U-Links and Municipality of Dysart et al Collaborative Research Project

Arsalan Asadpoori, Kanishk Chetan Amin, Katie Crosgrey, Manpreet Kaur, Arshjot Singh, Ullas Unnikrishnan Rugmini, and Nicole Zablocki

Sustainable Waste Management, Fleming College

Table of Contents

1 Introduction

The Municipality of Dysart et al is officially known as the United Townships of Dysart, Dudley, Harcourt, Guilford, Harburn, Bruton, Havelock, Eyre, and Clyde. The municipality is located in Haliburton County, Ontario and was established by the Canadian Land and Emigration Company to create the first township. Dysart et al has a population of 7,182 people with 7,298 households spanning 1,474.22km^2 (Statistics Canada, 2022). The Municipality of Dysart et al does not provide any curbside collection of waste. Ratepayers drop off their waste (garbage, recycling, scrap metal, etc.) at one of five waste disposal sites. Dysart does not offer any source-separated organics diversion program–food waste is simply part of the garbage stream.

Dysart does make backyard composters and digesters available for purchase, however, many residents are hesitant to use these devices due to animals, especially bears. In spring 2022, Dysart is piloting an in-home electric composting device, but it can be cost-prohibitive for many households or for wider community adoption. Exploring alternative and innovative diversion options for food waste offers a solution to the unique variables that Dysart experiences.

Food waste has become a global issue and can be categorized depending on edibility, state, origin or sector. Food waste reduction is important at each stage and must be addressed at a residential level. This report will further explain the categories of food waste, their best reduction strategies, and explore solutions for community connection and participation in reducing residential food waste. Dysart et al has collaborated with Fleming College's Sustainable Waste Program to create a food waste reduction plan and a campaign to reduce residential food waste, in a research project facilitated by U-Links.

2 Need for Food Waste Reduction

2.1 What is food waste?

Food waste is food and the associated inedible parts removed from the human food supply chain in the following sectors: retail, food services, and households (UNEP, 2022). The sources that generate food waste include any place or facility that makes food available on-site, ultimately leading to food waste generation, typically categorized under organic waste. 2.2 million tonnes of household food waste is produced annually, accounting for 21% of all potentially edible “food loss and waste” (referred to as FLW in this document) (Dojchinovska, 2022; Nikkel et al., 2019). Additionally, Canadians produce food waste mainly consisting of vegetables 30%, fruits 15%, leftovers 13%, and baked goods 9% (Love Food Hate Waste, 2017). With the increasing human population, a growing amount of food waste ends up in landfills globally (Arvanitoyanis, 2008).

2.2 Types of food waste

The majority of avoidable food waste contains food items that were once perfectly edible. Food waste is classified by avoidability and reason for disposal into three categories:

1. Avoidable: Unexpected or unplanned food waste from food that is edible at the time of disposal and often disposed of as a result of over-purchasing, improper interpretation of expiration labels, and underutilization of leftovers.
2. Possibly avoidable: Food and drink that some people eat and others do not, such as bread crusts; or that can be eaten when food is prepared in one way but not in another, such as potato skins (WRAP, 2009)
3. Unavoidable: Food by-products that are inedible and thrown out, such as animal bones, husks, and the planned waste that happens when food is cooked and processed (Nikkel et al., 2019)

2.3 Impact of food waste on the environment

Canadians are throwing out increased amounts of avoidable food waste. Buying excess food, cooking disproportionately to consumption, combined with improper storage, leads to FLW (Love Food Hate Waste, 2017). According to 2017 National Zero Waste Council (NZWC) statistics, 63% of edible food was discarded by Canadians. The average Canadian household produces approximately 140 kg of food waste annually, which equals roughly $1,000 of food per

year (Love Food Hate Waste, 2017). Additionally, Canada generates 2.2 billion tonnes of waste costing $17 billion annually. Canada's FLW generation produces approximately 9.8 million tonnes of carbon dioxide, which is equivalent to one million cars on the road (Love Food Hate Waste, 2017).

Food waste is a major contributor to greenhouse gas emissions and climate change. Food waste that ends up in landfills and mixed with carbon dioxide produces methane, a toxic greenhouse gas (GHG) 25 times more potent than carbon dioxide (Food waste, the environment + Climate Change, 2022). For every 100 pounds of food waste that ends up in landfills, approximately 8.5 pounds of methane gas is released into the atmosphere. Over time, methane can become 86 times more significant than carbon dioxide (Food Waste and the Climate Crisis, n.d.). Food waste reduction should be prioritized as its landfill by-product methane is the second most abundant GHG responsible for trapping heat in the atmosphere, producing harmful GHG emissions (Importance of Methane, 2021).

2.4 Food Wasted Globally

When food is wasted, the resources used to produce it are wasted. The problems surrounding food waste go beyond food that is thrown away and one must consider a life-cycle assessment of each item to thoroughly understand the impacts of food wasted. The process of growing, harvesting, and manufacturing food utilizes a significant amount of freshwater. For example, 125 litres of water is used to grow one apple, and 15,400 litres of water is needed to produce 1 kg of beef (The Dry Utility, 2021; Better Meets Reality, 2021). Additionally, 28% of the world’s agricultural areas are utilized to produce food that ultimately goes to waste (Silva, 2016). The sheer size of global food production is extraordinary when considering that nearly 1.4 billion hectares of agricultural land are used only for producing food that is lost or wasted (The World Counts, 2022). The entire manufacturing process of food requires an abundance of energy and utilizes several resources, with a large portion of the food after processing going to waste.

Food waste is also considered a global problem due to many people suffering from starvation. The social implications of food waste are mainly the threat to food security, which increases malnutrition and hunger globally and produces adverse environmental impacts. For example, each person could be fed with less than a quarter of the food that goes to waste globally each year (Saasha Celestial, n.d.). Therefore, reducing food waste can help eliminate unnecessary resource use and aid in food security.

3 Behavioural Change and Influence on Food Waste

Behaviours can positively impact food waste generation and, consequently, on efforts towards food waste prevention (Riley, 2016). As mentioned earlier, large numbers of resources are used on wasted foods. The environmental, social, and economic implications of improper resource use make focus on residential food waste prevention imperative in residences globally. The Theory of Planned Behaviour (TPB) has been used in many studies globally, including a study in London, Ontario (Werf et al.), as a basis for analyzing contributing factors to residential food waste. TPB predicts an individual's intention to engage in a behaviour at a specific time and place while analyzing the behavioural intentions that are influenced by the attitude about the likelihood that the behaviour will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome (LaMorte, 2019). Thus further discussion on behavioural change is necessary to evaluate and drive change in food waste reduction behaviours.

TPB distinguishes between behavioural, normative, and control beliefs. It is further broken down into six constructs that can collectively assist as a predictor of a person’s control in behavioural change related to food waste prevention: (1) attitude, (2) behavioural intention, (3) subjective norms, (4) social norms, (5) perceived norms, and (6) perceived behavioural control (LaMorte, 2019). For example, Heidari et al. found the following assessment of TPB in assimilation with food waste reduction based on studies by Mondéjar-Jiménez et al., Stefan et al., and Werf et al.:

1. People who have a positive and moral attitude towards the environment and the importance of food waste have a greater intention to reduce food waste.
2. Perceived behavioural control similarly affects the intention to reduce food waste and is one of the variables that can explain the intention to reduce food waste.
3. Subjective norm proved to be one of the critical factors in explaining the intention to reduce food waste.
4. Waste-preventing behaviour is the most important predictor of intention to reduce food waste, i.e. individuals who have done activities such as waste reuse, waste minimization, and waste recycling are more likely to produce less food waste.
5. The sale and marketing strategies promoted by supermarkets directly and significantly impact the perceived behaviour control.

6. Perceived responsibility for environmental issues directly affects moral attitude, subjective norm, and perceived behavioural control with a variance of intention.

Positive and moral attitudes and perceived behavioural control have a great likelihood and intention associated with reducing food waste. Furthermore, attitudes directly correlate based on past waste-preventing behaviours and community involvement in other programs. Therefore, pre-existing waste reduction programs with strong community participation create a solid foundation, providing ease of participation and success when introducing new programs and behaviours. Additionally, subjective norms are a great asset and should be prioritized in educational materials. Perceived norms and marketing influence in marketing promotions such as Buy-One-Get-One (BOGO) negatively impact food waste reduction and will be discussed in further detail in *meal planning* best practices. Perceived responsibility of food waste reduction will vary depending on all planned behaviours mentioned in addition to socio-demographic characteristics.

3.1 Socio-Demographic Impact of Food Waste

Socio-demographic variables and TPB constructs can help to explain the intention to reduce household food waste (Heidari et al., 2020). Among all socio-demographic characteristics, age, level of education, and income were those of demographic characteristics which had a significant influence on intention to reduce food waste (Heidari et al., 2020). Therefore, drawing comparisons with similar socio-demographic regions is the strongest base for collecting best practices in food waste in the absence of behavioural data from the residents of Dysart et al.

3.1.1 Age

Among other socio-demographic factors, age is one of the significant factors determining food waste impacts. Studies have indicated that people from older generations tend to waste less food (Koivupuro et al., 2012). The older generation has experienced significantly more economic hardships in the past, which has helped generate a behavioural pattern of not wasting food. On the other hand, individuals under the age of 34 have been found to waste more food than other age groups and are typically more focused on the financial aspect of food waste (Acheson, n.d; Irani et al., 2017).

3.1.2 Income

A household's income level determines the buying capacity of the food items and significantly contributes to the residential food waste. Households with higher incomes tend to waste more food than lower-income groups (Jörissen et al., 2015). A region's income level can also impact the stages at which food is being wasted. In countries with higher income like Europe, the food is being wasted at the distribution and consumption level, whereas, in lower-income countries like sub-Saharan Africa, food is primarily wasted during production and post-harvest stages (Barrera & Hertal, 2021).

3.1.3 Education

An individual's education level is an essential aspect of socio-demographics concerning food waste reduction. The level of education determines the general awareness of environmental issues and the impacts of individual actions. People with higher education tend to generally waste less food as they are more likely to understand the implications of their consumption behaviours (Koivupuro et al., 2012).

3.2 Dysart Socio-Demographics

The Municipality of Dysart et al is located in Haliburton County in Central Ontario, Canada. The following information was retrieved from the 2021 and 2016 Census Profile of Dysart et al Municipality, Ontario.

- Dysart et al has a population of approximately 7,182 permanent residents, an area of roughly 1,474.22km^2, and an average density of 4.2 persons per square kilometre.
- There are approximately 7,298 private households, of which 3,341 are permanent households.
- 10% of the region's population falls between 0 - 14 years, 57.6% between 15 - 64 years, and 36.1% who are 65 years and over, while the average individual age is 51.4 years.
- The number of households consisting of 2 individuals is approximately 1,390, while the average household consists of 2.1 persons.
- The average household income is $60,848, while approximately 5,570 individuals hold an education level of certificate, diploma, or degree.

3.3 Socio-Demographic Critical Analysis

Food waste production in households is primarily influenced by age, income level, number of people and the size of the households. To better understand the Municipality of

Dysart et al and their socio-demographic implications on food waste, an analysis of the findings thus far has been made as follows.

3.3.1 Age

The majority of the population is between the ages of 15 to 64 years which is an extensive range to draw comparisons. Instead, if we observe the average individual age, it gets easier to understand. For example, the average individual age of residents in Dysart et al is 51.4 years which is ten years higher than the national average (Statistics Canada, 2017). Therefore, it is fair to assume that the population living in the Dysart et al is relatively older. Furthermore, as per our literature study, older people tend to have the behavioural tendencies of wasting less food. Therefore, having most residents fall into the elder category is a positive indication for the project, and increases the likelihood that residents would receive the program positively.

3.3.2 Income

The average income level of a Canadian household is $57,000, which is lower than Dysart et al's average household income of $60,848 (Statistics Canada, 2017). Studies have indicated that higher-income households tend to waste more food (Jörissen et al., 2015). Therefore, based on the information available, an above-average income level could infer that the overall food waste generated in the region could be relatively higher than average.

3.3.3 Education

About 88% of the residents in the area have completed some level of education after high school suggesting that individuals in Dysart et al are likely to waste less food and will have a higher level of awareness on the issue**.**

4 Residential Food Waste Reduction Best Practices

Stefan et al. (2012) found that just the intention not to waste food does not significantly affect reported food wastage, and as such waste-preventing behaviour is recommended as an additional factor in TPB and is a crucial determinant of intention to reduce food waste (Riley, 2016; Heidari et al., 2020). Such behaviours include meal planning, cupboard checking and list-making before food shopping, proper storage of food items, use of food leftovers, cooking the right amount of food and careful use of expiration date labels (Riley, 2016).

4.1 Meal Planning

As noted, results show that the intention not to waste food does not significantly affect reported food waste (Stefan et al., 2012). Instead, planning and shopping routines explain most of the variance in food waste, with the latter having the most considerable influence (Stefan et al., 2013). Therefore, before going for food shopping and intending to reduce food waste, best meal planning practices follow three actions: (1) check cupboard inventory at home; (2) make a menu plan for the days that follow immediately; and (3) write down a list of the food items that need to be purchased (Riley, 2016).

Planning routines, including checking inventory, making shopping lists, and planning meals, will reduce food being wasted. However, shopping routines and behaviours such as buying too much food or unintended products should have the opposite effect (Stefan et al., 2012). Additionally, consistency between the resident responsible for cooking should mirror those making shopping lists, meal planning, and shopping. Findings from Mondéjar-Jiménez et al. confirmed that offers, advertisements, and the layout of goods in supermarkets could significantly affect food waste generation (Heidari et al., 2020). Post-consumer food waste accounts for the most significant overall losses within affluent economies (Riley, 2016). Therefore, further impact on food waste reduction will require collaboration with supermarkets on the educational subject matter and will aid in positive behavioural change through the purchasing habits of residents.

4.2 Food Storage and Preservation

Storing food under suboptimal conditions leads to losses in quality and therefore increased wastage (Riley, 2016). On the other hand, food stored properly reduces food waste while saving energy and time (Canada.ca, n.d). Household food items are classified into three groups; Perishable, Semi-perishable and Non-perishable. This categorization method, along with proper storing techniques, can increase the shelf life of different types of food (Robbins. O. 2019).

1. *Perishable food:* Many raw fruits, vegetables, meat, dairy, and eggs come under this category. Perishable foods also include all items that have been prepared. Perishable goods must be stored at refrigerator or freezer temperatures if they are to be kept for any period of time. If kept chilled, perishable items should be consumed within three to seven days (less for many animal products).

2. *Semi-perishable food:* Semi-perishable foods might go bad rapidly or have a long shelf life, depending on how they're stored and managed. Semi-perishable items include flour, grain goods, dried fruits, and dry mixes. Semi-perishable goods can last six months to a year if stored and managed properly, such as in a clean, vacuum-sealed bag. Some can last even longer when frozen.
3. *Non-perishable food:* Non-perishable foods include dried beans, spices, and canned items. Unless they're handled carelessly, they won't spoil. However, even if they're kept in ideal circumstances, they can lose quality with time.

There are many factors affecting the life of food items. However, the main contributors are temperature, humidity and the food itself. For example, strawberries can degrade in as little as a day, while potatoes can last for months when properly stored. Bacteria grow most rapidly in temperatures between 4°C and 60 °C, doubling in number in as little as 20 minutes. Hence, food kept at this temperature is more likely to get spoiled (USDA, 2020). In the case of humidity, it often leads to the growth of bacteria, mildew, or mould. When storing food, condensation on cold products also creates moisture risks (DCA, 2018). The food items will have more shelf life if they are not prone to these factors, and that is where proper food storing techniques come into play. There are numerous ways to store food, including conventional and unconventional methods, with benefits and downsides (Robbins. O. 2019). A few easy and convenient methods include:

a) *Freezing:* Freezing is the most common and easiest way of preserving food items. A well-kept freezer will keep food for a long time, after which you may safely defrost it (in the fridge or under cold water only) and prepare it as desired. Foods that you make at home and then freeze are nearly always healthier for you in terms of nutrition than frozen meals from the grocery store. Frozen foods, however, do not have an unlimited shelf life. Soups, stews, vegetables, and fruits can rot if left unattended for long periods. Storing more recently frozen foods at the back and choosing to thaw and eat the older items first generates a natural rotation and reduces food waste in the long run. Current refrigerators have advanced technologies that can prolong food items' life by optimizing temperature settings. Additionally, a crisper drawer is a refrigerator compartment designed to keep vegetables fresh for longer. Crisper drawers feature a different humidity level than the remainder of the refrigerator, allowing fruits and vegetables to stay fresher longer.

b) *Drying:* This preservation technique greatly benefits fruits, vegetables, and herbs. Dried food tends to have a stronger flavour, cost relatively less, and is easier to store due to its smaller size. Dehydration depletes the water content of fresh foods, preventing bacterial development. Home-dried food should have a moisture level of roughly 20% or less. Other options include harvesting an industrial dehydrator, hanging clusters of fresh herbs to dry (unless you live in a high humidity area), oven drying items, or using the sun to create a solar food dryer. Before drying, some fruits and vegetables can be preserved by blanching (dunk them quickly in hot water).

c) *Canning:* This is a cost-effective way of preserving food quality. Some examples are jams, jellies, applesauce, and purees. Thoroughly cleaning fresh fruit, peeling and hot packing if necessary, adding acids like lemon juice or vinegar if it doesn't already satisfy preservation acidity, and using self-sealing containers with lids are the fundamental stages for good canning. Canning jars are then processed by boiling water for acidic fruits and vegetables or using a pressure canner for low-acid fruits and vegetables. Processing helps to inhibit bacterial development and eliminate any diseases to maintain safety. Canned foods have a longer shelf life; however, some nutritional value is lost. 30-50% of vitamins A, C, thiamin, and riboflavin are lost during the heating process, with an additional 5-20%loss every year. Less sensitive vitamins last longer and are found in somewhat lower concentrations than in fresh food. Vegetables may be tough if handled and canned rapidly, and they can retain a lot of their nutritional value.

d) *Cold storage:* The most common method of storing produce. Produce such as apples, root vegetables, pears, cabbages, etc., will last up to several months if stored properly. To achieve the most extended shelf life from your food, make sure you’re aware of and follow the appropriate temperatures and conditions for storage. Apples, for example, should be kept in a wet, porous bag at slightly above freezing. It is also not wise to store all fresh produce close together, as many fruits and vegetables give off ethylene gas, making things around them ripe and brown faster.

e) *Pickling:* Pickling is a method of preserving food in a high-acid solution, either naturally or by adding vinegar, salt, and sometimes sugar. It keeps food from spoiling and increases its shelf life.

f) *Storing in Water:* Storing hardy vegetables such as carrots, celery, and potatoes after they are cut prolongs freshness. Changing the water every few days and refilling with fresh cool water can be administered for an even longer shelf life.

g) *Fermenting:* Fermenting foods is an excellent method to increase your probiotic (good bacteria) intake and is beneficial to your digestive system and immunity. Lacto-fermentation, a bacterial activity that maintains and increases nutrients in food, is the first step in the fermentation process. Secondly, chopping, grinding, or otherwise preparing your raw food, choosing the specific culture (usually salt, whey, or a starting culture), making and adding brine, and storing everything in an airtight container in a cold climate are the fundamental processes. Fermentation also utilizes excessive amounts of salt, which helps preserve food by drawing out the water content and reducing bacterial growth.

4.3 Expiration Dates vs. Best Before Dates

Inadequate knowledge about the terminology of expiration dates and best before dates can be considered as one of the main reasons food items end up in the garbage. Contrary to common belief, food labels do not correlate with food safety or standards. Most food items can last weeks or months longer than the best before dates seen on the product package and vary depending on the manufacturer (Wilkinson, 2021). In addition, there is a significant difference between best before dates and food spoilage. There may be quality loss in product nutrients after the best before or consume before date. However, products can be consumable without any adverse effects on the body even after this point. If the food is not preserved or stored in proper conditions, it can spoil with the growth of microbial colonies such as mould.

Types of expiration labels: What the labels indicate varies from producer to producer. So, depending on different manufacturers, there can be “best by”, “sell by”, “best if used before”, “best before”, “for full flavour, use by” labels. Even though these have different meanings, the average consumer might not know the difference. Any food product with the term “Expiration” means it may not be safe to consume past the date listed. According to the Government of Canada, expiration dates are required only on foods that have strict compositional and nutritional specifications which might not be met after the expiration date and apply to only five types of food: infant formula, nutritional supplements, meal replacements, foods sold by pharmacists, and formulated liquid diets (Government of Canada, 2022). All other labels like “best by”, “sell by”, “best if used before”, “best before”, “use by”, “freeze by” usually means the manufacturer’s recommendation for consuming food at peak quality or flavour, and does not make the food inedible (TooGoodToGo, n.d).

Consumption after food label expiration: Most packaged food items can be consumed even after their best before label date. Consumption can occur after label expiry because best before

dates are general approximations by the manufacturer of the food item. Products may sometimes lose a little bit of flavour or crunch after these dates but remain edible. The shelf life of such products can be increased by storing them in optimum conditions. For example, if the refrigerator is 1°C rather than the standard 4°C, food items such as milk can extend their consumption life by an extra week. Other dairy products like yogurt and cheese are also acceptable to eat after their best before dates. If cheese is affected by mould, it can be consumed by removing the part with the mould.

Furthermore, to know whether eggs are outdated, they can be placed in a water bowl. If the egg floats, it is rotten; if not, it is edible. Eggs often pass this test even two weeks after their date. With unopened processed foods like cereal and chips, you can also get away with eating them months after the best before date (Carr. R, 2017). The best way to know when the food is spoilt is by trusting your sense organs. By seeing, smelling, touching and tasting, we can understand whether the food is spoiled or not (Wilkinson. A, 2021).

4.4 Leftover Utilisation

The most common wasted food types include leftover meals, fresh vegetables, fruits, and potato products (primarily chips and wedges) (Acheson, n.d). The “once convenient” leftover food and spoiled produce account for approximately 25% of the total waste households produce (Gottfried et al., 2015). Household culture, demographics, and individual attitudes play a significant role in food waste and food loss prevention as households are the main contributor to food waste after the foodservice sector (Acheson, n.d). Individuals between 18 - 34 waste more food than other age groups, with younger individuals more focused on the financial aspect of food waste (Acheson, n.d). Comparatively, older individuals are more concerned with the social and environmental consequences (Irani et al., 2017). As meal planning is an integral part of food waste reduction, consuming any leftover food within four days of being cooked is vital for food safety and health.

Typically saving and eating leftovers are behaviours that lead to less food waste as leftovers can be placed back into storage and can subsequently be transformed into a new meal (Geffen et al., 2019). However, leftovers can also create more food waste if not consumed within the food safety window of being cooked. Leftover waste can be avoided by minimizing portion size when making meals. Storage of leftovers in the fridge is often a guilt deferral tactic, while poorly stored leftovers contribute to food decaying in the refrigerator (Roe et al., 2020). When enjoying a meal out at a restaurant, individuals are typically offered a to-go container for any

leftovers they may have. These containers are usually discarded the next day or left in the fridge to go bad while adding more plastic waste with takeaway packaging (Sun, 2018).

Individuals tend to feel less guilty about disposing of food that has gone bad compared to food that may still be edible or has aesthetic flaws (Schanes et al., 2018). Leftover food always has the option of being repurposed into a different meal the next day. It increases creativity by procuring a new or different meal, which may develop further knowledge and cooking skills (Schanes et al., 2018). A more effective strategy is cooking based on what is stored at home (Schanes et al., 2018). Online resources and food blogs are abundant, as are online access to recipes involving the use of leftovers. Dedicating one night per week to utilizing foods stored in either the fridge or freezer is a great way to minimize food waste and manage leftovers. Soups are also an efficient way to use up any produce left in the fridge that has not been used up yet. Additionally, shifting individual mentality away from the word leftovers to ingredients can alleviate the negative connotation of consuming leftover food (Mooth, 2014).

4.5 Disposal

4.5.1 Donation

Reducing food waste is a vital component that could potentially feed those in need and enhance food security (Schanes, 2018). Donation programs make it possible to contribute to improving the well-being of food insecure dwellers (Santeramo & Lamonaca, 2021). Donating surplus, unwanted, and unused edible food products to charitable organizations or a local food bank is an excellent way to reduce food waste. However, donating is not a long-term solution to food insecurity. The rising costs of food are becoming a significant barrier to food security. As of 2018, approximately 1 in 8 Canadian households are food insecure (PROOF, 2020). Furthermore, a study performed by U-Links in Haliburton County found that approximately 48% of respondents said that finances are a barrier to consuming fresh fruit and vegetables (Haliburton County CFA, 2015). In addition, food insecurity can contribute to adverse health effects, often leading to chronic health conditions and mental health issues (PROOF, 2020).

Food scraps and food waste can also be donated and repurposed to feed livestock. However, it may require more energy through heat processing which has become a universal requirement before being fed to livestock. The greenhouse gases produced during this process are comparable to composting, anaerobic digestion, or incineration but substantially less than landfills (Dou et al., 2018). In addition, there is a

potential for virus and disease-causing bacteria to develop and cause cross-contamination from the animal to the meat that is then sold to consumers when proper processing is not present (Dou et al., 2018). Depending on the types of farms in the surrounding areas, acceptance criteria may vary for food scraps from residential households.

The Food Donation Act Canada provides Canadians and farmers with tax credits to those that have donated to food banks or community food programs. Any donated food is not the type that would sell in an unrestricted marketplace, as all donations undergo inspection for food safety when received (Broad Leib et al., 2020). Food donations may also come from an operator's excess supply that they could not otherwise sell to retailers or consumers. However, donors do not benefit from these incentives (Broad Leib et al., 2020). When donating food, the costs associated with transportation and administration may also stand as potential deterrents, making disposal of food a cheaper option (Broad Leib et al., 2020). However, when addressing food insecurity and food waste, every donation effort can make a difference, whether big or small.

Community gardens in residential communities are an excellent resource for human health, the health of the environment, and food security. Community gardens generate food affordability by reducing food expenses and aid in changing residents' purchasing behaviours, positively contributing to rural and urban communities (Wijewardana et al., 2012). Several studies have revealed a positive association between community gardening and increasing the consumption of fruits and vegetables (Wijewardana et al., 2012). The inedible root portion of vegetables can be used to grow vegetables such as garlic, potatoes, onions, and most leafy greens (Hansen, 2018). When the base is placed in water on a sunny indoor windowsill, it can be transplanted from water into the soil as soon as roots develop (Hansen, 2018). Additionally, onions, leeks, and fennel can be regrown by cutting off its ends at approximately one inch with the small roots intact. This method is a great way to use food scraps that would end up in the green bin and achieve zero waste.

4.5.2 On-Site Composting

Composting can significantly reduce the amount of food waste thrown away from households. Composting improves soil health, conserves water and energy, and lowers the overall carbon footprint (Hu, 2020). Backyard composting systems can be aerobic,

anaerobic or vermicomposting. Even though all systems function differently, they are easy to install and a one-time investment for residents. In addition, they are inexpensive and can digest almost all organic matter fed to them. Aerobic composting and vermicomposting give fertile humus as a by-product that can be repurposed as garden manure. Comparatively, digesters like anaerobic composters do not provide such products.

Countertop composters or electric composters are also effective for reducing small food waste. Electric Composters, sometimes called food recyclers, are freestanding small kitchen appliances that break down food waste into compost or fertilizer. Unlike traditional home composting methods that rely on aerobic microbes to break organic matter into compost over a long period, electric composters heat and grind food scraps over several hours to produce a loose, dry substance that can be added to potted plants or garden soil as fertilizer (Earth911, 2021). Electric composters do not make compost; instead, they reduce the volume of food waste by processes involving heating and grinding (GardenMyth, 2021). The versatility regarding the feedstock is also a benefit due to the minimal amount of time needed to process them (Miller, 2019). Additionally, electric composters are convenient compared to conventional backyard composting methods and can be used every season. Wildlife concerns and interactions are minimal as the electric composter by-product is odourless and the tiny portable boxes can be kept inside. However, electric composters use electricity to work, cannot process large amounts of food waste in a single run, and are expensive (GardenMyth, 2021).

4.5.3 Wildlife Management and Composting

Backyard composting can produce odours as organic compounds decompose. The type of odour can vary depending on the composter used. For example, an anaerobic composter can have a foul smell when filled too quickly. Inappropriate materials added to the compost like meat or dairy products, producing a stinky smell can also contribute to improper decomposition and odour (Scientific American. 2010). In addition, such odours from the composters can attract wildlife ranging from squirrels to raccoons and bears. A survey on household composting conducted in Haliburton County found that the fear of attracting wildlife such as bears into property is a significant hindrance to a household’s desire to engage in composting at home. As discussed

earlier, electric composters can assist in eliminating wildlife concerns and interactions as the by-product created is odourless and can be used indoors.

5 Best Practices in Ontario

The primary focus of food waste reduction in small rural communities prioritizes strategies, communication channels, and by-laws mandating food waste management. However, there are limited existing programs comparable to Dysart et al's geographic specifications and niche seasonal hunter-gatherer population. Fortunately, food waste reduction strategies are transferable based on similarities in socio-demographic variables, as suggested earlier. Therefore, discussion on current municipal residential food waste reduction strategies in Ontario is beneficial.

Food waste reduction is gaining traction in public attention as food costs continue to rise and the youth's priority on sustainability begins to influence older generations. For example, Canada's Food Price Report 2021 predicts a historical increase in overall food costs of 3-5% from the previous year. Additionally, Ontario's available landfill capacity is expected to be exhausted by the year 2034 (OWMA, 2021). Therefore, the importance of food waste prevention in the absence of a supporting organics processing facility is imperative to reducing waste production and pressures on municipalities like Dysart et al. Several regions in Ontario have prioritized food waste reduction, including the Region of Peel, and the Region of Durham.

5.1 Region of Peel

5.1.1 Strategies

Peel Region focuses on three main *Smart* strategies to reduce residential food waste: (1) *Plan Smart*, (2) *Buy Smart*, and (3) *Store Smart*.

1. *Plan Smart* advises residents to check what food they already have at home, consider what meals they will make at home, and then make a shopping list. The plan also encourages residents to plan to serve leftovers.
2. *Buy Smart* explains that residents should avoid impulsive shopping, and wise shopping is recommended considering household size and needs. Buying smart confirms prior research that consideration must be made before purchasing items, including shelf life and expiration, the sell-by date, the best before date, and the expiration date (Region of Peel, 2022). Additionally, this step emphasizes only purchasing buy-one-get-one-free items if you are sure you will eat them.

3. The final stage, *Store Smart*, advises using the first-in, first-out method by eating older food items first. This step also instructs residents how to store their food at homes and refrigerators for a longer food lifespan and preservation, making sure that the fridge to the proper temperature of 4C and freezers to -18C. The tips also drag the resident's attention toward important dates such as sell-by date, best before date, and expiration date (Region of Peel, 2022).

5.1.2 Promotion and Communication

Peel Region communicates their *Smart* strategies and tips on their website. The strategy can be made responsible for helping the average Peel household cut food waste and save up to $112 per month (Region of Peel, 2022).

Peel Region takes other opportunities to educate its residents and promote food waste management and different organic types of waste. The Region provides access for residents to e-newsletters, online lesson plans, and live virtual waste workshops. The waste education plan and programs include:

- Kindergarten and Grade 1 lesson plans: An introduction to waste management
- Primary: Activity sheets, online games, videos, and lesson plans for K to 3
- Junior: Activity sheets, videos, and lesson plans for Grades 4 to 6
- Intermediate: Activity sheets, videos, and lesson plans for Grades 7 and 8
- Workshops, games, and other resources: Additional hands-on and online learning activities for Grades K to 8
- Secondary school: Lesson plans for Grades 9 to 12 (Region of Peel, 2022).

Peel Region conducts the *Teach Green in Peel* platform on the internet to engage students in environmental learning by searching for environmental education plans suitable to their ages and interests (Region of Peel, 2022). Peel Region is also a founding partner in the Ontario Food Collaborative (OFC) which is actively working to pass Bill 216 on Food Literacy for Students grades 1 to 12.

5.2 Region of Durham

5.2.1 Strategies

The Durham Region is extensively promoting the idea of reducing food waste at the household level through its "Buy it, Eat it" promotion and education campaign. The Durham Region promotes different strategies to reduce food waste at home in this

campaign. The campaign focuses on meal planning, checking pantry and fridge inventory before shopping, and purchasing only food that you will eat. Additionally, the program highlights the importance of leftover utilization and suggests getting creative with leftovers and thinking of them as an ingredient (Durham Region, 2022). Another way food waste prevention is being promoted in the Durham Region is by suggesting strategies for adequate food storage. The first-in, first-out method of food consumption at home is also suggested to avoid wastage and spoiling. Finally, unavoidable food waste disposal is recommended through composting, as composting will provide valuable manure and prevent food waste from reaching landfills (Durham Region, 2022).

5.2.2 Promotion and Communication

Durham Region's food waste reduction program, in collaboration with Durham College, "Buy It, Eat It," mainly comprises educational videos uploaded to social media platforms like youtube. Additional educational information is also available for residents online on the Durham Regions' official website. The Region also uses other social media platforms like Twitter, Facebook, and LinkedIn to communicate the program. The Region of Durham also notes considerable success in radio ads and news ads across local radio stations and newspapers. Virtual waste plan open houses and communication through emails and telephone were also part of the promotion and education programs. Additionally, Durham Region uses an application called "Durham Region Waste," which gives residents information about how to dispose of waste materials properly. Finally, Durham Region is currently developing new comprehensive materials and lesson plans for teachers to educate students about waste management (Durham Region, 2022).

5.3 Ontario Food and Organic Waste Framework

In 2018 pursuant to s. 11 of the Resource Recovery and Circular Economy Act, 2016, Ontario released the Ontario Food and Organic Waste Framework (Ontario, 2018). The Framework consists of two complementary components, the Action Plan, which outlines the strategic commitments to Ontario to address food and organic waste, and the Policy Statement, which provides direction to municipalities (Region of Durham, 2022). The Framework has four objectives.

1. Reduce food and organic waste
2. Recover resources from food and organic waste
3. Support resource recovery infrastructure
4. Promote beneficial uses of recovered organic resources

Many Ontario municipalities have begun to regulate organic waste by creating specifications around allowable organic curbside collection. However, there are significant gaps in current municipal by-laws and the Framework's objectives. Additionally, Ontario also plans to phase in an organics ban in landfills by 2030 in addition to imposing a mandatory organics diversion strategy. The logistics of a province-wide ban may be complex given the varied needs of municipalities across the province. Having a solid Residential Waste Reduction Strategy in place will better aid Dysart et al with ease in the event of a provincial organics ban in landfills.

6 Food Waste Reduction Applications & Tools

With the growth of the internet, many vendors are introducing mobile applications for smartphones that help facilitate and educate about food waste reduction. Here are some of the most common or popular food waste reduction mobile apps.

- **OLIO**
  OLIO is an online platform Tessa Clarke and Saasha Celestial founded in February 2015 (OLIO, 2022). Their idea was to stop any food from making its journey straight to the bins from the fridge. OLIO is a free app that will help residents connect with each other and help to share their extra food and leftovers. All the users need to do is take a picture and upload it in the app with the description of the food, where other residents can locate the items before it gets wasted. They have volunteers who come and collect surplus foods from places and redistribute them. Through this mobile app, people can share their foods and prevent them from reaching landfills. This app has successfully reduced food waste globally, with over 450,000 active users (Mouysset, 2019).
- **Too Good To Go**
  Too Good To Go is one of the most successful online food waste reduction platforms, founded in Denmark by Brian Christensen, Thomas Bjørn Momsen, Stian Olesen, Klaus Bagge Pedersen, and Adam Sigbrand in 2015. They started with a dream of ensuring the planet has no food waste and an ambitious goal of inspiring and making everyone fight against food waste. Here the users download the app for free, and it connects with food vendors near you. The food vendors sell their foods which are going to waste for a third of the selling price. The users barter the price and buy the magic bags which contain foods but are unaware of the items in the bag. The app helps food vendors sell their extra food and attract new customers to try their food while consumers can buy food for less price and help reduce food going to waste (Mouysset, 2019).

- **Bluapple**

  Most people know that storing bananas with other fruits and vegetables is a terrible idea since they release huge volumes of ethylene gas, which signals them to ripen quickly. Bluapple is a blue apple-shaped product that sits in your refrigerator and absorbs ethylene gas, allowing you to keep your produce fresher for longer. It lasts three months before needing to be refilled, and it can increase the shelf life of fruit by up to three times (Mouysset, 2019).

7 Survey

7.1 Methodology

To gain knowledge about Residential Food Waste Reduction Strategies (RFWRS) in Ontario municipalities, a survey was conducted by the students of the Sustainable Waste Management Program at Fleming College in early 2022. Eighteen questions were curated, including multiple-choice, text entry, and multiple selection. The survey was made available online through Qualtrics.com, an online survey tool. In addition, the survey link was shared with municipalities in Ontario through the Municipal Waste Association, the Ontario Food Collaborative's March 2022 newsletter, and LinkedIn. Four municipalities participated in the online survey: the Region of Peel, the City of Kawartha Lakes, the City of London, and the Region of Durham.

7.2 Results and Analysis

Sustainable Waste Management students prepared survey questions restricting responses beyond Q5 when a municipality did not have a RFWRS. Out of four responses received, one municipality had a RFWRS, two had no strategy, and the fourth had inconclusive answers. Therefore the analysis is purely based on the response from the Region of Durham. Listed below is the analysis of the survey results.

Q1 - Giving title to the municipality participating in the survey. As mentioned in the methodology section above, Region of Peel, Region of Durham, City of Kawartha Lakes and City of London are the four municipalities who participated in the survey.

Q2 - Description of the survey participant's role or position.

Q3 - Population range. Populations will vary concerning a particular municipality. If the Sustainable Waste Management Students at Fleming College received more responses, a shortlist would be drafted of municipalities that share similar demographics to Dysart et

al. However, RFWRS can be broadly adopted and generalized amongst regions even with differing populations.

Q4 - The results identified that all municipalities participating in the survey offer curbside garbage and recycling programs except one relatively large municipality. While two large municipalities offer a curbside organics program, only one of them has a RFWRS.

Q5 - Determining if the municipality has a RFWRS. If not, the survey is over. Out of four municipalities, the Region of Durham has RFWRS. Therefore, the following questions are based on the data received from the Region of Durham.

Q6 - Establishing how recent the municipality's RFWRS is. The response was one year, highlighting that it is a newly implemented strategy and potentially up to date with the current best practices.

Q7 - Identifying the different residential categories targeted in the RFWRS, such as, permanent residents or seasonal renters. The response revealed that their RFWRS has no such specific identification of requirements for different types of residents.

Q8 - Since Dysart et al has concerns with wildlife waste generated by hunters and anglers, this question addresses specific strategies adopted by a municipality to respond to the unique issue. The results were inconclusive as the Region of Durham does not have a large population of hunters and anglers. In the case of Dysart et al, a strategy that addresses the hunters and anglers would be beneficial.

Q9 - Planning, community participation, reaching the different types of residents (permanent or seasonal), involving the business sector, the non-profit sector, and fundings are some areas that prove challenging while implementing any municipal strategy. According to the Region of Durham, community participation is the most challenging aspect of RFWRS implementation.

Q10 - Consultation is vital before strategy implementation. The Region of Durham consulted residents and municipal council members. The Region of Durham commented that their RFWRS is newly implemented and has been successfully incorporated in their long-term waste plan. To integrate the RFWRS into the long-term waste plan, they consulted the stakeholders and public.

Q11 - Involving the public health department in the execution of RFWRS is crucial. Three options were given, described by their level of importance. The Region of Durham stated that it was somewhat important to have public health involvement.

Q12 - The Region of Durham used social media, newspapers, radio, their municipal website, videos with tips, tv commercials on local channels, billboards, and bus shelters as means of RFWRD promotion and communication.

Q13 - The Region of Durham posted a comment saying they don't have a measure of success yet as this strategy is still newly implemented and just recently approved by the council. Hence, they don't have solid metrics. However, their plan includes short, mid, and long-term goals with annual reporting on targets.

Q14 - The Region of Durham did not involve grocers, food banks, or other non-profit partners during the creation of their RFWRS.

Q15 - Determining the most effective aspect in their RFWRS, the Region of Durham notes that the quantities of avoidable food waste in the green bin program reduced significantly and were quantified by implementing and conducting regular waste audits.

Q16 - This question asked if there is anything that the municipality would like to change with their currently implemented RFWRS. No responses were received.

Q17 - The Region of Durham is willing to participate in a follow-up survey conversation.

Q18 - The final question asked if the municipalities are willing to share their RFWRS with Dysart et al. The Region of Durham agreed.

A comparative analysis requires more data and cannot be completed as only one municipality with a RFWRS participated. However, 75% of the respondents did not have a RFWRS, suggesting that such strategies are emerging within Ontario municipalities. Dysart et al has the opportunity to encourage and inspire other municipalities in Ontario and beyond to prioritize residential food waste reduction.

8 Promotion and Education

8.1 Educational Content

Stefan et al. (2012) found that just the intention not to waste food does not significantly affect reported food wastage. Therefore, waste-preventing behaviour is recommended as an additional factor in the Theory of Planned Behaviour (TPB) as it is a crucial determinant of intention to reduce food waste (Riley, 2016; Heidari et al., 2020). Such complementary behaviours include meal planning, cupboard checking and list-making before food shopping, proper storage of food items, use of food leftovers, cooking the right amount of food and careful use of expiration date labels (Riley, 2016). Based on the research drawn in this report, a public educational campaign, I TASTE ZERO WASTE, has been developed specifically for Dysart to promote best practices in reducing residential food waste in the five steps listed below:

1. **Meal Planning: Check, Plan, Purchase**

   Planning and shopping routines explain most of the variance in food waste, with planning having the most considerable influence. Planning routines, including checking inventory, making shopping lists, and planning meals, will positively impact residential food waste reduction (Stefan et al., 2013). Meal planning can be further aided by participating in community meal prep programs like the Rotary Club of Haliburton's "Good Food Box" program.

2. **Food Storage and Preservation**

   Fridge temperatures vary from top to bottom and are at optimal temperatures of 4C to 1C, respectively (Government of Canada, n.d). The fridge is divided into four food zones: (1) The upper shelf and door - ideal for sauces and quickly consumed foods, (2) The mid-shelf humidity-controlled crispers - ideal for fruits & vegetables, (3) The bottom shelf - ideal for food that requires cold, perishes quickly and cannot be frozen, (4) The freezer - ideal for food storage for extended periods at temperatures of -18C and lower (Government of Canada, n.d). The freezer air must move evenly around the food to keep it frozen. Additionally, counter foods such as tomatoes and avocados can be transferred to the fridge once they are ripe to extend their life by several weeks.

3. **Expiry Labels vs Food Expiration: "Best Before" doesn't mean "Use By"**

   Food labels have almost nothing to do with food safety and more to do with standardization. Most best before dates are used for marketing rather than identifying actual food spoilage.

When stored properly, food products can have a longer shelf life. Before throwing food out based on the expiration label, research the items' actual life expectancy because 'best before' and 'use by' have different meanings. *Always check your local health guidelines and advisories.

4. Leftover Utilisation: Lose the leftover guilt

Leftover food always has the option of being repurposed into a different meal the next day. However, it is ideal to minimize portion sizes and cook based on what is stored at home to reduce leftover food waste. In addition, storing leftovers efficiently can decrease food spoilage and increase freshness.

5. Disposal Best Practices

a. *Donation:* Surplus canned and dry goods can be donated to charitable organizations or a local food bank instead of being left in the pantry. Donations of these items make it possible to improve the well-being of food insecure individuals, especially as prices continue to increase. Food scraps and food waste can be donated to local farms that use them to feed their livestock. Community gardens are also a great way to get involved within the community and are beneficial to increasing food security and food affordability.

b. *Composting:* Composting can significantly reduce the amount of food waste thrown away from households. Composting improves soil health, conserves water and energy and lowers the overall carbon footprint (Hu. S. 2020). Composters, digesters, and countertop food cyclers are viable residential composting options. Proper composting techniques will decrease smells that attract wildlife visitors and can be found on the Dysart et al website.

8.2 Communication

The distribution of the educational materials is imperative to the program's success and is advised to be distributed in the form of promotional posters, educational guides, pins and magnets *(See Appendix A for the education & promotional materials)*. Educational posters will be posted in public community spaces such as the arena/community centre, library, schools, business, and other public areas participating in the program's success. The campaign should also be included in local newspapers and radio stations to increase the program's reach further. In addition, all educational and promotional materials will be accessible by QR code to provide a

paperless and on-the-go resource option for residents. The QR code will be located on all educational materials and will direct access to the educational guide.

Educational Guides will be distributed by mail and at waste disposal sites at the program's inception by the Municipality of Dysart et al. The distribution team, a.k.a. The I TASTE ZERO WASTE team, is recommended to be comprised of volunteers with a summer student leading facilitation to maintain budget targets. Recommendations for additional distribution locations include the Haliburton Farmers Market, schools, the Rotary Club of Haliburton, and other service organizations. Participation pins and magnets will be given to residents alongside the educational slip to those who commit to "taste zero waste".

How it works: When residents arrive at the transfer station to dispose of their waste, they will be greeted by the I TASTE ZERO WASTE team. The table will be located at the waste drop-off area where food waste is being disposed of. Residents will be asked to take the pledge to "taste zero waste" and, upon committing, will be given one pin per household resident and a magnet and educational guide per household. Acceptance of the pin or magnet is not mandatory, and a paperless alternative will be available to residents when scanning the poster QR code. In addition, the team will be able to answer any questions residents have about reducing their waste and encourage residents to place pins on their reusable grocery bags and children's backpacks. This process can be mimicked in additional locations such as the farmers market, schools, the Rotary Club, or grocery stores should the scope of the campaign promotion expand.

8.3 Program Efficacy

In consideration of TPB and best practices mentioned thus far, Community-Based Social Marketing (CBSM) has proven successful in developing and delivering programs to promote sustainability and therefore requires further discussion (Government of Canada 2022). The basis of CBSM is identifying the barriers to behaviour and the use of prompts, commitments, norms, and effective communication tools.

Participation pins and magnets are vital in aiding the program's CBSM success. The pin design has been curated with simplicity and proximity to appeal to a broad audience. The pin concept is familiar to an "I VOTED" pin, drawing on the human desire to partake in a normative activity. When a resident takes the pledge to "taste zero waste", they commit to participating in the campaign and will receive a pin and magnet in exchange. By asking the resident to commit to tasting zero waste, there is an increased potential for residential participation. For example, a

blood drive successfully increased the percentage of donors from 62% to 81% by asking participants if they could “count on seeing them at their appointment” (Lipsitz et al., 1989). Asking residents to take the pledge is a crucial driver to residents committing to food waste reduction and exemplifies the importance of the verbiage and delivery of the campaign.

Participation pins and magnets will also serve as visual prompts and remind residents to reduce their food waste. The fridge magnet prompt addresses the barrier of at-home accountability concerns, given that a large portion of the participation is done in private residences. The participation pin will also act as a visual prompt in the public while influencing subjective and social norms. When other residents see mass participation, they are likely to participate actively. Additionally, residents will be prompted by seeing the pin on reusable grocery bags and will be reminded of their behaviour change while shopping and lower marketing influences that negatively impact food waste reduction (Heidari et al., 2020). Furthermore, there is a potential for increased communication through social media and sharing of the hashtag #ITASTEZEROWASTE.

8.4 Potential Community Partners

A potential partnership with the Rotary Club of Haliburton’s “Good Food Box” prepared meals program would prove mutually beneficial as a campaign location. Meal planning and shopping routines explain most of the variance in food waste, with the latter having the most considerable influence (Stefan et al., 2013). Therefore, partnering with a locally prepared meal service will enable the program to reach a larger demographic while supporting best practices for food waste reduction. Additionally, partnering with the Haliburton County Farmers’ Market during the summer months as educational and campaign material will further benefit the program and align with the Farmers’ Market values of shopping locally and intentionally.

Findings from Mondéjar-Jiménez et al. confirmed that offers, advertisements, and the layout of goods in supermarkets could significantly affect food waste generation (Heidari et al., 2020). Therefore, future collaboration with supermarkets in promoting educational subject matter will aid in positive food reduction behavioural changes amongst residents. Additionally, Dysart et al would benefit from partnering with the local schools to encourage and teach the five steps of food waste reduction. It is essential to educate the youth as young individuals between 18-34 were found to waste proportionally more food than other age groups, highlighting the importance of early education (Acheson, n.d).

8.5 Budget

The budget estimation for this project campaign uses the Bottom-Up method. It entails detailed predictions for project components which are then added up to produce a total estimate for the complete project materials. The bottom-up method is regarded as one of the most accurate methods of estimating and can be effective in assessing the I TASTE ZERO WASTE program costs due to the relative simplicity of the project materials. Estimating a project's cost, length, or resource needs often begins with an approximate order of magnitude (Sebastian, 2021). For example, the I TASTE ZERO WASTE project will include the cost of posters, pins, pamphlets, and fridge magnets.

- Magnets & Pins: 10,000 units each to account for all community members. Units were approximated as the population of Dysart et al are approximately 7,200 residents and doubles/triples during the summer season.
- Button Bros. and Magnet Bros. were chosen as a supplier due to their location in North York, Ontario. In choosing a local supplier the program aims to lessen the environmental impacts of out-of-province shipping.
- Posters: 50 units to account for all potential public spaces.
- Education guide per household with the average number of households in Dysart et al of 3,000. QR codes will be available with this material on posters and educational guides to increase the paperless copies amongst the community.
- Poster sizes were determined to consider all members and their potential vision accommodations and needs.

Table 1: Material cost and budget breakdown

Material	Size (inches)	Cost per unit	Quantity	Subtotal	Source
Poster	24 x 36	$22.34	50	1,116.85	Vistaprint
Magnet (square)	2 x 2	$0.10	10,000	1,000.00	Magnet Bros.
Button/Pin (round)	1.5	$0.22	10,000	2,200.00	Button Bros.
Educational Guide (Flyer)	8.5 x 11	$0.14	3,000	418.00	Vistaprint
Total				**$4,734.85**	

** As noted in Section 4 Communication, the I TASTE ZERO WASTE team will be comprised of volunteers with a summer student leading facilitation to maintain budget targets.*

8.6 Strategies

8.6.1 Funding and Grants

It is important for a campaign to have financial support to ensure plan implementation is successful. Funding and grants available in the domain can be utilized for this project. The following are a few public and private grants available.

- **Green Municipal Fund (GMF)**

  The GMF fund is arranged by the Federation of Canadian Municipalities organization and it helps Canadian municipalities, private sector and non-governmental organizations to implement sustainable solutions in their local areas. GMF can support up to 50% cost of any program that protects land, water and air under their initiative (Federation of Canadian Municipalities, n.d.).

- **TD Friends of the Environment Foundation Grant (TD FEF)**

  This grant is organized by TD bank group of Canada which funds environmental projects across Canada. Municipalities, educational institutes, registered charities and indigenous groups are eligible to apply for this grant. TD FEF accepts applications for community education programs and can contribute between $2000 to $8000 (TD FEF, n.d.).

- **Mitsubishi Corporate Foundation (For the Americas)**

  Mitsubishi Corporate Foundation is a large organization who's For the Americas chapter provides grants to various organizations working in North and South America. The funding can be obtained for sustainable development, biodiversity conservations, environmental justice and environmental education-related projects. This organization supports more than 100 projects in 15 countries throughout the region (MCFA, n.d.).

8.6.2 Grocer Collaboration

Grocery stores and the Haliburton County Farmers' Markets can contribute significantly to the cause of residential food waste reduction. These establishments are the sources from which residents in Dysart et al procure their food, and it would make logical sense to involve these organizations in the campaign.

One of the ways with which grocery stores can contribute to the campaign is by generating awareness of expiry dates and labels among their customers. These stores can offer considerable discounts to their customers who are buying products closer to expiry. This action has the potential to increase food affordability for customers and increase expiry date awareness among customers. The customer will know that they are buying a product closer to expiry and must consume it before it gets wasted. In addition to this, grocery stores can put up information on how to properly store that type of food beside the aisle where it is kept.

The Haliburton County Farmers' Market is another source from which residents of the region buy their produce and products. A meal kit service in conjunction with the Farmer's Market could be started, which will include locally sourced products. A similar initiative took place in York Region, where the municipality, in association with York Region Food Network, delivered produce to their residents through the "Good Food Box" program (York Region Food Network, n.d.). By streamlining and structuring with proper recipes, this initiative can potentially save food waste among residents.

8.6.3 Non-profit Collaboration

There are quite a few not-for-profit organizations that are active in the area of Dysart et al such as SIRCH Community Services, Haliburton 4Cs Food Bank, and Meals on Wheels by Haliburton Highlands Health Services. These organizations have been working within the community for years towards food accessibility and security for people.

Non-profit organizations often accept donations. The donation channels for these organizations could be streamlined and can help reduce food waste in households. There could be designated days in the week kept for households in a community to donate the food which is not required by the residents. By this method, these non-profit organizations will benefit and give residents a chance to get rid of unwanted or access food in a way that can benefit society.

8.6.4 Sponsorship

There are sponsorship opportunities available across the community. The commercial and non-profit sectors like grocery stores, restaurants, and farmers' markets are the sources of food for consumers across the region. Collaboration with these units will help to spread the word related to food waste, but also it would be beneficial and

would help to create a positive brand for them. There is an opportunity where the grocery stores or restaurants of the region can contribute financially to this initiative.

In addition to this, other organizations like the Rotary Club of Haliburton can be approached for financial help. The Rotary Club distributes “The Good Food Box” in the community every month, where fresh produce like vegetables and fruits are distributed to whoever is in need in the community (Rotary Club of Haliburton, n.d.). It would be a good idea to get involved with local groups and streamline services like these so that they can serve the community better.

8.7 Monitoring and Metrics of Success

The program’s success can be linked to measuring a reduction of the organic content within the garbage stream. To calculate the campaign’s success results from Dysart et al’s first municipal waste audit are required as a baseline measure. Integration of the audit findings in Fleming Colleges’s U-Links and Dysart et al Collaborative Research Project would extend aid and success of the program integration.

After the food waste reduction campaign, a follow-up audit will take place to further monitor the effectiveness of the project and what strategies can be used in the future. As mentioned in the survey results, the Region of Durham notes the most effective aspect of their RFWRS is the implementation of conducting ongoing waste audits to measure and merit the program's continuance. Additional audits during the program will monitor the program’s effectiveness. Continuous monitoring throughout the program will identify areas of weakness and strength, while a post-audit will measure the project’s total influence on reducing organics in landfills.

The success of existing programs at Dysart et al, such as the composting and FoodCycler programs, can be used as a mirror of success due to the complementary nature of these programs to food waste reduction. However, as with the pillars of sustainability, a balance must be present. Therefore, these complimenting programs should be monitored and measured in conjunction with one another as their success is interdependent and mutually beneficial towards reducing food waste.

Furthermore, a post-program residential survey will provide feedback from residents and allow for program improvements and adjustments. The post-program survey will provide insight into the program’s success from the resident’s perspective and better understand the psychological factors that influence behavioural change. All audit and survey results should be

made public to aid other municipalities in spreading awareness of residential food waste reduction

9 Recommendations

1. It is recommended to conduct the “I TASTE ZERO WASTE” campaign during both summer and winter seasons with an audit during the seasonal change. It is imperative to see how the campaign changes throughout the year as the population and weather in Dysart et al fluctuate. The region experiences severe cold weather conditions in winter. Therefore, it is beneficial to make final decisions after analyzing the program’s results as participation in composting programs may be reduced during colder months. The most important factors of the program results include the psychological reaction of residents to change, the acceptance rate of the change, how people contribute to the planned program, and the cost of implementing the promotional and educational plans.
2. As young age groups have been found to typically produce more food waste, the schools in Dysart et al can incorporate food waste reduction into their curriculum as it is helpful to instill these practices at young ages (grades three to eight) and incorporate them into their daily lives (Acheson, n.d.). An excellent extension of the program would be including a school community garden to help students learn the impact of growing their food, tasting it, and caring for it. It is also adequate support for mental health and well-being.
3. The Municipality of Dysart et al can complement the I TASTE ZERO WASTE campaign by continuing the use of clear bags when residents dispose of their waste at the waste disposal sites. Monitoring how much food waste is visible in the clear bags can assist in minimizing future food waste through social norms. The waste disposal sites can target how much food waste they will accept in the clear bags. Residents can then be charged a set fine for any amounts over the target percentage, as increasing disposal costs incentivize residents to follow the program. It is not advised that the transfer station discontinue the acceptance of organic waste as this may risk illegal dumping. The current limit of garbage disposal in Dysart et al is three bags of garbage per household at no cost. Encouraging residents to dispose of fewer bags and reduce the organic content of each bag could be rewarded by giving coupons and discounts provided by community partnerships such as the “Good Food Box” or grocery stores. Giving

incentives is a great way to boost participation within the community and reduce food waste.

4. The use of social media and the Dysart et al municipal website can serve as an effective way to implement change and promote educational content to all residents. It is recommended that an online pledge be available on Dysart et al's website to increase the accessibility of the #ITASTEZEROWASTE campaign. Additionally, the program's reach can be extended further through the use of social media apps such as Instagram (*See Appendix B for social media samples)*
5. Public areas including parks and the Haliburton County Farmers' Market are ideal spaces for Dysart et al to host a booth or hold a pop-up event providing information about the campaign and how residents can reduce their food waste. Dysart et al can also challenge other local municipalities to reduce food waste by hosting a challenge to see which community can produce less. Competition is an effective means of implementing community collaboration. Expanding the program to include a leftover recipe search through the use of the #ITASTEZEROWASTE campaign containing different uses for leftovers would further complement the educational guide the residents will receive.
6. Further research on the behavioural habits of Dysart et al's residents would deepen the specific understanding of planned behaviour among residents. A survey would be beneficial to discuss socio-demographics and their relation to behavioural change within Dysart et al. A behavioural analysis would provide a targeted assessment of areas of improvement within these behaviours and enable better use of behavioural change tools related to food waste reduction. The residential survey would provide supplemental information related to all waste streams as most reduction behaviours are transferable.

10 Conclusion

The proposal aims to reduce food waste in Dysart et al by assessing changes in the resident's consumption habits and in keeping with food waste reduction best practices. It is also focused on promoting and raising the residents' awareness about the importance of reducing food waste through introducing cost-effective and simple strategies. The research work included the existing plans and programs in several other municipal areas to learn what practices could be best for Dysart et al based on its characteristics. Also, more information was obtained through questioning food waste reduction planners in several municipalities via an online comprehensive and informational survey.

It is imperative to smoothly integrate and entice residents to contribute to the program while instilling a sense of responsibility for their role in society. The likelihood of success increases when residents perceive there are benefits for them to contribute. Therefore, introducing incentive rewards, facilitating access, conducting engaging events, and providing education to reduce household costs such as meal planning, proper food storage, and tangible instructions to increase food lifespan at homes are will contribute as motivational elements of success.

Various cost-effective and practically viable ways of communication, education and promotion surrounding food waste reduction have been introduced. It has been predicted that residents would learn through graphically attractive signs and posters. Proper means of communication have been defined for effective conveying of what the program initially aims at. Publicly favourable locations such as grocery stores have been introduced as the hotspots for advertising and knowledge distribution with non-profit involvement playing a crucial role in increasing the program's demographic reach.

The proposal is expected to show high efficacy in the area within mid-term and long-term periods of advertising and effective communication. At its early stages, it is suggested to get the word out about the program so residents become aware of the program and show some interest and curiosity to know the details. It is also predicted that the program will reduce food waste in the area in time. The permanent residents and the seasonal population at Dysart et al. consolidate in the program scope as the population is small enough to become impacted by a dominant culture of reducing food waste.

References

Acheson, C. (n.d.). Food waste: The student perspective - zero waste Scotland. *Food Waste: The Student Perspective*. Retrieved February 10, 2022, from https://www.zerowastescotland.org.uk/sites/default/files/Food%20Waste%20-%20A%20Student%20Perspective.pdf

About Our Food Future. (n.d.). *Food Future Kitchen Table*. Retrieved February 16, 2022, from https://foodfuture.ca/about-our-food-future

Arvanitoyanis, I. S. (2008). Waste Management for the Food Industries. *Academic Press*. Retrieved from https://www.sciencedirect.com/book/9780123736543/waste-management-for-the-food-industries#book-description

Barrera, E. L., & Hertal, T. (2021). Global food waste across the income spectrum: Implications for food prices, production and resource use | *Elsevier Enhanced Reader*. Retrieved from https://doi.org/10.1016/j.foodpol.2020.101874

Better Meets Reality. (2021, November 11). *Foods (& Crops) That Take The Most Water To Produce & Make*. Retrieved from https://bettermeetsreality.com/foods-that-take-the-most-water-to-produce-make/

Broad Leib, E. M., Ardura, A., Fink, B., Nitsche, J., Harding, A., Welsh, J., & Dodson, T. (2020, June). *Canada Legal Guide - Food Donation Law and Policy*. Retrieved March 16, 2022, from https://www.foodbanking.org/wp-content/uploads/2020/06/Canada-Legal-Guide.pdf

BCFN. (2012). Food waste: causes, impacts and proposals. *Barilla Centre for Food and Nutrition*.Retrieved from https://www.barillacfn.com/m/publications/food-waste-causes-impact-proposals.pdf

Carr. R (2017). Food is still ok to eat even after the expiration date - here's for how long. *Insider*. Retrieved from https://www.businessinsider.com/how-long-can-i-eat-food-expired-food-2017-4

Christian Mouysset 2019-06-10, Mouysset, C., Mouysset, C., 2019-06-10, Written by Christian Mouysset Graduating from Cambridge University in Computer Science, by, W., & Graduating from Cambridge University in Computer Science. (2020, November 17). Emerging technologies helping reduce food waste. *Lightspeed*. Retrieved February 24, 2022, from https://www.lightspeedhq.com.au/blog/food-waste-solutions/

County of Simcoe. (2002). *By-Law No. 4805.* Retrieved from *District of Simcoe*: https://www.simcoe.ca/ByLawEnforcement/Documents/Anti%20Dumping%20By-law%20No.%204805.pdf

County of Simcoe. (2013). *BY-LAW NO. 6256.* Retrieved from *County of Simcoe*: https://www.simcoe.ca/SolidWasteManagement/Documents/Waste%20Management%20By-Law.pdf

County of Simcoe. (2013). *Cottage Waste Collections.* Retrieved from *County of Simcoe*: https://www.simcoe.ca/SolidWasteManagement/Documents/SWM%20Seasonal%20Homes%20.pdf#search=seasonal

County of Simcoe. (2019). Solid Waste Management Strategy-2018 Annual Report. *County of Simcoe*. Retrieved from:

https://www.simcoe.ca/SolidWasteManagement/Documents/Solid%20Waste%20Management%20Strategy%20Annual%20Report.pdf

DCA. (August 31, 2018). Importance of Controlling Moisture in Food Production and Storage. *Dehumidifier Corporation of America*. Retrieved from https://www.dehumidifiercorp.com/blog/importance-of-controlling-moisture-in-food-production-and-storage/#:~:text=The%20presence%20of%20moisture%20and,moisture%20risks%20when%20storing%20food.

District of Simcoe. (2014). *Learning and Living Green*. Retrieved from *County of Simcoe*: https://www.simcoe.ca/SolidWasteManagement/Pages/LLG/What-is-the-LLG-Program.aspx

District of Simcoe. (2014). *Waste Education & Resources*. Retrieved from *County of Simcoe*: https://www.simcoe.ca/dpt/swm/education

District of Simcoe. (2014). *Waste Facilities*. Retrieved from *County of Simcoe*: https://www.simcoe.ca/dpt/swm/landfills

Dojchinovska, A. (2022). 20Aastonishing Canada Food Waste Facts. *Reviewlution*. https://reviewlution.ca/resources/food-waste-statistics/

Dou, Z., Toth, J. D., & Westendorf, M. L. (2018). Food waste for livestock feed: Feasibility, safety, and sustainability implications. *Global Food Security*, 17, 154–161. https://www.sciencedirect.com/science/article/pii/S2211912417301384

Dufferin County. (n.d.). Plan to Save: Food Waste Reduction. Retrieved February 21, 2022, from https://www.dufferincounty.ca/foodwaste

Durham Region. (2022). Garbage and recycling. https://www.durham.ca/en/living-here/garbage-and-recycling.aspx

Durham Region. (2022). Buy It, Eat It. Retrieved from https://www.durham.ca/en/living-here/buy-it-eat-it.aspx

Earth911. (2021). Electric Composters: Sustainability Win or Another Unnecessary Appliance?. *Earth911*. Retrieved from: https://earth911.com/home-garden/electric-composters-sustainability-win-or-another-unnecessary-appliance/

Federation of Canadian Municipalities. (n.d.). Funding opportunities | *FCM*. Retrieved March 2, 2022, from https://fcm.ca/en/funding

Food Waste Reduction - SWS. (n.d.). *Wellington County* https://www.wellington.ca/en/resident-services/sws-foodwastereduction.aspx

Food Waste and the Climate Crisis. (n.d.). Retrieved from *ExtraFood*: https://extrafood.org/the-need/food-waste/

Food waste, the environment + Climate Change. (2022). *CEC.* Retrieved from: http://www.cec.org/flwy/food-waste-climate-change/

Food waste toolkit, *Sustain Ontario*, 2016. Retrieved from: https://sustainontario.com/custom/uploads/2016/08/FoodWasteToolkit_SustainOntario_2016.pdf

GardenMyth. (2021). Electric Composters – An Eco Win or Unnecessary Appliance?. Retrieved from: https://www.gardenmyths.com/electric-composters/

Geffen, L. van, Herpen, E. van, & Trijp, H. van. (2019). Household Food Waste—How to Avoid It? An Integrative Review. *Food Waste Management Solving the Wicked Problem*, 27–55. Retrieved from: https://www.researchgate.net/publication/335610119_Household_Food_Waste-How_to_Avoid_It_An_Integrative_Review

Gottfried, A., Frank, J., Shulman, T., & Yang, W. (2015, August). Residential Food Waste Prevention. *British Columbia Ministry of the Environment*. Retrieved February 16, 2022, from https://www2.gov.bc.ca/assets/gov/environment/waste-management/organic-waste/food_waste_reduction_toolkit.pdf

Government of Canada. (n.d). Safe food storage. Retrieved from: https://www.canada.ca/en/health-canada/services/general-food-safety-tips/safe-food-storage.html

Government of Canada. (2022). Date Labelling on pre-packaged foods. Retrieved from https://inspection.canada.ca/food-label-requirements/labelling/consumers/date-labelling/eng/1332357469487/1332357545633

Government of Canada. (2022). An Overview of Community-Based Social Marketing. Retrieved from:https://www.nrcan.gc.ca/energy/efficiency/communities-infrastructure/transportation/municipal-communities/4401

Haliburton County CFA. (2015). Haliburton County: The Food System and official plans. Harvest Haliburton. Retrieved February 16, 2022, from http://www.harvesthaliburton.com/uploads/1/3/8/9/13895416/food_and_offical_plan_report__final_for_distribution.pdf

Hansen, J. (2018). *How to Grow Fruits and Vegetables from Table Scraps*. GardenTech.com. Retrieved March 1, 2022, from https://www.gardentech.com/blog/gardening-and-healthy-living/growing-food-from-kitchen-scraps

Heidari, A., Mirzaii, F., Rahnama, M., & Alidoost, F. (2020). A theoretical framework for explaining the determinants of food waste reduction in residential households: a case study of Mashhad, Iran. Environmental Science and Pollution Research, 27(7), 6774. https://doi-org.sandford.idm.oclc.org/10.1007/s11356-019-06518-8

Hu. S (20 July, 2020). Composting 101. *NRDC*. Retrieved from: https://www.nrdc.org/stories/composting-101#benefits

Irani, Z., Sharif, A. M., Lee, H., Topaloğlu, Z., van't Wout, T., & Huda, S. (2017). Managing food security through food waste and loss: *Small data to big data*. Computers; Operations Research, 98, 367–383. https://www.sciencedirect.com/science/article/pii/S030505481730271X

Importance of Methane. (2021, June 30). Retrieved from *EPA*: https://www.epa.gov/gmi/importance-methane

Jörissen, J., Priefer, C., & Bräutigam, K.-R. (2015). Food Waste Generation at Household Level: Results of a Survey among Employees of Two European Research Centers in Italy and Germany. *Sustainability*, 7(3), 2695–2715. Retrieved from: https://doi.org/10.3390/su7032695

Koivupuro, H.-K., Hartikainen, H., Silvennoinen, K., Katajajuuri, J.-M., Heikintalo, N., Reinikainen, A., & Jalkanen, L. (2012). Influence of socio-demographical, behavioural and attitudinal factors on the amount of avoidable food waste generated in Finnish households. *International Journal of Consumer Studies*, 36(2), 183–191. Retrieved from: https://doi.org/10.1111/j.1470-6431.2011.01080.x

LaMorte, W. (2019, September 9). The Theory of Planned Behavior**.** *Boston University School of Public Health*. Retrieved from https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/BehavioralChangeTheories3.html

Lipsitz, A., Kallmeyer, K., Ferguson, M., & Abas, A. (1989). Counting on blood donors: Increasing the impact of reminder calls. *Journal of Applied Social Psychology*, 19, 1057–1067. Retrieved from: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1559-1816.1989.tb01239.x

Love Food Hate Waste (2017). FOOD WASTE IN THE HOME.*Love Food Hate Waste Canada* Retrieved from: https://lovefoodhatewaste.ca/about/food-waste/

Love Food Hate Waste Canada. (n.d.). *FRIDGE GUIDE.* Retrieved from *Love Food Hate Waste Canada*: https://lovefoodhatewaste.ca/keep-it-fresh/fridge-guide/

Lundqvist J, F. C. (2008). Saving Water: From Field to Fork — Curbing Losses and Wastage in the Food Chain, SIWI Policy Brief. Stockholm: *Stockholm International Water Institute*. Retrieved from: https://www.researchgate.net/publication/42765864_Saving_Water_From_Field_to_Fork_Curbing_Losses_and_Wastage_in_the_Food_Chain

Machate, M. (2021, April 21). Chapter: Reflections on the Influence of Family Demographics on Food Waste Generation among the City of Tshwane Households, Republic of South Africa. *IntechOpen*. Retrieved from: https://www.intechopen.com/chapters/73477

MCFA. (n.d.). About the MCFA | *Mitsubishi Corporation Foundation for the Americas*. Retrieved March 2, 2022, from https://www.mitsubishicorp.com/us/en/mcfa/about.html

Miller. S (2019). Electric Composters: What Are They and How Do They Work?. *Foodcycler*. Retrieved from: https://www.foodcycler.com/post/electric-composters-what-are-they-and-how-do-they-work

Mondéjar-Jiménez J-A, Ferrari G, Secondi L, Principato L. (2016). From the table to waste: an exploratory study on behaviour towards food waste of Spanish and Italian youths. *J Clean Prod*.138: 8-18. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S0959652616306862

Mooth, B. (2014). Don't throw that away! 10 creative ways to use leftovers. I *Value Food*. Retrieved February 16, 2022, from https://ivaluefood.com/resources/cooking-eating/creative-ways-to-use-leftovers/

Nikkel, L., Maguire, M., Gooch, M., Bucknell, D., LaPlain, D., Dent, B., Whitehead, P., Felfel, A. (2019). The Avoidable Crisis of Food Waste: Roadmap; *Second Harvest and Value Chain Management International*. Retrieved from https://secondharvest.ca/wp-content/uploads/2019/01/Avoidable-Crisis-of-Food-Waste-The-Roadmap-by-SecondHarvest-and-VCMI.pdf

Ontario. (2018). Ontario's Food and Organic Food Waste Framework: Action Plan. *Ontario.* Retrieved from https://files.ontario.ca/food_and_organic_waste_framework.pdf

Ontario. (2018). Ontario's Food and Organic Food Waste Policy Statement. Ontario. Retrieved from https://files.ontario.ca/food_and_organic_waste_policy_statement.pdf

OWMA. (2021, January). State of Waste in Ontario: Landfill Report. OWMA. Retrieved from https://www.owma.org/down/eJwFwQEKgCAMAMAXqeGmab!ZKynKlDYIen13u!qQxTk5rlOUHrUClhp9@aZXLPfmphQjUkbDgNVggs0UzMVA8Jl59gF8tGOtP8LsF0U=/OWMA20Landfill%20Report%202021%20_FINAL_lowres.pdf

PROOF. (2020, March 11). More Canadians are food insecure than ever before - and the problem is only getting worse. PROOF Food Insecurity Policy Approach. *PROOF Food Insecurity Policy Research.* Retrieved from https://proof.utoronto.ca/more-canadians-are-food-insecure-than-ever-before-and-the-problem-is-only-getting-worse/

Quested, T., & Johnson, H. (2009). Household Food and Drink Waste. Banbury: *WRAP*. Retrieved from https://wrap.org.uk/resources/report/household-food-drink-waste-people-focus

Region of Durham. (2022). Region of Durham Long-Term Waste Management Plan. Retrieved from https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_LTWMP_FINAL_Jan-31-2022-AODA.pdf

Region of Peel. (2022). *Collection schedules*. Retrieved from https://peelregion.ca/waste/collection-schedules/#collection-moving

Region of Peel. (2022). *Compost*. Retrieved from https://peelregion.ca/waste/compost/#compost-buy-composter

Region of Peel. (2022). *Learn how to save up to $112/month*. Retrieved from https://peelregion.ca/articles/christmas-food-waste.asp

Region of Peel. (2022). *Organics*. Retrieved from https://peelregion.ca/waste/organics/#reduce

Region of Peel. (2022). *Teach Green in Peel - Search*. Retrieved from https://peelregion.ca/conservation/teachgreen/advancedsearch.asp?t=1

Region of Peel. (2022). *Waste education resources*. Retrieved from https://peelregion.ca/environmental-education/waste

Riley, G. L. (2016). Food Waste : Practices, Management and Challenges. *Nova Science Publishers, Inc*. Retrieved from https://novapublishers.com/shop/food-waste-practices-management-and-challenges/

Robbins. O (2019). Food Storage and Preservation: Why it Matters and How to Do it Properly. *Food Revolution Network*. Retreived from https://foodrevolution.org/blog/food-storage-food-preservation/

Roe, B. E., Apolzan, J. W., Qi, D., & Martin, C. K. (2020). Selection, intake, and plate waste patterns of leftover food items among U.S. consumers: A pilot study. *PLoS One*, 15(9). Retrieved from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0238050

Rotary Club of Haliburton. (n.d.). *Home Page | Rotary Club of Haliburton*. Retrieved March 2, 2022, from https://portal.clubrunner.ca/201/

Santeramo, F. G., Lamonaca, E. (2021). Food Loss–Food Waste–Food Security: A New Research Agenda. *Sustainability 2021*, 13(9). Retrieved from https://www.mdpi.com/2071-1050/13/9/4642

Saasha Celestial, T. C. (n.d.). THE PROBLEM OF FOOD WASTE. Retrieved from https://olioex.com/food-waste/the-problem-of-food-waste/

Schanes, K., Dobernig, K., Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications. *Cleaner Production*, 182, 978–991.Retrieved from https://www.sciencedirect.com/science/article/pii/S0959652618303366

Scientific American (2010). Trashing Gardens: Is There a Way to Use Compost without Attracting Unwanted Critters?. Retrieved from https://www.scientificamerican.com/article/earth-talk-trashing-gardens/

Silva, J. G. (2016, August 10). Food losses and waste: a challenge to sustainable development.Retrieved from *Food and Agriculture Organisation of the United Nations*: https://www.fao.org/save-food/news-and-multimedia/news/news-details/en/c/429182/

Statistics Canada. (2017) *Census Profile*. 2016 Census. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released November 29, 2017. Retrieved from https://www12-2021.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3546024&Geo2=CSD&Code2=6103097&SearchType=Begins&SearchPR=01&B1=All

Statistics Canada. (2022) *Census Profile*. 2021 Census. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released February 9, 2022. Retrieved from https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?DGUIDlist=2021A00053546024&GENDERlist=1&HEADERlist=0&Lang=E&STATISTIClist=1&SearchText=Dysart+et+al

Stefan V, van Herpen E, Tudoran AA, Lähteenmäki L. (2012). Avoiding food waste by Romanian consumers: the importance of planning and shopping routines. *Food Qual Prefer*.; 28: 375-381. 10.1016/j.foodqual.2012.11.001

Sun, A. (2018, June 28). Waste away: why taking home leftovers is as bad as throwing away scraps in a restaurant. *South China Morning Post*. Retrieved February 3, 2022, from https://www.scmp.com/lifestyle/food-drink/article/2152671/waste-away-why-taking-home-leftovers-bad-throwing-away-scraps

TD FEF. (n.d.). *Environmental Grants & Funding for Environmental Projects | TD FEF*. Retrieved February 27, 2022, from https://www.td.com/ca/en/about-td/ready-commitment/funding/fef-grant/

The Dry Utility. (2021). HOW MUCH WATER DOES IT TAKE to make your favourite foods? Retrieved from https://dryutility.info/wp-content/uploads/2020/05/Food-water-challenge-Answers.pdf

The World Counts. (2022). *Tons of Food Lost or Wasted*. Retrieved from https://www.theworldcounts.com/challenges/people-and-poverty/hunger-and-obesity/food-waste-statistics/story

TooGoodToGo.(n.d). Understand Food Labels & Expiration Dates. Retrieved from https://toogoodtogo.com/en-us/movement/households/understand-food-labels-expiration-dates

Town of View Royal. (2017, January). *BYLAW NO. 745, 2009.* Retrieved from https://www.viewroyal.ca/assets/Town~Hall/Bylaws/745%20Collection%20&%20Disposal%20of%20Residential%20Garbage%20&%20Household%20Food%20Waste%20consolidated-.pdf

UNEP. (2022). Food Waste Index Report 2021. *UNEP.* Retrieved from https://www.ipsnews.net/Library/2021/03/2021-UNEP-Food-Waste-Index-Report.pdf

USDA. (October 19. 2020). How Temperatures Affect Food. *United States Department of Agriculture*. Retrieved from https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/how-temperatures-affect-food

Wilkinson. A (2021). The lie of “expired” food and the disastrous truth of America’s food waste problem. *Vox*. Retrieved from https://www.vox.com/22559293/food-waste-expiration-label-best-before

Wijewardana, N., Galagedara, L., Mowjood, M. I. M. (2012, January). Schematic diagram of landfill design [11] | download ... GprMax2D Modeling to Identify Contaminated Areas in Groundwater with Landfill Leachate. Retrieved February 14, 2022, from https://www.researchgate.net/figure/Schematic-diagram-of-landfill-design-11_fig1_234840428

WRAP. (2009). Household food and drink waste in the UK: Final report. *Wastes & Resources Action Programme (WRAP)*. Retrieved from http://www.wrap.org.uk/downloads/Household_food_and_drink_waste_in_the_UK_-_report.8438d59b.8048.pdf

York Region food network. (n.d.). Good Food Box. Retrieved March 2, 2022, from https://yrfn.ca/programs/good-food-box/

York Region Food Network. (n.d.).. The Good Food Challenge. Retrieved February 21, 2022, from https://yrfn.ca/the-good-food-challenge.

APPENDIX A

Promotion & Educational Materials

Figure 1: “I TASTE ZERO WASTE” Poster

Figure 2: Promotional Pin

Figure 3: Promotional Magnet

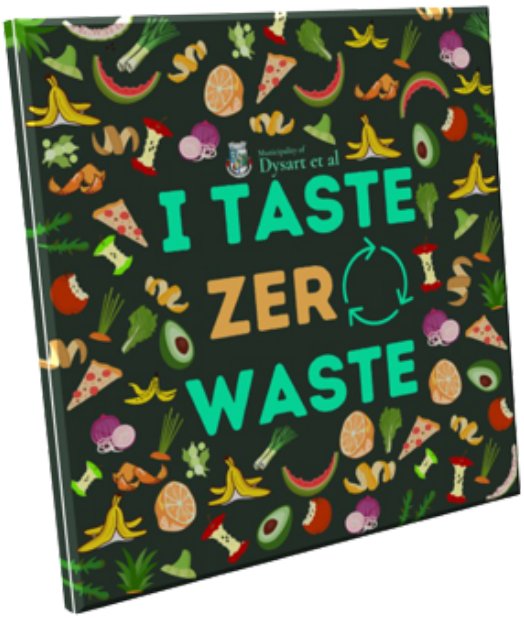
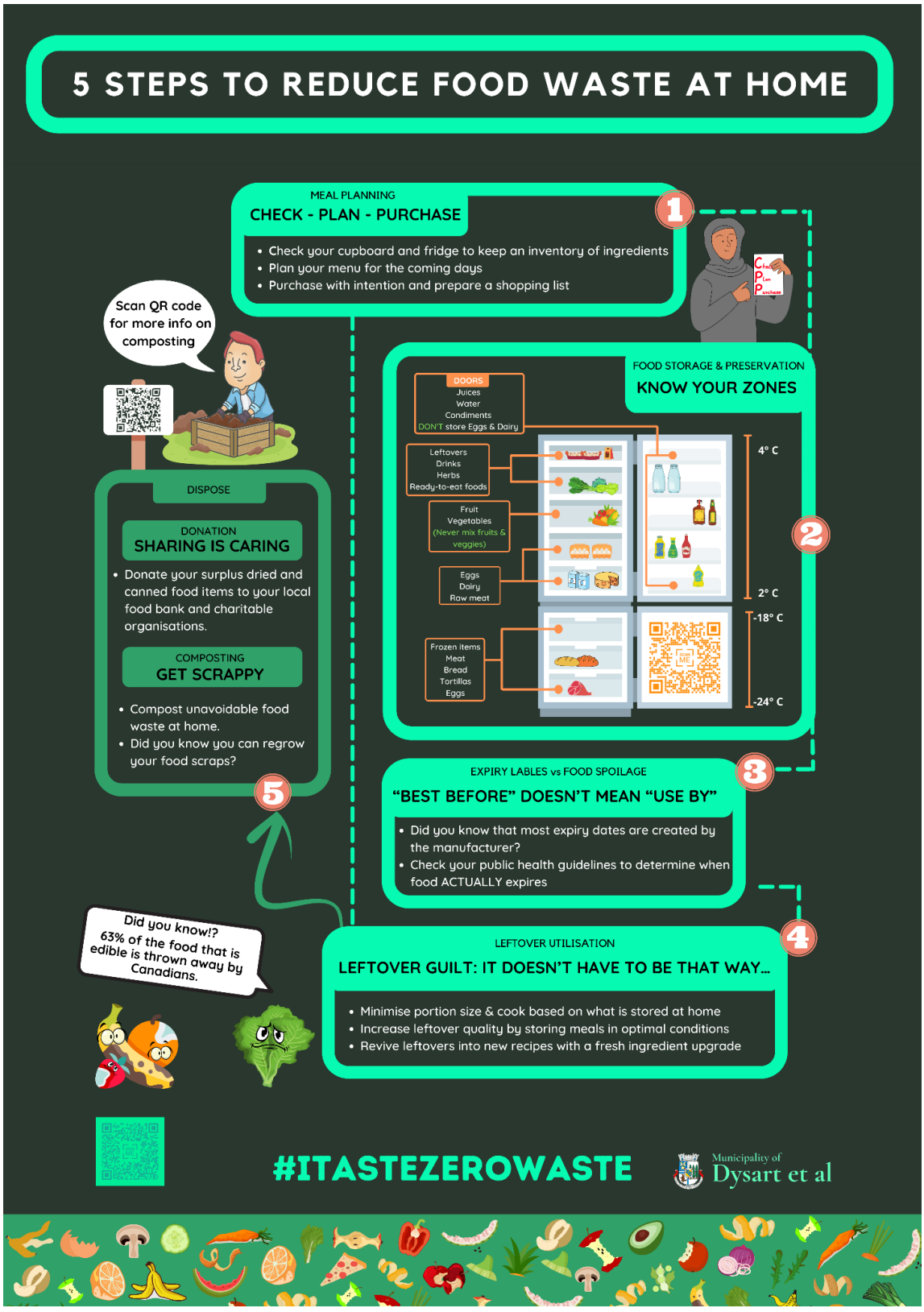


Figure 4: Educational Pamphlet



APPENDIX B

Social Media Samples

Figure 1: Social Media Sample One

Figure 2: Social Media Sample Two

2017 National Zero Waste Council