

Major Research Paper

A UK Case Study: What Canada can learn from their consumer food waste policies

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ABSTRACT

Food loss and waste (FLW) is a problem in Canada, where consumers and households generate one of the largest sources of avoidable food waste. The United Kingdom (UK) is a leader in addressing consumer food loss and waste through government policies and programs. For Canada to learn from the UK's consumer food waste policies, I conducted a systematic literature review of the academic and grey literature in addition to government documents. Through my case study, I compared the landscape of the UK's FLW policies and programs to that of Canada and provided recommendations that could be harnessed by the Government of Canada to address this issue. Recommendations included providing consistent federal funding to national waste reduction councils and organizations, creating monitoring and evaluation frameworks during foundational policy development, linking FLW reductions to climate change ambitions and investing in behavioural science research.

KEYWORDS: UK, Canada, food loss and waste (FLW), consumer behaviour, circular economy, public policy and programs

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List of Abbreviation

<i>Abbreviation</i>	<i>Definition</i>
BCI	Behaviour Change Intervention
CCME	Canadian Council of Ministers of the Environment
CFIA	Canadian Food Inspection Agency
COIL	Circular Opportunity Innovation Launchpad
Defra	Department of Environment, Food & Rural Affairs
DG SANTE	Directorate-General for Health and Food Safety
EAP	European Action Programme
EC	European Commission
EC-JRC	European Commission's Joint Research Centre
FLW	Food loss and waste
FUSIONS	Food Use for Social Innovation by Optimising waste prevention Strategies
NZWC	National Zero Waste Council
PARCA	Program of Applied Research on Climate Action in Canada
RAF	Resource Action Fund
SAS	Sustainable Agricultural Strategy
SDG	Sustainable Development Goals
SEPA	Scottish Environment Protection Agency
WRAP	Waste & Resource Action Programme

1. INTRODUCTION

Background

Global and Canadian Food Systems

According to the OECD (2021), the term ‘food systems’ refers to “all the elements and activities related to producing and consuming food, and their effects, including economic, health, and environmental outcomes.” Similar to the OECD, the Food Policy for Canada says that food systems include the way food is produced, processed, distributed, consumed, and disposed (AAFC, 2019). They have direct impacts on the lives and well-being of Canadian communities, including Northern and Indigenous communities, public health, environmental sustainability and our economy.

Global food systems are currently facing a triple long-term challenge. First, food systems must provide nutritious food security to a growing population, which is expected to reach nearly 10 billion by mid-century (OECD, 2021). Globally, around 2 billion people do not have access to sufficient nutritious foods while obesity is growing (OECD, 2021). Second, the repercussions of Covid-19 are placing pressure on the lives of people working on 570 million farms and at various stages in the food supply chain (OECD, 2021). Lastly, the environmental damages due to food production are staggering, with 80% of all threatened terrestrial bird and mammal species further endangered by agricultural expansion, causing loss of habitat (OECD, 2021). In addition to the harmful impacts on air, soil and water quality, 21-37% of anthropogenic greenhouse gas emissions are caused by pre and post food production activities (OECD, 2021).

Canada’s food systems are one of the most important economic sectors in the country. In 2020, our food systems generated \$139 billion in GDP (7.4% of Canada’s total GDP) and

created 2.1 million jobs, equating to 1 in 9 jobs (AAFC, 2022a). Furthermore, Canada is one of the world's largest food exporters, exporting food to the United States and China while increasing sales to Asia and Europe (AAFC, 2022a). In 2021, Canada exported approximately \$82.2 billion in food and agricultural products such as raw agricultural materials, fish and seafood and processed foods (AAFC, 2022a).

This contribution comes at a cost, where 10% of the country's greenhouse gas emissions come from crop and livestock production (AAFC, 2022b). A large portion of greenhouse gas emissions from the agricultural sector is generated in the Prairie provinces, "representing 64% of Canada's agricultural emissions and over 6% of Canada's total emissions" (IISD, 2021). Compounding the issues within global and domestic food systems, food loss and waste presents another challenge to Canada's environmental problems.

The Problem

Food Loss and Waste (FLW)

Roughly 35.5 million tonnes of food is wasted in Canada, accounting for 58% of all food produced in the country (SPI, 2021). Of the 35.5 million tonnes of food wasted, 32% is considered avoidable food waste that has yet to be consumed, valued at \$49.46 billion (SPI, 2021). The largest source of avoidable food loss comes from manufacturing (23%), household (21%) and processing waste (20%) (SPI, 2021). Of the household food waste generated in Canada, 63% could have been consumed, costing the average Canadian household \$1,300 per year (Love Food Hate Waste, 2020). Reducing avoidable FLW in Canada can lead to a 4% reduction in Canada's greenhouse gas emissions stemming from organic waste, largely food waste, from landfills (SPI, 2021). Addressing FLW in Canada can help alleviate food security

pressures on the growing population while reducing environmental impacts that express themselves in the areas of climate change, biodiversity loss, food waste and pollution.

Table 1 below outlines the causes of FLW across the North American food supply chain as well as within Canadian households and consumers:

Table 1. Causes of food loss and waste (FLW) in the North American food supply chain and amongst Canadian households and consumers.

Causes of Food Loss and Waste (FLW)	
North American Food Supply Chain (CEC, 2017)	Canadian Households & Consumers (ECCC, 2019)
<ul style="list-style-type: none"> • <i>Overproduction by processors, wholesalers and retailers;</i> • <i>Product damage;</i> • <i>Lack of cold-chain infrastructure (e.g.: refrigeration during transportation and storage);</i> • <i>Rigid food-grading specifications;</i> • <i>Varying customer demand; and</i> • <i>Market fluctuations.</i> 	<ul style="list-style-type: none"> • <i>Lifestyles - Over-purchasing, lack of meal planning, and limited use of grocery lists</i> • <i>Spoilage due to improper storage</i> • <i>Concern for food safety and freshness - poor understanding of shelf life; confusing “sell by”, “use by”, “best before”, and “expiration” date labels</i> • <i>Eating preferences - willingness to store and eat leftovers, and the acceptability of eating food past peak freshness</i> • <i>Uninformed decisions - limited awareness of the costs and impacts of food waste</i>

Government FLW Policies

To tackle food-related opportunities and challenges and create a coordinated food-systems-based approach, the first food policy for Canada was established in 2019. The *Food Policy for Canada* has a vision that “All people in Canada are able to access a sufficient amount

of safe, nutritious, and culturally diverse food. Canada’s food system is resilient and innovative, sustains our environment and supports our economy” (AAFC, 2019).

Reducing FLW through prevention and diversion across Canada’s food systems is a key priority. The Government of Canada has invested over \$100 million in initiatives to prevent and divert food loss and waste, through programs such as:

- *Food Waste Reduction Challenge* – supports innovative business models and technological solutions
- *Low Carbon Economy Fund* – supports organics recycling infrastructure projects
- *Surplus Food Rescue Program* – redistributed eight million kilograms of food from disrupted supply chains to help meet growing demand at food banks and community food organizations during the Covid-19 pandemic (AAFC, 2022b).

The programs listed above align with the principles of the circular economy and demonstrate the Government of Canada’s commitment to advancing a circular food system. These initiatives provide a foundation and future opportunity for the federal government to further our actions in growing a circular food system in Canada. As discussed in Ghisellini and Ulgiati (2020), legislative and government support will be crucial in the early stages of implementing a circular economy in the food system to avoid creating barriers for consumers.

The Concept of the Circular Economy

The circular economy is a systems-wide alternative to our current linear economy which traditionally follows a ‘take-make-waste’ framework. The circular economy is based on three principles driven by design (Ellen MacArthur Foundation, 2022):

1. Eliminate waste and pollution

2. Circulate products and materials at their highest value
3. Regenerate nature

According to a publication by the OECD, “A circular economy aims to transform the current linear economy into a circular model to reduce consumption of finite material resources by recovering materials from waste streams for recycling or reuse, using products longer, and exploiting the potential of the sharing and services economy” (Agrawala, 2022, p. 36). The circular economy strives for resource efficiency and sustainable consumption and production, in alignment with UN Sustainable Development Goal (SDG) 12.

Changing our food system to reflect the principles of the circular economy can help to address the triple planetary crisis of climate change, biodiversity loss and waste and pollution while providing safe and nutritious food. This will entail regenerative food production that works with nature and eliminates food waste by redistributing surpluses of edible food and creating food products from food by-products and waste. An important issue lies within the behavioural sciences: research on consumer attitudes, the willingness to assume circular behaviors and how public policies can drive changes in consumer food waste.

Despite Canada’s recent efforts to address FLW through circular principles, many other nations have been moving further and faster on implementing circular food policies. The European Union (EU) and the United Kingdom (UK) have long established practices on circular food management and are early leaders on developing consumer food waste policies. This Major Research Paper reviewed the initial drivers, development and implementation efforts by the UK to reduce consumer food waste. The emphasis of this study will be the UK however, EU food loss and waste efforts were additionally reviewed because prior to Brexit in January 2020, both the UK and the EU were influential to one another’s policy development. The conclusions from

this review were used in a comparative analysis of Canada's consumer food waste policies and recommendations for Canada were drawn from and the EU and UK's approach to this issue.

2. DESIGN AND METHODOLOGY

Research Questions

In this paper, I focused on this overarching research question: What can Canada learn from UK consumer food waste policies?

The following sub-questions were addressed:

- How did the UK reduce food waste through behaviour change-based policies?
- What conditions are unique to the UK and which would be applicable to Canada?

Justification of Scope

I reviewed many countries as contenders for my case study including France, Norway, Japan, South Korea, Denmark and the United Kingdom. All these countries have unique approaches to reducing food waste in their country, for example through legal bans on food waste, education campaigns with regards to 'best before dates' and fees to discard food waste. After my preliminary research, I narrowed down my choice to Denmark or the UK, who have both shown significant reductions in their household food waste by focusing their efforts on consumer behaviours. In the end, I chose the UK as Denmark's success has been led by a non-governmental organization, *Stop Wasting Food*, while the UK's consumer behaviour research and food waste policy development has been led by and funded through the national government. I wanted to place focus on how Canadian public policies could be shaped by learnings from the UK's process and approach.

Methodology

I conducted a literature review and observed the best practices of a systematic literature review to the extent time permitted.

Search engines

The primary literature was retrieved through the University of Ottawa's library, accessed through *Omni*. After consulting a librarian at the University of Ottawa, they recommended I review literature through the multidisciplinary academic databases, *Web of Science*, *SCOPUS*, and *ProQuest*, which contained key journals from the sciences, social sciences and political sciences. These disciplines were reviewed in relevancy to food loss and waste, behavioural science and policies. Lastly, the websites *GOV.UK*, *Europa.EU* and *publications.gc.ca* were visited to locate official reports, policies, and other publications from the UK, EU and Canada for my review.

Types of literature

The review encompassed the academic literature and grey literature pertaining to consumer-focused food waste policies in the United Kingdom. To avoid bias, I set inclusion criteria of my reviewed sources, reviewing those that particularly focus on UK food policy stimulus, development process, integration and outcomes. I compared my case study to Canadian public policies on this topic, gathering information from the available academic and grey literature.

Scope

The scope of my literature review was defined by the following metrics, outlined by McKenzie et al. (2022) in the *Cochrane Handbook for Systematic Reviews of Interventions*:

- population,
- types of interventions, and the
- types of outcomes of interest

The population of interest was consumers and households generating food waste in the UK and Canada. The types of interventions were different public policy tools such as regulations, standards, pricing instruments, research investments, programs, funding etc. The types of outcomes of interest were the efficacy of consumer food waste policies in decreasing household food waste. This was evaluated based on change in food waste behaviour and the amount of food waste prevented.

This paper primarily focused on the United Kingdom's consumer food waste policies yet included a review of food loss and waste policies in the European Union as the UK and the EU were integral to each other's policy development prior to Brexit on Jan 31, 2020. The EU and UK worked closely together to make policy decisions that influenced each other's consumer FLW policies. For example, the UK's waste policies were mainly guided by the EU's Waste Framework Directive however, the responsibility was delegated to each Administration in the UK to develop their own food waste strategies (UK Parliament, 2016).

Search strings

I selected the search strings below inductively based on a series of preliminary searches and a preliminary reading of key literature. For each search string used, Web of Science would

often yield more results than SCOPUS and ProQuest however on average, each search resulted in about 10-150 hits. For my review presented below, I selected 20 recent academic sources from these journals based on their relevancy to the United Kingdoms' food waste policies and consumer programs. I created inclusion criteria of my reviewed sources, reviewing those that particularly focus on UK food policy stimulus, development process, integration and outcomes. I selected approximately 30 sources from the grey literature retrieved from government publication websites such as *GOV.UK*, *Europa.EU* and *publications.gc.ca*. To avoid selection bias, I gathered sources from a variety of resources to generate a comprehensive and diverse review of the literature. Some examples of search strings I used include:

- (United Kingdom OR UK) AND (food waste OR food loss) AND (policy)
- (United Kingdom OR UK) AND (food waste OR food loss) AND (public policy) AND (consumer)
- (United Kingdom OR UK) AND (food waste OR food loss) AND (public policy) AND (consumer behaviour) AND (circular economy)
- (United Kingdom OR UK) AND (WRAP) AND (food waste OR food loss)
- (European Union OR EU) AND (food waste OR food loss) AND (policy)
- (European Union OR EU) AND (food waste OR food loss) AND (public policy) AND (consumer)
- (European Union OR EU) AND (food waste OR food loss) AND (public policy) AND (consumer behaviour) AND (circular economy)

3. HISTORY OF FOOD LOSS & WASTE POLICIES

The European Union (2011-2022)

History of Resource Efficiency

The European Union (EU) was one of the pioneers of not only environmental and climate action but a front-runner in the circular economy. In 2011, the EU's *Roadmap to a Resource Efficient Europe* was released, where the food sector was identified as an area where resource efficiency could be improved (EU FUSIONS, 2016a). An aspirational goal was set by the European Commission to achieve 50% reduction of food waste and a 20% reduction in the food chain's resource inputs by 2020 (EU FUSIONS, 2016a). Finally, the need for a common EU strategy against food waste was brought forward in the 7th Environmental Action Programme (EAP) adopted in November 2013. The European Commission (EC) was then required to present a comprehensive strategy to address unnecessary food waste and work with Member States to achieve this ambition (EU FUSIONS, 2016a).

The EU's project *FUSIONS* (Food Use for Social Innovation by Optimising waste prevention Strategies, 2012-2016) helped the EU achieve a *Resource Efficient Europe* by food waste reductions. The goal of *FUSIONS* was to use social innovations such as new products, models and service ideas to meet social needs, creating new social relationships and connections (EU FUSIONS, 2016a). The aim of this project was to harmonize food waste monitoring and create a *Common Food Waste Policy* for EU27, utilizing behavioural change recommendations. This was accomplished through a European multi-stakeholder platform who created a comprehensive vision and strategy to prevent food loss and reduce waste along the whole supply

chain. The stakeholder platform included regulators, businesses, NGOs and knowledge institutes, with an integrated connection to consumer organizations (EU FUSIONS, 2016a).

UN Sustainable Development Goal 12: Reduce Consumption & Production

While the EU was developing its own waste management policies, it also adopted in 2015 the United Nations' 2030 Agenda for Sustainable Development. The Agenda outlines 17 Sustainable Development Goals that will help member nations achieve “peace and prosperity for people and the planet, now and into the future” (United Nations, 2015). Of the 17 goals, goal 12 is to “ensure sustainable consumption and production patterns”, where many countries have pointed to the circular economy to help in achieving this goal (United Nations, 2015). Under Goal 12 is SDG Target 12.3: “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses” (FAO, 2023).

In the EU's efforts to achieve Goal 12, the EU released *Closing the Loop: An EU Action Plan for the Circular Economy* in 2015. To support Target 12.3, the Communication on Circular Economy called on the European Commission to create a platform dedicated to food waste prevention (European Commission, 2015). In 2016, the *EU Platform on Food Losses and Food Waste* (FLW) was formed of EU institutions, experts from EU countries and international organizations, with the purpose of formulating food waste prevention measures, best practices and progress evaluation (European Commission, 2015). The Commission had committed to the following priorities to achieve Target 12.3 (European Commission, 2015):

- *Develop a common EU methodology to measure food waste and define relevant indicators. It will create a platform involving Member States and stakeholders in order to*

support the achievement of the SDG targets on food waste, through the sharing of best practice and the evaluation of progress made over time.

- *Take measures to clarify EU legislation relating to waste, food and feed and facilitate food donation and the use of former foodstuff and by-products from the food chain in feed production without compromising food and feed safety; and*
- *Examine ways to improve the use of date marking by actors in the food chain and its understanding by consumers, in particular the "best before" label.*

In addition to improving date marking for better consumer understanding, the Commission emphasized the need for national, regional and local awareness campaigns to positively influence consumer behaviours to reduce food loss and waste. To continue supporting the EU's transition to a circular economy and address the problem of overconsumption, the European Commission released *A New Circular Economy Action Plan* in 2020, which outlined a product policy framework that aims to make sustainable products mainstream, transform consumption patterns and create internal markets for high-quality secondary raw materials (European Commission, 2020c).

Circular Economy & Climate Change

In 2020, the EU approved the *European Green Deal*, a package of policy initiatives that will help the EU and their member countries achieve no net emissions of greenhouse gases by 2050. The EU has committed to this being accomplished through resource efficiency and decoupling economic growth from resource use, ensuring no persons are left behind in the

process (European Commission, 2020a). The *European Green Deal* is evidence of their belief that the circular economy is a strategic means to achieve their climate goals.

The *European Green Deal* emphasizes key sectors for action including climate, energy, environment and oceans, transportation and agriculture. With the growing understanding of the environmental and economic damage caused by food waste, there is growing unanimity from public and political parties that food waste must be addressed (De Laurentiis et al., 2020). In lieu of this problem, the *Farm to Fork Strategy* was proposed as a key pillar in the *European Green Deal*, with the goal of achieving fair, healthy and environmentally friendly food systems. To support the implementation of this strategy and the development of a sustainable food policy, a proposal was put forward for a legislative framework for sustainable food systems (European Commission, 2020b).

Of the total food wasted in the EU, 71% originates from households, food services and retail sectors while the remaining 29% stems from food production and processing (European Commission, 2021). To address the highest share of food wastage, the EC's Joint Research Centre (EC-JRC) established the European Consumer Food Waste Forum, a multi-disciplinary forum to address consumer food waste, in collaboration with the Directorate-General for Health and Food Safety (DG SANTE) (European Commission, 2022). This forum will feed into the work of the *EU Platform on Food Losses and Food Waste*. The objective of the forum is to gather data to offer evidence-based tools and recommendations and solutions to reduce consumer level food waste. The project will run for two years and expected outcomes include “review of evidence on drivers of consumer food waste and levers for behavioural change” (European Commission, 2022).

Consumer Awareness & Education Campaigns

Consumer focused interventions are essential to reducing total food waste as households generate over half of the total food waste in the EU. The *EU Platform on Food Losses and Food Waste* requires that all members participate in raising consumer awareness on food waste through campaigns, events and in-store actions (EU FUSIONS, 2016). Through these initiatives, consumers are educated about proper food storage practices and the impacts of food waste on the environment. Furthermore, consumers are taught how to interpret the difference between ‘use by’ and ‘best before’ dates to avoid discarding safe and edible foods (EU FUSIONS, 2016). Alternative terminologies for date labeling are being considered to avoid confusion and unnecessary food waste amongst consumers. There are efforts to integrate this messaging on FLW in school curriculums and professional trainings for food operators (EU FUSIONS, 2016; European Commission, 2021).

[The United Kingdom \(2007-2022\)](#)

Although the EU has been guiding member nations to adopt consumer food waste policies, the UK has been a leader on this issue. The UK government has implemented a number of policies and programs to invest in food waste research and behavioural science, consumer awareness, education and fund programs to innovate consumer food waste solutions. One critical program the UK has established is the Waste & Resource Action Programme (WRAP).

Waste & Resource Action Programme (WRAP)

In 2018, the UK generated approximately 9.5 million tonnes of food waste, equating to 25 million tonnes of greenhouse gas emissions and holds a lost value of £19 billion a year (WRAP, 2020a). Of this waste, 70% (6.6 million) was edible foods intended for consumption yet wasted by households and could have provided over 15 billion meals (WRAP, 2020a). In the UK, the most common food types wasted in the household by weight are fresh vegetables and salads, beverages and fresh fruit (WRAP, 2018a).

In December 2018, the UK Government published *Our Waste, Our Resources: A Strategy for England*, where they stated their stance on food waste saying it is “morally wrong, environmentally damaging, and costs money” (Department of Environment, Food & Rural Affairs (Defra), 2018). Recognizing the environmental, economic and social losses associated with consumer food waste, the UK has taken actions to reduce their food waste. The main proponent of change has been the Waste & Resource Action Programme (WRAP), the UK's main delivery body for government policy on waste and resource efficiency who work closely with the waste and circular economy unit in the government (Quested et al., 2013). WRAP is a registered charity operating in all four nations of the UK and receives the majority of their funding through the UK Government, the Welsh Government and the Northern Ireland Executive (Defra, 2018). In addition, they lead projects funded by the European Union, global organizations and businesses (Quested et al., 2013).

WRAP has been successful in delivering programs to reduce household food waste since 2006 (Quested et al., 2013). Between 2007 and 2012, the amount of edible food waste was reduced by 21% or 1.1 million tonnes, largely driven by WRAP's Love Food Hate Waste campaign (Government Office for Science, 2017a). Through their many efforts, WRAP has

concluded that the UK is on the right trajectory to meet the UN's SDG 12.3, assuming that plans continue to progress and move forward (WRAP, 2020b).

The *Courtauld Commitment 2030* is another innovative tool developed by WRAP to manage food waste. It is a voluntary agreement and supported by the UK government to reduce food waste, greenhouse gas emissions and water stress across the entire UK food chain (WRAP, 2020b). The agreement is between organizations across the entire food system. The Commitments food waste reduction goal is to reduce per capita food waste by 20% by 2025 and since its inception, “300 food businesses have committed to the *Food Waste Reduction Roadmap*, including all of the major grocery retailers” and “4.4m citizens changed behaviour as a result of seeing Food Waste Action Week 2022” (WRAP, 2020b). According to estimates, the UK is on track to meet the *Courtauld Commitment* by 2030 with ongoing initiatives and programs (WRAP, 2020b).

Love Food Hate Waste by WRAP

Love Food Hate Waste is a multi-faceted campaign launched in 2007 and operated by WRAP that works to enable citizen behaviour change and reduce food waste. It is another WRAP inspired tool that combines consumer education with technical programs related to food formulation, packaging and marketing (Quested et al., 2013; Spang et al., 2019). In developing a business case for consumer behaviour research, WRAP conducted a cost benefit analysis finding that for every £1 spent on influencing food waste reductions in the household, between £4.70 and £6.50 would be benefited to consumers (Government Office for Science, 2017a).

In the infancy of the campaign, there was a lack of awareness by households on the effects of food waste and a low mention of this issue in the media (Quested et al., 2011).

Therefore, the initial goal of the campaign was to raise awareness about the environmental and economic benefits of reducing food waste and enable personal conviction to act on this issue at home (Quested et al., 2013). They developed guidelines and recommendations, such as how to effectively use domestic freezers and plan portion sizes (Quested et al., 2013).

Recognizing that people have different barriers to reducing food waste in their homes, Love Food Hate Waste has been successful in delivering tailored engagement to citizens through ‘cascade training’. This type of training involves educating a group of people who then have the knowledge to train new groups, while considering individual barriers and needs. Research has shown this to be a cost-effective way to communicate these ideologies to a large number of people (Quested et al., 2013).

Food Waste Action Week is an annual citizen behaviour change campaign operated under Love Food Hate Waste. In 2022, the campaign reached over 8 million people in the UK with 55% of participants saying they did something to reduce food waste as a result. For 2023, the theme is ‘Win. Don’t Bin’ where the goal is to “demonstrate how valuable food is in our lives, how it unites people and how using up everything we buy saves money, time and the planet. The campaign aims to increase citizens confidence in ‘using up leftovers’ by promoting a range of skills that can be easily adopted but potentially have the greatest impact on reducing food waste in the home (WRAP, 2023).”

Food Waste Attitudes and Behaviours

WRAP has conducted numerous studies to understand the factors and drivers that will stimulate consumer food waste reductions. Firstly, they have found that the demographic of their audience has a significant influence on the narrative and approach they will use to influence

people's behaviour. Compared to the other segments of the population, where there are negligible differences in the amount of food waste generated, those over 65 years old generate approximately 25% less food waste than the rest of the population (Quested et al., 2013). Further investigation suggests that those over 65 years are not motivated to reduce their food waste for environmental reasons. Rather, this population believes that wasting anything, including food, is morally wrong (Quested et al., 2013). Moreover, this demographic is more propelled to reduce their food waste for the associated cost savings (Quested et al., 2013).

In addition to targeting strategic demographics, there are key feelings that can be harnessed in consumers to reduce their food waste. For example, guilt was found to play an important role in reducing food waste, where most people feel a sense of guilt when wasting food, impelling them to run a more efficient, waste-free home (Quested et al., 2013). Lastly, the time in someone's life in which they are engaged in food waste reduction will influence the success of the engagement. WRAP has found that when university students are engaged in this topic, they are more likely to adopt food positive behaviours that will persist into adulthood, as this is an impressionable time when they are forming new habits (Quested et al., 2013). In addition, there is opportunity to break bad food habits when people are going through a period of change such as retirement (Quested et al., 2013).

During the lockdown measures in place for the Covid-19 pandemic, the UK reduced their household food waste by one-third (WRAP, 2020c). From November 2019 to April 2020, food waste had fallen by 43% (WRAP, 2020c). As lockdown measures had begun to ease in the summer months, food waste began to slowly rise but remained below pre-lockdown levels. The Covid-19 pandemic promoted food waste reduction behaviours as more people were cooking from home (to save money and stay safe), reusing leftovers, planning their grocery lists,

conducting inventory on their food cupboards and using foods in the freezer (WRAP, 2020c).

The pandemic had presented key predictors of food waste, outlined by WRAP (2020c):

- **Demographics** – 18-34s are consistently more likely to report higher levels of food waste, as are those with younger children aged 0-10 at home.
- **Time pressure** – those who say they feel under more time pressure in their day-to-day life are significantly more likely to report higher levels of food waste.
- **Routines in flux and returning to ‘normal’ post-lockdown** – levels of food waste are notably higher among those who say their food shopping and preparation behaviours had returned to normal compared to those who say they have kept many of their lockdown behaviours. Likewise, levels of food waste were higher among those who had a change in working circumstances (e.g. furloughed, reduced hours, working from home) and had then returned to normal (compared to the same groups who had not yet returned to normal).
- **Displaced meals** – there is a strong association between food waste and displaced meals, with reported food waste higher among those who ate out or ordered takeaways

[UK Government Actions](#)

Scotland: An Early Mover on Food Waste Reduction

Households are the largest source of food waste in Scotland, generating 61% of all food wasted and costing over £1 billion each year (Zero Waste Scotland, 2019). Household food waste has been reduced by 5.7% between 2009 and 2014 (Zero Waste Scotland, 2016). Yet regardless of their initial efforts, Scottish households disposed of approximately 600,000 tonnes of food and drink waste in 2014 (Zero Waste Scotland, 2016).

In Scotland's continued pursuit to reduce food waste, the Scottish Government announced the *Making Things Last* strategy in 2016 that set a new ambitious target to reduce per capita food waste in Scotland by 33% (from 2013 levels) by 2025. This strategy was groundbreaking, being the first of its kind in Europe to make the connection between food waste, climate change and how a circular, resource efficient economy could be the solution to address these intersectional problems (Zero Waste Scotland, 2019).

The Scottish Government has created a Food Waste Hub that centralizes all food waste related issues and efforts in Scotland. This includes food waste prevention measures and the use of waste products for bio-resources. The Hub will unite and strengthen the efforts of key Scottish, UK and EU actors such as Zero Waste Scotland, Scottish Environment Protection Agency (SEPA), Food Standards Scotland, Scottish Research Institutes, and the Courtauld Commitment signatories (Zero Waste Scotland, 2019).

Scotland has invested in a range of initiatives and programs to achieve their ambitious targets on household food waste, focusing on consumer communication and behaviour change. For example, Scotland has launched a national campaign *Food Gone Bad* "to educate consumers on the environmental damage caused by food waste and encourage them to recycle unavoidable food waste" (Zero Waste Scotland, 2019). Moreover, Scotland has emphasized the need for audience-specific marketing and communication campaigns, based on the latest behavioural science research that suggests providing sustained messaging to different types of consumers (Zero Waste Scotland, 2019).

Government Funding

In 2022, the UK's Department of Environment, Food & Rural Affairs (Defra) announced the £18 million *Resource Action Fund* (RAF) “to support resource efficiency projects, with the goal of diverting, reducing, and better managing waste” (WRAP, 2022b). The RAF grants intended to address food waste prevention had three main purposes: “utilisation of surplus food; turning unavoidable food waste into valuable products; changing consumer behaviours” (WRAP, 2022b). The initiatives funded through RAF are expected to divert over 30,466 tonnes of food from being wasted and thus avoid over 122,588 tonnes of CO₂ emissions (WRAP, 2022b).

On January 30, 2020, the UK government announced £1.15 million of government funding to tackle household and supply chain food waste (Defra, 2020). The funding was presented to businesses and not-for-profits who supports the creative development of new interventions to change people's behaviours and transform food waste into valuable resources and products (Defra, 2020). The funds were awarded through two grant streams: *Citizen Food Waste Prevention* (total worth of £650,000) and *Value From Food Waste* pilot projects (total worth of £500,000). The government bestowed the responsibility of managing these grants to WRAP who has experience working with governments, local councils, businesses and citizens (Defra, 2020). The investment is evidence of the government's commitment to reducing food waste and is reconfirmed in the Environment Bill, where the UK restates their commitment to reduce their food waste footprint (Defra, 2020).

These three grant funds reflect the UK's commitment to the circular economy by supporting the '9Rs' circular economic framework: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover. These nine actions illustrate how materials can be used at their highest value to minimize waste and environmental impacts (Potting et al.,

2017). Engaging citizens in food waste reduction behaviour supports the idea of refusing and rethinking food waste by promoting food prevention behaviours. Furthermore, consumer food waste interventions can help reduce the amount of food waste generated. While investing in value from food waste supports repurposing, by taking former waste products and creating something of value.

The UK Government's Chief Scientific Advisor underscored the economic and environmental opportunity to support the circular bioeconomy by utilizing homogenous agri-food wastes to create new or existing products through new processes. These waste streams are estimated at £36 billion per annum and would lead to greater food system resiliency and less dependence on finite resources (Government Office for Science, 2017b).

Influencing behaviour through public policy

Behavioural economist Richard Thaler and legal scholar Cass Sunstein developed Nudge Theory in 2008, defining the intervention as “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives” (Zero Waste Scotland, 2020). Behavioural economics helps policymakers understand how people truly act, make decisions and with these insights develop effective solutions that coincide with policy priorities (Zero Waste Scotland, 2020).

In June 2020, Zero Waste Scotland embarked on a behaviour change approach by publishing a study titled *How to systematically trial behavioural interventions to change the common behaviours which contribute to the climate crisis: A case study on using the nudge technique to reduce food waste in a Scottish school*. From the learnings of the study, Zero Waste Scotland created a guide on how to use Nudge Theory in practice, providing recommendations

and advice to research practitioners. These include collecting baseline data to determine impact, understand your audience, be flexible, adaptable and reflective, consider ethical concerns, remember nudges are context specific and humans do not always act rationally and logically (Zero Waste Scotland, 2020).

England's Waste Strategy has a strong focus on using circular economy principles to guide their path forward. The Strategy emphasizes sustainable production, resource recovery and how consumers can take more considered action to reduce waste. With the proper policies, infrastructure and enforcement measures in place, consumers can begin to see waste as a resource and be nudged to make environmentally conscious choices. These steps will encourage people to adapt their long-term mindsets and attitudes towards waste (Defra, 2018).

In 2010, the Cabinet Office commissioned the Institute of Government to write a research report, exploring the applications of behavioural theory to public policy, with the hope of building capacity in influencing behaviour through public policy. This could be done through complementing established policy tools or creating new innovative interventions (Institute of Government, 2010). The Institute created MINDSPACE, a checklist of influences on our behaviour when making policy. The government continues to explore ways in which they can incentivize action amongst the public through the application of behavioural insights that complement conventional economic thinking. Behavioural science provides the government with a new lens to guide policy development and effectively create regulatory, market and communication tools (Defra, 2018).

4. KEY FOOD LOSS & WASTE RECOMMENDATIONS FROM THE UK

The UK has developed several policies and approaches to managing food waste such as the WRAP project and Love Food Hate Waste campaign. Since their implementation and a review of their effectiveness, the UK has presented a number of recommendations to strengthen consumer food waste reduction efforts. These include the following:

1) Re-evaluating the application of ‘best before’ and ‘open life’ (best used after certain days opened) labels has been cited as an effective way to reduce household food waste (WRAP, 2022a). Since the release of *The Courtauld Commitment 2030 Progress and Insights Report* (WRAP, 2022a), many large UK retailers have removed ‘best before’ dates from uncut fresh produce and ‘open life’ dates from hard cheeses and meats.

2) In addition, further investment into behaviour research and programming, such as WRAP’s programme of behaviour change intervention (BCI) provides a good opportunity to use behavioural science to overcome the causes of food waste such as lack of time to meal plan.

3) Increasing consumer education and awareness has helped to promote less wasteful food consumption behaviours. For example, delivering consumer advice on proper food storage, freezing, fridge temperatures, portion sizes and interpretation of best before dates. Furthermore, improved education to universities and schools on the value of food and the impacts of food waste on the environment will help create a conscious community (WRAP, 2020c). Lastly, there is a need to expand on the difference between food waste prevention versus participating in compost collection. Food waste prevention requires making conscious choices that will reduce food waste production while composting programs continue to generate waste and release harmful methane emissions through food decomposition (WRAP, 2020c).

5. MONITORING & EVALUATION OF FOOD WASTE POLICIES

To determine the efficacy of a consumer food waste policy, monitoring and evaluation frameworks should be established during policy development as a foundational element. This will ensure that the results of policy interventions will be measured and allow policy makers to ensure positive outcomes are being met and adjust as needed. International and EU monitoring measures have been created for policy review and assessment purposes.

International

To address the need for a standardized approach for food loss and waste measurement, the international *Food Loss and Waste Accounting and Reporting Standard* was established in 2016. This standard can be used across most organizations including government, businesses and NGOs. The following is a list of regional FLW quantification initiatives that comply with this international standard (Spang et al., 2019):

- EU FUSIONS project manual for European nations (EU FUSIONS, 2016b);
- Commission for Environmental Cooperation for businesses in Canada, Mexico, and the United States (CEC, 2018);
- UK Food Waste Reduction Roadmap and Toolkit (WRAP, 2018b);
- National Zero Waste Council of Canada's household food waste guide (NZWC, 2018a).

European Union

REFRESH is a program funded by the EU with the goal of achieving a resource efficient food and drink system across the entire food chain. In 2019, *REFRESH* released *Guidance for*

evaluating interventions preventing household food waste, with the intention of determining the efficacy of different methods to reduce household food waste in a variety of contexts. The term intervention refers to policies, campaigns, or changes to food packaging or products that are intended to reduce household food waste (Quested, 2019).

Three evaluation frameworks were developed to test the efficacy of different types of interventions: testing in controlled conditions, user experience and piloting with evaluation. Testing an intervention using a controlled condition would involve academic researchers who would conduct scientific comparisons between a control and intervention group. To yield accurate results, the conditions for the study would have to be as realistic as possible to mimic real world applications. Furthermore, this type of study may draw useful information for future research that pertains to processes, empirical impacts, economic costs, testing theories etc. (Quested, 2019).

User experience evaluation frameworks would involve user-experience practitioners testing and understanding how people interact with an intervention such as campaign material or food waste reduction technology or software. User experience testing presents flexibility, as it can be performed at any stage of the intervention design and often draws results focused on process evaluation and whether the intended intervention outcome was achieved. Moreover, user experience tests can be presented in a variety of ways such as “observing people interact with the intervention, interviews with testers and data relating to the intervention (e.g. amounts of food waste generated in tester’s home)” (Quested, 2019).

Lastly, evaluating through a pilot project involves testing the intervention on a small scale that allows researchers to see the strengths and weaknesses of an intervention in a realistic

setting. This is a low risk evaluation option that presents lower costs compared to a full-scale implementation effort (Quested, 2019).

EU *FUSIONS* has identified various policies in different sectors that might unintentionally present synergies or trade-offs to FLW policies. The potential spillover effects of FLW policies will likely influence policies in the agriculture, environment, and fisheries sector (Vittuari et al., 2015). Potential positive spillover effects have been suggested from achieving SDG 12.3 (Reduce food loss and waste), including helping to address “poverty (SDG 1), hunger (SDG 2), clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), climate action (SDG 13), life below water (SDG 14), and life on land (SDG 15)” (Wieben, 2016). Further research is needed to identify the potential trade-offs and unintended consequences on FLW policies to the environment, the economy and society (Spang et al., 2019).

To address the need for a standard approach to evaluate the performance of food waste prevention initiatives in an unbiased manner, the European Commission Joint Research Centre (EU-JRC) developed a reporting and evaluation framework to assess food waste prevention actions. The effectiveness of an action is defined as “the degree to which it was successful in producing the desired results, as defined by the objectives and related targets set upfront”, where the desired results can be measured in quantitative or qualitative targets (De Laurentiis et al., 2020). The evaluation framework functions as a calculator that can analyze a variety of food waste prevention interventions including avoiding the generation of food waste by nudging a behavioural change in citizens (De Laurentiis et al., 2020).

The calculator is a model supported by Microsoft Excel that is available online and intended for non-expert use. The purpose of the model is to help policymakers assess the net economic and environmental benefits and drawbacks from food waste prevention interventions.

The calculator is user friendly, requiring readily available input data while having the capacity to provide proxy data where data gaps are met. The following inputs are required to perform the calculation and analysis (Caldeira et al., 2019):

- *Country where the action takes place (EU countries only)*
- *Type of food waste prevention action (redistribution, consumers behaviour change, supply chain efficiency, or food waste prevention governance)*
- *Stage of the FSC where the food waste is prevented*
- *Cost of implementing the action*
- *Resources needed to implement the action (e.g. number of leaflets, kilometres of transport, electricity used)*
- *Waste treatment that would have been used if the food had been wasted*
- *Types and quantities of food items saved (choosing from a list of 32 food commodities)*
- *Economic value of the food items saved*

[Academic Reviews](#)

Although there are means to quantify the effects of food waste prevention measures, such as through the calculator created by the EU-JRC, researchers have predominantly relied on qualitative approaches to assess the policy impacts. For example, a study conducted by Vittuari et al., (2015) provided content experts with a survey to comment on the impacts of EU legislative acts pertaining to food loss and waste. Of the experts surveyed, they believed that communication efforts around the EU circular economy package were most impactful. Another study pertaining to consumer intentions of recycling found that civic duty and environmental responsibility were the key drivers to positive recycling habits, leading researchers to believe that

awareness campaigns focused on moral responsibility may be more effective than those focused on social pressures (Ferrara & Missios, 2012).

Despite the importance to tackle consumer food waste behaviours, including individual food purchasing practices, it is important to consider the “social, cultural, and structural drivers and pressures shaping the larger social phenomenon of food waste” (Hebrok & Boks, 2017). Although many consumers wish to avoid food waste, there are competing priorities such as food safety, convenience and time demands (Watson, 2012).

A review conducted by Aschemann-Witzel et al. (2017) looked at the success of existing food waste prevention measures and found that “collaboration between different stakeholders, correct timing, the involvement of people with the right competencies, the adoption of a positive focus, the suggestion of easy-to-implement solutions, and the large scale of operations are key factors in securing the success of food waste prevention measures”. Nonetheless, some scholars believe that the current methods of evaluation are not robust and fail to capture the true effectiveness of food waste reduction measures due to the lack of scientific evidence of effectiveness (Hebrok & Boks, 2017; Reynolds et al., 2019). There is a need for longitudinal studies that involve a large sample size (De Laurentiis et al., 2020). According to the Stöckli et al. (2018) review of consumer food waste interventions, they state that “interventions should be evaluated in a systematic manner, by using a framework that implements standardized definitions and measurement methods, addresses specific behaviours and behavioural change processes, differentiates between combined interventions (i.e., a campaign as a whole) and isolated interventions, and ensures evaluations of long-term effectiveness.”

6. FOOD WASTE POLICIES IN CANADA

Federal Actions

While not as leading or comprehensive as the UK approach to food waste reduction, Canada has developed its own initiatives. In December 2020, the Government of Canada released a plan for *A Healthy Environment and a Healthy Economy* that strives to achieve both environmental and economic goals for clean air, waste and long-term secure jobs. Outlined in this framework are three actions the federal government plans to take to support the agricultural sectors (Government of Canada, 2020):

1. Invest to support the development of transformative clean technologies and the adoption of commercially available clean technology over seven years
2. Set a national target for a reduction in emissions from fertilisers bringing emissions 30% below 2020 levels
3. Boost climate-smart agriculture under the current *Canadian Agricultural Partnership*

Initial funding of \$134.4 million that was allocated for short-term actions in 2019-2024 to support the *Food Policy for Canada* and address key gaps in four priority action areas within food systems (AAFC, 2019):

1. *Help Canadian communities access healthy food*
2. *Make Canadian food the top choice at home and abroad*
3. *Support food security in Northern and Indigenous communities*
4. *Reduce food waste*

In the area of food waste reduction, the Canadian federal government is encouraging stakeholders belonging to the food value chain to eliminate, reduce or repurpose food waste by

launching a *No-Waste Food Fund*. According to *Canada's National Pathways*, this fund will help the federal government make progress towards a circular economy (AAFC, 2022b).

Building from lessons learned from the *Food Waste Reduction Challenge*, the circular economy—through design—would reduce food loss and waste out of the system by preventing it at the source, recover waste for alternative uses and divert residuals from environmentally harmful waste streams. This fund would stimulate commercialized innovation and the adoption of technologies and practices that can eliminate, reduce, or repurpose food waste.

Agriculture and Agri-Food Canada is developing a Sustainable Agricultural Strategy (SAS) that will help set the direction for long-term actions in the agricultural sector by prioritizing the environment while providing healthy and affordable food that grows the Canadian economy (AAFC, 2023). The strategy includes circularity as one of the guiding principles, using agricultural waste as a resource and stating the importance of reducing food loss and waste. However, the Strategy does not mention any new federal efforts to address FLW in Canada (AAFC, 2023).

There are also other efforts being made amongst many Government of Canada departments to reduce food waste within their mandates and jurisdictional boundaries. A pillar in Health Canada's *Healthy Eating Strategy* is to increase food literacy of Canadians, help consumers to shop, and use food efficiently and thereby reduce household food waste (ECCC, 2019). Furthermore, the Canadian Food Inspection Agency (CFIA) is reviewing national regulations and requirements around date labelling and investing in educational campaigns to improve clarity and understanding of 'best before' and 'expiry' dates (ECCC, 2019). These endeavours will help to prevent unnecessary and premature disposal of edible and safe foods.

National Zero Waste Council

The National Zero Waste Council (NZWC) is a leadership organization promoting Canada's transition to a circular economy by advancing a national waste prevention agenda. NZWC works with provinces, municipalities, national governmental organisations (e.g.: Canadian Council of Ministers of the Environment - CCME), private and NGO stakeholder to promote domestic waste production that strengthens the Canadian economy (NZWC, 2023). The council has many areas of focus including circular economy, construction and demolition, product and packaging design, plastics, and food.

To help guide the direction of food loss and waste efforts in Canada, NZWC released *A Food Loss and Waste Strategy for Canada* in 2018. This strategy, which was developed in consultation with the Canadian agri-food sector, governments, and community organizations, calls for a systems approach that combines policy and practice with collaboration from all food system stakeholders (NZWC, 2018b). The strategy recommends four key action areas, one being the development of a national consumer campaign (ECCC, 2019). The National Zero Waste Council has led the adoption of Love Food Hate Waste Canada, a national consumer facing food waste campaign created by the UK's Waste Reduction Action Program (WRAP) that has shown to produce positive results in consumer food waste reduction (NZWC, 2023). The campaign delivers simple messaging through social media and in-store promotion by demonstrating how to properly store, economically use food, and thereby prevent unnecessary waste (NZWC, 2018b).

Circular Opportunity Innovation Launchpad (COIL) & Our Food Future

The Circular Opportunity Innovation Launchpad (COIL) is an innovation platform and activation network that helps businesses, not-for-profits, and social enterprises create and scale transformative ideas into sustainable, circular economy opportunities in the food and environment sectors (Our Food Future & COIL, 2023). COIL's programming and funding will be delivered in collaboration with the City of Guelph and the County of Wellington's initiative Our Food Future. In 2019, Guelph-Wellington was awarded \$10 million through Infrastructure Canada's *Smart Cities Challenge* to develop Our Food Future. Our Food Future is a regional effort operating in Ontario, working to create Canada's first sustainable and technology-enabled circular food economy (FedDev, 2021).

Between 2020-2022, Our Food Future and COIL made significant impacts on addressing food waste in the Guelph-Wellington region and supported circular food practices. Their impacts include recovering \$641,467 in value of edible food, developing 23 new products and services related to diverted food waste, upcycling or recycling 86,458 tonnes of food waste and upcycling 75,567 tonnes of food to new products (Our Food Future & COIL, 2023).

7. COMPARATIVE ANALYSIS: UK AND CANADA

National Public Policies

The European Union and United Kingdom have drafted and implemented key strategies, roadmaps, action plans, collaboration platforms and funding programs that state their intention and guide their direction on the circular economy, food loss, and waste. These include the EU's project *FUSIONS* (Food Use for Social Innovation by Optimising waste prevention Strategies,

2012-2016), *A New Circular Economy Action Plan*, *EU Platform on Food Losses and Food Waste (FLW)* and the *Citizen Food Waste Prevention* fund, to name a few.

In contrast, the majority of FLW policies and initiatives in Canada have been less ambitious rather than a focus, represented by the *Sustainable Agricultural Strategy* and the *Food Policy for Canada*, where the *Food Waste Reduction Challenge* is only briefly mentioned. More intentional direction set by the Canadian federal government on the circular economy and consumer food waste could help create cohesive efforts on these issues in Canada and avoid siloed efforts amongst provinces and territories, municipalities, private and non-governmental organizations and actors. A national circular economy strategy or roadmap could encompass efforts to reduce consumer food waste in Canada and guide domestic efforts on this issue. In doing so, it would highlight sectors with momentum and create investment opportunities while identifying policy gaps.

The federal government will need to work closely with provincial and territorial counterparts because jurisdictional complexities can arise and present difficulties for support and uptake of a federal strategy, action plan, or roadmap pertaining to the circular economy and food waste. The federal government should consider creating and nurturing collaboration between provincial and territorial waste councils. It is a practice seen in Zero Waste Scotland, where local agencies tailor their policies and programs to their region.

The UK government has announced its intention to incorporate behavioural interventions in public policy development through the MINDSPACE program. Likewise, the Canadian federal government has established a method to address consumer food waste reduction through behavioural interventions that involves using The Program of Applied Research on Climate Action in Canada (PARCA Canada). PARCA Canada utilizes insights and methods from

behavioural science to analyze and develop policies. This program was developed by Impact Canada, in partnership with Environment and Climate Change Canada and Natural Resources Canada, in September 2021. Impact Canada is a government-wide effort that helps departments adopt innovative funding approaches to deliver meaningful results to Canadians (Impact Canada, 2023).

National Waste Reduction Organization

Both the UK and Canada have established national waste reduction organizations responsible for managing and meeting waste targets in their country: Waste Reduction Action Programme (WRAP) in the UK and National Zero Waste Council (NZWC) in Canada. The United Kingdom's Waste Reduction Action Programme developed Love Food Hate Waste, the successful behaviour change campaign that was adopted nationwide by Canada's National Zero Waste Council in 2018. The launch of this program involved the collaboration of local, provincial and territorial governments, along with NGOs and national food retailers in Canada (NZWC, 2018b). The Love Food Hate Waste campaign has been successful through the use of consistent and persuasive messaging, amplified by their partner organizations, empowering Canadians to take action against household food waste (Love Food Hate Waste, 2022).

WRAP is committed to supporting Love Food Hate Waste Canada in their efforts through collaborative projects, such as their partnership with Hellmann's Canada. Working alongside a behavioral science firm in Toronto, Ontario, Hellmann's developed the *Fridge Night* program. This initiative revealed straightforward ways for consumers to view ingredients differently, resulting in positive behavioral changes that can save households money and reduce food waste by 33% (Hellmann's, 2021).

Both these organizations emphasize national waste reduction by working with stakeholders in all levels of government, businesses, NGOs and citizens. Their mandates both strive for a sustainable future by using the principles of the circular economy, which offer specific suggestions on changing the ways in which things are produced, consumed and disposed while also offering more global innovations in design and behavioral modification. However, there are also key differences in approach. While WRAP has focused their efforts on the climate crisis, NZWC's agenda has focused on maximizing economic opportunities for all Canadians. These differing approaches and choice of narrative may reflect each country's views on what is most effective in reducing FLW in their society.

Federal Investment

Waste Reduction Action Programme (WRAP) and National Zero Waste Council (NZWC) differ in the ways in which they are supported financially that affect the resources at their disposal. WRAP is funded by the UK federal government while NZWC is supported by a lower jurisdiction, in this case founded by Metro Vancouver and in collaboration with the Federation of Canadian Municipalities. Compared to WRAP, which was first established in 2000, the National Zero Waste Council is relatively new having been found in 2013. With WRAP's 13-year head start in producing waste reduction results, the NZWC can follow a similar path and is in position to make similar achievements, adopting campaigns successful to WRAP such as Love Food Hate Waste Canada. The federal government can help ensure the continued success of NZWC by providing long-term sustaining support similar to the UK government.

To date, Canada has taken approaches to address consumer food waste that are similar to the UK and is on the right path to achieving significant household food waste reduction.

However, much more can be achieved with more sustained funding and support. Based on the UK case study, I recommend Canada address consumer-driven food waste by providing further federal funding to domestic waste reduction organizations, developing policy monitoring and evaluation frameworks during policy development, creating connections to climate change targets, and investing in behavioural science and consumer research.

8. WHAT WE CAN LEARN FROM THE UK: RECOMMENDATIONS FOR CANADA

Federal Funding

From this case study, I conclude that a significant part of the federal role should encompass providing funding to Canadian NGOs to support their operational needs and further development. These organizations would include the National Zero Waste Council and Circular Opportunity Innovation Launchpad, who have proven to deliver successful consumer food waste reduction initiatives and campaigns and understands the regional needs that will bring about success. Similar to WRAP, the federal government would be well advised to entrust these organizations with leading, managing, and delivering federal funds to small and medium sized businesses and organizations working towards addressing food loss and waste in Canada.

Circular Opportunity Innovation Launchpad (COIL) is an emerging actor in food waste reduction in Guelph-Wellington, Ontario. This project presents Canada with a unique opportunity to address food waste through the circular economy. COIL is regionally focused and currently works as a business accelerator to help businesses shift to a circular economy by providing grant money to drive innovation. The organization is well positioned to support consumer food waste reduction efforts as they prioritize the food and environment sectors.

Furthermore, they are located in the Guelph-Wellington region in Ontario, a prominent agricultural hub in Canada. COIL has developed meaningful relationships with food stakeholders along the supply chain and can harness their network to support the reduction of household food waste in Canada. As stated in *Our Waste, Our Resources: A Strategy for England*, incentives, behaviour change campaigns and regulations can only go so far to address resource efficiency challenges in which market-ready solutions are not yet available (Defra, 2018). Investing in innovation will help address the lack of effective and scalable solutions to solve household FLW in Canada. COIL has the knowledge and resources to support businesses in finding circular solutions; however, government funding is essential to support COIL in mitigating the financial risks and uncertainties involved in investing in innovative solutions and circular business models.

Since COIL's inception, they have proven to be an important stakeholder in the Canadian circular economy situated in the food sector. However, their capacity to grow their organization to a national level is hindered by the limitations of their current funding. COIL is funded by a 5-year funding scheme provided by the Federal Economic Development Agency for Southern Ontario (FedDev, 2021). Due to the regional nature of their funding, COIL is unable to grow their operations outside of Southern Ontario even though they have hopes to create a national organization. Moreover, it is challenging to conduct long-term strategizing when the longevity and renewal of their funding is uncertain. Like the National Zero Waste Council, COIL would benefit from consistent funding from the government, whether that be provincial or federal support. Similar to how the UK government invested in WRAP to effectively deliver funding to food waste initiatives, the Government of Canada can take a similar approach in delivering funding to COIL and the National Zero Waste Council. Canada would benefit from both

organizations being federally funded, as NZWC envisions national food waste strategies and plans while COIL has the expertise to deliver food waste reduction at a regional or community scale.

[Investment in Monitoring and Evaluation](#)

Consistent measurement, monitoring and evaluation frameworks are essential in determining whether consumer food waste reduction initiatives are successful and if improvements need to be made. Although Canada can learn from the EU and UK's approach to food waste measurement, it may be unrealistic for Canada to directly adopt frameworks established in the EU and UK due to cultural differences, jurisdictional complexities, and differing geographies that uniquely affect the food system and supply chain in Canada. Therefore, investing in measurement tools that reflect Canada's food waste landscape should be a priority for Canadian policymakers. With good data and consistent methodologies for measurement, we can better understand the choices and motivational factors that lead to unnecessary household and consumer food waste and will allow us to design policy tools to address these behaviours (Love Food Hate Waste, 2018).

[Generating a Climate Case for FLW Action](#)

The UK has presented consumer food waste reduction efforts as a means to achieve their national environmental and climate change goals. Many Canadian organizations have taken a similar approach, linking food waste reduction efforts to reductions in greenhouse gas emissions. It is important for the Government of Canada to identify and address unintended regulatory barriers and seek solutions that can enable climate-FLW synergies (NZWC, 2022). If the

Canadian government develops a comprehensive food waste policy, there will be added benefits to achieving Canada's net zero agenda and aligning with many Government of Canada departmental mandates. Connecting food waste reduction to Canada's climate targets and the potential benefits to our economy will provide a narrative and framing that will convince government officials, policymakers, private stakeholders and members of the public that food waste reduction is an important and pressing issue to address.

[Behavioural Science & Consumer Demographics](#)

According to the National Zero Waste Council (2022) the barriers to achieving behavioural and culture shifts around food waste in Canada are difficult to achieve because of a “lack of impetus for change; unsustainable eating habits; disconnect between consumers and the food system and cultural norms”. To understand the mechanisms that would address these barriers and motivate Canadians to reduce their food waste, greater funding towards behavioural science will be crucial in understanding how to effectively nudge consumers. The scope of research conducted by the Program of Applied Research on Climate Action in Canada (PARCA Canada) should begin to encompass consumer food waste attitudes and beliefs, to understand the policy levers and program tools that would help to effectively address food waste and thus climate action in Canada.

To maximize impact and inform strategic policy, it is advisable that the government conduct their own study on the impacts of demographics on food waste behaviours. If the UK and Canadian populations are found to act similarly concerning food waste behaviours, policies should be targeted to people between the ages of 18-34 as per WRAP's research findings. This particular age group is more likely to report higher levels of food waste along with those who

have young children aged between 0-10. It is important to tailor the narrative and incentives for reducing food waste according to the audience. In the context of a younger demographic, younger people who are motivated by climate change action can be better informed about the environmental benefits of reducing food waste. And in the context of an older population, people aged 65 or above can be better informed about the financial savings of reducing food waste, as highlighted in Quested et al.'s study (2013).

Federal Efforts and Interdepartmental Collaboration

The Government of Canada has already implemented similar initiatives undertaken by the UK government. This includes Environment and Climate Change Canada's efforts to outline key action areas that can help reduce household and consumer food waste. This includes developing consumer awareness campaigns, educational programs promoting food literacy for homes and schools, adjusting food packaging and portion sizes, and continuing efforts to reduce date labelling confusions (ECCC, 2019). One assessment of information campaigns suggested this approach to be a cost-effective option to address consumer food waste behaviours that could lead to a 15-33% reduction in food waste. However, the comfort of everyday routines and social habituation can make it difficult to adopt new long-term behavioural change (Spang et al., 2019). Additional research is needed to understand how people relate to food waste in their day-to-day lives (e.g., values, convenience, health and risk perceptions) and how larger social, cultural and structural drivers, and pressures such as purchasing norms influence consumer choices and waste behaviours (Spang et al., 2019).

Although it is important for the Government of Canada to address consumer food loss and waste in a variety of departments such as Agriculture and Agri-Food Canada and Health

Canada, a comprehensive and overarching strategy could help to centralize relevant work. In addition to the need for regular interdepartmental meetings these initiatives can benefit from an overall strategy that will bring together public servants with a variety of expertise to address this complex issue spanning many departments. Increasing coordination and collaboration across the government will prevent silos of work and better enable food waste-related policies to achieve mutually reinforcing goals. To address consumer food loss and waste, the Government of Canada must address horizontal considerations and engage various departments to address interdependencies and promote cross discipline collaboration.

9. CONCLUSION

Approximately 32% of edible food is wasted in Canada, valued annually at roughly \$50 billion (SPI, 2021). One of the largest sources of edible food waste is generated by households (21%) (Love Food Hate Waste, 2020). Reducing consumer and household food waste would provide environmental, economic, and social benefits and advance a circular economy in Canada. A key method in addressing consumer food waste is through consumer-focused behaviour change interventions influenced by public policy.

The UK has been a leader in consumer food waste reduction, with efforts being led by the successful Waste Reduction Action Program (WRAP), funded by the UK government. In the programs first five years, the organization achieved a 21% reductions of edible food waste through their consumer behaviour campaign, Love Food Hate Waste. Although Canada has taken similar actions as the UK to address consumer FLW, Canada can learn from the UK's success and evaluate recommendations that would help Canada achieve similar goals.

This paper has argued that Canada should consider providing consistent federal funding to national waste reduction organizations such as the National Zero Waste Council (NZWC) and the Circular Opportunity Innovation Launchpad (COIL) to build their capacity to deliver greater consumer FLW reduction through consumer programs. Furthermore, making the connection between consumer food waste reduction and climate change could lead to mutually reinforcing successes. Lastly, providing a stronger role for the behavioural sciences in policy development will ensure policies are tailored to the intended audience and where positive behaviours are adopted and favourable outcomes are achieved. More extensive research is necessary to comprehend the metrics and methodology required by policymakers that will guarantee the implementation of beneficial policies, rather than harmful ones, aimed at reducing food loss and waste (FLW) among Canadian consumers.

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APPENDIX – Response to second reader’s comments on the proposal

Proposal: *The circular economy is a systems-based solution to our current linear economy which traditionally follows a “take-make-waste” framework.*

- **Comment:** Not 100% clear on what this means. A reform of the system? A system-wide solution?
- **Response:** Reworded this sentence, using their suggestion, to enhance clarity.

Proposal: *This will mainly entail regenerative food production that improves natural capital and eliminates food waste by redistributing surpluses of edible food and creating food products from food by-products and waste.*

- **Comment:** May require an explanation - or avoid the jargon and simply state "environmental outcomes"...Agreed. Natural capital can mean many things
- **Response:** Rephrased the sentence to ‘This will entail regenerative food production that works with nature and eliminates food waste by redistributing surpluses of edible food and creating food products from food by-products and waste’.

Proposal: *Sources will be included if the data relates public policies, consumer behaviour and food waste. Variables under consideration will have a Canadian focus when possible. A source will be excluded if it is deemed irrelevant outdated*

- **Comment:** Please have a look at the design of a "systematic literature review". I don't think you can do that for a MRP, but I think it will inspire you to formulate literature search and selection criteria upfront. Spending an hour or two on learning this formal method will be worthwhile. And why not formulate a search string / strings here?...Agreed that the literature search needs structure (search strings)
- **Response:** Reviewed the design of a ‘systematic literature review’ and conducted a literature review observing the best practices of a systematic literature review to the extent possible with the time given for my Major Research Paper. I formulated and included search strings in my *Design and Methodology* section.

Proposal: Potential sampling biases may be present in the literature and sources I will be analyzing, as the sources may have biases and preference towards the implementation of a Canadian circular economy.

- **Comment:** I think you need some kind of a coding strategy. How will you handle the information coming from these sources? Coding is information management that allows

you to draw summaries & make comparisons across a diverse literature. Some discussion of how you will do that is required.

- **Response:** My supervisor and I discussed the option to code the literature using a software such as NVivo however we concluded that using coding software was not necessary for this type of research. Rather, we agreed I would use an inductive method to gather sources and informally group them based on the topic of relevance (e.g.: UK FLW policies, UK consumer behaviour policies, general consumer behaviours on FLW, Recommendations etc.)