert suggested that businesses are often unaware of what options are actually available to them to divert their organics.

*Infrastructure*

Infrastructure was also noted as a barrier, in that storage and space is needed for the collection food waste for organics pickup, and/or even the space to build an anaerobic digester:

We need space in order to put...equipment inside or outside of the site of our clients...the biggest [barrier] is the space issue (Private Waste Hauler 1)

In terms of anaerobic digestion facilities, these need to be airtight with an air management system that is big enough to fit trucks in order to drop off the food waste, which presents a number of issues. As an anaerobic digester respondent noted:

Basically you’re talking about what’s going to be a large, air-tight building that you can back the truck into that has advanced odour control and air management systems, and...trying to get a piece of land, and dealing with NIMBY, and getting approvals from the municipality and from the Ministry of Environment (Anaerobic Digester 1)

This quote exemplifies not only the infrastructure needs for anaerobic digestion facilities, but also approvals for such facilities from government, as well as societal attitudes toward waste and waste management facilities. This is also discussed below in the regulations section.
Quality of Feedstock

Quality of feedstock was mentioned as a barrier for what anaerobic digesters can accept. Clean material is needed, and as a biogas industry representative noted, this is one of the biggest challenges for the biogas sector. Both the biogas industry representative and waste management expert commented on this:

I think the biggest challenge for our sector is to ensure the stability and availability of the feedstock…one of the critical aspects of a successful operation of a biogas facility, so the availability, the security, the cleanliness of the material, so it’s not populated with a lot of [contaminants] or debris, uh, that is not organic in nature, that would cause issues with either the mechanical or biological processes, so the feedstock in and of itself is a critical component (Key Informant 3)

The more contaminated your material is…it potentially impacts what your end product is (Key Informant 4)

Regulation

Regulatory concerns are a unique barrier for the waste management sector. For example, municipal zoning issues poses problems for the siting of anaerobic digestion facilities, and many approvals are needed, such as building codes, as well as for anaerobic digestion facilities to sell digestate as fertilizer. Regulations exist for all end market products, and are often quite strict. An anaerobic digester respondent and waste management expert both noted that in terms of approvals, it is difficult to move forward with organic waste management projects, since organic waste comes with odour concerns and the public generally are resistant to waste management facilities in their neighbourhoods (Not in My Backyard, NIMBY):

It’s still very, very difficult to move forward with any type of waste facility, including facilities that are processing organic waste…nobody wants a plant that’s processing waste in their backyard (Key Informant 4)

People don’t want waste management facilities in their backyard, and when our facility here was proposed…it was aggressively fought by local citizens (Anaerobic Digester 1)
Odour

Odour concerns are another barrier. The biggest concern for organics pickup programs is the smell of the bins (and complaints from retailers). There is no specific answer to this concern: rotting food waiting for pickup will smell, and this will require a shift in mindset. Anaerobic digestion facilities are attempting to address odour concerns, however: the anaerobic digestion facility respondent reported they have yet to have an odour complaint at their facility, and are striving to ensure there will not be one in order to prove that this can be done successfully.

3.2.6 Section Summary

A number of barriers were identified in this section, and while there were common barriers among sectors, each sector also experienced different barriers, and complexities within these barriers. It is important to note that each of these sectors have multiple identities and roles in creating, reducing, and accepting food waste. These complexities are important to understand so that appropriate opportunities can be identified that address these complexities. For example, regulation was only identified as a barrier for the waste management sector, but this is an important barrier to note, and requires a specific solution addressing those regulations. As well, only the distribution and retail sector experienced vendor control as a barrier, which also requires a specific solution. The opening paragraph discussed the commonalities among barriers, but exploring each by sector highlights these complexities and captures the details and nuances within each sector. Each of these sectors touches on the materiality of waste in different ways. In identifying these barriers, motivations and potential opportunities were revealed that will be explored in the following section.
3.3 Objective 3: Identify the motivations for those who do engage in redirection activities, and what potential opportunities exist for further food waste diversion

This section explores the factors that motivate the redirection of food waste along the food waste hierarchy, as well as the potential opportunities that were revealed by exploring these motivations. Following are two tables that identify the motivations and opportunities identified by respondents.
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Table 2: Motivations by Sector. The ‘X’ denotes which motivation is experienced by which sector. The right hand column provides illustrative quotations as an example of each motivation.
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<td>There’s a lot of material out there that is just simply being diverted to the lowest common denominator, and we have a long ways to go in terms of educating and looking to re-divert that material to a more useful place (Key Informant 3)</td>
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<tr>
<td>Improving Infrastructure/ Logistics</td>
<td>X</td>
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<td>A refrigerated truck would really facilitate the transfer of food from farms or retailers to a cold storage facility, and then again, to emergency food providers or their other outlets (Key Informant 2)</td>
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<tr>
<td>Increased connections</td>
<td>X</td>
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<td>[We’re] looking at options...working with food distributors, farmers, emergency food providers, looking to create links between those two groups, along with other food security related organizations, with the potential of working with retail as well if they have any items that might be going towards unsellability, we could probably redistribute that kind of thing (Key Informant 2)</td>
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<tr>
<td>Legislation</td>
<td>X</td>
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<td>X</td>
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<td>X</td>
<td>We would do it anyways, but this makes it...it sort of pays for the time I take to put it aside and do that (Producer 1)</td>
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<td>Economic</td>
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<td>I think we see a huge opportunity...in Ontario right now, we create a lot of waste and we dispose of a lot of waste, and so we have been strong promoters of...finding ways to increase the value of the resources that are in our waste stream. So we see a strong economic opportunity, and environmental opportunity in doing that, and so you know, there’s a huge potential here, to meet a whole bunch of the government’s goals, by diverting more of this material and creating valuable products (Key Informant 4)</td>
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Table 3: Opportunities by Sector. The 'X' denotes which opportunity is experienced by which sector. The right hand column provides illustrative quotations as an example of each opportunity.
As evidenced by Tables 2 and 3, the themes that emerged from identifying the motivations were convenience, economics, environment, food security, and image. The themes that emerged from identifying opportunities were education and awareness, improving infrastructure and logistics, increased connections, legislation, and economics. These sections are presented together because there is a synergy between the motivations and opportunities. However, in some cases, the opportunities did not align with the motivations. These analyses of where the synergies and conflicts lie will be discussed in the conclusion of this chapter. Similar to the barriers section, it is important to explore these on a sector-by-sector basis, as unique motivations and opportunities for individual sectors are present; however, the prominent themes will be discussed upfront before delving into the sector results.

Economic considerations were identified as a main motivator for all sectors, as well as an area of opportunity, by being able to offer flexible pricing on items nearing end of life for quick sale, as well as repurposing items to make them more appealing or even to make a profit. The development of end markets for biogas and compost were identified as another opportunity in the economic sphere. Creating stronger end markets for compost or digestate would be valuable for increasing anaerobic digestion and compost diversion options. For emergency food providers, it was often cheaper to compost (partnerships with farmers or their own community garden, not a service) than to pay disposal fees.

Environmental concerns were another motivating factor for redirecting food waste, where compost could be used to grow more food, as well as creating renewable energy and vehicle fuel through anaerobic digestion processes, which ties into the economic opportunity of developing end markets. Food security was another motivation; while this is the main mandate for emergency food providers, other sectors also all noted that donation helps the community. Image
was another motivation; as more attention is being paid to corporate actions, and the public is becoming more aware of environmental issues (especially food waste!), this is an increasingly attractive reason to divert organics. Businesses believed donating food and diverting waste would help to gain customers because they support these kinds of initiatives.

Convenience was another motivation, where respondents noted they would donate or divert organics if it was easy. Therefore, having proper infrastructure and logistics in place would assist with these activities. Education and awareness is a very broad theme and applies to all sectors about increasing food literacy skills (see also, for example, Uzea et al., 2013; Thyberg & Tonjes, 2016) and can work to reduce stigma around surplus ‘garbage’ food. Increasing connections was a prominent theme noted by all respondents (see also Uzea et al., 2013; Thyberg & Tonjes, 2016; Evans-Cowley & Arroyo-Rodrigues, 2013; Halloran et al., 2014). This would enable more partnerships across the value chain and allow for an increase in donation and diversion activities by knowing who accepts surplus food and food waste as feedstock for compost and anaerobic digestion. Legislation and policy were another prominent theme in identifying opportunities (for example, see also Prakash, Ambuko, Belik, Huang & Timmermans, 2014; Thyberg & Tonjes, 2016). Implementing legislation like producer responsibility, such as mandatory composting for food processors if they create a certain amount of food waste would also serve to increase connections and relationships, because compost needs more than one input. These kinds of legislation can facilitate bigger players to actually do something bigger. Other examples of legislation or policy include organics bans, and incentives that promote donation (although it is important to acknowledge who is benefitting from these incentives). Creating regional food policies that have a focused area on food waste/surplus food could mean specific strategies and tactics could be built around redistribution activities, as
Evans-Cowley & Arroyo-Rodriguez (2013) note is essential in food system planning. As appropriate, the motivations and opportunities as listed in Tables 2 and 3, will be discussed on a sector-by-sector basis.

3.3.1 Producers

Motivations

Small-scale producers largely compost their waste, and will often only donate their excess food based on how convenient it is (since time is a limiting factor for producers). One producer noted they will always donate their excess at the end of the day if an emergency food provider has a stall set up for donations because it is convenient and they do not have to haul their unsalable product back to their farm:

> At the farmer’s market the [emergency food provider] has a stand, so I can donate anything that I don’t think I will be able to sell at the end of market, which is really great, it’s actually super convenient (Producer 2)

Another motivation for diverting food waste for producers is economic. If they sell their less-than-perfect but still edible food for a reduced rate, that still provides some income for their work. For these producers, environmental motivations played a role in waste diversion. Producers often prefer composting over other methods of diversion, and as one producer respondent noted:

> Compostables are a really important part of nutrient cycling (Producer 4)

Food security was another motivating factor for producers. Several producers stated that coming home from market with a bin of unsold vegetables that they worked hard to produce to compost it felt “wrong” and that they would rather donate it and have people eat it:

> If it’s going to the compost or someone could eat it, you might as well donate it… it’s certainly like a good fit, I think, for a business that has perishable items to donate them instead of throwing them away (Producer 5)

These motivations reveal potential opportunities, as discussed below.
Opportunities

Improving logistics and infrastructure

If an emergency food provider was able to pick up the donation, or had a stall at the farmer’s market that producers could donate their unsold items to at the end of the day, producers indicated they would be more likely to donate.

Another respondent noted that they would like to be able to accept compost (and have compost production) from retailers/businesses (who have expressed interest in this), but lacked appropriate composting facilities, such as being accessible and able to compost in the winter.

Economic

As discussed in the motivations for this sector, being able to sell their less-than-perfect but still edible food for a reduced rate is also an opportunity. One producer stated that having staggered market days helps to reduce food waste because if something does not sell that day, they are able to sell it at the next market day. They then only harvest the amount needed for the next market day, according to how many leftovers there are, and effectively plan their numbers accordingly.

Being able to sell products at wholesale when producers have a bounty of items was also cited as an opportunity. As one producer stated:

There’s always a chance of crop failure, so you can’t just grow numbers so intact that…[you] won’t have a crop if something goes awry, there’s always going to be a certain amount of excess and it’s having a good outlet for it, is really what we need…and maybe there’d be a coordinated system where that could be sent out to different places that would maybe then buy those [excess]…there’s definitely stuff that could happen that’s not happening…infrastructure could be put in place to make it easier for farmers to deal with excess (Producer 5)

In addition, producers stated that they lack the time to search around for buyers when they do have excess, so having that infrastructure already in place would be beneficial.
Stemming from economic motivations, repurposing was another area of opportunity. This means allowing something to grow into something else (e.g., if too many salad greens are ready at the same time, they can harvest what they need and allow others to grow bigger and become braising greens to sell as a different item). Repurposing also allows for the preserving and processing of any excess food for better storage (and potentially added value) for either personal use or sale at another time (e.g. offering these processed items as part of a winter CSA when there is less fresh produce available).

*Increased connections*

Another producer noted that small-scale organic farms often lack adequate amounts of compost stock and would like to build relationships with businesses in order to acquire more, as well as with other producers to pool resources.

As mentioned above, donating sometimes fits in with how convenient the logistics are. Therefore, increasing connections with the community, including building relationships with more emergency food providers presented a valuable opportunity. Several respondents noted that because farmers lack the time to harvest “seconds”, they would appreciate allowing someone else to come in and do that (i.e., gleaners), either for themselves or for donation, but were unaware of any organizations involved in those activities except for the two in southern Ontario that operate on a much larger scale.

Along these same lines, another respondent suggested a U-Pick type activity where they could open up sections of their farm when they had already done a picking and it is no longer worth it for them to pick more, but could allow individuals who want to come in and pick their own (this is particular useful for farms that have good community connections).
**Education and Awareness**

One producer suggested training programs in composting might make it more accessible to both the public and businesses to raise awareness and learn what options exist and how to compost properly, without attracting pests or odour.

**Legislation**

Producers also cited legislation as an area of opportunity that could be put in place in order for industry to deal with their own waste, for example mandatory composting for those involved in the food industry.

An example of legislation that is related to food security motivations is the Local Food Act, 2013 that was implemented in order to increase donations from farmers to emergency food providers in Ontario. It provides a non-refundable income tax credit worth 25% of the market value of products donated (Ontario Ministry of Finance, 2014). Respondents noted that while this does not cover the costs associated with producing, harvesting, sorting, and transporting products, it does provide some compensation for the costs, and has worked to increase donations from farmers. As one producer noted:

> We would do it anyways, but this makes it…it sort of pays for the time I take to put it aside and do that (Producer 1)

### 3.3.2 Distributors/Retailers

**Motivations**

Economic considerations were a major motivation for food waste reduction and diversion for the distributor and retail sectors. Environment also proved to be a motivation for this sector. For those who do donate food and/or divert organics, they felt image was an important motivation. One retailer who uses an organics program stated that they have to “do [their] fair share” (Retailer 2). Another retailer said they implemented a diversion program because it was
part of their brand, as a natural health store. Food security was a motivation for retailers who donate, noting how this helps and gives back to the community. One respondent noted there was a benefit for donating good products that will be beneficial to the recipients’ health, as health is linked with a variety of other aspects of wellness, and that those who are food insecure “shouldn’t have to eat horribly” (Retailer 4).

**Opportunities**

**Economic**

The ability to offer flexible pricing represents an opportunity for this sector. Items that are approaching a best before date can be offered at a reduced price to encourage quick sale. This does not necessarily result in a profit for the retailer (although they try to set a price that still benefits the store), but it reduces waste at the store level (although this could represent more household food waste), and offers a discount to customers.

Culled produce is often repurposed into a salad, or even simply as “pre-cut” and then can be sold at a premium. This is an effective way of controlling and reducing waste, but still making a profit. Two retailers commented on this:

Unfortunately sometimes if our peppers come in and they’re a bit wrinkly, they just…we can’t sell them, so we usually end up, we’ll cut them up, or do something like that, and then we would sell them back [to the customer], and…it’s usually good for our margins as well because you’re usually selling them at a premium price for what you would actually get for them (Retailer 4)

Cut fruit is a very interesting…cut fruit is uh, about 60% margin. There’s a big process to it, so most of our stores now, cut fruit’s all done in the cut fruit room. They have it all refrigerated, so we go out to the shelf, you take a bunch of stuff off the shelf that looks like - or he’s culled it and it’s going to back and it’s almost ready to be reduce, that gets chilled, and then [they] cut it all up and process it, and put it in the cut fruit…Most of the produce waste went into cut fruit (Retailer 2)

A further opportunity is to have a prepared foods/eatery section in the store that can use any damaged food or cook with items that are about to rot. This type of opportunity ties into the
materiality of food and the disconnection we have to our food system, to be discussed in the following chapter.

*Education: (Staff training)*

Education and awareness for staff represented an area of opportunity for this sector. Increasing awareness around how much and what is being wasted at the retail level with employees was cited as an important aspect of reducing waste, and subsequently diverting what is wasted.

Learning the patterns and trends of the store goes a long way to reduce waste. Proper training was cited by respondents with helping employees understand how to properly handle product and why it is important to do so, as well as the importance of first-in-first-out procedures to ensure that the oldest product is bought before newer items.

*Improved infrastructure*

Retailers that do use ordering and tracking systems have reported that it has greatly reduced their food waste. Ordering and tracking systems assist with having accurate numbers to provide adequate orders and sales projections. This type of system would be a good opportunity for other retailers to assist with decreasing food waste.

*Increased connections*

Retailers cited the need for relationships with local farmers to accept compost. Another opportunity retailers noted would be to have reliable and consistent relationships with emergency food providers, and to have someone at the retail level responsible for setting up and maintaining these connections. For the distributors and retailers that do donate, it is often because there is
someone who is invested in doing that work, and who takes the time and effort to set up and maintain those relationships.

3.3.3 Food Service

Motivations

Food waste equals an economic loss to the food service sector as well. Food security was also a motivation for caterers in this sector. Since wasted food from events was the most prevalent source of their waste, and this food no longer affects their bottom line – it has already been paid for by the client – it was a sense of “moral obligation” to avoid waste and feed hungry people that motivated donating it:

People get fed…people [who] don’t have food do, because of us and other people who take the time to donate (Caterer 3)

Opportunities

Improving logistics and Infrastructure

Improving logistics was also cited as an area of opportunity for the food service sector. Food needs to be transported and stored in a particular way, and this sector often lacks either the proper storage space or transportation to drop off excess food. If this could be remedied, more prepared foods could be donated.

In terms of lacking proper disposal units at events (for caterers), one respondent stated they bring proper bags for recycling and compost, so that even if the receptacles are lacking, they can at least make an effort by using bags (although this is not as fast and efficient).

Education: Staff Training

Food service respondents stated that it is in their best interest to utilize everything and have the foresight to manage and store the food appropriately. Another suggestion was having a “check-in” with staff at the beginning of a shift or event as a reminder of how the waste is going
to be managed. One respondent noted that the most important thing is teaching staff how and why waste needs to be managed a certain way.

Economic

Although many food service businesses try to not waste food, repurposing more of it was cited as an opportunity. As one restaurant manager noted:

We could keep vegetable scraps and that kind of thing to make stocks for soup… it would save money as opposed to getting a concentrated powder… something like that would be easy to do (Restaurant 1)

Increasing connections

A further opportunity in this sector was also increasing connections and relationships. Most food service respondents suggested partnering with producers to bring scrap foods for compost or animal feed (and in return perhaps receiving farm fresh eggs or other food items) would be ideal and something that they were interested in.

3.3.4 Emergency Food Providers

Motivations

For this sector, food security is the main motivation for accepting surplus food. In terms of managing any food waste they may generate, however, economic and environmental motivations were the reasons why one emergency food provider decided to divert their organic waste:

We try to divert as much from the landfill as possible. First of all, it helps our own environment, but it also helps us save money by filling up bins with something that could be used by the animals, or even…for compost (Emergency food provider 6)

Opportunities

Improving logistics and infrastructure

As noted by a key informant, improving infrastructure and logistics was the “key link that’s missing” (Key Informant 2) for this sector. Respondents stated that it would be helpful to
have an alternative distribution point – especially a cold storage one – in the city that was accessible by all emergency food providers. This would allow for bigger and fresher donations, and a refrigerated truck would cut down on concerns of food temperature safety. As a key informant noted:

A refrigerated truck would really facilitate the transfer of food from farms or retailers to a cold storage facility, and then again, to emergency food providers or their other outlets (Key Informant 2)

A key informant also spoke about a “food access van”: a mobile van that serves prepared food to those in need, but by-laws at the time of this interview did not allow for such food trucks in Guelph. Since then, a bylaw was passed in July 2015 that created a special licensing category for food trucks, so this may be a possibility now. This idea is based on the Good Food Mobile Market in Toronto that offers nutritious food to areas with little access to fresh food for a low price. The Vancouver Food Bank has a similar set up with the Angel Food Runner Network, a refrigerated truck that is able to pick up reclaimed food from events, food service, retailers – anyone with surplus food – and drop it off to emergency food providers across the city.

A key informant stated that having the proper infrastructure of a cold storage site and/or access to an industrial kitchen to process and preserve food, so that blemishes can be removed and only the good part of the product is being served, would be a valuable opportunity. This also addresses the dignity aspect of emergency food provision: people are not being served or expected to take “imperfect” produce or products that are starting to rot, instead they are turned into something else. This also allows for larger donations of perishable products to be processed and/or stored in a way that makes them last much longer. Processed donations can also be kept until the winter when there are much fewer perishable items donated.
Increased connections

Having regular and more frequent donations and better relationships was widely cited as key opportunity. One emergency food provider stated that they were looking at alternative ways of procuring food, suggesting that building relationships with food processors might be a viable option. A key informant echoed this sentiment, and spoke to the need for an increase of connections in general between distributors, farmers, retailers, caterers, and emergency food providers, noting that organizations often end up working in silos:

[We’re] looking at options…working with food distributors, farmers, emergency food providers, looking to create links between those two groups, along with other food security related organizations, with the potential of working with retail as well if they have any items that might be going towards unsellability, we could probably redistribute that kind of thing (Key Informant 2)

Legislation and Policy

Legislation around best before dates was cited as a huge opportunity. Although Food Banks Canada has literature and guidelines on this, it would be more useful and clarifying to have more stringent regulations.

Emergency food providers stated that the Local Food Act, 2013 was helpful to increase donations; however, it is important to be mindful of the fact that farmers are often living close to the poverty line as well, so it can be difficult to ask them to donate.

Economic

Cost can also create food waste for some of the sectors emergency food providers and food rescue organizations partner with, and can up increasing donations. For example, a food rescue organization commented on some of the produce they received:

Beautiful, number one grade food, with the wrong sticker, so what happens is, you know, the company is not going to pay somebody to stand there and pick all those stickers off, they just…the they just get rid of them (Food Rescue Organization 2)
Another opportunity for this sector proposed by a key informant is the revaluation of food through initiatives like The Real Junk Food Project. This project reclaims food from a variety of sources, including places such as community gardens, restaurants, and events. They prepare and serve this reclaimed food in a pay-what-you-feel format. The UK, France, Berlin, and Australia have adopted this initiative so far. This revaluation of food waste also works to reduce the stigma around who eats ‘garbage’ food by serving to everyone.

_Education_

A valuable opportunity here would be raising awareness among donors around what is usable and edible, as well as awareness of the Donation of Food Act to increase donations. A key informant in this sector noted that having knowledge of who has excess food to donate, and who has the programs to accept it is essential. Another aspect of education is knowing what kinds of dents in cans are safe: Food Banks Canada has an information sheet for this, but not everyone is aware of this.

Knowing how best to store food (especially perishable items and produce) and safe food handling were noted as important factors for both staff and clients.

One respondent said they have a community garden, and make an effort to let clients pick from it, pointing out that produce is often not perfect, but fresh from the garden.

_3.3.5 Waste Management_

_Motivations_

Motivations for the waste management sector are largely economic and environmental. Offering organics pick-up programs, and composting and anaerobic digestion facilities for food waste diversion are all motivated by offering a service (economic) that is diverting food waste
away from landfill, and, for anaerobic digestion specifically, creating a renewable fuel (environmental). As an anaerobic digestion respondent noted:

More and more it seems likely that organic waste will be banned from disposal throughout North America, and we have a great technological approach (anaerobic digestion) that can, you know, be the solution…we’re making renewable energy out of [food waste] (Anaerobic Digester 1)

A biogas industry representative noted that anaerobic digestion:

Taking advantage of that organic material…to divert it to an anaerobic digestion process, which can then capture the energy, recycle and recover the nutrients back to the land and have all of these other ancillary benefits in terms of [the] reduction of methane which helps to improve our GHG emission profile…so there’s a lot of benefits that come from…diverting the organic material. I think the now novel opportunity is to be able to capture that and use the biogas to be able to utilize it as a renewable form of energy (Key Informant 3)

This benefits the environment and fits into developing climate change initiatives and calls to reduce overall GHG emissions. For anaerobic digestion facilities and waste haulers that pick up organic waste, convenience is something they can offer to encourage food waste diversion. They can accept food waste deliveries all year long (versus some on-farm digesters that accept food waste that are often inaccessible in winter). Image was another motivation cited by the waste management sector for something they could offer other sectors. A respondent noted that as corporations and the communities they serve become increasingly concerned with corporate sustainability, image and branding become significantly impacted by how they choose to operate and deal with their waste:

I think as they [retailers/corporations] move forward, you will see more of them examine organic diversion programs, simply to present the right image and be the corporate citizen they really want to be (Private waste hauler 1)

Choosing options such as organics collection offers an attractive solution that bolsters corporate image, as food waste becomes an increasingly visible problem.
Opportunities

Education

A biogas industry representative noted that educating and informing the public, as well as the food industry (i.e. food processors), and municipalities of the available technologies is fundamental in creating awareness around organics diversion. As they noted:

There’s a lot of material out there that is just simply being diverted to the lowest common denominator, and we have a long ways to go in terms of educating and looking to re-divert that material to a more useful place (Key Informant 3)

Better educating the public and a better understanding of value creation is needed, sought through campaigns such as WRAP’s Love Food Hate Waste in the UK and in Metro Vancouver. This helps not only consumers, but businesses as well. WRAP has also provided some useful information around the use of digestate and compost (in the UK), and the sharing of that information represents a good opportunity, a waste management expert noted.

Improving infrastructure

Improving infrastructure is yet another area of opportunity for the waste management sector. Building anaerobic digestion facilities that have the ability to de-packaging food waste is one suggestion:

[Anaerobic digestion] ha[s] an inherent ability to handle wastes that are enormously more contaminated than any composting facility could ever dream of, so it’s another reason why I think it’s going to become a predominant way of dealing with stuff (Anaerobic Digester 1)

Economic

Economics was cited as an area of opportunity for the waste management sector. As an anaerobic digestion facility manager noted, these facilities can be built for capital costs that are less than composting facilities, and a well-designed facility can be operated cost effectively.
However, this is still believed to be an expensive technology by many in the waste management sector. As this respondent stated:

> We’re trying to get that out there. It’s a secret somehow, or people are very skeptical, but um, as opportunities to actually bid work and submit proposals arise in coming years, [nearby region] is probably going to put out a request for proposals for an anaerobic digester for its green bin material in about a year from now, uh, and then I think people will start to see what’s possible (Anaerobic Digester 1)

The development of end markets is another economic opportunity for this sector. As a waste management expert noted:

> I think we see a huge opportunity…in Ontario right now, we create a lot of waste and we dispose of a lot of waste, and so we have been strong promoters of…finding ways to increase the value of the resources that are in our waste stream. So we see a strong economic opportunity, and environmental opportunity in doing that, and so you know, there’s a huge potential here, to meet a whole bunch of the government’s goals, by diverting more of this material and creating valuable products (Key Informant 4)

**Legislation**

Legislation/policy was also cited as a lever for change. As a biogas industry representative noted, there is a need for policy that could help to increase food waste diversion. The waste management expert noted that residential organics programs have worked because of provincial regulations (i.e. Regulation 101 leaf and yard waste) that justified bringing in green bin programs to municipalities. An anaerobic digestion facility manager stated that the opportunity lies with government to enforce change, as individual change is often difficult:

> You can’t control individuals’ behaviour, including what they do with their food waste, but if you focus on building large societal changes that create incentives or rules or whatever to shift the whole picture…I just think that’s a better use of people’s time (Anaerobic Digester 1)

**Increased Connections**

Waste management experts at both the city and provincial level cited increasing connections among sectors as a valuable opportunity. Examples include bringing together all the associations that deal with waste issues (Canadian Biogas Association, Canadian Compost
Council, the Ontario Environmental Industry Association, Regional Public Works Commissioner) in order to work together toward a solution.

3.3.6 Section Summary

Similar to the barriers section, the motivations and opportunities identified by respondents across sectors possessed commonalities, but they also varied across and within sectors. The factors that motivated each sector to divert food waste were unique, and the opportunities were dependent on the nature of the sector. It is especially important to understand the opportunities by sector, because any viable opportunity would have to address the specific concerns of the particular sector. One solution would not fit all in the case of food waste diversion.
3.4 Conclusion

In examining food waste diversion, a multitude of barriers were identified, and motivations for participating in diversion activities (or desiring to) were discussed. Both barriers and motivations identified in this chapter revealed potential opportunities for increasing the flow of food waste away from landfill.

Many respondents noted that they care about food waste, but were unaware of what programs existed, or who to connect with, signifying the need for increased connections and increased education and awareness about diversion options. There is a synergy between barriers such as a lack of infrastructure and logistics, motivations of convenience (which become an economic motivation when framed around needing to be cost effective and not requiring extra time) and opportunities like improving infrastructure/logistics and increasing connections across sectors. Increasing connections was a prominent theme revealed in the opportunities section, corroborating much of what the literature states about collaboration amongst the food value chain. If diversion activities are made easy and convenient by having the appropriate infrastructure/logistics in place, and people know who to connect with for donations or other diversion programs, then they are much more easily implemented. In practice, however, it may be difficult to build more storage spaces in already existing structures. Having a central cold storage distribution hub, as is currently being worked on in Guelph, could be a solution to this problem for producers and retailers being able to drop off items, and emergency food providers for pick up. The barrier of odour could also be addressed with the opportunity of improving infrastructure and logistics: having proper cold storage would help to reduce odour, as well as having appropriate organics bins and space for them. Regular pick-ups are necessary for organic diversion programs to work.
Several of the other barriers revealed across sectors – such as a lack of education and training, health and liability concerns, quality of feedstock issues, stigma – revealed an opportunity to increase education and awareness about proper food handling, food safety, increasing staff training, and proper composting techniques. With the barrier of stigma, however, any opportunities also require a shift in mindset and preconceived notions about the appearance of food and who eats what.

Economic motivations often revealed economic opportunities: since waste often equals economic loss for businesses, the main opportunity is being able to offer flexible pricing on potential waste items. For the waste management sector, the development of end markets is ultimately motivated by economics (although some stated environmental motivations); being able to turn waste into a product is not only a sustainable option, but the ultimate goal of circular economies.

Environmental motivations also often correspond to image motivations for retailers (and for what organics programs and anaerobic digestion facilities can offer). As food waste increasingly becomes visible within society, these motivations will likely continue to grow, and are valuable opportunities the waste management sector can offer. Since economic considerations are often paired with either food security or environmental concerns for motivating factors for many of the sectors, legislation that incentivizes diversion activities financially is a viable opportunity. Both producers and emergency food providers cited the Local Food Act, 2013 as a useful incentive that helped to increase donations since it was implemented. However, it matters who is benefiting: incentivizing donations from corporations with a tax credit to corporations will most likely act to increase the phenomenon of ‘dumping’ inedible food on organizations who then have to pay for its disposal.
Cost, or the inability to pay staff was one barrier that seems difficult to reconcile. However, since this can create waste in some sectors - referring to the specific example of perfectly good produce being labeled wrong; it is often not worth the time/money for retailers/distributors to correct this - but this can be an opportunity for emergency food providers as a way to increase donations of perfectly good food. Also, NIMBY-ism for the waste management sector was another barrier that requires a shift in mindset and how we relate to waste.

Many of the barriers are a result of how we conceptualize and relate to our food and waste systems, as well as how food and food waste need to be handled. Some of the opportunities presented mean that we need to make significant changes in how we think about food waste before we can implement viable solutions, and lead to questions about the materiality of food itself. This will be examined in the following chapter.
Chapter 4: Discussion

We are disconnected from both our food and our waste systems. Currently, the socio-materiality of waste (how waste exists in society; how it is described and managed) is detached from society (Hultman & Corvellec, 2012). It is something to be removed of quickly and not thought of again. As de Coverly, McDonagh, O’Malley & Patterson (2008) note, we are socialized to think that waste should not be visible in public spaces. This was exemplified in the previous chapter by the NIMBY-ism experienced by proposed anaerobic digestion facilities in neighbourhoods. Waste is therefore irrelevant: “as if it existed in a world apart from the one we inhabit in our daily, routine lives” (O’Brien, 1999, p. 262; in de Coverly et al., 2008). The waste that exists in societies presently is created by mass consumption and production, driven by both an increase in the availability of resources as well as consumer demand, and is inherently an environmental concern. The technologies we have implemented to deal with this waste, such as landfills and incineration, have only exacerbated this concern (Hultman & Corvellec, 2012). Further, as Hultman & Corvellec (2012) posit, these technologies have only served to further increase our distance and disconnect us from the waste we produce. However, Hultman & Corvellec (2012) suggest that the ways in which we deal with waste are changing, as can be seen with waste being regarded as a resource, as will be discussed below.

We are also disconnected from our food system. Our current food system is set at a global-scale (Evans et al., 2013), whereby food production chains are lengthy and far removed from where purchasing and consumption occur, and industrial supply chains are not transparent to consumers (Watson & Meah, 2013; Alexander et al., 2013). This in itself exacerbates food waste: when supply chain networks are disrupted through any variety of factors, such as transportation or refrigeration issues, perishable items become waste (Alexander et al., 2013).
The industrial food system also results in a lack of knowledge of where food comes from, how it is produced, and ultimately leads to technological intervention. This is exemplified with the barriers related to a lack of food literacy skills and the expectation of food to look ‘perfect’. Another example here is the implementation of best before dates by food manufacturers, where responsibility and knowledge of food safety are shifted from the consumer to what we assume as “microbiological expertise” (Milne, 2013, p. 94). This is exemplified with the barrier of liability concerns with the donation of food, as well as retailer policies to dispose of food before the best before date.

The socio-materiality of both food and waste – how we define them and how they exist in our society – becomes important in understanding and managing food waste.

4.1 Materiality

How food waste is thought of and understood is important to how we deal with it. Materiality researchers note that the materiality of ‘matter matters’, meaning that the physical properties of stuff are important, and they affect how things are understood and managed. As Bakker and Bridge (2006) state, “to discuss materiality is to engage with metaphysical questions of ontology, agency, and intentionality” (p. 18), meaning that considering the materiality of something brings into question the theoretical concepts of being and knowing, the kinds of things that have existence and the relations between them, and the capacity to act or cause action, either deliberately or not. They call for further work on the materiality of resources. This theoretical framing recognizes that things (including humans, resources, biophysical processes) affect and impact social relations and practices (Bakker & Bridge, 2006). That is to say, objects have agency and the capacity to influence the things around them (although not in a deliberate sense, but an actant can elicit a response or a difference in another actor/actant or network) (Bosco,
Social relations do not only involve humans; objects play a crucial role and therefore require attention as well (Liboiron, 2015). It is impossible to achieve anything in everyday life without stuff, and this relies on how material aspects of stuff are organized (Corvellec & Hultman, 2012). As Hawkins (2009) notes, as much as humans like to think we are in control and manage the material, materials – such as waste - are just as likely to influence humans. With waste management, people have to engage with these materials through changes in their behaviour, interactions with recycling centers, developing proper disposal techniques, and the like (Corvellec & Hultman, 2012). This was exemplified in the previous chapter with the barrier of cost - having to pay for an organics pick up service, or having to pay staff to sort and de-package items for compost. These changes in waste disposal change how people/businesses relate to waste, and are often met with refusal.

Liboiron (2015) exemplifies this argument with plastic waste, arguing that the particularities of plastic fundamentally affect their agency (i.e. their ability to affect how humans react to it) and ultimately how we regulate plastic pollution. For example, PET plastics typically found in items such as pop bottles and PVC plastic common in piping are two very different materials, although they are both “plastic”. They break down differently and affect human bodies in different ways, and therefore we need to know the type of plastic in order to manage it correctly. As Liboiron (2015) specifies, “it matters whether that PET or PVC is in water, in a cod stomach, or on a store shelf because it will cause harm differently, and cause different types of harm” (p. 5). Another example Liboiron (2015) provides about the materiality of plastic is that many of the plans to clean up plastics from the ocean only actually deal with larger pieces of plastic, and this misses the ‘microplastics’ that make up a large percentage of the problem.
Similarly, Bakker (2005), Bakker & Bridge (2006), and Gibbs (2013; 2014) analyze water with a materialist lens, suggesting that the physical properties of a resource impact the socio-political and economic system of which it belongs. For example, nature (e.g. water) rarely works in a rational, expected way: it is distinct from other resources because it is a “life-giving, continually circulating, scale-linking resource, whose biophysical, spatial, and socio-cultural characteristics render it particularly resistant to commodification” (Bakker, 2005, p. 559). This is analogous to food waste: distinct from other resources, it ripens and rots independent of human action, and these physical properties impact our socio-political and economic decisions of how we deal with this waste. This is exemplified by the economic barriers, motivations, and opportunities identified by respondents, as well as societal resistance to organics programs and waste management facilities due to odour concerns. Human and cultural geographers explore the agency of water and its connections in order to understand how these affects meanings, decisions, and practices (Gibbs, 2013; 2014).

Yet another example is asbestos, examined by Gregson et al. (2010b). Asbestos was considered an excellent building material because of certain properties (heat resistance, tensile strength, insulating), but is also extremely toxic when its fibers become airborne and are inhaled by humans. Although food waste is not toxic in this way to humans, when landfilled it has global and far-reaching consequences of exacerbating climate change. The consideration of the materiality of asbestos prompted a response from society: banning its use and implementing occupational health legislation for those who may come into contact with it through their work. Likewise, the consideration of food waste’s materiality is beginning to prompt a response with landfill organic bans. Gregson et al. (2010b) aptly note how a focus on the materiality of objects adds to the evolving conversation of ‘vital materialisms’.
In all of these cases, the stuff of what objects are made up affects how they are governed. This is important because how the problem is outlined is directly related to the solutions sought (Liboiron, 2015). Thus, we need to take into account and understand the materiality of food because food is a different type of resource. This relates to not only how it is managed, but also how it is understood, dominant perceptions of food waste, and how these are disconnected from the materiality of food.

Regarding food, it has been noted that the organic nature of food matters: it is time sensitive and prone to decay (Evans et al., 2013; Waitt & Phillips, 2015). This is evidenced by the specific handling food requires, and the identified barriers and opportunities in the previous chapter of infrastructure and logistical issues. Evans (2013) for example suggests the importance of the material qualities of food itself. Along these same lines, I argue that the way we think of food and waste is an important consideration in how we prevent and manage food waste. This relational materialist perspective provides a way to explore how “the matter that is wasted is an active force in the situations in which it becomes waste” (Watson & Meah, 2013, p. 103; see also Hawkins, 2009; Gregson et al., 2010b). Because of its natural/physical characteristics, food waste cannot simply be broken down into its components and recycled in the same way as a car can be, and food – even as waste – is time sensitive and cannot sit around waiting to be dealt with (Halloran et al., 2014). Many respondents noted this as a barrier for storing food for donation, as well as for having an organics program, where odour concerns were an issue.

Through this lens of materiality, the findings presented in the previous chapter align along three main themes: 1) food is subject to a quick transformation from edible to inedible; 2) the line between ‘good’ and ‘bad’ food is blurred, indistinct and unclear (i.e., arbitrary best before dates, health and safety standards, people’s perceptions); and 3) food waste, unlike many
other waste materials, still has the ability to be useful as an energy source; however, once food has been discarded we cease to think about the usefulness and just want it gone (due to odour concerns, attracting pests, ‘grossness’, etc.).

4.1.1 The Quick Transformation of Food to Waste

Food never exists in a static or stationary state; it is always in constant flux, and is “always in the process of becoming” (Alexander et al., 2013, p. 479). Food is prone to rotting in a relatively quick time frame. It is an organic material that is subject to internal processes of growth and ripening in production, through to the microbial processes of decay (Bennett, 2007; Evans et al., 2013; Alexander et al., 2013). This theme exemplifies the barriers identified in the previous chapter of adequate infrastructure and logistics (including how food has to be handled, stored, and transported in a particular way), the barrier of having excess food (it is difficult to sustainably manage since food is time sensitive and cannot be stored), and odour concerns (food smells when it starts to rot).

Therefore, the agency of food necessitates specific handling. This means that the food supply chain is a unique one, with complex logistics (Goebel et al., 2015). Due to the natural characteristics of food, waste is largely dependent on how food waste is managed, such as shelf-life considerations and proper temperature regime (Mena et al., 2011). While most developed countries have well-developed cold chains, and refrigerating or freezing products is a nutritionally good way of preserving food, this requires a reliable cold chain throughout all stages of the supply chain (Institution of Mechanical Engineers, 2013). While cold chains obviously help to keep products from spoiling, they were found to be one of the root causes of food waste at the retail level due to mismanagement or broken cold chains (Mena et al., 2011; Felfel & Rich, 2015; Uzea et al., 2013). Disrupted temperature regimes result in faster
deterioration and increased potential for bacterial growth (Buzby, Hyman, Stewart & Wells, 2011). As one retail respondent noted:

> When we receive perishables, [we have to] get them under refrigeration in a timely fashion. There’s a process for everything, it has to be chilled, it has to be cold, they cannot [re]use it the next day for salads if it’s not chilled the night before, it’s gotta be cold. If it’s not, it’s garbage (Retailer 2)

Donation of surplus food is the highest priority waste management option according to the food waste hierarchy. However, some food ends up being discarded because of temperature “abuse” due to a broken cold chain (Erikkson et al., 2015; Buzby et al., 2011; Prakash et al., 2014), or because of lack of cold storage transportation or storage. As one respondent noted in the previous chapter, cold storage is often lacking for producers to store excess; as well, those accepting donations often have no place to store perishable items. A key informant also noted in the previous chapter that an opportunity exists in having a refrigerated truck to facilitate the transfer of food from farms or retailers to emergency food providers, as well as a cold storage distribution hub.

### 4.1.2 A Thin and Blurred Line Between Food and Waste

There is a thin and blurry line between food and waste. Many food products, especially produce and perishable goods, turn quickly from edible to inedible due to the agency of microbial decay. The liveliness of food is seen in the molding and softening slime found on ageing foods. Non-human entities, such as the refrigerator, microbes, temperature, oxygen, all act to blur the boundaries between food and waste (Waitt & Phillips, 2015). However, as Alexander et al. (2013) note, bacteria need not even be present in order to create food waste. This was exemplified in the previous chapter with the barriers of health and liability concerns and education and food literacy skills. Because food is subject to rotting and mold, health scares like salmonella, listeria, and E. Coli (Murdoch et al., 2000; Alexander et al., 2013; Milne, 2013) have
contributed to the modern age of anxiety and the “risk society”, where the potential of food poisoning has been accompanied by strict health and safety guidelines and arbitrary best before dates (for more on risk society, see Beck, 1992; also noted in Atkins, 2013). Because food literacy skills are lacking across society (and for this research this included retail staff and emergency food providers and their clients), this meant that reliance on best before dates and a lack of how to properly handle and repurpose food created a barrier for edible food being redirected to people, as it should be. It should be noted that best before dates in Canada do not ensure the safety of food before or after the date, and only provide information about the freshness of the food. They are only required on food items with an expected shelf-life of less than 90 days; anything that would be expected to last more than 90 days does not require a best before date. Further, these dates are not regulated and the responsibility lies with the manufacturer to determine if the item has a shelf life of 90 days or less, and the actual date (Canadian Food Inspection Agency, 2015). The problem with arbitrary best before dates is that we confuse them for expiration dates and codify them as markers of safety, when in fact they are not.

The potential threat of bacteria making us sick can be traced back to Latour’s interpretation of Pasteur’s discovery of bacteria. Latour (1988) posits that bacteria did not exist prior to its discovery, since bacteria only became real (in our conceptual reality) once it was discovered to interact with and contaminate food (Gratton, 2014). Prior to this discovery, we were unaware that this threat existed. However, now that this is known, it has become such a concern in the modern ‘risk society’ that it need not even be present to be perceived as a threat and cause food to be wasted. The barriers identified in the previous chapter relating to liability concerns exemplify this. For retailers and food service providers, this concern was often enough to not
donate any surplus food at all, and emergency food providers did not want to accept or offer food past its best before date because they did not want to “take the risk”. The popular adage “when in doubt, throw it out” exemplifies this concern with safety.

Nimmo (2011) discusses the discovery of bacteria similarly in a study on milk. Prior to the discovery of bacteria (pre-1870s), milk was expected to be ‘warm from the cow’ to be considered fresh, and was extremely susceptible to bacterial growth. However, bacteria were not known then, and when people began getting sick from milk that was transported further distances, it was thought that the milk had been tampered with. With the discovery of bacteria and innovations in pasteurization and refrigeration technology, milk had to be cold and pasteurized to be considered fresh. This knowledge of bacteria and the technology subsequently implemented had acted to disconnect humans from the source of milk – the cow (Nimmo, 2011). These technological interventions have continued to sever our connection to food and food literacy skills. We are unable to tell when food is ‘bad’, and the knowledge of bacteria has served to create such a scare that instead of trusting our instincts and developing food literacy skills to be able to tell when food actually is inedible, we rely on technology and date labels to tell us when we should/should not eat something. The industrial food system, food safety experts, and government bodies mediate our relationship to food. As Milne (2013) notes, these technological shifts in both the retailing and the preparation of food have inhibited our understanding of food freshness, and thusly affects the food retailers sell and what consumers are willing to buy.

As mentioned in Chapter 1, eating surplus food is considered the most sustainable waste management option, but if a retailer/food service provider cannot guarantee that the food is safe or that the cold chain has not been broken, it has to be thrown out, even if it is actually still edible (Eriksson et al., 2015). A food service respondent noted:
So it’s…unavoidable, we temped it, it was…unavoidable. Can we save it? No, it’s been past safety temperatures for too long (Restaurant 1)

This was also a concern for the donation of food for food service providers and retailers, as identified in the previous chapter with any returned items that cannot be put out on the shelves for sale, or recalled items that have to be destroyed. Emergency food providers also identified this as a concern regarding dented cans in the previous chapter.

Best before dates have also contributed to food waste. Milne (2013) found in a study in the UK that date labels have caused needless discarding of edible food (see also Stuart, 2009). This also leads into a discussion about the lack of knowledge and education around food and food safety, whereby people rely on dates rather than their own knowledge of what is still safe to eat (Milne, 2013). As one retailer noted:

Well, it’s pretty well dictated for us, most everything is dated nowadays, so you gotta look at expiration dates, we have a policy in place of 5 days, most things are within 5 days of a code, we pull it out (Retailer 2)

This quote exemplifies the preventative caution placed around food safety and dates. Not only are best before dates arbitrary and do not indicate when food has gone “bad”, but food is not even permitted on store shelves almost a week before its best before date arrives. This notion that food can turn from nutritious to dangerous on a pre-determined date is not only false, but demonstrates the disconnect we have to our food and its quality. Although this policy is set by the retailer, it could be considered that the lack of consumer demand to purchase close to best before date items are also a cause of this policy. If consumers will not buy the product due to the perceived notion that best before dates equal expiry dates, then this forces this type of policy onto the retailer. In this way, consumers can be seen as actors in the food waste network. Similarly to the way the different sectors of the food value chain are interconnected, the consumer can also be seen as part of this interconnection.
Additionally, food often never even makes it to grocery store shelves due to quality selection and cosmetic standards, again creating unnecessary waste (Institution of Mechanical Engineers, 2013). A producer also commented on this:

I guess, food that would not be used…would be either like, a quality thing, if we’re harvesting things that are cracked, or deformed, or…in one way or another, not salable, up to our sort of standard, would be left in the field, culled out in processing (Producer 5)

This quote exemplifies the notion that even though these foods are still perfectly edible and nutritious, they are not salable due to their appearance. Furthermore, it is not even worth the producer’s time or labour to harvest and sell them, even at a reduced rate. However, an interesting waste reduction measure that retailers practice in some cases (to not only cut losses, but also gain a profit) is to take produce that can no longer be sold as is, cut it up and package it, and then sell it for a premium. This was identified as an opportunity for retailers in the previous chapter. This process exemplifies this blurred line between food and waste, and the stigma that exists around what food looks like. This produce is still edible, but no one will buy it if it looks less than perfect. People will buy it and spend more money on it if it is cut up so they do not see the ‘gross’ parts. This also demonstrates the blurred line between ‘good’ and ‘bad’ food because the food is ‘about to turn’; by processing it even slightly, the life of this food can be extended by cutting off any parts that may speed up decay. This type of processing works not only for interrupting decay, but also for interrupting people’s preconceived notions of what ‘good’ or ‘safe’ food looks like. In this example as well we see the consumer as a potentially active force in what is considered salable: it could be considered that consumers refuse to buy ‘ugly’ produce, and so appearance standards are set, or it could be that because appearance standards have been put in place, consumers are conditioned to expect produce to look perfect. This is exemplified
with processed produce: if consumers are not aware of what it looks like before it is packaged, they will buy it, and often at a premium price.

4.1.3 Out of Sight, Out of Mind: Even when food is waste, it is still useful

Waste is often thought of as “matter out of place” (Douglas, 1966), which allows for society to think that waste needs to be disposed of and kept out of sight. Watson and Meah (2013) make the important note that the connection between food for humans (we need it to survive) and its materiality (how quickly it can rot and subsequently make us sick) makes us more readily distance ourselves from it both individually and societally as compared to other types of waste. For example, a broken TV can sit in a house endlessly without being more than an eyesore, but food waste cannot.

However, with more discussion around the circular economy and recycling, waste is now seen as a potential resource. With this possibility of waste as an economic resource, more interest and research into the materiality of waste is being sought (Hultman & Corvellec, 2012). Because food waste has the unique ability to be converted into useful and viable products such as fertilizer and biogas, it can therefore act to reduce the amount of fossil fuel energy used. The potentials and opportunities for recovery are receiving increasing attention from both the public and policy-makers. The opportunity for creating end markets for biogas, renewable fuel, compost, and digestate identified by the waste management sector exemplifies this theme.

Theories of waste management, such as waste hierarchies, provide prioritized options for dealing with waste in an environmentally friendly manner and provides new significance to these previously black-boxed groups by entwining the economy and the environment together along with a change in consumerism (e.g. producing and buying less) (Hultman & Corvellec, 2012). The food waste hierarchy is one such theory that is shining a light on food waste, which has only
recently been addressed by policy makers and researchers. Aside from edible surplus food being reused and repurposed as food, inedible food waste has uses as well. Once food has turned moldy and is discarded, however, it is often thought of merely as waste that needs to be disposed of, rather than as a resource. A key informant for the waste sector commented on the different public perception that exists around food waste:

Sometimes, [it is] not as easy, and for the average consumer…their old phone, they keep in a drawer, and they can see some value in that product. The rotten tomato they just want to get out of the house. So there’s a bit of a different public perception around value, when it comes to some of the things that we’re tackling on the waste side (Key Informant 4)

As Waitt & Phillips (2015) note, when food waste is simply seen as a ‘culturally circumscribed’ thing, its agency and relations are overlooked. One common waste management option is composting (aerobic degradation) in order to recycle nutrients back to the earth and provide for more food production. With this process, food waste is converted into fertilizer through the biological activity of microorganisms. Oxygen is an important component in this process, as are temperature, pH levels, carbon/nitrogen ratios, and moisture content (Otles, Despoudi, Bucatariu & Kartal 2015). The end product – compost – improves soil quality by increasing nutrients and water capacity, and supporting soil organisms (Otles et al., 2015). As noted in the opportunities section of the previous chapter, producers stated that composting their ‘waste’ was a motivating factor in their waste diversion activities, as this provided important nutrient cycling for the following year.

Higher on the food waste hierarchy, however, is the conversion of food waste to energy through anaerobic digestion processes. Because of the materiality of food, when it is sent to landfill, it oxidizes, decomposes, and creates methane gas (Otles et al., 2015). This is usually seen as a negative environmental impact of wasted food. However, the gas created through the decomposition of food waste could also be captured under a controlled environment, and
converted into energy that is recovered as either heat or electricity (biofuel). There are two main biofuel conversion methods: anaerobic digestion and thermochemical treatments (combustion, gasification, pyrolysis) (Otles et al., 2015). Thermochemical treatments are increasingly coming under scrutiny for their emissions and adverse environmental impacts (Otles et al., 2015). Anaerobic digestion is the process by which food decomposes without oxygen, and creates biogas – primarily methane and carbon dioxide, as well as trace amounts of nitrogen, oxygen, and hydrogen sulfide. This process occurs naturally in covered landfills, where these trace gases escape into the atmosphere and cause environmental pollution and contribute to climate change, even when methane capture systems are built into landfills (Zhu, Gikas, Zhang, Lord, Jenkins & Li, 2009 in Pham et al., 2014). There exists an opportunity to take advantage of food waste, as a biogas industry representative noted in the previous chapter, to capture the methane and be able to use it as a renewable form of energy.

However, food waste recovery can be complex. As Gregson et al. (2015) note, food waste as a feedstock for anaerobic digestion can be problematic; its composition can be seasonally inconsistent, but more an issue is that it is often contaminated with inorganic matter such as plastics, packaging, and pallets, as was noted as a barrier in the previous chapter. This means that inputs have to be screened, and in some cases the compost output has to be pasteurized, as even seemingly insignificant amounts of glass or plastic could ruin the end product (Levis et al., 2010). This issue around the quality of feedstock was identified as a barrier in the previous chapter. And as waste expert respondents noted, this was additionally seen as a barrier since it adds to the costs of processing food waste, and anaerobic digestion in general (see also Gregson et al., 2015).
In terms of the materiality of food waste, it is specifically organics that are useful for recovery and conversion. Other non-organic materials contaminate this waste and make it more difficult to process. This means food waste can be useful, but it needs to be properly separated before becoming feedstock. Proper diversion is therefore part of food waste management considerations. While the materiality of food waste presents obstacles physically for some diversion practices, such as the quality of feedstock for anaerobic digestion, obstacles exist socially as well.

In a socio-material sense, food waste diversion can also be problematic because of our detachment from waste systems. People do not want waste facilities in their backyard (NIMBY), and organics waste management comes with odour concerns. As both a waste management expert and an anaerobic digestion facility manager noted in the previous chapter, it is difficult to move forward with facilities that are processing organic waste, since society is resistant to these facilities in their backyard.

Additionally, infrastructure changes are needed to build anaerobic digestion facilities, and the presence of separation and collection systems needs to be considered. End markets need to be developed for the end products, especially biogas, as noted by the waste management respondents. If used for vehicle fuel, as promoted by the anaerobic digestion facility respondent and the biogas industry representative, vehicles then need to be adapted to accept this type of fuel. As Gregson et al. (2015) note, these end products (digestate and biogas) are still relatively new materials, and the safety and usefulness of these end products need to be ensured in order to develop a successful market for them, as this could considerably limit the development of anaerobic digestion.
As Alexander et al. (2013) note, all of these changes depend on a “complex assemblage of legislation, capital mobilization, infrastructure, households, and additional technologies” (p. 481). With the increased societal recognition of the benefits of recovery, food waste management will be tied to both the economics and the politics of waste management technologies moving forward (Alexander et al., 2013).

4.2 Conclusion

Considering and understanding the materiality of food has allowed for a “rethinking of the object” (Bakker & Bridge, 2006, p. 5-6) and reveals that food waste is a different sort of resource that needs to be dealt with in a particular way. Food is in constant flux and has no fixed qualities: its matter is constantly changing (e.g., ripening to rotting to being converted for energy).

The transformation from food to waste is quick, and the line between the two is unclear. What is waste to some is not to others, and when food is no longer edible (and what makes it so) can be subjective. Without food literacy skills, technological reliance on arbitrary best before dates often is the ultimate determination for when food becomes waste (Parizeau et al., 2015), and this is due to an over-cautious concern about health and safety around food. Watson and Meah (2013) aptly note that a tension exists between reducing food waste and health and safety concerns. Finally, the complexity of food waste recovery is another consideration of materiality. The state of food ‘waste’ matters for how it is recovered: if it is still edible, people should eat it; however if it is rotten, it should be redirected to compost or anaerobic digestion facilities. Even then, materiality matters – only organic food waste can be used for anaerobic digestion and compost. Inorganic materials like packaging need to be removed. Our current ‘out of sight, out of mind’ mentality around our waste systems means that food waste is pushed to the fringes of
society, where it is landfilled and contributes to climate change. Because of this mentality, respondents noted they were not even aware of all disposal options available to them.

Revealing the agency of actants and the consideration of the materiality of waste objects means that we often reorganize society around these revelations. The way in which society reorganizes itself after the discovery of objects, items, etc. often means creating and implementing legislation or a different way of doing something. Milk is now pasteurized and refrigerated. Asbestos is another example of a material that since its discovery as a toxic substance has caused changes in society: it is banned in many countries and has prompted occupational health legislation for demolition sites (Gregson et al., 2010b). Similarly for food waste, we need policy/legislation that redirects it to something useful. The same methane that exacerbates climate change can also be harnessed and used to create renewable energy sources. As Liboiron (2015) notes, “material specificity matters for action” (p. 5): if we do not consider how materials (and the agency of objects) fit into our broader societal systems, solutions tend to be ineffective. If we did not consider bacteria, or the materiality of asbestos, it is likely that we would not have adequately addressed the problems they caused.

As discussed previously, food is mutable. But food is also obstinate; we have no control over the fact that it rots and releases methane, but we do have control over how we manage it. Food’s capacity to grow mold, rot, make us sick, and release methane are all examples of how food waste has agency and captures humans. An important idea that emerges from this research is that the capacity of food waste to act is dependent on its material state: food waste is useful when it is composted and returned to the earth as nutrients for growing more food, or processed in a way to create renewable fuel, yet when landfilled, it creates a potent greenhouse gas. This capacity is starting to affect the way in which we manage food waste, and realize it cannot
simply be sent to landfill. Considering the materiality of food waste then is important on a global scale and for future generations; food waste requires a responsibility in how it is managed. We must consider the afterlife of food waste: if we allow food waste to be disposed of in landfills simply because we are disgusted by rotting food, it has global ramifications for climate change.
Chapter 5: Conclusion

5.1 Summary

This chapter provides a summary of this research and the key findings, followed by a discussion of both the scholarly and practical contributions. Finally, this chapter also provides recommendations for future research.

5.1.2 Objective 1: Map the network of food waste flows in Guelph

This research traced the flow of food waste through the city of Guelph. My first objective was to identify the connections that already exist within the City for waste diversion. I used the food waste hierarchy as a framework for this flow of food waste. Many of these connections were private, with few policy or company mandates, except for one corporate retailer. Sectors reduced waste where possible, since waste was often equated with economic loss, especially for producers, distributors/retailers, and the food service sector. Many small-scale producers managed their waste well, and either composted it, fed it to livestock, or donated it, where possible. Food distributors also donated some food (depending on the vendor), some used an organics program, but much of it was redirected to the landfill. Similarly with retailers (again, depending on the vendor), some donated what they could – especially non-perishable items, since these were perceived as less likely to cause health issues; some had organics pick up that took it to an anaerobic digestion facility; some smaller independent retailers had relationships with farmers to pick up their compost, but again, in many cases, it went to the landfill. The food service sector donated food if it had not been served to the public, but in most cases composted it if logistics were in place to do so, or ended up throwing it out. Emergency food providers, who were already part of the food waste hierarchy by taking in surplus food, produced some amount of waste themselves – some items they were given that were past the best before date were put
on a ‘free table’ where people could choose whether or not to take it, but then anything that was not taken, or donated food that was inedible usually ended up in the landfill.

5.1.3 Objectives 2 and 3: Identify the barriers to increased food waste diversion; identify the motivations for those who do engage in redirection activities and what potential opportunities exist for further food waste diversion

My next two objectives were to identify the barriers, motivations, and opportunities for increasing the flow of food waste away from landfill. The key findings of the results indicated that as food waste becomes a more visible problem, people are concerned and thinking about it. A multitude of barriers were identified, often reflecting that people wanted to engage in diversion activities, but often lacked adequate infrastructure and logistics (knowing who or what programs existed) in order to deal with food waste effectively, and information about what to do with their surplus food and food waste. Food waste represented an economic loss for many businesses (producers, retailers, food service), and economic considerations were also a barrier for many diversion options, as well as for those who accepted surplus food/food waste (emergency food providers, anaerobic digestion, organics programs). For example, those who accept surplus food often lack capacity to deal with donated food, and organics programs and anaerobic digestion cost more than traditional waste hauling. In addition, because of the way we have distanced ourselves from waste, we are unaware of what options exist to divert it from landfill, or we are not open to hearing about them because we perceive garbage as ‘gross’ (as the barriers of both stigma and odour both demonstrate). This was exemplified by NIMBY-ism and community reactions to the implementation of anaerobic digestion facilities.

Many respondents with excess food (producers, retailers, food service) were concerned about liability issues for donation. This means we need increased education about food, the Food Donation Act, food safety, and what food looks like aesthetically. On a practical level, we need
to implement measures such as increasing food literacy and composting skills. This was also one of the opportunities identified by respondents.

A few motivations for diverting food waste were identified, including convenience, food security, environment, and corporate image; however, they generally could all relate back to or be paired with economic incentives. Economic opportunities were therefore a factor in implementing diversion strategies. This generally means things like being able to sell less-than-perfect items at a reduced rate, or repurposing products for a value add, or developing end markets for biogas and compost. A unique opportunity here includes initiatives like the Junk Food Café. Not only would this type of initiative garner some economic gain, but it also works to revalue food and reduce stigma of who eats what.

5.1.4 Objective 4: Use an Actor-Network Theory methodology and framework to interpret the flow of food waste within the City of Guelph.

My fourth objective was to use an Actor-Network Theory methodology and framework to interpret the flow of food waste in Guelph. I employed ANT methodology to trace the flow of food waste and illuminate barriers to diversion in the City of Guelph. This theory revealed the agency of the materiality of food/waste, and how it is an active agent in how it is understood, treated, and managed. Many of these findings fit into the materiality of food. If we do not think about how the natural properties of food create these barriers, then we will not fully understand the need to implement measures that address and recognize issues such as odour concerns, or stigma around who eats what. This study was set at the city-scale. This allowed for a tracing of how food waste flows within the city, and uncovered the formal and informal paths it takes. While this local scale is useful in understanding the movement of food waste throughout the city, this can miss some of the bigger picture opportunities (i.e. some legislation that is set at the large
scale or requires a larger region to be implemented effectively). Expanding this type of study to a broader scale would likely eclipse some of the more informal paths and relationships food waste takes and networks it creates; however, the broader scale would allow for more complex paths to be considered and would likely examine province-wide initiatives, such as legislation. Other examples here include raising tipping fees at landfill and Bill 151: The Waste Free Ontario Act. Low tipping fees was discussed as a barrier to diverting food waste, and raising them will be discussed below as a potential policy recommendation. However, because waste often travels to where the cheapest tipping fees are, this would require change in multiple locations, and therefore was too broad to fully explore in this study. Likewise, Bill 151 is another potential solution, and will be discussed as a recommendation below, but this was not fully examined previously as an opportunity because of the provincial scale, and therefore was outside the scope of this study.

5.2 Contributions

Practical contributions of this study include identifying and understanding the barriers for food waste diversion, which made possible the identification of potential opportunities for increasing the flow of food waste along the food waste hierarchy. Understanding these barriers will make for better policy formation that takes into account these barriers, and work to increase food waste diversion away from landfill.

The novel contribution of this research is the connection back to Actor-Network Theory and materiality of food waste. I used the ANT approach to highlight the materiality of food waste. The majority of the barriers identified here fall under one broad emergent theme, and that is that food is a very different material from other resources and waste products. These barriers all relate to the ‘stuff’ of food: food has to be handled in a particular way, transported and stored...
in a particular way. Food waste can create odour concerns. Feedstock for compost or anaerobic digestion has to be uncontaminated. There is stigma attached to ‘garbage’ food and who eats it, as well as what food is ‘expected’ to look like. Further, the socio-technical food waste networks (which include) people, fridges, best before dates, packaging, waste haulers and services, organics bins, and landfills have effectively severed the everyday connection we once had to both food and waste systems, where communities recycled food waste as animal feed and composted it so that the nutrients are returned to the soil to grow more food (Alexander et al., 2013).

By highlighting this materiality, we can more fully understand and situate food waste within our broader societal systems, and how we distance ourselves from waste. An important idea that emerges from this research is that the capacity of food waste to act is dependent on its material state: food waste is useful when composted or used to create renewable energy, but when landfilled is not useful, and has far-reaching consequences causing climate change.

5.3 Moving forward: Recommendations for Future Research

- More research on best before dates and risk society. This research has highlighted the tension between not wasting food and food safety. Since many respondents noted the confusion around best before dates, and would rather not ‘risk it’ by eating or selling food that was even near the best before date, this demonstrates that more research is needed around this perception.

- More research on food waste along the food value chain as a whole. Many respondents noted that they care about food waste, but were unaware of what programs existed, or who to connect with, signifying the need for increased connections and increased education
and awareness about diversion options. As well, as some respondents noted, waste and decisions about waste occurred at different points of the food value chain, demonstrating that continued research of the food value chain as a whole is important.

- More research on the materiality of food waste. The barriers highlighted in this research revealed that food is a different type of resource and needs to be managed differently than many other waste products. This research is part of an initial investigation into this topic, and more research on the materiality of food waste would serve to increase our understanding of how food waste is managed.

- More place-based studies of food waste – as noted in the literature, we have only just begun to delve into food waste research. Since food and waste systems are localized and place-based, it is important that more place-based studies of food waste are conducted.

- Problematizing the food waste hierarchy as a concept. Increasing attention is being paid to ‘circular economies’. While these types of ‘reduce, reuse, recycle’/circular economy waste management plans are ideal in theory, they are also very nuanced and need to be explored in more detail before being implemented. As briefly discussed in this thesis, the redirection of food ‘waste’ to people in need is highly problematic. A colleague in our research group is currently researching this aspect in much more detail, but each step of the food waste hierarchy could similarly be examined. Another example of this is the critique of using food waste as a feedstock for anaerobic digestion, and how this can encourage more food waste. Alexander et al. (2013) also lightly touch on this, but this could be examined in much more detail.
5.4 Policy Recommendations

Education and awareness campaigns have been successful in reducing and diverting food waste, for example WRAP’s work in the UK for both household and businesses. WRAP was founded in the UK in 2000 in order to promote markets for recycling products. It is funded by the government and has evolved since then to address food waste. They have a number of initiatives and campaigns that work with various sectors, including retailers, manufactures, food service, hospitality, institutions, and households to raise awareness about food waste, provide best practices, and step-by-step guides on how to address, reduce, and divert food waste away from landfill. They also have worked with waste management companies to promote the collection of food waste from organizations and businesses in order to work toward the implementation of commercial food waste collection services (Uzea et al., 2013; WRAP.org.uk). WRAP has also provided some useful information around the use of digestate and compost in the UK. These kinds of campaigns need to continue. Metro Vancouver has also implemented WRAP’s household food waste reduction campaign, Love Food Hate Waste. The Food Waste Reduction Alliance (FWRA) in the US is another initiative that was created in 2010 to address food waste among the retail, manufacturing, and restaurant sectors, and has successfully created best practices to reduce and divert food waste within these sectors (Uzea et al., 2013).

Legislation like the Local Food Act, 2013 has been useful in increasing donations from farmers. Financial incentives like these can be beneficial, but it is important to acknowledge who is benefitting from them. Proposed incentives that reward corporations for donations are unnecessary and can create more problems like the donation of inedible food that organizations then have to pay to dispose of (see Henderson, 2004; Tarasuk, 2001), as well as not actually addressing the root cause of food waste (Saul, 2016). Another example of legislation could be
the banning of organics from landfills. This has been implemented already in Canada in Halifax (in 1998) and in Metro Vancouver (in 2015), as well as in some states in the US. This works by monitoring the waste sent to landfill, and implementing fines (to the waste haulers in the case of Metro Vancouver) if there is more than a certain percentage of organics in the waste. Many jurisdictions have done this with leaf and yard waste, and a waste management expert noted the success of these regulations, and how this helped to promote the municipal green bin programs, and suggested that implementing green bin programs more widely to include the Industrial, Commercial, and Institutional (IC&I) sector could be beneficial.

Vaz (2015) notes that Massachusetts implemented an organics ban but also supplemented the building of anaerobic digesters in order to accept the diverted food waste. Levis et al. (2010) and Uzea et al. (2013) both note that these bans have the potential to be a driving force in food waste diversion, especially with large food waste generators, such as the IC&I sector, including producers, retailers, restaurants, and manufacturers.

Raising tipping fees at landfills is another option that has been identified as a way to divert organics (Uzea et al., 2013). Because it is usually cheaper to dispose of waste in landfills rather than using organic diversion programs, this could be a viable option. However, it is important to note that waste will also often flow to wherever the cheapest rate is, as waste management respondents noted in the barriers section, as well as discussed by Levis et al. (2010). In addition, private waste haulers currently have little accountability and are not tracked, meaning the actual locations of where they dispose of waste remain largely unknown. Therefore, for legislation like this to work, tipping fees would have to be raised in all areas. Because this study was at the city-scale, this type of legislation is too broad and complex to be addressed here, but would be more suitably discussed in a study at a broader scale.
In order to address food waste diversion initiatives, the amount of food waste being generated needs to be quantified in a meaningful way. There is a lack of data around waste amounts, and even though there are requirements around data reporting, it is not standardized. Both the Ontario Waste Management Association and a report issued by the Canadian Council of Ministers of the Environment cited this as an issue that needed to be addressed. Standardizing the data that are collected represents a valuable opportunity. As seen with household food waste studies, quantifying the amount of food waste that is generated is the first step in addressing the problem. One provincial waste management organization is currently working to address this issue, and cited its usefulness. As previously discussed, there is a dearth of information on food waste in Canada; however, we can again look to WRAP’s work in the UK in the IC&I sector on best practices and step-by-step guides on how to quantify and reduce waste within these sectors (retailers, manufacturers, food service and hospitality).

To that end, creating end markets for digestate, compost, and biogas will only serve to increase interest in them and their production. For example, some regions in Canada have already implemented waste vehicle fleets to run on biogas. This returns to the idea of having the proper infrastructure in place so these types of initiatives are easy to implement. If vehicle fleets are ready to run on biogas, then this encourages the creation and use of biogas from food waste.

Ontario has recently put forward Bill 151, the Waste Free Ontario Act, which passed its final reading in June 2016 and works in tandem with ideas like developing end markets. This Act promotes resource recovery and the development of circular economies in order to divert more waste from landfills, and necessitates producer responsibility. It will also promote the development of new recycling processes, lower recycling costs, and provide more accessible recycling options for consumers. In doing so, this act will also help to fight climate change by
reducing the greenhouse gas emissions from landfills of items that should be recycled or composted. As resource use and environmental sustainability are increasingly becoming forefront issues, circular economies and ‘zero waste’ ideologies are potentially viable options. These ideas use products that are at the end of their life as inputs for other products, thereby ‘closing loops’ and reducing overall waste (Stahel, 2016). As Stahel (2016) notes, this would “change economic logic” (p. 435) because a circular economy reuses, recycles, repairs, and re-manufactures items instead of being primarily concerned with production, as linear economies are. San Francisco has introduced a zero-waste scheme by implementing citywide policies that encourage and/or require zero-waste practices (i.e. mandatory recycling and composting, adequate space requirements, producer responsibility) and has set the target to be ‘waste-free’ by 2020. While this is a lofty goal, the city states they have reached an 80 percent diversion rate (although some have argued this is closer to 60 percent) (SF Environment, n.d.; Bialik, 2014).

The European Commission announced a circular economy plan in December 2015, but it has not yet been implemented (Matthews & Tan, 2016). China, however, has been the leader in circular economic thinking over the past decade. In 2005, the government issued a policy paper that recognized a circular economy as the solution to their environmentally and economically detrimental heavy resource exploitation. Tax breaks were provided to companies in the re-use sector and the country’s planning agency helped to finance more re-use initiatives. Since then, waste levels have decreased and they have become more efficient. Although they still have a long way to go, this example has shown that circular economy policy can work (for a more detailed discussion on China’s circular economy, see Matthews & Tan, 2016). While circular economies and zero-waste schemes seem like viable solutions, they are still relatively new ideas and need more research before being implemented. As Gregson et al. (2015) note, these ideas are

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“more often celebrated than critically interrogated” (p. 218) (and for a more thorough critical discussion on circular economies, see Gregson et al., 2015).

It is important to critically interrogate initiatives like these to ensure that the issues are understood so that they can properly be implemented. Research around these types of bills is required before we can implement them, otherwise problems might arise that become more difficult (for example, one respondent noted that the EU waste directive was implemented too quickly and without regulation, so the end product – compost – was contaminated and not useful).

Food waste is a serious issue with global consequences. While increasing attention is being paid to this problem, the majority of food waste is still currently directed to landfill, and barriers to food waste diversion remain in place, which results in little food waste being diverted. As discussed, this is highly problematic since food waste creates methane when buried in landfill, and has far reaching consequences, both globally and for future generations. This research has revealed a number of barriers that remain in place for increased food waste diversion, which ultimately relate to the materiality of food, and how we interact with our food and waste systems. However, this research has also revealed a number of opportunities that are viable if we understand why we waste food and why these barriers stop us from diverting food away from landfill. Before moving ahead with any legislation or diversion practices, we need to make sure to have the proper infrastructure in place so these practices can be implemented effectively.
References


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Appendix A: Information Letter and Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

"Mapping food waste challenges and opportunities in Canada"

You are asked to participate in a research study conducted by Dr. Kate Parizeau and Alexis Van Bemmel from the Geography Department at the University of Guelph.

If you have any questions or concerns about the research, please feel free to contact Kate Parizeau at (519)731-5851 (cell), (519)824-4120 ext. 52174 (office), or kate.parizeau@uoguelph.ca, AND Alexis Van Bemmel at (519) 362-0879, or avanbemm@uoguelph.ca

PURPOSE OF THE STUDY

The purpose of this study is to learn about the redistribution of food waste in Canada, and to understand the barriers to, and opportunities for, increased food waste diversion across the food value chain.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

You will be asked to participate in an individual interview that will take about one hour. Verbatim quotes from this interview may be used in the research that emerges from this project. The interview will be recorded. We will keep the de-identified transcript of this interview in a password protected computer in a locked office in perpetuity. You can choose to refuse to answer any questions at any time during the interview.

POTENTIAL RISKS AND DISCOMFORTS

There are minor risks of loss of social status through the discussion of waste and associated stigma. You will be asked to share information about the day-to-day work of you and your organization (if applicable). However, there is a potential for such information to be political in nature, and the publication of these political opinions and perspectives may cause conflict or discord with other actors. You can choose not to answer any questions that you believe invite risk, and can also choose to keep your name and your organization’s name confidential in order to avoid such risks.
POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

The information collected in this study may enable you to better address and eliminate barriers to food waste redistribution / diversion. There are social justice implications for increased redistribution of food to those who are food insecure, and environmental implications to the reduction of food waste (which is a waste of energy/resource inputs, as well as a major contributor to greenhouse gas emissions). If you are interested in the results of this study, we will e-mail you a copy of the completed thesis project when the study has ended.

PAYMENT FOR PARTICIPATION

You will not be paid for your participation in this study.

CONFIDENTIALITY

Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study.

Your name will not be released in association with this interview, and your organization name can also be kept confidential, if you wish. Interview tapes will be stored in a password protected computer in a locked office or room. Only the research team will have access to any identifiable data from this study.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you don’t want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise that warrant doing so.

RIGHTS OF RESEARCH PARTICIPANTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, contact: Director, Research Ethics, University of Guelph; (519) 824-4120, ext. 56606; sauld@uoguelph.ca
Do you consent to the use of this interview data for potential future comparative research?

YES ☐ NO ☐

Would you like to receive a copy of this thesis via e-mail when it is completed (we will record your e-mail address separately)?

YES ☐ NO ☐

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Appendix B: Sample Interview Questions

Sample interview questions for food redistribution organizations

Please tell me about your organization and the services you provide here.

Who do you partner with in your food-related activities (retailers / producers / other community organizations)? Do you think there are other partnerships to be made?

How would you describe your clientele?

Does your organization use reclaimed food waste in their programs? (Following questions to be asked if Yes):

- How do you define the food you use in your programs? (Waste, surplus, reclaimed, other term…)
- Where does the food you use come from? Are there other places you think you could get food from?
- How much food do you receive, and how often do you receive it?
- What kind of foods do you receive?
- What foods can you accept? (What can’t you accept? Why?)
- What happens to food you receive that is not used for human consumption? How do you determine which foods that you receive can or cannot be used in your programs?
- Why did you decide to use reclaimed food in your programs?

What are the challenges to using reclaimed food waste in your programs? What are the opportunities?

In what ways are you and your organization working to overcome the challenges you have identified?

What would you like to see done by your organization/others to overcome these challenges?

Do you believe that municipal or regional polices impact food reclamation activities? If yes, how so? (i.e. Donation of Food Act)

Do you think there is a stigma around using reclaimed food waste for human consumption? Please explain.

How do you think your clientele feel about the use of reclaimed food?

Is there anything else that you think I should know about food reclamation and redistribution in this community?

Is there anyone else who you think I should speak with about the topics we’ve discussed in this interview?
Sample interview questions for food retailers / producers (Bring food waste hierarchy)

Please tell me about your organization / business and your food-related operations.

How do you decide when food becomes unusable / unsellable? When does food become “waste”?

Where does your food waste typically go at the end of a day? How do you manage your food waste?

Are different types of food wastes managed differently (i.e. produce, dairy, baked goods, meat, etc.)?

What are the factors that influence where your food waste goes?

Have government policies had any impact on where your food waste goes?

Do you donate unusable food? (Following questions to be asked if Yes):

- Who do you partner with in your food donation activities (community organizations, brokers, corporate office, other retailers / producers)? Are there other community partnerships you see as viable?
- What types of food do you donate?
- Why did you decide to start donating your food waste?
- What are the benefits to donating food?
- Do you know other businesses that donate their food waste?

Do you send food waste to be used for animal food, compost, or biogas / energy production? If so, how did you learn about these opportunities? Why did you decide to introduce these practices? Do you sell food waste for these purposes, or donate it free of cost?

What are the challenges to reducing food waste in your operations?

In what ways are you working to overcome these challenges? Are there others in your organization/company that are also working toward overcoming these barriers?

What would you like to see done by your organization/others to overcome these challenges?

Do you think there is a stigma around using reclaimed food waste for human consumption? Please explain.

Is there anything else that you think I should know about food reclamation and redistribution in this community?

Is there anyone else who you think I should speak with about the topics we’ve discussed in this interview?