Taking the City of Vancouver Towards Zero Waste: Best Practices for Food Waste Avoidance and Rescue in the Retail Sector

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Executive Summary

The unprecedented scale of food wastage is attracting increasing attention. In Canada, 58% of the food intended for human consumption is lost or wasted. This comes with major socio-ethical, economic and environmental consequences, and signifies a malfunctioning food supply chain. Preventing and avoiding food loss and waste, as well as improving food rescue and redistribution systems for surplus foods, will be essential to achieve the City of Vancouver's Zero Waste 2040 goal and to become a leading city in food waste prevention. Grocery retailers are central stakeholders in the food supply chain that connect with downstream consumers as well as upstream stakeholders, such as distributors and manufacturers. Starting with grocery stores as the influential gateway to food waste both up and down stream, the City has set out to first learn how retailers can be supported by governing bodies to avoid and reduce wasted food within the store environment. This project uses a behavior change perspective and insights from psychology to identify best practices that engage retailers in food waste avoidance and prevention. The project consisted of a literature review, primary data collection and a collation of best practices.

The literature review critically examines proposed strategies for food waste avoidance in the retail sector from the academic and grey literature with the aim to identify intervention points and best practices. Within the reviewed literature, a wide range of strategies are examined, including the adaptation of smart technologies, sales of imperfect produce, partnerships between stakeholders in the food supply chain, flexible procedures of food handling and repurposing in store, as well as training and engagement of managers and staff. The literature also reveals that to date, there has been limited evaluation of the ease of implementation of these strategies. Moreover, little knowledge exists on whether and how the strategies have been effective. The review therefore highlights a need for further examination of how retailers are employing best practices as well as the challenges they face in implementation and execution.

The primary data collection consisted of visits to grocery stores in the Vancouver area. Four store visits were conducted, where each visit consisted of a store tour and interview with the store manager. Additionally, two expert interviews were conducted. These have provided insights into current practices as well as opportunities and threats for Vancouver grocery stores in terms of food wastage. Overall, results indicate that wasted food at the retail level

stems from a malfunctioning food supply chain. Attempts to address food wastage must therefore address root causes that occur throughout the supply chain.

Results from the store visits indicate that a wide variety of food waste avoidance and reduction strategies are currently used by grocery stores in the Vancouver area. Of particular importance is the store manager's involvement and dedication to reduce food wastage, enabling policies from the parent organization, goal setting and measurement, and strong partnerships between stakeholders in the food supply chain that facilitate food waste avoidance and redistribution of surplus food. The findings from this project emphasize food waste avoidance and reduction strategies as beneficial business solutions which provide both financial and reputational value. Stores that have already adopted strategies to address food wastage demonstrate positive attitudes from contributing to less waste, and a strong store culture for continued work to achieve zero waste.

The literature review and primary research both show that food wastage is a systemic issue that occurs throughout the supply chain, within which retailers have uniquely tailored connections. Solutions and best practices must therefore be suited to individual retailers. Moreover, voluntary action is more likely to result in lasting behavior change than introducing regulations and bylaws. The identified recommended best practices, including goal setting, measuring progress towards waste reduction, empowering managers and staff, and establishing partnerships, aim to facilitate the adoption of food waste avoidance strategies in the retail sector that positively impact the food supply chain as a whole.

This report highlights that individual solutions cannot address food wastage. To address the deeply rooted causes it is necessary to establish partnerships and communication between different stakeholders in the food supply chain. This leaves ample engagement possibilities for governing bodies such as cities. The City of Vancouver has a strong interest in the adaptation of best practices and the commitment to food waste reduction. Through establishing collaborative dialogue, the City of Vancouver can act as a convener of best practices to bring retailers together to share knowledge and expertise. With engagement that builds trust while supporting system-wide change, the City of Vancouver can progress towards its goal of becoming a leading city in food waste prevention.

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Introduction

Wasted food is a global phenomenon with environmental, economic, social and nutritional impacts. Globally, one third of the food produced is wasted or gets lost on the path from farm to fork (FAO, 2014). The food lost and wasted through the entire food supply chain is associated with greenhouse gas emissions, unnecessary use of energy and water as well as unrealized potential to alleviate hunger (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014; Raak, Symmank, Zahn, Aschemann-Witzel, & Rohm, 2017). Wasted food thus epitomizes an unsustainable system of food production. This has urged the United Nations to implement target 12.3 as part of the 17 Sustainable Development Goals. The Goals address key global challenges that must be addressed in order to ensure a better and sustainable future for all. Target 12.3 aims to "by 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (UN, 2017). Reducing wasted food is therefore on the agenda for governments worldwide.

In Canada, 58% of the food that is intended for human consumption is lost or wasted along the supply chain. Of this, 18% can be avoided (NZWC, 2018a). Wasted food represents significant economic, social and environmental consequences. As food wastage is a behavioral issue, it requires behaviorally informed solutions. This project therefore uses insights from psychology and behavioral science to identify best practices for food waste avoidance and rescue in the context of grocery retailers in Vancouver. It furthermore explores how the City of Vancouver (hereafter referred to as the 'City') can support adoption of these best practices. Cities clearly have a role to play in facilitating solutions by enabling partnerships, providing guidelines and introducing bylaws. However, stakeholders in the supply chain likely have the most direct impact in solving the problems (Deloitte, 2015), as they are the ones who source, handle, distribute and conduct quality control of the food. In the current project, grocery retailers were identified as an attractive intervention point in the food supply chain, as they connect to upstream manufacturers, distributors and farmers, as well as to downstream consumers. Retailers thereby have an ideal position and purchasing power to influence other stakeholders in the food supply chain (MacRae et al., 2016). It further allows for a focus on food waste avoidance and reduction, rather than on waste diversion and composting, by enabling collaborative partnerships.

The project has consisted of three steps to achieve the aims of identifying and supporting adaptation of best practices for food waste avoidance and rescue. The first step was to conduct a literature review in order to identify current best practices of food waste avoidance and prevention from the grey and academic literature. The review focused on which practices were currently in use by grocery stores, their effectiveness, and the ways in which cities can support such practices. The second part of the project builds on the strategies identified in the literature review. It reports findings from primary research conducted with four grocery stores in the Vancouver area as well as two food industry experts. The grocery stores were visited and their managers interviewed in order to establish a collaborative partnership between the City and identify the current food waste avoidance and reduction strategies already in use. The expert interviews explored the food supply chain and the root causes of food wastage. The final part of the report summarizes best practices based on the literature review and the observations from the primary data, and presents recommendations for how the City can engage with grocery retailers. It highlights wasted food as a systemic issue that requires an integrated approach with collaboration and partnerships between different stakeholders throughout the food supply chain. The report concludes that tackling the issue of food waste includes moving from a supply chain perspective in which stakeholders act in their own best interest with limited communication with other stakeholders, to a value chain perspective in which stakeholders throughout the chain communicate and collaborate (Gooch et al., 2019). The City can support grocery retailers in adopting best practices and incorporating value chain perspectives by enabling and supporting collaborative partnerships with different stakeholders in the retail sector and along the supply chain.

Literature Review

This section reviews retail-relevant studies and papers related to wasted food, with the aim of identifying and synthesizing the best practices for food waste avoidance in the retail sector. It will commence by evaluating the triple bottom line of reducing food wastage, followed by its contribution to the City's strategic policy framework to achieve zero waste by 2040. The identified food waste mitigation strategies will be evaluated according to this framework. The best practices will be categorized within three main categories: avoidance, reusing (food rescue), and recycling (composting), where the avoidance strategies should be

prioritized. The need for behavior change requires an examination of how these strategies can include all levels of the grocery store business structure in avoiding food wastage, including staff, managers and parent organizations. This section will conclude with a summary section of the identified strategies and their specific benefits and barriers. The paper's contribution is threefold. Firstly, it employs perspectives from behavior change and psychology to identify the best practices for avoiding food wastage. Secondly, it reveals the lack of data regarding ease of implementation of the best practices for grocery retailers. Finally, it highlights the need for better examination of how retailers are employing best practices as well as the challenges they face in implementation and execution. A summary of best practices can be found in Appendix 1.

WASTED FOOD IN THE RETAIL SECTOR

The food production industry accounts for approximately 30% of global carbon dioxide emissions, of which 27% can be attributed to wasted food (Scholz, Eriksson, & Strid, 2015; Lukic, Kljenak, & Jovancevic, 2014). Wasted food can be defined as "the removal of food from the supply chain which is fit for consumption, or which has spoiled or expired, mainly caused by economic behavior, poor stock management or neglect" (FAO, 2014, 4). As the recognition of the severity of the issue of food wastage has increased, studies assessing the causes of food wastage in the food supply chain have grown rapidly in the last decade (Chen et al., 2017; Mena et al., 2011, 2014; Papargyropoulou et al., 2014).

Wasted food is also a top priority in Canada, where one in eight reports being food insecure (Canada Without Poverty, 2019). Work within food waste avoidance has identified the retail sector as a point of particular importance. Although it is estimated to account for just 5-12% of total wasted food in the Canadian food supply chain (Gooch et al., 2019) it is a point that connects multiple stakeholders in the food chain, including manufacturers and consumers (Parfitt, Barthel, & Macnaughton, 2010; Filimonau & Gherbin, 2017; Teller et al., 2018). Retailers thereby have a significant influence on their own food handling practices, as well as food production and processing, and the preferences of consumers (Gruber, Holweg, & Teller, 2016). As such, through their actions retailers have a potential to shift the supply chain's focus from food waste management to food waste avoidance.

Behavior change at the business level is therefore necessary to address food wastage, however successful behavior change is challenging to implement. A first step will thus be to make the case for why food waste avoidance is beneficial for the business. Then, in order to identify how grocery retailers can best engage in food waste avoidance, it will be necessary to evaluate existing food waste avoidance strategies, their efficacy as well as the ease with which they have been implemented.

THE TRIPLE BOTTOM LINE OF WASTED FOOD

Wasted food is associated with significant negative costs for the economy, communities and the environment. The literature highlights the possibility for a triple win by addressing wasted food, including economic, social and environmental gains (e.g., Dreyer, Dukovska-Popovska, Yu, & Hedenstierna, 2019; Gokarn & Kuthambalayan, 2017; ReFED, 2018).

The economic case. Economic losses caused by wasted food have been highlighted as one of the most important motivators for change in the retail sector (e.g., Brancoli, Rousta, & Bolton, 2017; Hanson & Mitchell, 2017; Devenau, 2018; Skeaff, Goodman-Smith, & Mirosa, 2019). In Canada, the quantifiable cost of food wastage was estimated to be $49 billion in 2019 (Gooch et al., 2019), which is equivalent to feeding the entire Canadian population for five months (for a discussion of the cost of food wastage, see Gooch & Flefel, 2014; Gooch et al., 2019). Champions 12.3, a coalition of governments, organizations and research institutes dedicated to inspiring action on food waste reduction, conducted a cost-benefit analysis of food waste mitigation strategies and found that for every $1 invested in food waste reduction in the retail sector, an estimated $5-$10 would be realized in financial benefit (Hanson & Mitchell, 2017). Moreover, a study which examined the return on investment in food waste reduction of 1200 businesses (including grocery retailers, restaurants, and manufacturers) across 17 countries found that the median benefit-cost ratio for investments in food waste reduction strategies was 14:1 (Hanson & Mitchell, 2017). In other words, half of the businesses earned more than a 14 times financial return on investment. Initiatives such as marketing imperfect produce, adopting improved inventory management and merchandising systems as well as spoilage prevention packaging could boost revenue while also strengthening the social and ethical values within the business (ReFED, 2018). Gooch and Flefel (2014) conclude that

by addressing food waste, retailers have the possibility to reduce operating costs by up to 20% and increase profitability by the equivalent of 5-11%.

The social case. The literature presents a strong social case for reducing wasted food. Non-financial motivators such as satisfying ethical responsibility and strengthening customer relationships were noted as significant drivers for retailers to reduce food wastage in a report by Champions 12.3 (Hanson & Mitchell, 2017). A large share of rejected food is still fit for human consumption (ReFED, 2018). The ethical dimension of food wastage is thus increasing the pressure on retailers to display corporate social responsibility related to communities that experience food insecurity and hunger, and therefore to rescue wasted food (Teller et al., 2018; Gruber et al., 2016). Food security as a driver for food wastage reduction was also articulated by business leaders, from across the food supply chain, who were interviewed by Champions 12.3 (Hanson & Mitchell, 2017). There is thus a sense of ethical responsibility and concern for increased food security that can be realized by addressing wasted food. By engaging in food waste avoidance, retailers can display corporate social responsibility (Teller et al., 2018) and improve their image in the public eye (Cicatiello et al., 2017). Addressing food wastage will further contribute to a society with stronger ties between community members and increased valuation of food and resources.

The environmental case. Addressing food wastage is essential for combating climate change (Eriksson & Spångberg, 2017). Studies that have explored the environmental impacts of wasted food have identified greenhouse gas emissions that occur throughout the life cycle of the food (Scholz et al., 2015; Brancoli et al., 2017) and resources used to produce wasted food (Cicatiello et al., 2016) as the main negative climate impacts. According to FAO (2014), if wasted food were a country, it would be the third largest emitter of greenhouse gases, after USA and China. Moreover, ensuring environmental sustainability has also been highlighted as a main driver for reducing food waste in the retail sector (Hanson & Mitchell, 2017). Environmental impacts of food waste stem from overproduction of food, wasted resources, processing and transporting surplus food, and food going to landfill (Thyberg & Tonjes, 2016). As grocery retailers are the intermediary between manufacturers and consumers, they are well positioned to influence food waste practices and therefore the resulting environmental impacts that occur throughout the food supply chain. Specifically, grocery retailers can influence emissions from transport (Scholz et al., 2015); the environmental impact of store

waste (Brancoli et al., 2017); type of produce that is sold (CEC, 2019); and consumer behavior, as consumers often do not consider the environmental impacts of food waste (Filimonau & Gherbin, 2017). Food waste avoidance strategies at the retail level can thereby lead to a substantial, environmentally beneficial ripple effect in the supply chain.

In summary, the triple bottom line of sustainability (Norman & MacDonald, 2004) stipulates a strong case for food waste avoidance. Importantly, food waste avoidance is associated with the highest gains (e.g., ReFED, 2018; Halloran et al., 2014) and represents the preferable long-term solution over food waste rescue or composting. The following section presents and situates food waste within the context of the City and grocery retailers.

Vancouver's Zero Waste 2040 Action Plan

The City has commenced a long-term strategic goal to be a forerunner for urban sustainability, with the ambition for Vancouver to achieve zero waste by 2040. In terms of improving food rescue and redistribution in the retail sector, the City can adopt a supportive role by creating cross-sectoral collaboration as well as momentum to influence change. By acting as an educator and convener of knowledge, the City can support system-wide change with the goal of becoming a leading city in food waste prevention.

As noted above, it is estimated that 5-12% of total wasted food in the Canadian food supply chain comes from the retail sector (Gooch et al., 2019). As grocery retailers are ideally situated as a link between manufacturers and consumers, they are a strategic point of intervention for wasted food. The following section presents and evaluates the best practices from the reviewed literature. The practices will be clustered according to the hierarchy illustrated in Figure 1; first practices for food waste avoidance will be presented, thereafter food waste reduction and reuse (food rescue) strategies, and finally food waste recycling (composting) strategies.

Figure 1. Vancouver's Zero Waste approach, adapted from Greenest City Action Plan (2015).

Food waste avoidance strategies

Of strategies to address food wastage, avoidance strategies have the highest social, economic and environmental benefits. Authors thus focus on avoidance as the desired approach (see for instance Gooch et al., 2019; ReFED, 2018; Halloran et al., 2014). The environmental benefits stem from avoided food production (Schott & Canovas, 2015; Scholz et al., 2015), whereas social and economic gains are realized by not purchasing food that will likely be disposed (Thyberg & Tonjes, 2016; ReFED, 2018). Therefore, recommendations for grocers are based on upstream production and purchasing behaviors that contribute to the avoidance of food wastage at the store level. Relevant behaviors include choices related to quantities of available food for sale and visual quality of food, including unpurchased special food related to holidays (e.g., Easter eggs), overstocking/maintaining large quantities of products on shelves, damaged packaging, damaged or inadequately prepared items, routine kitchen preparation waste, and quality control (Gooch, Bucknell, & Whitehead, 2018; Buzby, Wells, & Hyman, 2014). Strategies for avoiding food wastage at the retail level must therefore acknowledge the complex environment from which wasted food originates as well as the barriers and challenges that allow food wastage to persist.

In this sense, addressing food wastage necessitates organizational and behavior change. Produce management at the retail level as well as throughout the supply chain, such as culling and trimming, have become so embedded that they could be considered normative (Gould et al., 2016). Yet, the current practices contribute to the generation of wasted food.

While there has been some interest by retailers to sell "rebel" or "imperfectly perfect" produce, the majority of grocery retailers only want cosmetically perfect produce, and therefore those with imperfections are discarded throughout the supply chain (see below, Solution: Selling imperfect produce).

In the reviewed literature, the focus has largely been on operational strategies that grocery retailers can employ to address food wastage. However, outside of the retail environment, there is abundant literature on behavioral interventions addressing waste and recycling, such as changing defaults by adding recycling bins next to trashcans, offering convenient curbside pickup and addressing social norms by providing comparative feedback. These interventions have been found to increase recycling, although the effects were often mediated by personal values (Byerly et al., 2018). This review therefore highlights interventions that aim to increase personal engagement in food waste mitigation by both manager and staff as the most important strategies.

Managerial involvement**.** A central driver of food waste is store managers' involvement and perception of food waste (DEQ, 2017; Filimonau & Gherbin, 2017; Gruber et al., 2016). Literature that examines retail managers' perception of wasted food have found that store managers currently do not see the full impact that wasted food has on store operations, profitability or wider social and environmental consequences. Filimonau and Gherbin (2017) conducted interviews regarding retail managers' knowledge and approaches to food wastage in the UK, and the majority of managers did not perceive wasted food as a major issue. This stems from a failure to address food wastage from a value chain perspective, and relates to the competitive and adversarial relationships that characterize the food industry (Gooch & Flefel, 2014). Of the food waste reduction strategies that were mentioned, composting and food donation were the major waste mitigation practices. The perceived barriers to food waste reduction were consumer behavior and awareness, corporate policies, suppliers, employees and supermarket size, where larger stores are more likely to have more waste (Filimonau & Gherbin, 2017). As Gooch et al. (2019) argue, a move from a food supply chain towards a value chain perspective will address the problem of disconnectedness between stakeholders, foster communication and partnerships, and thereby improve the overall quality and provision of food and therefore the amount that is wasted.

Gruber et al. (2016) carried out a set of semi-structured interviews with retail store managers that aimed to explore the participants' behavior regarding wasted food. The major theme which emerged from the interviews was the store manager's personal attitudes on food wastage, and the 'human morality' of wasted food. Store managers explained the constraints they were operating within, including the larger regulatory framework of the organization as a societal environment, and the systemic environment of the retail and wholesale sector. These constrains were perceived by store managers as contributing factors to an increased sense of moral burden. The system complexity and ease of simply sending food to landfill thus both caused them to not engage in food waste mitigation (Gruber et al., 2016).

The studies on managerial practices demonstrate that managers face challenges in navigating entrenched policy and procedural frameworks in the retail sector as a whole and those originating from parent organization. Additionally, they feel pressure from the expectations and unpredictable purchase behavior of consumers. This results in an overwhelming situation that facilitates the denial of wasted food as a problem and therefore lessens the likelihood of engaging in food waste mitigation. In order to address food wastage in the retail sector it is therefore essential to support, engage and motivate store managers. A proposed strategy is to provide store managers with larger flexibility by the parent organizations (Filimonau & Gherbin, 2017; Gruber et al., 2016; Holweg et al., 2016). Store managers would then have more autonomy and therefore be more empowered to take proactive measures to ameliorate the situation in their store (Skeaff et al., 2019). This could include engagement in employee training, adapting offers in-store to change consumer demands, adjusting production of ready-to-go meals throughout the day based on sales and donating surplus food (Gruber et al., 2016). Retail store managers should therefore be regarded as an untapped resource for reducing food waste in the retail sector.

Setting goals and measuring progress**.** Changed management behavior sets the stage for new strategies and vision. Yet in order to produce the desired change in the business it is necessary to communicate this new strategy, to motivate as well as to empower all managers and staff. Motivation can be fostered by setting goals that direct attention, inspire action and persistence, and identify relevant strategies for success (Locke & Latham, 2002). Goal setting has a prevalent influence on managerial and employee behavior and performance in

organizations (Lunenburg, 2011), and has been recommended as a strategy for achieving food waste mitigation (ReFED, 2017; Chen & Chen, 2018; Strotmann et al., 2017). Defining specific, measurable and achievable goals is important for fostering motivation and producing lasting practices (Martin-Rios et al., 2018; CFI, 2019). From an individual perspective, successes and achievements of goals have been tied to self-efficacy. Self-efficacy refers to the belief that one is capable of producing the desired change or effect; otherwise one has little motivation to act or persevere in the face of challenge (Bandura & Locke, 2003). Self-efficacy is influenced by self-assessment, self-observation and perceived achievability of the goal (Schunk, 1990).

Principles such as self-motivation also prevail at the business level, where success in achieving goals stems from the perceived progress towards a goal and the associated sense of accomplishment (Wu, Matthews, & Daghter, 2007). Goal setting is thus an important means of motivating action, which requires adequate measuring of progress and the skills required to change in order to succeed. Therefore, goal setting and commitments to food waste reduction by retailers need to be coupled with training of staff and regular assessments in order to evaluate progress and foster motivation.

Training and motivating store personnel**.** The literature has identified the behavior of store workers as a central contributor to food waste at the retail level (e.g. Chen & Chen, 2018; Devenau, 2018; Teller et al., 2018; Gooch et al., 2019). The staff actions and attitudes with the greatest contribution to food wastage included over ordering and replenishment, lack of experience and low motivation. The managerial practices included scheduling insufficient staff numbers (Teller et al., 2018). The result is less capacity for staff to follow waste reduction strategies. For staff to manage food waste on a daily basis it is pivotal to ensure that they are also motivated and empowered to engage in waste reduction strategies (Filimonau & Gherbin, 2017).

Among the barriers for improved staff engagement in food waste reduction, Skeaff et al. (2019) identified adequate training and education, food safety concerns, quality standards and expectations, as well as waste diversion capacity and availability of resources that would make in-store management of food possible. Thus, a key practice for retailers is to hold in-store training programs which target resource management in order to divert surplus food from ending in the waste stream. The programs should include information about social,

environmental and financial benefits of resource and surplus food management, as these have been identified as the main motivators for engagement in improved practices (Thyberg & Tonjes, 2016; Hanson & Mitchell, 2017; Skeaff et al., 2019). Stores also need to ensure that there are adequate procedures and equipment in place to facilitate food waste avoidance. One example is cold storage; Eriksson, Strid and Hansson (2016) found that wasted food from fresh produce could be reduced by 30% when storage temperature is decreased to 2 °C.

The literature further highlights that food waste avoidance can be added to the already existing scope of staff responsibilities. Moreover, such strategies do not require more skill or knowledge by management, but rather more attention and consideration (Teller et al., 2018; Cicatiello et al., 2017). Incorporating employees' perspectives and knowledge into avoidance strategies and decision making related to waste management practices increases the likelihood that they will overcome any reservations they may have about the change (Strotmann et al., 2017). Barriers and drawbacks to staff engagement and training include already large areas of responsibilities for staff, high turnover rates, and potential higher costs required for adequate training and food waste avoidance strategies such as cool spaces.

Measurement of wasted food**.** In order to track goal achievement, evaluate strategies and manage food waste initiatives it is imperative to collect data on actual weights of wasted food. There is abundant literature which outlines the importance of food waste measurement in the retail sector (e.g., Teller et al., 2018; Martin-Rios et al., 2018; CEC, 2019), and detailed instructions for retailers on how to calculate and report wasted food are provided by Commission for Environmental Cooperation (CEC, 2019), Tesco (2019) and WRAP (2018). Gooch et al. (2019) further present three overarching approaches to reducing food waste, where 'measure' is the first approach. Food waste measurements and reporting should be standardized in order to improve forecasting, communication and collaboration regarding food waste (Gooch et al., 2019). Quantifying food waste is imperative for tracking progress (Chen & Chen, 2018), to facilitate leadership (Gooch et al., 2019) and to inform behavior and operation changes (ReFED, 2018). Multiple tools have been developed in order to assist retailers in measuring and tracking the food waste produced in store (see Garcha, 2017 for an extensive list). One example of a service is LeanPath (www.leanpath.com) which tracks and monitors waste that is thrown out and provides opportunities to reduce waste. Barriers to the measurement of food waste include the skill, cost and equipment necessary to produce

accurate estimates. However, studies have consistently demonstrated that these investments will result in a solid financial return (Hanson & Mitchell, 2017; ReFED, 2018) and enable capacity building to drive changes in business practices.

Create a new culture to make change stick**.** As noted above, successful food waste mitigation in stores requires changed behavior by both store managers and staff. Although education interventions, information brochures, policies and procedures facilitate the shift towards improved waste management practices it is necessary to encourage and motivate managers and staff to personally engage in waste mitigation (Byerly et al., 2018). This could include fostering a sense of community in the store and making waste management a core business value, where the store takes pride in reducing food waste. Studies suggest that establishing social norms are one of the most efficient means of encouraging persistent behavior change (Tversky & Kahneman, 1974; Biel, 2017). Moreover, by training staff and integrating waste management practices into the daily routine, these practices will become the default behavior by staff and therefore be more likely to persist. People are less likely to change themselves or their practices based on data and analysis than on compelling experiences (see for instance Kotter, 1995; Kotter & Cohen, 2012). Little knowledge exists regarding the ease of implementation and efficacy of food waste avoidance strategies for retailers who have adopted such strategies or the challenges they have faced. There is thus a need for engagement with retailers in order to explore and evaluate what food waste avoidance strategies are effective. This further highlights the importance of setting achievable goals, measuring progress and motivating and educating employees.

Technology for improved stock management**.** The literature further highlights the potential for technological solutions to address food waste. Overstocking is one of the main food waste contributors. Retailers face the challenge of predicting fluctuant consumer purchase behavior, and incorrect inventory management has led to dramatic markdowns for retailers (Holweg, Teller, & Kotzab, 2016). Technological solutions could be used to predict consumer demand and thereby inform stock management (HBR, 2017; Guiseppe et al., 2014; ReFED, 2017).

Relex (2019) highlights the potential for technology to improve communication between the retail sector and the suppliers. Factors, including the emergence of online

markets, the increased popularity of eating out, discount retailers, demands for smaller store spaces and convenience put advances in supply chain management at the forefront of successful retailing in the future. Their recommendations for best practices include using modern technology and artificial intelligence (Relex, 2019). Modern technology will be able to use big data to detect patterns in sales, such as weekday-related variation in sales, the impacts of promotions and seasonal demands, and thereby include this data into inventory assessments and demand projections (ReFED, 2018). As such, upgrading inventory systems with the latest technology will allow the identification of food waste sources, prioritize hotspots of food wastage, and measure progress over time (Hanson & Mitchell, 2017). A main barrier is the cost necessary to implement such technology as well as the skill necessary to operate and manage the systems on a daily basis.

Sell imperfect produce**.** The literature emphasizes the potential for reducing food waste by selling imperfect produce and produce with cosmetic damage (CEC, 2019), an increasingly popular strategy that affects both the supplier and consumer. Cosmetic standards applied to produce are among the policies and practices that result in significant food waste. It is currently estimated that one third of wasted food in the retail sector can be attributed to produce that does not meet cosmetic standards (Porter, Reay, Bomberg, & Higgins, 2018). Therefore, policies and practices that target retailers and incentivize sales of non-perfect produce can reduce waste.

Sales of imperfect produce are on the increase, and consumers show engagement around programs such as “the odd bunch” and “perfectly imperfect” (Chen & Chen, 2018). For instance, Tesco has had success with the “perfectly imperfect” program in the UK (Bowden, 2016), and Intermarché in France claim huge success from their campaign of selling products made from “inglorious” fruits and vegetables that would otherwise have been thrown out (e.g., carrot soup). An additional benefit from such programs is to highlight to consumers that ‘wonky’ produce has the same culinary value and taste as cosmetically perfect produce (Havercamp, 2015). However there is little in the literature in terms of the tangible benefits of these programs, both in terms of wasted food going to landfill and economic returns. Measurement and tracking of food wastage in order to assess the efficacy of these programs and to motivate other grocery retailers to initiate similar programs is therefore crucial.

Consumer education and awareness campaigns. An important driver of food waste in the retail sector is consumer demands and behavior. Research that has sought to identify causes of food waste creation using surveys and interviews has revealed that food waste awareness, family lifestyles, and convenience lifestyles were related to food waste production at the consumer level (Neff et al., 2015; Parizeau, von Massow, & Martin, 2015), where the primary food groups wasted were fresh fruit and vegetables, baked goods, meat and seafood (Chen & Chen, 2018). Filimonau and Gherbin (2017) emphasize that consumers often do not consider the environmental, social and economic impacts of food waste when shopping, and tend to buy more food than they need. Consumers also associate quality with appearance and plentiful displays. This causes overstocking, with the less appealing products being left behind. These consumer expectations are closely linked with retail behavior, and businesses are unwilling to change their practices if those practices are linked to their image (ReFED, 2018). For instance, the issue of overstocking by retailers is driven by consumers' demand for full shelves, aesthetically pleasing displays, a diverse offer of foods and perfect produce (Lukic et al., 2014). A prevailing perception by retailers is that in order to maintain their position in the market, retailers must meet the consumer demands of fully stocked shelves and a wide variety of products (Gobel et al., 2015). Yet promotion and stocking practices by supermarkets, such as 'buy one get one free,' might be a way to simply shift the responsibility of food waste onto the consumer (see box 1 for an example of a possible alternative). It is therefore important that store managers recognize their influence on consumer behavior (Filimonau & Gherbin, 2017), and to consider the diversity of factors that contribute to food wastage (Strotmann et al., 2017). See Appendix 2 for examples of strategies that target both retailers and consumers.

Barriers to such interventions include the time and specific set of skills required to develop effective campaigns. Campaigns can also be expensive and time-consuming to develop. Moreover, they risk backfiring and discouraging action unless store staff and management are already showing engagement, motivation and willingness to raise conversations around food waste. Encouraging partnerships with existing consumer awareness programs such as Love Food Hate Waste represent a way for retailers to engage in food waste avoidance campaigns.

Box 1: *Buy one get one later.*

Tesco, a UK supermarket chain, has replaced the frequently used campaign "buy one get one free" with "buy one get one free – later" as part of a 'green consumer revolution' to cut waste. This campaign provides consumers with an alternative to taking advantage of promotions that causes them to end up with too much perishable food that ultimately results in food wastage. With the new "buy one get one later" campaigns the consumers can come back to the store and claim the free item at a time when it will be used (Gray, 2009).

UPSTREAM AVOIDANCE STRATEGIES

Although the scope of this paper is the retail sector, there are multiple upstream strategies that can be impactful at the retail level and encouraged by the food industry. Two such strategies will be highlighted here; clarifying the date labeling system, and improving food packaging.

Clarify food labeling system**.** The literature highlights the importance of a consistent and clear shelf-life labeling system so that manufacturers, retailers and consumers can make better informed decisions regarding food storage and consumption (Hanson & Mitchell, 2017; ReFED, 2018; Gooch et al., 2018). Currently, although the labeling system is standardized within Canada, imported goods often do not comply with these regulations (for a review of date labeling literature, see Collart & Interis, 2018). This contributes to food wastage at the retail level by provoking conservative estimations of when products that are approaching their "best-before" date should be sold. The Canadian Food Inspection Agency's review of date labelling as part of their labeling modernization initiative is intended to create clarity for the public and for the industrial, commercial and institutional food business sectors. Changes to the understanding of date labeling could benefit grocery retailers and help them reduce their food wastage (ReFED, 2018).

Improve Packaging**.** Among the contributors to wasted food across the supply chain is suboptimal packaging. Damage due to technical malfunctions of packaging during storage and inadequate stock management are both prevailing causes for wasted food (Gooch et al., 2018; Ziegler & Floros, 2011; Lukic et al., 2014; Cicatiello et al., 2017: Chen & Chen, 2018). Investments in spoilage prevention packaging and packaging adjustments will therefore

contribute to food waste avoidance and thereby result in longer-term economic benefits (ReFED, 2018; Guiseppe et al., 2014). This would require partnerships between farms, manufacturers and retailers, as well as innovative solutions for shelf-life prolonging packaging (Filimonau & Gherbin, 2017). The investment and partnerships necessary to develop innovative and functional packaging represent a barrier for the retail sector, however a large economic benefit will be gained in the long term.

Downstream avoidance strategies

Sell surplus food to secondary markets**.** Foods that do not meet cosmetic standards and damaged foods are central drivers of food wastage. Secondary markets for surplus food would thus represent an opportunity to sell food that would otherwise go to waste, such as mildly dented cans or broken bags that do not affect the safety of the food (Parfitt et al., 2010; Chen & Chen, 2018). Stores can also establish dedicated sections in their own store to highlight discounted produce approaching its peak freshness. This represents a low-cost method of decreasing wasted food and increased economic return for the grocery store, and an opportunity for consumers to save money from the discounted produce.

Food waste reduction strategies

Discount food that is approaching best-before date. Discounting food or produce that is not at the peak of freshness represents a cost-effective and easy practice that can be used in order to sell food that would otherwise go to waste (Gunders, 2017; Holweg et al., 2016). For instance, the British chain Itsu discounts all prepared food 30 minutes before closing, in both their retail shops and restaurants (Martin-Rios et al., 2018). It is also important to note that discount practices by stores must be carefully evaluated, as discounting products may encourage consumers to buy more than they need and therefore represent a practice that merely shifts food wastage from the retailer to the consumer (Gooch et al., 2018). A barrier for engaging in discounting practices includes the perceived loss of income by the retailer that results from discounting products that are still within their sell-by date (although more would be lost if the product was to go to waste or even donated).

Avoid filling shelves at the end of the day. Stores report difficulty in navigating the complex and unpredictable demands by consumers (Teller et al., 2018), and therefore a common practice is to ensure that shelves are always fully stocked, even towards the end of

the day. In order to avoid food wastage, retailers should allow perishable food (including sandwiches and other items in the deli or grab-to-go sections) to sell out near closing time without replenishing (Gunders, 2017; ReFED; 2018). Although overproduction and over-purchasing are main contributors to food wastage, changing these practices often represents a barrier, as there is a perceived threat to profitability by not fully stocking shelves (Skeaff et al., 2019). This must therefore be incorporated into a larger strategy to motivate action on wasted food.

Product handling**.** Effective food handling that follows best practices (and often food safety practices) is essential for maintaining freshness and quality of food as long as possible (ReFED, 2018; Lukic et al., 2014). Practices such as adequate cold storage (Eriksson et al., 2016) and bagging ripe produce for quick sale (Devenau, 2018) have both been successful ways of avoiding food wastage. Such handling and preservation practices link back to motivating store personnel to engage in resource management. It further represents a low-cost method for avoiding food wastage with immediate results for grocery retailers.

Reuse strategies

Products that are perceived as "unsalable," either because they do not meet consumer expectations or because there is insufficient demand, are not necessarily inedible or in need of disposal. In fact they are often consumable as long as safety requirements are met (Papagyropoulou et al., 2014).

Stores can generate social or financial value from non-standard products through donation to charities or sales to a range of stakeholders, including secondary market retailers and consumers, as shown by Holweg et al. (2016). The following section outlines reuse strategies that avoid surplus food going to waste.

Donate surplus food. Food donation represents one of the most frequently mentioned food waste reduction strategies by retailers (Filimonau & Gherbin, 2017). The National Zero Waste Council (2018) provides clear guidelines to inform retailers about donation and liability concerns. Yet according to industrial reports by Food Waste Reduction Alliance (2016), many Canadian retailers do not donate because they are unaware of food donation legislation (see NZWC, 2018b). By increasing awareness of guidelines, donation policies, expanding tax

benefits for food donations to businesses and by simplifying donation reporting and tax deductions, more food surplus could be donated rather than being wasted (ReFED, 2018). Examples of the effectiveness of government interventions to facilitate food donation in the retail sector come from France and Italy, whose governments' pioneer decision discouraged larger supermarkets from generating avoidable food waste which ought to be donated to charities and food banks instead (Chrisafis, 2016; Gonzales-Torre & Coque, 2016; Kirschgaessner, 2016). This has accelerated food donations significantly within major grocery retailers, which can be further reinforced by facilitating strategic partnerships with online surplus food distribution platforms (ReFED, 2018).

Utilize matching technology for food donors and charities. Technology can assist retailers with surplus food to identify charities and organizations which accept food donations. A report by Provision Coalition (Garcha, 2017) presents multiple innovative applications and webpages that aim to connect food donors and recipients.

Produce new products from surplus food in-store. Allowing retailers to handle and repurpose food in store can contribute to less wasted food. For instance, vegetable trimmings and animal bones can be repurposed into stews and broths, as done by Intermarché in France (Havercamp, 2015). In Vancouver, Nada (www.nadagrocery.com), a store dedicated to zero waste, has developed a model that minimizes food wastage. They have established an in-store café where they repurpose surplus food from their store into soups, stews and other dishes. Another example comes from Walmart, who repackaged damaged or bruised produce into discount bags (e.g., $1 or $2 apple bags) and significantly reduced food wastage (Devenau, 2018). Such initiatives can be taken by other grocery retailers and will likely return positive financial and reputational gains. Importantly, the impact of such programs should be measured and tracked in order to assess efficacy and the potential for other retailers to develop similar programs.

Recycle strategies

Although strategies for avoiding food wastage should be prioritized, there will necessarily be unavoidable food waste that cannot be redistributed or repurposed. Currently, approximately 30% of retailers surveyed in Canada indicate that landfill is a main destination for their food waste (Gooch et al., 2019). It is therefore important to establish practices that recover and recycle unavoidable food waste in a responsible manner in order to minimize social, environmental and economic costs and impacts. The literature highlights that common practices in the retail sector include recovering food scraps for animal feed, as well as recycling by composting and anaerobic digestion (ReFED, 2018; Chen & Chen, 2018; Skeaff et al., 2019). In order to divert waste from landfill it is necessary that the infrastructure and skills are available to engage in these practices.

Success Case: Walmart

The strategies mentioned above represent a comprehensive set of best practices for reducing food wastage in the retail sector. Yet, the literature provides little information on cases where retailers have successfully adopted such best practices, or what challenges persist to prevent their adoption or success. There is thus a need for engaging with retailers first-hand in order to examine possible points of intervention, and what strategies represent the easiest options that are most likely to succeed.

Walmart successfully executed a food waste reduction program and reduced food wastage by 23 % from 2015 to 2017. In 2017, Walmart donated the equivalent of 562 million meals and sold more than 262 million units of meat, dairy and baked goods employing dynamic discounting policies and systems that adjust price of products approaching their “best-before” date, thereby avoiding food wastage (ReFED, 2018). The main initiatives in the on-going program include: discounting repackaged bruised and past-peak produce by means of a $1 or $2 Bag program, and reducing prices on meat, dairy and other produce that is approaching their “best-before” dates; reducing overproduction in bakery departments, providing additional training and resources to staff; implementing organic recycling programs in stores and distribution centers that take unsalable and unsold food for repurposing into animal feed, composting and energy; partnering with local food banks to assist in maximizing food donation; working with suppliers to improve packaging and food handling to maintain

quality and freshness (Devenau, 2018). Walmart's approach thus successfully broke with the traditional consumer-driven practice of overstocking and overproducing. It also shows that compelling reasons for reducing food wastage for retailers are the economic benefits and reputational value that come with it (Devenau, 2018).

More cases like Walmart should be examined in greater detail in order to inform other retailers of opportunities for avoiding wasted food as well as the benefits that come with it. Such cases can critically question the view that stores need to be highly efficient in terms of turnover rates and that the ultimate goal is to have a satisfactory customer service level in terms of high shelf availability for the lowest possible prices (Holweg et al., 2016). They further demonstrate that surplus food should be seen as a resource and an opportunity for both the retailer as well as other stakeholders.

Summary and Opportunities

In summary, addressing food wastage in the retail sector represents a unique opportunity to improve the Canadian society. It will reduce economic costs, reduce food insecurity, and benefit the environment by cutting emissions. Wasted food at the retail store level stems from an interaction between internal factors (staff practices, resources dedicated to food waste avoidance and managerial motivation) and external factors (consumer demand patterns, donation opportunities and a malfunctioning supply chain). The literature indicates that the dominant perception by managers and staff is that food wastage is a better option than risking store reputation by having less perishable foods on display, such as produce or bread, or selling food past its peak of freshness. Yet, reducing food wastage is and should be considered a potential for both economic and reputational value. Behavior change at the organizational level as well as individual store level is therefore necessary to address food wastage in the retail sector. The successes from retailers that have implemented food waste avoidance strategies, such as Walmart, demonstrate that food waste avoidance can be integrated into core business values and practices and return both financial and reputational gains. Stories about operational and cultural change, such as Walmart's must be highlighted in order to demonstrate the benefits of food waste avoidance to more retailers. There is currently a lack of in-depth insight into how retailers perceive and address barriers for avoiding food wastage. Further engagement with retailers must go beyond descriptive

approaches that merely examine current practices at a superficial level, to examine how to best motivate and empower retailers in food waste avoidance. Ultimately, grocery retailers must be considered as part of a larger value chain solution (Deloitte, 2015). The interdependencies between the stakeholders in the food supply chain, including grocery retailers, the City and consumers, highlight that although each is responsible for mitigating food wastage, partnerships between them are crucial for food waste avoidance strategies to be effectively executed.

These gaps and opportunities have laid the foundation for the second part of the project, the primary data collection phase. We visited a total of four grocery stores in the Metro Vancouver area, where three were in the main catchment area within the City limits. Each visit consisted of a store tour and interview with the store manager. These visits aimed to establish a working relationship with the grocery stores and allow them to share their knowledge and practices regarding food wastage. Allowing grocery retailers to share their current strategies and perceptions related to food wastage enabled a deeper understanding of the barriers and opportunities they experience, and the support they need from the City in adopting best practices. No names of the interviewees will be included in the following report due to privacy/confidentiality commitments.

Additionally, two expert interviews were conducted. These have provided insights into the issue of the food supply chain and the benefits of a value chain approach, in which stakeholders communicate more directly, add value to food through their activities and increase transparency. The experts further discussed the root causes of wasted food and stressed that strategies adopted by grocery retailers must address the root causes for there to be effective change. The interviews have highlighted the opportunities and threats that grocery stores are facing in relation to food waste avoidance, and the insights have been valuable not only for informing our understanding of the supply chain, but also our approach to store visits: the questions to ask and what to look for.

Primary Research Findings

The following section presents the findings from the primary research. It commences with the expert interviews, follows with the findings from the store visits, and concludes with recommendations.

Expert Interviews

As the literature review has indicated, wasted food is a product of dysfunctional policies and behavior that occur in the industry. The expert interviews highlighted that such dysfunctional policies also occur in government, and by the interaction of the two sectors. No level of government has ultimate responsibility for food wastage. Yet, all levels including local, regional and national levels of government interact with the food supply chain.

Disposal rates to landfill was highlighted as an example. Regional policies such as low tipping fees and low disposal rates of waste and compost could exacerbate food wastage through the perception that composting edible food is a "green" solution. It is therefore important from a City perspective to work collaboratively with different levels of government and the food supply chain in order to refine messaging and find effective food waste prevention solutions.

The food waste experts emphasize how important efficiency of the food chain is, and that it is ultimately a profit-driven market. One expert explained that there are two concerning trends that contribute to food waste in Canada. The first trend represents the lack of transparency in the food value chain. In order for stakeholders to make decisions that address root causes and improve the system as a whole, they need to be able to understand interactions throughout the whole value chain. Currently, stakeholders make seemingly rational decisions depending on the information that is available to them, named "bounded rationality" (see for instance Kahneman, 2003). These decisions, which are based on limited and often flawed information, can be enormous contributors to inefficiencies and increased food wastage

The second concerning trend is the stagnant market growth that has produced hyper competitiveness between grocery retailers, foodservice operators and the suppliers. One of the store interviewees reported that the profit margin at grocery stores is 3%. Grocers

therefore aim to sell as much as possible to increase their profits. Overall, shrink levels, or the amount of food that is lost or wasted at the retail store (including spoiled food, damaged food, stolen food), range between 3-8%. Some stores reported slightly lower levels (around 4%) than others (6-8%). Reducing shrink by only 1-2 % would represent a significant reduction of surplus food and a major impact on the grocer's bottom line (MacRae et al., 2016). One store also highlighted that higher shrink levels are indicative of poor inventory control and ordering practices.

The lack of transparency in the food supply chain and hyper competitiveness lie at the root of food wastage. The horsemeat scandal in Europe exemplifies a lack of transparency where meat advertised as beef turned out to be horsemeat, and signifies how a lack of transparency can be detrimental for the food supply chain (Sharp, 2015). Increased transparency in the food supply chain brings increased possibility to reduce food waste as it increases accountability. The experts suggested that consumers are more likely to purchase items if there is transparency in how they have been handled and transported.

Moreover, transparency can also contribute to closer working relationships between stakeholders and thereby reduce competitiveness. With reduced competitiveness comes increased trust and willingness to share information (Gooch et al., 2016). Facilitation of dialogue throughout the food value chain can further increase transparency, and policies which aim to address food wastage, should be introduced with the root causes of hyper competitiveness and transparency in mind. As an example, policies introduced in France attempted to address food wastage by imposing regulations only at the retail sector level (Chrisafis, 2016). Although the regulations addressed food waste at the retail level, they are were unsuccessful in addressing food waste upstream. They furthermore have the potential to exacerbate food waste creation, as retailers could be motivated to reject products and pass food waste back upstream. Such actions can further cause food wastage to be externalized and therefore not perceived as something that the grocery store can address. Rather than federal legislation or municipal bylaws, the desirable option will be to motivate grocers to take voluntary action to reduce food wastage, which the City is adequately situated to do. For instance, the City can establish dialogue, facilitate partnerships and provide recommendations for best practices. By making it evident that other stakeholders in the supply chain are taking

action and reaping the benefits of food waste reduction, more grocery stores are likely to also take action.

The expert interviews further stressed how changing business practices happen on the floor of the stores. Unless the managers and staff themselves are on board and motivated to reduce the amount of wasted food within the store, change is unlikely to happen. Initiatives may originate at the managerial level, but it is staff that carry out the daily routines and food handling. As such, any change is more likely to be long lasting if the staff are included in decision-making and therefore motivated to carry out best practices. Observations from the stores support this recommendation. Systems used to address food wastage, such as ordering systems and donation practices, were more likely to succeed where staff had been included in decision-making and adequately trained to use them. The solution has to fit within the business model and be easy to implement and follow in order to contribute to the desired change. Therefore, it is important to foster a store culture that aligns with sustainable practices and minimizing food wastage.

Another insight from the experts was that managers are more likely to act on financial savings and arguments for reducing food wastage, whereas staff are more likely to respond to societal arguments representing how many meals can be saved. One of the experts also highlighted that the solutions which are often the most effective in addressing wasted food are often the cheapest and most cost-effective. However, these solutions are less likely to reach higher levels of the organization, as departments and individual stores are not obliged to reach up the chain of command for financial support. Therefore, these solutions often end up being the ones that are implemented the slowest and latest. This is counterproductive as the cost-effective strategies with the quickest results for addressing food waste should be implemented first. Communication in the food supply chain and collaboration between the store level and the head office is therefore important to assist retailers in implementing food waste reduction strategies.

The experts stressed that ultimately, addressing food wastage comes down to changing the second-order thinking of grocery retailers, a deliberate process that examines both the intended and unintended outcomes of interventions, and considers long-term consequences of repeated actions (Marks, 2011). Retailers must change their behavior not

only because of an external cause, which is less likely to result in lasting business change; they should also set targets that reflect their business goals. This allows for reflection on why they are following certain practices, which facilitates ambitious goalsetting for food waste avoidance and reduction that evolve as the goals are reached. The City can facilitate this reflection by providing recommendations that present the business case for reducing food wastage, including the possibilities for financial gains and reputational value. The recommendations should highlight the importance of goal setting and measuring of food wastage, as well as a timeline for how targets can be achieved.

As such, root causes of the food waste crisis include:

- a lack of transparency in the food value chain,
- hyper competitiveness between stores,
- store culture that accepts the inevitability of wasted food and the lack of agency for frontline managers and staff to identify and initiate change, and
- failure to acknowledge the financial and societal value of wasted food.

The following section expands on the root causes identified from the expert interviews and reports the findings from the grocery store visits.

FINDINGS FROM STORE VISITS

The template used to track the different strategies employed by the stores is attached in Appendix 3.

Liability concerns. The store visits indicate that liability concerns represent a major contributor to food wastage. One store manager highlighted that stores are often overly cautious and dispose of food that might be safe to consume in order to avoid any potential liability and law suits from customers and to preserve the store's reputation. This experience was echoed by other stores we visited. Selling foods that are unsafe could indeed damage a store's reputation and position in the marketplace. Managers and their staff thus need to feel comfortable making decisions about selling or repurposing surplus food if they are to reduce food wastage. These decisions are based on a sound understanding of food safety that comes with training and regular practice.

Limited food safety knowledge and concerns about liability and reputation directly impact food rescue, as it is often the foods that are no longer in prime condition that are considered for donation. Making the distinction between aesthetic and food safety concerns requires knowledge that some staff may not have. The Food Donor Encouragement Act (FDEA)[SBC 1997] addresses the potential of unsafe food being accidentally donated by releasing the donor of any liability when food is donated in good faith (BC Laws, 2019). Several of the stores indicated that they were not familiar with this legislation, which is in place across all provinces and territories in Canada.

Clearly, food safety is important when donating food. The FDEA is in place to encourage donations rather than to absolve grocers from unsafe food handling. One store manager identified partnerships between health authorities and store managers as an option to ease the liability concerns and reduce the amount of food that is wasted rather than donated. Additionally, safe food handling keeps foods in optimum condition, extending the life of food and reducing waste. There is thus a need for education about food safety, liability concerns and the FDEA. The City could facilitate such education by providing information from the health authorities, or by facilitating consultations and engagement with local environmental health officers.

Discounting food. Another practice that was frequently encountered during store visits was to discount foods that were damaged or short dated (approaching their "best-before" date). Stores displayed different strategies regarding discounting food. One store found discounting highly effective and employed it as one of their main strategies for selling products that were either cosmetically imperfect (e.g. dented cans) or past their peak of freshness (e.g. short dated meat). Other stores avoided discounting products, as they associated discounting with poor stock inventory. A third store avoided discounting foods to prevent creating a "discount market" where customers only purchase discounted products and thus cannibalize the sale of the same products at the regular price. The interviews showed that the same strategy is not necessarily equally efficient or perceived as useful by different stores.

Composting. In nearly all stores, composting produce trim and other food scraps contributed to the perception that food was not being wasted (see Figure 2 for an example).

The perception of the organics waste stream as a zero waste solution also represents a barrier for working towards reducing the amount of surplus food being purchased in the first place. The unintended consequence of composted food not being seen as wasted food could be the 'rebound effect' in which stores dispose of more food and food trimmings into the organics stream than they would have disposed to landfill (Hertwich, 2005; Salemdeeb, Vivanco, Al-Tabbaa, & Ermgassen, 2017). It is therefore important to emphasize food waste avoidance as the desired strategy over composting.

Figure 2. At one store, three 'organics waste' bins were filled with trimmings every day. As the trimmings were sent to compost, it was not perceived as wasted food. Photo taken with permission from the store.

Communication. One of the stores interviewed and visited highlighted that their proudest accomplishment was the communication that was established with farmers and growers. The grocer explained how frequent communication and tight working relationships allow for easy movement of produce. Moreover, the store is able to accept product for rapid sale when farmers have a surplus. This exemplifies a culture that facilitates awareness of food wastage, and how close partnerships contribute to improved business management and reduced food wastage by both farmer and grocery retailer. Additionally, it fosters an appreciation of the resources involved in producing food from farm to fork. This valuation of food as a finite, valuable resource will more likely contribute to long-term behavior change and food waste avoidance by retailers and farmers alike. Such partnerships are important for transparency in the food supply chain and for reducing food wastage.

Research shows that people are more likely to change their behavior if their networks display the desired behavior (Rare, 2019). In terms of the food industry supply chain, successfully introducing the norms of communication, transparency and zero waste will increase the likelihood of changes to practices that will reflect these norms.

Incentives. Incentives that affect profitability can also change behavior. If current behavior is profitable, stores are likely to continue with that behavior unless an easy, more profitable option is available. One of the expert interviewees identified increasing tipping fees to landfill as an effective incentive system. Such fees should be increased incrementally in order to encourage a shift away from disposing surplus food in the waste stream (see also NZWC, 2018a) towards other practices. In Metro Vancouver, as part of the organics disposal ban, landfill tipping fees were increased while compost tipping fees were decreased. While this encourages less landfill, it does not address food waste prevention. Incentive systems must therefore be grounded in systemic root causes to be effective.

From a City perspective, adequate incentive systems that support assist grocers to keep waste down. However, as Box 2 exemplifies, it is important to not have patronizing policies and regulations.

Box 2: *Regulations of waste water management for farmers in the Great Barrier Reef (GBR) Catchment in Queensland, Australia*

The GBR is the largest coral reef in the world, a hotspot for biodiversity and a significant tourist attraction. However, it is currently threatened by human activity and climate change. Second to climate change, farming has the most detrimental impacts on the GBR, and waste water runoff (WWR) from farming represents one of the major threats to the GBR. In order to mitigate the damage from WWR, regional governments in Queensland imposed a regulation on farmers to limit pesticide use and other damaging substances. Farmers strongly protested these regulations, and refused to comply. The policy makers thereafter recruited behavioral scientists to design behaviorally informed solutions. By including the farmers in developing solutions to minimize harmful WWR, the farmers were given control of the narrative and consulted in the policy making process. They were given the option to offer their opinion and expertise, and even came up with a slogan so that more farmers would join in to protect the GBR. This sparked a new social norm and a network of farmers that were all united to protect the GBR. As such, good communication and an inclusive approach can have larger impact than imposing policies and restrictions. (Information summarized from Pickering, 2018, and www.canechanger.com)

Partnerships: FoodMesh. The literature review and expert interviews highlight that partnerships and coordination between different stakeholders in the supply chain is essential for addressing wasted food. Such partnerships could be horizontal, which involves sharing knowledge or best practices with those at the same level in the supply chain. They could also be vertical, where stakeholders at different levels coordinate their efforts to address food wastage. An example of a vertical initiative that has been implemented by one of the stores is the use of FoodMesh (FM), a web-based platform that allows coordination between charities and grocery stores to safely divert surplus food to the highest end use. A more detailed description of FM is provided in Appendix 2. The following section presents a brief summary as well as the main takeaways from the initiative.

FM facilitates partnerships between stores and charities such as food banks, for the donation of food. An aspect of the FM system is to consolidate "unsaleable" foods for donation in one area prior to pick-up. The items are placed in donation bins to be picked up daily by the food bank or another charity. The recipient organization sorts the food and a portion of the edible food is used by the recipient organization with the remainder being picked up by other charities with food programming. Inedible food scraps go to farmers as animal feed, and remains are composted. The recipient organization brings the cleaned and sanitized bins back to the store every day.

Although donating the surplus food is a social benefit, giving food away still impacts the store from a business perspective. Consolidating the donation before pick-up allows store staff and managers to see the total amount and value of donated food. The amounts of food have been surprising, triggering discussions by staff and management about preventative solutions to minimize the amount of food being donated. One solution was to reduce the size of produce displays in order to increase turnover rates and reduce purchasing levels needed for larger displays. Another situation, involving significant amounts of wasted pork, resulted in identifying a faulty vent in a meat cooler that needed repair. Seeing the extent of the food waste problem first hand, in a daily pile, has led to important preventative solutions. The staff commented that FM instruction and support onsite during the first few weeks was instrumental in integrating FM into daily procedures. The staff further reported relief knowing that the food went to those who needed help and would "do good" in the community.

FM in addition provides statistics on how much food is diverted in terms of weight, which is displayed both graphically and numerically. The store manager reported that this data supplements the information provided in regular reports from head office regarding the dollar value and category of scanned out items (shrink) that are sent through the FM program. Together these metrics provide powerful insights into how much food is diverted from waste, as well as how much food the store purchased but did not sell. From the City's perspective, weights of diverted food, food scraps and other materials and the total waste disposed of in landfill are particularly important as progress towards food waste reduction goals is measured in tonnes, and in tonnes of carbon dioxide equivalent. Moreover, as one of the main strategies highlighted in the literature review is to set ambitious goals and measure progress towards them, the statistics are essential to monitoring the company's progress on waste reduction. The store manager mentioned that they used the statistics to further motivate staff by printing out charts of diversion rates and place them in the staff lunch area. Statistics can thus contribute to both monitoring progress as well as a sense of achievement for employees, thereby fostering a store culture that values zero waste.

In summary, the main takeaways from FM were:

- on the floor support from the operator of FM as well as store managers overcame initial doubts by the store staff about the new program and its effect on their routine,
- the donation program's contribution to helping people in the community and addressing food insecurity resolved staff concerns about good food being wasted. This in turn boosted motivation and increased the likelihood of continued efforts to use the program,
- making the amount of wasted food visible allows staff and managers alike to question why so much waste is being produced and how they can prevent it,
- providing detailed statistics and summary charts helped staff and mangers to focus on the areas where food waste was being generated.

This example shows that a well-run systemized food donation program, can be a step towards designing preventative solutions. It also highlights a potential role for the City to facilitate such partnerships. (See https://foodmesh.ca/ for more information.)

Picking errors. One store highlighted picking errors, where food items not ordered by the grocer are mistakenly delivered by a supplier, as a significant contributor to food waste. Upon receiving unexpected items the store would either return them, attempt to sell them, (usually at a discount), or "scan them out" as compost or donation. Other stores reported that picking errors did happen, however they did not experience it as a significant issue. This highlights discrepancies in the food supply chains that require unique solutions.

Consumer demands. Grocery stores often face complex public demands in terms of product preferences. Moreover, the dominant perception by the grocers is that plentiful displays are needed to attract consumers. This contributes to food waste when there is slow turnover or in the case of produce and other perishables, the product is not as fresh. A produce buyer at one of the stores reduced the size of the display tables so less produce was needed for the table to look plentiful. The buyer also found that culling and sorting was easier so less handling was needed to maintain the display. The result was less produce damage and less waste from stock that did not sell.

Ordering practices. Grocery stores reported different ways of ordering. One store reported ordering small quantities frequently, up to six days per week, in order to maintain fresh product and make purchasing adjustments throughout the week based on demand. Another highlighted the benefits of automated ordering for inventory management. Automated ordering is intended to reduce over-ordering, however concerns about running out often mean that buyers override the system, resulting in excess quantities being ordered. In general, stores would rather have too much of a product than to run out. This highlights the challenges of sales forecasting for grocers.

Summary of Recommendations from Primary Research Phase

This section summarizes the findings and presents recommendations based on the primary research part of the project.

Set ambitious goals

Setting ambitious goals represents a key strategy for reducing food wastage. Grocers are more likely to take action by establishing a deadline for a concrete food waste reduction goal. As leading stakeholders in the food supply chain, grocery stores could align their targets

to external goals such as the City's zero waste by 2040 goal or the Sustainable Development Goal 12.3 of 50% food waste reduction by 2030. In addition, setting goals contributes to sustained behavior change by increasing the behavioral observability and accountability of efforts to reduce food wastage (Rare, 2019).

CONSULT DIFFERENT STAKEHOLDERS IN GOAL SETTING

When determining goals it is essential to consult all levels of the organization, from head office to frontline staff, in order to change work practices and develop a new, desirable norm of food waste avoidance. Consulting different stakeholders is also important to encourage widespread peer-to-peer commitments for behavior change (Rare, 2019). It is particularly important to involve frontline staff in the decision making as they are the ones who will be implementing the changes. One example of a successful policy introduced after an elaborate consultation period from another waste sector is the Recycle BC curbside collection (see Box 3).

Box 3: *The Curbside Recycling Program.*

Recycle BC has incorporated multiple stakeholder and community consultations in developing the curbside collection program, in order to design a program that would be accessible and easy to use. Initiated in 2014, 98% of B.C. residents now have access to curbside recycling. Recycle B.C. currently has a 75 % recovery rate of recyclables, and conduct regular revisions and consultations in order to develop a circular economy of plastics and other materials (Recycle BC, 2018).

MEASURE PROGRESS TOWARDS GOALS

As both the literature and primary research have emphasized, goal achievement depends on continuously evaluating progress. Timely, structured feedback increases the likelihood of achieving a goal (Locke & Latham, 2002), and using statistics such as those provided by FM would be crucial to ensure goal attainment. This allows for adjustment of practices in cases where progress is not being made.

By using metrics that are meaningful to staff and managers in shaping and achieving goals, grocery stores can harness the momentum created by a commitment to food waste reduction. As noted above, managers respond to statistics highlighting financial benefits, whereas staff responds to the number of meals being saved. Goals can incorporate these viewpoints, such as "by 2030, we will reduce the amount of wasted food by 50%, which saves us from a loss of $20 million, or XX meals."

Consulting research on food waste reduction and recommendations of best practices from resources such as those listed in the appendix can contribute to better target setting and metrics collection.

BUILD AN EXPERIENCED AND ENGAGED TEAM

All store visits revealed that dedicated and involved staff is important for sustaining best practices for food waste avoidance and rescue. It is important that staff know how to best handle and sort food items and that they feel empowered to carry out best practices (Chen & Chen, 2018). One store reported difficulties in acquiring good and dedicated staff, and mentioned the hard labor and long hours that go into produce handling in particular. The current produce manager works five or six days per week, mainly in the back where he receives and stores incoming produce, and coordinates the produce to display on the retail floor. His previous recruit lasted one day. None of the stores indicated that they had a specialized training/engagement program for staff in relation to food waste mitigation. There is thus a need to examine how such training programs could be effective solutions to address food wastage in grocery stores. Research suggests that in order to motivate behavioral change among staff, educational and engagement messaging should leverage positive emotions and frame messaging to the staff's personal values and interests (Rare, 2019). This will contextualize wasted food as something that impacts them and their community, and thereby

motivates sustained action beyond simple training programs that focus on procedures and technicalities of food waste avoidance.

Engage store managers

The store visits revealed that store manager engagement is vital to the store's participation in food waste avoidance. The manager can serve as an internal champion for adopting food waste reduction strategies. However, the manager can also represent a barrier for adopting best strategies. Whereas some of the stores set ambitious targets to keep working towards zero waste and welcomed innovative solutions and strategies, there were other stores that did not have the same ambitions, and expressed satisfaction with current business practices. As the supervisor and person in power, the store manager may also be the right messenger to deliver food waste avoidance strategy to the rest of the store (Rare, 2019). A potential role for the City could be to facilitate dialogue between different grocery store managers. This would inspire collaborative work and learning from each other, as well as facilitate sharing of success stories and empower managers to take action in their store.

Diffuse ambitions from company head office

One of the stores specifically highlighted that ambitions from the company's head office were guiding their initiatives to reduce food waste in their store. Since the head office had set ambitious targets to achieve zero waste, the stores had adopted new practices such as recycling schemes and food donation in order to reduce the waste produced in the store. Another store using a waste reduction program for packaging materials (cardboard, plastic and metal) from head office had connected the program with food waste recycling to follow and promote a broad zero waste culture in the store.

Establish partnerships

As the case of FM illustrates, it is vital to establish productive collaborations between different stakeholders in the supply chain. One of the stores also highlighted the direct contact with other stakeholders such as farmers. This collaborative partnership helped coordinating orders, improving stock management and enabling farmers to sell out surplus produce through the retailer. Additionally, such partnerships also aid in increasing the transparency in

the food supply chain, and build a norm of ensuring food is put to the highest end use and collaborating to reduce food wastage.

Promote fair quality and quantity expectations of products

As indicated in both the literature review and store visits, grocery stores currently perceive that abundance of produce and fully stocked shelves is attractive to consumers. Despite contributing to more wastage and higher costs due to unsold product, they believe an abundance of food will increase sales in the long term. One store indicated that plentiful displays in the produce section was indeed important, but not an issue or contributor to waste as they were in a 'health-conscious neighborhood' in the words of the manager, and experienced rapid turnover of produce. Another store reported that maintaining full displays required them to be consistently replenished, and that consumers would favor the freshest products and leave behind slightly older or irregular produce. Consumers' actual and perceived cosmetic standards of produce also impacts farmers, who strive to provide the most cosmetically perfect produce in order to attract sales and realize the best price. The decision of customers, as a result, impacts culling practices and on-farm contributions to food loss. Farmers may also overproduce to fulfill retailer demands for perfection, thus highlighting the importance of communication between different stakeholders in the food supply chain and the promotion of fair expectations in terms of quality and abundance of produce.

Establish sound ordering and inventory control practices

Ordering practices were highlighted in the literature review and by multiple stores as a strategy worth noting for reducing food wastage. It was also noted to be a practice that can contribute to wasted food, either through over ordering or misjudging current stock. Ordering practices can differ for each store depending on their size, location and customer base. Stores should therefore assess ordering practices and inventory control routines to find what works best from a triple bottom line perspective, including food waste reduction. One store highlighted frequent, smaller orders as important for keeping waste amounts to a minimum. This allowed for improved inventory control and minimal pre-ordering, particularly for finite-date products such as dairy, produce, meat and eggs. A store that had adopted a new stock management system that automated ordering of products found it improved inventory control. This system used sales rates to calculate the grocery quantities needed, thus

addressing any human biases when ordering. The store manager expressed excitement about the new system. He indicated that although there are pros and cons to manual and automated ordering – machines can also be inaccurate – he considered the new system to be helpful for improving stock management and reducing surplus food. The City can further facilitate the spread of such practices through collaborative networks that encourage knowledge sharing.

Opportunities and Areas of Growth

There are multiple opportunities for growth in the retail sector for adopting best practices in food waste avoidance. These are areas that the City can play a pivotal role in advancing.

Inform Donation and Liability Concerns

A trend observed during the grocery store interviews was managers' lack of awareness of the FDEA and its purpose to release food businesses from any liability when food is donated in good faith. There is therefore an opportunity to foster awareness among grocery retailers regarding liability concerns.

Provide Guidance for Goal Setting

Limited goalsetting was observed; few of the stores mentioned that they are setting new and ambitious goals for food waste reduction. One store mentioned that they had already reached their food waste reduction target, and were now working on setting a new, more aspirational goal. Fostering a growth mindset within the organization and engaging staff in food waste reduction represents an area of opportunity for all stores visited. In addition, research suggests that setting goals and making commitments are more likely to result in behavior change, and commitments that are made publicly are the most likely to result in lasting change (Cialdini et al., 2006). This aligns with the principle of social proof – practices that are considered socially acceptable tend to be followed. This is therefore an important opportunity for growth.

Foster Positive Store Cultures

The visits revealed that few stores had made food waste reduction part of their staff culture. There are different strategies that could be introduced in store for getting staff more

engaged in food waste reduction strategies. One example is to provide bonuses if the targets to reduce food waste are met. These bonuses need not be monetary. Experiments indicate that people are less likely to change their behavior with rewards such as money and prizes, and that these can actually undermine intrinsic motivation (Kohn, 1999). Instead, praise has been found to increase desire and efforts to achieve a goal.

Enable partnerships between Stakeholders in the food supply chain

Grocery retailers handle vast amounts of food on a daily basis, and are therefore familiar with which types of foods are susceptible to damage and spoilage. This knowledge could be the basis for collaboration with the packaging industry, informing innovative solutions for sustainable and durable packaging that reduce spoilage and damage.

Advance the use of multiple strategies

While there is abundant literature on the causes of food waste and numerous best practice toolkits to inform food waste avoidance and rescue practices, none of the stores indicated that they consulted or based their practices on these resources. The interviews also showed the variety of strategies already used in each store and that no universal set of best practices can work in all instances. For successful implementation of new best practices it is best to involve staff. As noted above, behavior change is complicated, especially when addressing the root causes of food waste. For instance, FM's success in implementing procedural change is due to their commitment to engage management and staff directly in the process and facilitate the adaptation of the program to suit the store's individual requirements. So, while documented causes of food waste and complied best practices are important sources of information, to facilitate long-term change they work best in conjunction with strategies that engage staff and encourage consultation.

Next Steps

The need for collaborative and coordinated action places the City in the crucial role of convener and facilitator. The steps noted here are not exhaustive. They show the necessity of a nimble approach to change that builds on multiple informed strategies.

- Influence the food business discourse towards preventing wasted food. Encourage food rescue for unavoidable food surpluses and composting for inedible food scraps.
- Bring grocers and stakeholders from different grocery chains and positions together to establish dialogue, identify root causes and collaborate to foster behavioral and operational change. Allowing grocers to control the narrative and share their stories reduces the risk of introducing policies and bylaws that support minimum standards of compliance at the expense of true business change and innovative solutions. Including staff, managers and personnel from head office is important to this step.
- Share the resulting collection of innovative food waste avoidance and food rescue best practices, using tool kits or other education platforms, with Vancouver's grocery sector to facilitate their widespread integration.
- Introduce the opportunity to grocers of housing public education campaigns such as LFHW (LFHW, 2016) in their stores.
- Encourage the development and use of programs like FM to mitigate and measure food wastage in daily operations.

Achieving the goal of zero food waste will be a challenging process. Cooperative action and partnerships between stakeholders can help reveal food wastage triggers by identifying the key modifiable behavioral, psychological and attitudinal factors of managers and staff that are predictive of food wastage. The steps needed to achieve zero waste will thus change with our understanding of how to avoid food wastage at the onset.

Conclusion

Wasted food in the retail sector is a highly complex issue with causes that are deeply rooted throughout the food supply chain. This calls for action to tackle food wastage using a complete value chain perspective, rather than addressing wasted food where it is most apparent in the supply chain. At the retail level, effective strategies call for communication and planning within organizations as well as with other stakeholders to overcome the deeply rooted barriers of structural and cultural practices in the food supply chain that contribute to wasted food. Change must therefore be for all stakeholders in the food supply chain, not just for grocery retailers.

As this report highlights, individual solutions cannot address food wastage. With its role of supporting system wide change towards becoming a zero waste community by 2040, the City has great prospect of creating momentum to influence change and cross-sectoral collaboration. As different strategies are being used by different stores, the City can act as an educator and convener of best practices and bring different retailers together to share knowledge and expertise. By engaging grocery retailers in food waste avoidance with the goal of supporting system-wide change, the City can progress towards its goal of becoming a leading city in food waste prevention.

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Appendix 1

SUMMARY OF BEST PRACTICES FOR FOOD WASTE AVOIDANCE AND RESCUE

Solution: Increase manager flexibility

Greater flexibility provided by parent organizations to store managers would result in more autonomy for store managers, who would feel more empowered to take proactive and innovative measures to address food wastage in their store.

- Specific considerations: Current status quo of food waste as the default practice; motivating change; implementing flexible regulations while maintaining quality control, discretionary funds for small in-store food waste reduction projects.

Solution: Set goals and measure progress

Both short-term and long-term goals can be set to achieve in-store food waste reduction. Producing short-term wins is crucial for encouraging motivation among staff and creating a sense of achievement. Long-term goals will inspire continued effort after initial success. The goals should also include an articulation of the vision and change strategy, which clarifies how the future will be different from the current situation.

- Specific considerations: setting ambitious goals that are achievable but not unreachable; communicating goals to staff.

Solution: Training and motivating store personnel

Empowering staff with the necessary skills and motivating them to engage in food waste mitigation practices is important for long-term change. As staff manage day-to-day waste it is crucial that they understand and advance the vision of reducing food wastage. Considering their knowledge and experience with handling food, it is important that they be included in decision making.

- Specific considerations: costs of developing and conducting training program; ensuring that facilities can support food waste mitigation strategies.

Solution: Measurement of wasted food

Tracking changes and measuring progress is necessary for regular comparisons with the established food waste reduction goal (% reduction and deadline).

- Specific considerations: Recording and analyzing/graphing diversion and disposal weights from haulers or measurement technology for internal tracking and weighing, and the needed skills to measure and quantify wasted food.

Solution: Creation of a new culture

Changing the normative behavior related to food handling (particularly produce) and food surpluses is essential to reduce food wastage. This entails updating the standard operating procedures and their guidelines to establish food waste reduction is the default practice. Examples of in-store practices include repurposing foods in the deli or bakery, discounting for in-store sale, or donating so that food is always used for highest and best purpose when surpluses occurs, and is diverted from the landfill.

- Specific considerations: the time needed and interventions required for fostering a new culture within the business; assessment of integration of food waste reduction strategies within the store, engaging staff to help update procedures.

Solution: Technology for improved stock management

Using technology to track food in the store to avoid over purchasing and over stocking, to forecast what product is needed, to monitor the time that a product can stay on the shelf based on the "best-before" date or purchase date, as well as to establish the amount that was sold of the product over a period of time. To improve transparency, data can be shared with manufacturers and suppliers in order to better match supply and demand. One example of inventory technology is Spoiler Alert, a notification system for keeping track on the freshness of produce and food (https://www.spoileralert.com/).

- Specific considerations: cost and skill necessary to use the application.
- Benefits: improved communication between retailers and suppliers.

Solution: Selling imperfect produce

Implementing a misfit program similar to "the odd bunch" and "rebel" produce items sold and promoted by Growcom and Discovery Organics respectively.

Selling such product will directly reduce the amount of wasted food by not rejecting produce that simply does not meet aesthetic ideal. At the same time it will also foster positive behavior change in consumers to not demand perfect produce and rather to embrace natural variation. Moreover, farmers will be able to sell more of their produce, and customers will have the opportunity to save money and contribute to food waste reduction.

- Specific consideration: overcome perceived threat to store identity and need for aesthetic displays to please consumers.

Solution: Consumer education awareness campaign

This can benefit both consumers and retailers. Retailers strengthen their ethical and environmental reputation and leadership, deepen customer relations, increase customer loyalty and influence consumers to make more sustainable choices. Consumers learn how to save money by not wasting food and by purchasing discounted surplus foods. For instance, Walmart held a campaign in 2015 that showed food waste reduction strategies to customers

in the check-out line. Existing popular campaigns such as Love Food Hate Waste can be tailored for in-store use.

- Specific considerations: developing and implementing programs in store; determining success of consumer behavior change requires a long-term observation period and it may be difficult to track impact; resources and time necessary to implement and execute campaign. Establishing a partnership with an established campaign can help address these barriers.

Solution: Increase flexibility to handle and repurpose food in store

If grocery retailers can handle and repurpose surplus food in store, more food can be diverted from the waste stream. Ready meals represent a large portion of wasted food, and repurposing this food represents an area with potential for food waste reduction. In-store cafes could be established in order to more easily repurpose food (e.g., the Nada model)

- Specific considerations: time, space, and expertise to establish and staff café.

Solution: Discount food that is not at peak of freshness

Retailers can discount foods such as produce and baked goods that have passed their peak of freshness and establish a discount shelf to highlight discounted products to consumers. NOTE: As surpluses lessen with better predictive purchasing practices the amount of food discounted is reduced. For pricing technology solutions look at dynamic pricing systems.

- Specific considerations: overcoming perceived loss of income resulting from discounting products that are still within their sell-by date, technology necessary if using dynamic purchasing system.

Solution: Avoid filling shelves at the end of the day

Although consumer demand is unpredictable, food waste is reduced by retailers avoiding restocking perishable foods toward the end of the day, including the on-the-go meals and foods in deli sections.

- Specific consideration: overcoming perceived loss of from lack of fully stocked shelves.

Solution: Improved product handling

Additional attention paid to product handling can help prevent food wastage by reducing damage. This includes, but is not limited to, temperature controlled storage that meets or exceeds food safety requirements, gentle handling of perishables, separating ripe from non-ripe produce, fewer layers of product on display easier culling and reducing bruising and over handling.

Specific considerations: time demands for already busy staff; appropriate storage space.

Solution: Donate surplus food

Food donation represents a strategy that can be employed if retailers have surplus food, yet it should be considered a secondary strategy after reducing surplus food levels. Establishing one or more relationships with community organizations such as neighborhood houses, that use food in their programming can be done through matching services such as FoodMesh or by calling the local food bank. For more information on donating food see the *Industry Food Donation Guidelines* by the BC Centre for Disease Control (BCCDC, 2016).

- Specific considerations: coordination with accepting charities; lost income by giving food away (see selling discounted food above).

Appendix 2

ANECDOTES

Food waste avoidance strategies targeting both retailers and consumers

Examples of strategies and movements against food waste that target both retailers and consumers are emerging. One example is the Love Food Hate Waste, a campaign which was introduced in the UK in 2007 by WRAP (LFHW, 2016). This campaign can be displayed in stores to promote food waste avoidance for consumers where they are making their purchasing decisions. Another example is the Stop Wasting Food movement in Denmark (www.stopspildafmad.dk). It's important the grocery store staff know about the in-store interventions being used to reduce waste these public campaigns are seen as part of a comprehensive strategy.

These education and awareness campaigns have had significant impact; the latter led to the adoption of food waste reduction strategies by all Danish retailers, whereas Love Food Hate Waste reduced the amount of avoidable food waste by 14% within the first six months of introduction in London, and returned £8 for every £1 invested in food waste (WRAP, 2013). Although these immediate results may stem from the 'low hanging fruit,' they exemplify the power of awareness campaigns introduced in grocery stores. By targeting consumers they also reflect well on retailers, both in terms of image and economic gain from reduced food wastage.

Shrink levels

The store visits highlighted that grocery stores are highly focused on volume and selling large quantities in order to make a profit. This focus is therefore a driver of food wastage. One store indicated that the profit margin for grocery stores overall is 1-3%, and that the larger volume of products is sold, the better the store can manage on a smaller profit margin. For instance, stores that operate on large scales (e.g. international chains such as Walmart) can do well on a 1% profit margin. Locally based stores however need to be closer to 3% in order to be profitable. Moreover, some products are sold with a loss, whereas other products are sold with a larger profit, thereby balancing out the profit margin. One of the stores mentioned that farmers would often feel exploited if the grocer was making a large profit; in one case, a

farmer believed that the store was making a 24% profit on the produce, whereas the farmer itself would only make a single-digit profit.

Stores operate in individual environments

Multiple grocery stores highlighted the complex environment they operate in, both within the store itself as well as in relation to other stakeholders in the supply chain and consumers. Common internal limitations included store size, and the lack of space to store unsalable food. Surplus food would therefore be composted rather stored for charitable tdonation. Another complexity was how consumer trends differed in each store's catchment area. For instance, one store highlighted that the organics and health food section was their most profitable section as the neighborhood they were situated in was highly health conscious. Another store highlighted the grab-to-go and deli sections as popular due to students from a school nearby that would buy their lunch. It is therefore important to work with retailers to find solutions and strategies that fit into their individual environment and business model.

Partnerships: FoodMesh

Food Mesh (FM) (https://foodmesh.ca/) is an example of a vertical initiative which includes coordination of efforts between stakeholders at different levels in the food supply chain. FM is a web-based platform that facilitates partnerships between charities such as food banks and grocery stores for the donation of food as well as other unsalable items including toys, crockery and utensils to the highest end use.

Each section of the store, such as the deli, produce, and meat section, would do a daily inventory check and place any unsalable items into donation bins. These bins would be put in a designated area on the store premises. The store staff would label the bins according to the condition of the food, edible food would be separated from foods that were in unknown condition (e.g., meat with torn packaging) and in inedible condition (e.g., food scraps). A food bank or other charity would come daily to pick up the surplus food. Once at their location, the food bank or charity would sort through the food to determine whether it was safe for human consumption, fit for animal feed, or whether it should be composted. This allows for higher accuracy in terms of deciding which foods are safe to consume than if the sorting was done by the store, as it is done by people working at the food bank that has specific competence. A portion of the edible food would be used by the food bank and the rest would be distributed

to other charities with food programming, inedible food scraps would go to farmers as animal feed, and remains would be composted. The food bank would bring clean, sanitized bins back to the store every day.

The manager was proud of the FM system. Moreover, the different managers of the sections such as the produce manager, deli manager etc. all reported that they were very happy with the program. It was easy for them to adopt the system and use it correctly, in large part due to the training and support provided initially by FM as well as the simplicity of the system. All they had to do was to place food into the FM bins rather than to send them to compost or waste as they had done previously, and make sure the bins were ready for pick-up by FM in the morning. Moreover, store staff expressed satisfaction from knowing that the food would go to the hungry or be otherwise put to good use rather than to go straight to compost.

An interesting observation from the store that used FM is that they seemed to adopt the new culture of zero waste holistically in the store, and not just for the typical items such as fresh produce, meat and groceries. For instance, the store manager shared an incident in which they received a faulty shipment of potato chips. Normally they would return the packets of chips to the manufacturer and receive credits. The chips would be disposed of by the manufacturer, most likely to compost. However, with FM the store personnel saw the potential for both the packaging and the chips to also be diverted. They repackaged the chips in-store into another plastic bag which they sent to FM, so that they could return the packaging to the manufacturer and still receive the credits. Having adopted a culture of zero waste the store was thus able to see opportunities where they would previously have sent the chips to compost. They were also emphasizing that packaging including cardboard and hard plastic were disposed of appropriately into the correct recycling streams.

Market competitiveness

Several of the stores as well as one expert interviewee mentioned the impact of competitiveness in the food supply chain. There can also be an opposing dynamic where the desire for food waste reduction is expressed publicly by grocers and other stakeholders in the food supply chain may differ from the internal values that inform daily operations. Our expert is concerned that stores in particular associate less wasted food with less profitability. If

households do not waste as much food they do not have to buy as much food, and farmers with decreased food quantities will deliver less produce at a less reliable quality. This will contribute to decreased sales for the grocers. As food waste reduction strategies are typically measured against a cost-benefit ratio the considerations of ecological impacts are often omitted (MacRae et al., 2016). However, this might be mitigated if households then spend the savings from having to buy less food on more high-end products.

General: Acknowledgements and thoughts

After conducting the literature review, one thing that stood out was the difficulty in finding information regarding how food waste reduction strategies are used. The literature focuses to a large extent on quantifying food waste and how to reuse and redistribute food surplus. However, there is a large need to focus on developing preventative strategies in order to reduce surplus food from occurring in the first place.

Overall, this report reveals a system in which wasted food, and food more generally, is reduced to a mere spreadsheet figure and stripped of its value and potential benefits to various market participants. It reveals a lack of understanding that unfortunately leads to a lack of respect by industry and by the general public. Consumers are ignorant of the effort that goes into food, from it is grown to it ends up on our plate. Moreover, producers, manufacturers and retailers operate in silos without communicating adequately. Addressing food wastage requires a holistic and integrated understanding of surplus food as not purely a performance measure, but rather as a product of human practices.

A question that I am left with then is how did this situation emerge and progress. How did we get here? We are expecting full shelves of produce and perfect vegetables, carrots that are 10 cm long, straight and perfectly symmetric, which is clearly unsustainable. Yet, from my research for this project and by working with grocers I am positive that collaborate efforts and coordinated action can result in innovative solutions and a more sustainable food value chain.

Appendix 3

RETAILER SCORE CARD USED DURING VISITS

Retailer engagement in best practices for food waste avoidance

Strategy	How retailer engages	Additional comments
Engagement		
Managerial involvement		
Training and motivating store personnel		
Create a new culture, employing social norms		
Consumer education and awareness campaigns		
Measurement and Data Collection		
Measurement of wasted food		
Scans out?		
Setting goals and measuring progress		
Technology for improved stock management		
Data: Distinguishes edible food surplus and inedible food scraps?		
In-store Purchasing and Merchandising Solutions		
Sell imperfect produce		

Increase flexibility to handle and repurpose food in store		
Repurpose surplus food		
Discount produce that is past its peak of freshness		
Avoid filling shelves at the end of the day		
Product handling: Rotation, “kid-glove” approach		
Transfer to outside destination		
Engagement with secondary markets for surplus food		
Donate surplus food		
Utilize matching technology for food donors and charities		
Recycle strategies		