# Investigating the behaviours and attitudes towards household food waste management in Scotland. Can we become more resilient and sustainable to achieve the Scottish Government 33% food waste reduction target by 2025?

**Amy Smyth**

Submitted in partial fulfilment for the

Degree of Master of Science

in Environmental Management.

School of Computing, Engineering and the Built Environment

Glasgow Caledonian University

Cowcaddens Road, Glasgow, G4 OBA

Supervisor: Professor Nicholas Hytiris

April 2021

Word Count: 14,996

*‘This dissertation is my own original work and has not been submitted elsewhere in fulfilment of the requirements of this or any other award’.*

# Abstract

Food waste is a profound detrimental problem not only within Scotland but across the globe. One third of the total food produced from human consumption, or £18 million-worth, was reported to be consequently wasted and thrown away each year before it had reached the ‘use by’ date. Moreover, 60% of this waste had come from households. Hence the reason why this project examined the various behaviours and attitudes of individuals that have impacted food waste management within the household sector. It was important that food loss and waste from earlier stages of the FSC also taken into consideration as these influenced the behaviours and attitudes found at the household consumption stage.

A questionnaire which consisted of 20 questions, both opened and closed type of questions, was issued to member of the public who participated by choice and conveyed why subsequent behaviours and attitudes occurred within their households. This determined the root of the problem and influencing factors that caused the generation of food waste. It was found that overall household food waste management attitudes and behaviours with Scottish households were deemed as **satisfactory**. Whilst there were exemplary efforts in place to mitigate food waste, there was still many challenges identified. Poor shopping habits and inadequate local authority collection services were identified as two main problems that contributed to Scotland’s household food waste problem. The 2018 Climate Change Plan and 2019 Food Waste Reduction Action Plan are two key management strategies, as well as many others identified within this project, that have been effective so far at combating this problem and driving change. New innovative ideas must be developed, however, to ensure individuals within Scotland become more resilient and sustainable and ultimately reach The Scottish Government’s 33% food waste reduction target by 2025.

# Acknowledgements

Firstly, I would like to personally thank my project supervisor, Dr Nick Hytiris for the support, guidance and encouragement to complete this project.

I would also like to thank my personal tutor and module lead of MSc Environmental Management, Professor Jim Baird, for all the engaging and insightful modules that have set me up for the career I wish to pursue to drive change in waste management and wider sustainability issues.

A special thank you to my family who have been through my highs and lows of online learning due to Covid-19.

I would not have got through this project without the constant support, encouragement and inspiration from my best friends Katie, Shannon and Lauren.

# Table of Contents

# Tables of Figures and Tables

| **List of Tables** | **Caption** | **Page Number** |
|---|---|---|
| **Table 4.1** | Personal difficulties foreseen by respondents when disposing of food waste at other ('Other' response from Figure 4.4). | **34 - 36** |
| **Table 5.1** | Six solutions individuals could enforce at home to reduce the production of food waste. | **49 - 50** |
| **Table 5.2** | Key targets and policies Tesco introduced to contribute to preventing and reducing food waste by consumers. | **53-54** |
| **Table 5.3** | Four basic pillars of the Save Food initiative. | **62 - 63** |

# Glossary

| Term | Definition |
|---|---|
| **FSC** | Food Supply Chain |
| **EfW** | Energy from Waste |
| **FAO** | The Food and Agricultural Organisation of the United Nations |
| **WRAP** | Waste and Resources Action Programme |
| **LDCs** | Least Developed Countries |
| **SDG** | Sustainable Development Goal |
| **GCC** | Glasgow City Council |
| **Mt** | Million Tonnes |

# Chapter 1: Introduction

## 1.1 Definition of Food Waste

Food waste is the accumulation of materials intended for human consumption, that instead, was subsequently lost, degraded, contaminated or discharged into the environment (Girotto et al., 2015) at various stages of the food supply chain (FSC): agricultural production, handling and storage post-harvest, processing, manufacturing and retailer distribution, and household consumption (Parfitt et al., 2010; Gustavsson et al., 2011). Thus, it was established that the term 'food loss' often overlapped and used alongside the term 'food waste' as it did not always occur at the final human consumption stage (Williams et al., 2015). The European Commission classified food waste in to three categories, the first being **food losses** during the production stage. The second category was reported as **unavoidable** food waste: fruit peels or cores and the third category was **avoidable** food waste: food that could have been eaten but was wasted (Thi and Kumar, 2015).

## 1.2 Drivers of Food Waste

The global population has been evolving and urbanising, people have become wealthier thus there is an increased demand for food, and this is only predicted to increase for the next 40 years. An increased demand for food meant an intensified use of resources and in conjunction with the interchanging environmental impacts, this inevitably created difficulties across the globe (Garnett, 2014). Several drivers as to why food waste occurred have been identified and perspectives varied between people and places. These drivers were culturally, personally, politically geographically and economically driven (Thyberg and Tonjes, 2016). Two profound issues regarding food waste were due to poor attitudes and behaviour within households, which often saw food of high quality either not consumed or discarded incorrectly, without consideration of the further problems this would create: neglience and a food waste crisis, which ultimately this project aimed to investigate and how consumers could become more sustainable within their own home by preventing and reducing food waste (Brian et al., 2013; Thi and Kumar, 2015).

## 1.3 Food Waste in Scotland

The Scottish Government strongly believed that too much food and drink was wasted across the FSC. Natural resources were depleted, and budgets were exhausted. Worryingly, 61% of this waste came from households, 25% from food and drink manufacturing sector and 14% from other areas of industry (Scottish Government [A], 2020). This accounted for approximately 1.35 Mt of food waste generated in Scotland each year. Consumption of food accounted for 20% of Scotland's carbon footprint. Thus, when food was wasted, the energy used for efficient and effective growing, harvesting, transporting, processing and preparation strategies was also wasted (Zero Waste Scotland, 2016). Furthermore, when food was sent to landfill it decomposed and generated toxic greenhouse gases, such as carbon dioxide which is detrimental to the environment. Food waste originated back to the farm, and links to what we now present on our plates. Therefore, this meant that everyone has the responsibility to play their part in reducing food waste within Scotland (Zero Waste Scotland, 2016). Scottish Water have played a key role to help divert household food waste from landfill. They built Scotland's first large-scale food waste recycling centre in Lanarkshire in 2010, which consisted of an anaerobic digestion plant and has already recycled more than 145,000 tonnes of food waste and converted it to green energy (Scottish Water, 2019).

## 1.4 Scottish Households

Food waste within Scottish households was identified as a significant problem it contributed to 60% of this problem which equated to approximately 600,000 tonnes, including avoidable and unavoidable food waste. It was established that two-thirds or more of this waste could have been eaten; costing £1 billion per year and half of the good food households disposed of had not been touched. Moreover, one in seven items were still found within its original packaging which has highlighted that people were not separating their disposed food correctly, raising issues that food waste packaging could also be a contributing problem (Zero Waste Scotland, 2016). Love Food Hate Waste Scotland is a campaign by Zero Waste Scotland have identified that food waste costs an average person £200 per year and each average household £460 per year. Thus, if each household used up what they bought and prevented throwing food away, £38 a month would be saved. Not only would this benefit an individual economically, it also reduced the potential detrimental social and environmental

impacts; it would contribute towards slowing down the rates of global warming and deforestation (Love Food Hate Waste Scotland [A], 2021). Shockingly, £18 million worth of this food was still in date when it was thrown, which in turn costs local authorities across Scotland £85 million per year to deal with. Targeted management strategies have been enforced to help fight food waste (Zero Waste Scotland 2016).

## 1.5 Management Strategies

Food waste is an evident problem within Scottish households that many key stakeholders were involved with to implement key policies and management strategies to reduce the amount of food waste generated. If each individual made small changes to their daily lifestyle and started making full use of the food they purchased; collectively this would make a significant difference to the world we live in, edging towards a leaner and greener planet (Love Food Hate Waste [A], 2021).

Over 1.5 million Scottish households have had access to a food waste collection services, which was a key approach to Scotland's environmental targets to increase sustainability and the green economy and ultimately reduce food waste (Zero Waste Scotland, 2016). Prevention policies were key to targeting consumers behaviours and attitudes to reduce and prevent food waste. These policies focussed on improving resource conservation, food security, environmental and economic costs of food waste and a just transition approach which encompassed sustainable practices within households (Thyberg and Tonjes, 2016) and these were implemented by The Scottish Government who have played a key role in the reduction of food wasted within households. Scotland's Climate Change Plan produced in 2018 indicated that The Scottish Government were fully committed to reduce levels of food waste generated by 33% by 2025, which included both avoidable and unavoidable waste, in line with the UN's Sustainable Development Goal (SDG) 12.3, with prevention being the key focus (Zero Waste Scotland, 2016).

Furthermore, the Scottish Government published The Food Waste Reduction Action Plan in 2019, developed with Zero Waste Scotland, which indicated how they would drive and deliver their commitment to the target of 33%. The management strategies they intended to impose included: improved monitoring and infrastructure, sector leadership, increased public engagement and communication, and increasing education to raise awareness and support delivery of a new approach to reducing food

waste (Scottish Government [A], 2020). This also included educating households on how they could make changes to their behaviour, providing activities on how to reduce levels of potential food waste generated which in turn, should see improved attitudes (Scottish Government, 2019).

There was a network of bodies identified across Scotland who implemented plans and strategies that has helped towards combating food waste within households. Guidance, support and infrastructure that has driven change and delivered targets was performed by Scottish Environment Protection Agency (SEPA) and Food Standards Scotland. Residents of Scotland should be motivated and feel empowered to reduce food waste and contribute towards driving changes in their behaviours and attitudes. To meet the 2025 target at least 279,000 tonnes of food waste must be prevented per year (Scottish Government, 2019).

## 1.6 Aim and Objectives

The overarching aim of this project was to critically analyse and investigate the attitudes and behaviours around food waste within households across Scotland. This project explored the environmental, social and economic barriers that impacted the populations' ability to reduce, reuse and recycle, and determined how the population contributed towards fighting this food waste problem to ultimately reach the Scottish Government reduction target of 33% by 2025.

This project focused primarily on Scotland's household sector and critically analysed food waste management strategies already in place and compared these to what measures were in place across the globe. This ultimately determined if Scotland could adopt additional measures to improve the already existing ones, or if innovation could introduce new strategies or ideas to provide a just transition approach to more resilient and sustainable practices within households.

This will be achieved through the following objectives:

1. Conducting questionnaires to members of the public, over the age of 18, within Scotland to critically explore the subsequent attitudes and behaviours towards household food waste management.
2. Identifying the current management strategies and legalisation in place for households to prevent, reduce, reuse, recycle and dispose of food waste.

3. Examining the effectiveness of the management strategies to tackle food waste management issues and encourage sustainable development.
4. Critically explore the efficacy of the Food and Agriculture Organisation's global initiative "Save Food" and The Netherlands "United Against Food Waste" initiative to ultimately establish if further methods could be adopted or developed to enhance Scotland's approach at tackling food waste.

# Chapter 2: Literature Review

## 2.1 Food Waste Management

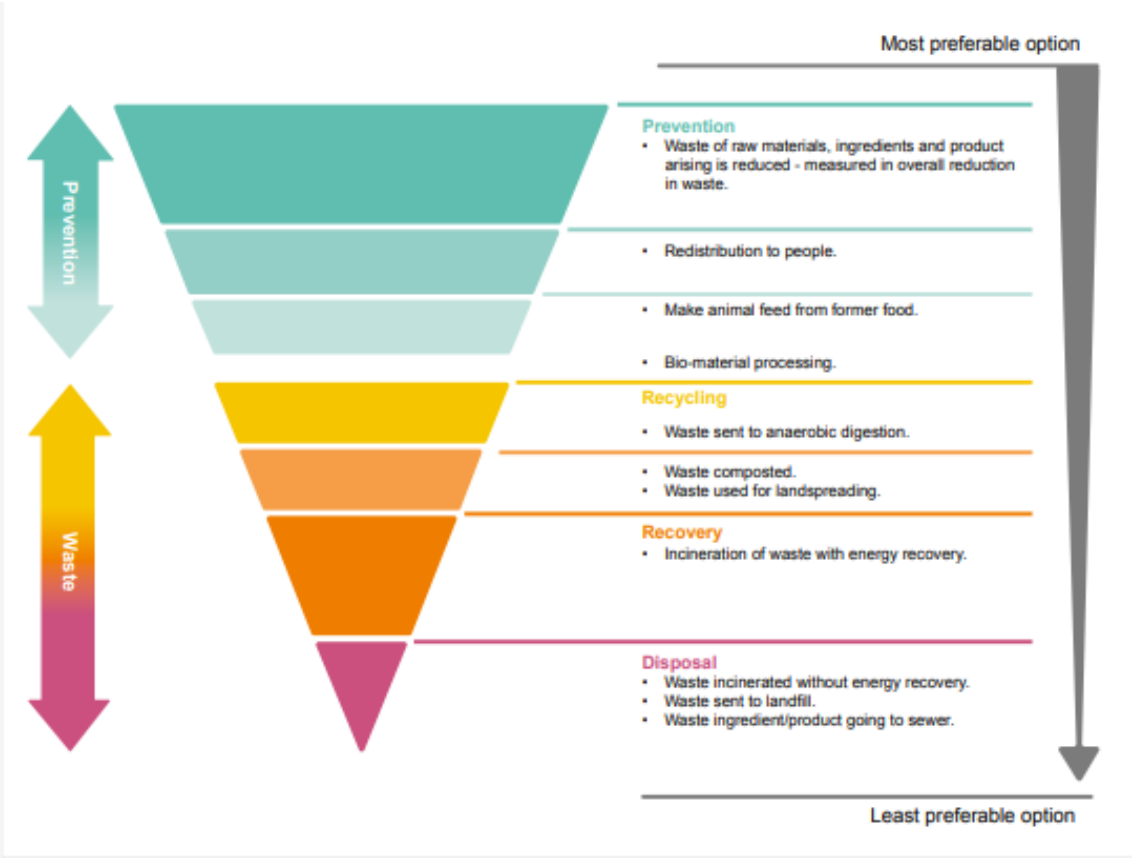



***Figure 2.1: The Food Waste Hierarchy presented by Zero Waste Scotland (The Scottish Government, 2019)***

Wasted food, both avoidable and unavoidable, was identified as a major contributor to the global food system challenges (Godfray et al., 2010). Thus, appropriate and targeted food waste management was a key approach to achieve sustainable development (UNEP, 2021). Many frameworks and concepts have been established across the globe: The Food and Drink Material Hierarchy, 3R's (reduce, reuse, recycle), Extended Producer Responsibility, Polluter Pays Principle, Life Cycle Assessment and Sustainable Consumption and Production. Thus, this recognised that food waste could be prevented, recycled or used as a resource before being discarded to landfill or sewers (Papargyropoulou et al., 2014). A study from 2015 highlighted that in the US, food waste awareness amongst consumers was only just beginning to

increase but it is still a concerning factor. Limited preventative initiatives and recovery of food waste subsequently impacted consumer's behaviour and attitudes (Thybert and Tonjes, 2016). The food and drink material hierarchy presented by Waste and Resources Action Programme (WRAP) was a method proposed to increase consumers awareness and educate individuals which effectively managed food waste at home and allowed them to become more sustainable, minimising waste and shifting towards a circular economy (WRAP, 2020).

### *2.1.1 Prevention*

Ultimately, this was the main goal of the food waste hierarchy. The purpose of prevention was to divert food waste, no longer intended for human consumption, from landfill or an incinerator and treated it appropriately at an anaerobic digestion or composting facility obtaining nutrients and energy for reuse (Schott and Canovas, 2015). This was recognised as the most preferred and suitable option that should be considered first, whereby waste of raw materials, ingredients and product arising should be reduced as much as possible. In order to prevent food waste, surplus food could be redistributed to people or charities, for example: The 'Too Good To Go' initiative and Love Food Hate Waste Scotland campaign, or food banks and homeless shelters. Moreover, food waste such as fruit and vegetables could be utilised for animal feed in farms (WRAP, 2020). If we had sufficient and adequate packaging, with clear descriptions on how to correctly store food at home, this would allow consumers to develop a clear understanding of 'use by' and 'best before' labels. Moreover, it would positively impact consumer behaviour and attitudes, thus consumers would not overbuy, preventing food waste (Williams and Wikström, 2011). It was established that prevention is feasible; there is scope for potential to reduce food waste and losses by up to 63% across the globe. This was identified as most significant and critical at the household consumption stage of the FSC as the associated environmental impacts accumulated along the FSC, therefore, avoiding and reducing food waste would decrease any needless associated environmental impacts such as emissions, pollution and climate change (Stancu et al., 2016). Furthermore, it was highlighted that prevention of food waste would encourage significant economic and social benefits, which in turn would improve attitude and behaviours of consumers when managing food waste at home (Schott and Canovas, 2015).

### *2.1.2 Recycling*

Recycling was recognised as the second most favoured option on the hierarchy model. Whereby, when food waste cannot be prevented, redistributed to people or used for animal feed, it could be recycled to prevent it being sent to landfill. Food waste recycling was sent to biogas plants for anaerobic digestion and composting to be carried out in safe and controlled conditions which prevented the escape of methane or other toxic greenhouse gas emissions into the atmosphere. One condition of this is that food waste must be collected separately (WRAP, 2020). At home composting could be considered as a third option, garden and food waste like peels or cores, which could ultimately be converted to a digestate to be uses as a nutrient-rich fertiliser. Although, it was important to recognise that it must meet waste regulatory controls and end-of-waste criteria before it could spread it on land, which could create some issues (Defra, 2018).

### *2.1.3 Recovery*

The third stage on the hierarchy was recovery. This is where food waste being disposed of is done so by incineration at an energy from waste (EfW) plant to allow energy to be recovered efficiently from the waste (WRAP, 2020), which generated heat and electricity (Defra, 2018). An advantage identified is that it was a carbon neutral treatment for food waste and produced biogas and various other valuable outputs. However, this process of recovery was also be deemed as inefficient as food waste consisted of 70% water, therefore it required extra fuel to ensure there are substantial levels of energy to burn the waste, thus increasing costs and making it an expensive way to acquire energy (C40 Cities Climate Leadership Group, 2019). Recovering food waste at EfW plants was recognised as not efficient nor effective as valuable nutrients could not be captured, and subsequently created further environmental impacts as a result of poor air pollution control measures (Thyberg and Tonjes, 2016). Although it is least favoured over prevention and recycling, it should be considered before the disposal stage as long as there are strict rules and procedures implemented to ensure that segregation of materials was enforced at the source to reduce the potential for contamination or pollution, with high tipping fees in place. Land is scarce thus this resulted in land disposal being expensive and demand for heat and power was high (C40 Cities Climate Leadership Group, 2019).

### *2.1.4 Disposal*

The last stage of the hierarchy was disposal. This should only be the last option considered if prevention, recycling or recovery was not possible. Here waste was sent to landfill or sewers and incinerated without recovering energy, due to environmental impacts and high costs of treatment (Defra, 2018). Sending food waste to landfill or sewer could subsequently create contamination and pollution issues, other significant environmental impacts (WRAP, 2020). Disposal will lower the environmental performance of waste management systems and so should be avoided to help improve recycling rates and overall sustainability (Thyberg and Tonjes, 2016).

## 2.2 Determinants of Food Waste

Although there was substantial evidence and statistics that highlighted significant amounts of food waste was generated across the globe and had lingering consequences, information and literature on the determinants, attitudes and behaviours of why consumers waste food is scarce (Stancu et al., 2016). It was identified that consumers were often concerned that wasting food meant they were wasting money, as opposed to the associated negative environmental impacts as a result of food waste or disposal (Brook Lynhurst, 2007). Hence the purpose of this project: to investigate this lack of positive attitude and behaviours. A study conducted in 2013 highlighted that the economic implications were of most concern to householders, most notably wasting money. Few recognised the social impacts as a concerning factor such as feeling guilty for wasting food, and very few were aware of the environmental implications such as greenhouse gas emissions (Watson and Meah, 2013). Household routines was also a key determinant of food waste, from planning, to shopping, to the final cooking stage, and the skills of people living within each house: how they manage routines and behaviour associated with food waste (Stancu et al., 2016).

## 2.3 Scale of the problem

Food waste has been evolving problem and it is still on the rise globally, in all sectors of waste management. Problems were established from the initial production and collection at agricultural stage to the final consumption and disposal at household level (Girotto at al., 2015). The Food and Agricultural Organisation of the United Nations (FAO) reported that one-third or 1.3 billion tonnes of edible food, intended for human

consumption was lost or wasted along the FSC each year, globally (Ishangulyyev et al., 2019). Thus, production, distribution and consumption of food and its subsequent losses or waste created a burden of environmental and socio-economic impacts endured across the globe (Williams and Wikström, 2011). The production and post-harvest of food within the agricultural sector was a significant contributor to food waste, more-so in Least Developed Countries (LDCs). Farming inevitably produced waste or waste by-products, such as low-quality fruits or vegetables, or damaged food crops that subsequently had a low commercial value and were ultimately discarded or lost at this stage before they were considered for distribution. Food waste within manufacturing and industrial sectors was predominantly produced during the production stage which resulted in damage from incorrect transportation, storage problems, lack of processing or contamination protection, and incorrect packaging. Within the retail and business sectors, food waste was often generated from lack of proper conservation or handling, and poor cooling or cold storage facilities (Partfitt et al., 2010).

## 2.4 Impacts of Food Waste

### *2.4.1 Environmental*

It was highlighted that food waste was detrimental to the environment and contributed 22% of the release of toxic greenhouse gas emissions such as methane when incorrectly disposed of and sent to landfill or sewers. Furthermore, the production of food was known to be resource intensive and so, food waste and loss were deemed to be a cause of concern for Earth's natural resource depletion (Papargyropoulou et al., 2014). This included water, croplands, fertilisers and fossil fuels and disrupt biogenic cycles which contributed to the crisis around climate change (Kummu et al., 2012). This caused a decline in soil fertility and caused degradation within the marine environment. It consumed 30% of the world's total energy (United Nations, no date). Natural resources used for growing, producing, processing and transporting edible food were subsequently wasted and contributed to a wide array of unnecessary environmental implications (Gustavsson et al., 2011). These included problems associated with land degradation and increased soil erosion, which was most prominent at the agricultural stage of the FSC where the food was initially produced. There was also a substantial increase in deforestation, air and water pollution. Thus, if we prevented or reduced food waste at household level then we could mitigate or

reduce the intensity of these problems at earlier stages of the FSC from occurring in future (Papargyropoulou et al., 2014).

### *2.4.2 Social*

There were significant ethical and moral factors that posed as a threat towards the concept of global food security, people often felt guilty for wasting food (Papargyropoulou et al., 2014). Additionally, it was deemed that food waste only contributed to the shortage of food which appeared to be an abundant problem across many countries globally, in particular the LDCs, and as a consequence there was apparent issues associated with hunger and feeding the world's population (Stancu et al., 2016), which increased the number of people suffering from malnutrition and other health conditions. Lack of experience in planning and poor routines within households resulted in uncertainty around how much food is needed and so often ended up in overbuying which led to spoilage (Scherhaufer et al., 2015).

### *2.4.3 Economic*

Economically, there was significant detrimental impacts associated with food waste for all individuals and organisations along the entire FSC. For example, both farmers and consumers incomes were affected (Papargyropoulou et al., 2014) as a result of increased demand, supply, prices and trade (Scherhaufer et al., 2015). A previous study established that households in Japan have reported nearly 17 million tonnes of edible food was discarded per year, and in China, food waste accounted for 70% from households. This had knock-on financial implications for the subsequent collection systems, transportation and disposal waste management facilities, increased food waste means increased running costs to manage this problem (Venkat, 2011). Thus, contributing to the recognised global food insecurity issues (Gustavsson et al., 2011).

## 2.5 Household Food Waste

Despite these ongoing issues and implications associated with food waste along the FSC, increased attention from local, national and European policymakers, as well as international organisations and academics, recognised that household food waste was a significant contributor to the generation of overall food waste. Research of why household food waste occurred was scarce, hence the increased and intensified attention it has received in recent years across the globe and will form the basis of this project (Schanes et al., 2018). The suspected and proposed main reasons for the

generation of food waste within households was often as a result of over-purchasing, inadequate storage, over-preparing or cooking, spoilage, and simply by making portions too large. In addition, confusion or lack of understanding between best before and use by terms appeared to be a common problem (Papargyropoulou et al., 2014). Food wasted by households meant that all energy and effort put into the previous production, processing, transportation, cooling and preparing stages was also lost (Schanes et al., 2018). Thus, food waste generation at household level was a complex issue with many factors, practices and determinants that are needed to be considered and strongly integrated into both research, and practice to deepen our understanding of the subsequent impacts that occurred within earlier stages of the FSC to the disposal at household level, and how these can be reduced or prevented in future to meet goals or targets (Schanes et al., 2018).

## 2.6 Importance of the Food Waste Hierarchy Model

The negative environmental, economic and social impacts associated with food waste were not going by unrecognised. Countries across the globe have been pressured to devise practical, applicable and viable management strategies in line with the waste hierarchy model to prevent food waste (Stancu et al., 2016). With excessive amounts of food waste being generated at household level, the application of the food waste hierarchy model was a major first step which began educating consumers and raised awareness on how to control and prevent food waste (Parfitt et al., 2010), adapting to more sustainable food waste practices and systems, which in turn helped lessen the climate change impacts (Godfray and Garnett, 2014).

## 2.7 The Global Food Waste Challenge

The underlying reasons for food waste differed between countries, most notably between developed and LDCs (Venkat, 2012). With the global population only expected to increase in future years, it meant restraints are needed to be placed on the amount of food available to feed nations across the globe (Godfray el al., 2016). Thus, it was recognised that food security was an imperative issue, and to ensure food waste was considered as a priority waste stream, national and regional polices must developed and implemented (Papargyropoulou et al., 2014). The global food waste challenge identified that food has been or lost along the entire FSC, and so if we prevented and reduced in more developed countries, then this would increase the

supply of food to LDCs. People within LDCs would significantly benefit and it would ultimately increase the amount food available to meet the needs of an increasing population (Godfray et al., 2016). Gross National Income helped us identify between a developed and LDC. Countries with a GNI of US$11,905 or less are classed as a LDC and this was a significant factor which contributed to the rate of generation of food waste (Thi and Kumar, 2015).

### *2.7.1 Developed Countries*

It has been reported that food waste in developed countries was higher than the waste and losses in LDCs; for example, Europe and North America witnessed 280-300kg of food loss per capita per year (Papargyropoulou et al., 2014). This was most commonly generated at household level during distribution and consumption of food and accounted for approximately half of the total waste (Stancu et al., 2016). In the UK, excluding the inedible waste, it was established that households contributed the largest proportion to total food waste according to 2018 figures: 71% or 4.5Mt. This is closely followed by hospitality and food services at 13% or 0.8Mt, manufacturing at 12% or 0.8Mt, and retail at 4% or 0.3Mt (WRAP, 2020).

### *2.7.2 Less Developed Countries*

In lower income, LDCs, food loss was more prominent than food waste and was often established at the agricultural and post-harvest stages of the FSC before it was distributed to manufacturers and retailers, and subsequently consumed by humans (Stancu at el., 2016). Food waste and loss figures were often lower in LDC. For example, it was reported that in Sub-Saharan Africa, South and Southeast Asia, loss averaged at 120-170 kg per capita per year (Papargyropoulou et al., 2014). This was due to a lack of efficient harvesting technologies, transportation and storage, combined with climate extremes, that made it almost impossible for food to make it past the first stages of the FSC (Papargyropoulou et al., 2014). In LDCs, food waste was identified as a significant threat for sustainable development and the implementation of efficient management systems which resulted in several environmental and sanitary issues. Taiwan is a key LDC that has been working on introducing new regulations, developing innovative treatment technology and enhancing educational activities to encourage food waste reduce, reuse and recycling (Thi and Kumar, 2015).

## 2.8 UN Sustainable Development Goal 12.3


***Figure 2.2: SDG 12 (United Nations, no date)***

By 2030, the United Nations want to ensure sustainable consumption and production patterns are achieved through reducing waste by prevention, reduction, recycling and reuse strategies, worldwide. SDG target 12.3 was of particular interest to this project. The United Nations aimed to halve food waste per capita, globally, at retail and consumer levels, and reduce food loss during production and earlier stages of the FSC, including the post-harvest losses. Thus, by adopting more sustainable practices and promoting public procurement, people around the globe would become educated and have increased awareness of sustainable development in relation to food waste. Developed countries could take control and support LDC to enhance their approaches and increase their capacity of future development to become more sustainable and reduce food waste and losses (United Nations, no date).

# Chapter 3: Methodology

## 3.1 Introduction

This chapter provided a critical discussion of how the aim and objectives of this project were achieved. Mostly qualitative, with some quantitative, data collection methods were utilised to obtain both primary and secondary research of already existing food waste strategies and initiatives enforced in Scotland and compared these to the results acquired from the questionnaire as per appendix 1. Moreover, two case studies were examined, of successful global initiatives that have both proven to be innovative and sustainable and these proposed significant new approaches that could be implemented within Scotland for the population to practice better food waste management now and in the future.

## 3.2 Primary Research Strategies

Primary research was predominantly collected using a questionnaire on Microsoft Forms conducted with the general public, who were aged 18 and over, which successfully established behaviour and attitudes related to food waste management within households in Scotland. Additionally, a site visit to a food waste recycling facility in Cumbernauld, Lanarkshire was proposed, however, due to COVID-19 and The Scottish Government guidelines, an online site visit was conducted and utilised pictorial and video evidence that was presented in the form of a case study.

### *3.2.1 Household Questionnaire*

The design of this questionnaire, as per appendix 1, was carefully sought out through guidance from the article presented by Marshall (2005): “The purpose, design and administration of a questionnaire for data collection”. It was a web-based questionnaire on Microsoft Forms, designed to reach a larger target audience due to COVID-19 and travel restrictions in place. It simply allowed respondents to complete this in the convenience of their own home. Household food waste is a common, present-day problem, thus choosing this topic increased response rates as more people were able to relate. More-so since the start of 2020 where a greater number of the population were working from home and so more food was inevitably purchased and increased likelihood of more waste being generated (Aydin and Yildirim, 2021). This questionnaire assessed respondents’ attitudes adapted from (Visschers et al., 2016)

and behaviours adapted from (Stefan et al., 2013) to food waste management at home; incorporating personal norms and what has impacted people's ability to collect and correctly dispose of food waste, adapted from (Aydin and Yildirim, 2021). Before issuing this questionnaire to the general public, it was tested with my project supervisor and family members which ensured it was adequate and met the standards required.

Questions were short and focused, with a mixture of qualitative and some quantitative. Although questions were predominantly multiple choice or known as closed questions, an 'Other' option was added to the bottom of each question (when and where appropriate) which allowed respondents to expand or provide any extra information they felt was necessary and beneficial to the research. Thus, this created open questions which allowed deeper analysis of responses in a systematic approach (Bell 1987; Marshall 2005). This was witnessed on questions 2 – 5, 7 – 10, 12 – 17 and 20, as per appendix 1. Additionally, quantity type questions were utilised when establishing how often food waste bins were emptied and collected, how much food waste purchased ended up in the bin, and how much an average household spent on food waste per year. This allowed direct, numerical responses to be given which were easier for the reader to interpret and display. Furthermore, list type questions were common for this research. As food waste was identified as a profound issue across many households in Scotland, personal reasons varied and were not mutually exclusive, therefore a variety of potential reasons were captured to ensure all respondents participated. List questions were also open questions with the other option included, which ensured that all factors and personal circumstances were considered and ensured a fair and equal approach was taken with no presumptions or prejudgments. This can be viewed in questions 5, 10 – 16, and 20, as per appendix 1 (Jack and Clarke, 1998; Marshall, 2005).

A systematic approach was taken during the design of this questionnaire, whereby it was split into categories ensuring that relevant detail was acquired, and the respondents were able to follow each question with ease. The first set of questions, 7 to 12, focused on consumer behaviour around food waste management established what food waste storage respondents had at home and if they were the main person who managed their food waste. It is important to note that if they did not personally manage food waste at home, use of the branching feature on Microsoft Forms directed respondents to the attitude focused block of questions, question 13 onwards as per

appendix 1. Respondents who solely managed food waste at home or played part of the role were first directed to the behaviour block of questions before completing the attitude block. The behaviour questions consisted of how often food waste was emptied from internal to external bins; how much of the food purchased ended up spoiled, i.e., past its use-by or best before date, and subsequently thrown out; how often food waste was collected by the authority; problems encountered when collecting and storing food waste; what personal difficulties people experienced when disposing of food waste at home; and what problems are encountered with local authority collection.

The attitude focused questions,13 to 20, allowed all respondents to participate. These questions were adapted and influenced from many academics: Stancu et al., (2016) which determined the personal attitudes and shopping behaviour of respondents; Visschers et al., (2016) who explored food conservation procedures - the motivators and barriers as to why household food waste was generated; and explored participants eating habitats and general household practices which determined if they over-bought or did not use leftovers (Schanes et al., 2018)

### *3.3.2 Site Visit: Deerdkyes, Lanarkshire*

Conducting on-site visits to food waste treatment facilities was a significant research method to obtain data and further analysis of the range of technologies and subsequent processes that occurred beyond household disposal. It allowed a deeper understanding and a first-hand visual of the extent of the food waste problem to be obtained; what treatment methods were with the disposal of food waste and how the treatment plants operated. Findings could then the used to educate and increase the populations awareness (Gao et al., 2017). Furthermore, a site visit allowed patterns or trends to be identified and deepened understanding of any pre-existing conditions that impacted or influenced studies (White and Feiner, 2009).

***Figure 3.1: Deerdykes Bioresources Centre, Lanarkshire (Dolan, Scottish Water Horizons, 2019).***

Due to the ongoing COVID-19 pandemic and Scottish Government travel guidelines, the desired site visit was not able to be conducted, so instead a virtual site visit in the form of case study was carried out. Deerdykes near Cumbernauld, Lanarkshire, operated by Scottish Water is the first large-scale food waste recycling facility in Scotland which has processed over 155,000 tonnes of food waste from surrounding Glasgow and Lanarkshire homes since it opened in 2010. Food waste was treated here using high functioning anaerobic digestion technology which diverted waste from landfill, generated green energy and ultimately reduced emissions of toxic greenhouse gases (Scottish Water, 2019). The purpose of this online site visit was to highlight the extent of the food waste problem from, Scottish Water Horizons' perspective and establishing if and what measures they had in place to help the general public reduce or correctly dispose of their food waste at home.

## 3.3 Secondary Research Strategies

Section 3.3 displayed the secondary research methods that were researched. This project entailed examining the current management strategies and initiatives in place across Scotland that has helped mitigate and reduce levels of food waste within households that has ultimately contributed to protecting the environment helping to reach the 33% food waste reduction target by 2025. The current strategies ensured all citizens and organisation's have played their part and contributed towards making

a difference. The Scottish Government have imposed the Climate Change Plan 2018 and The Food Waste Reduction Action Plan, regulated by The Waste (Scotland) Regulations 2012, which provided support and guidance to all bodies involved of measures and strategies that were implemented.

Furthermore, from a global perspective, this project examined the FOA's "Save Food" initiative, and from European level, the "United Against Food Waste" initiative implemented in The Netherlands. The purpose of examining both strategies was to identify any similarities and differences in how these organisation's tackle household food waste management in comparison to Scotland's approaches. Thus, more resilient and sustainable approaches were then proposed that Scottish households adopted to ultimately fight food waste and protect the planet.

# Chapter 4: Results

The findings and subsequent figures on this chapter, ***Figure 4.1 to Figure 4.13***, were derived from the questionnaire produced on Microsoft Forms (Appendix 1) which was conducted to the general public, across the household sector in Scotland. The data then collected was exported to Microsoft Excel whereby the following Figures were then created and presented the data clearly and concisely.

## 4.1 Food Waste Storage

It is apparent from ***Figure 4.1*** that a variety of food waste storage options were prominent and heavily utilised within households across Scotland, with the external bin being the most preferred option.

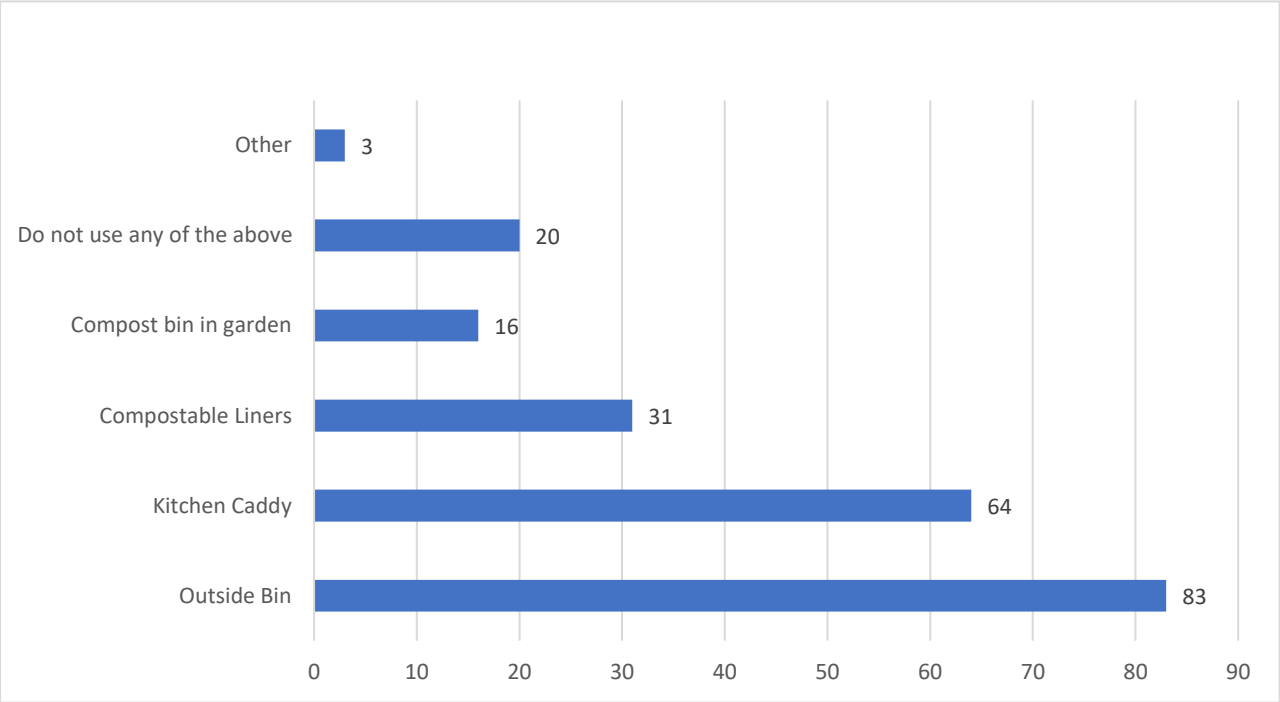



***Figure 4.1: What food waste storage respondents reported to utilise within their household.***

It can be highlighted that out of 128 respondents, 64.8% of respondents disposed of their food waste in an outside bin; 50% of respondents used a kitchen caddy; 24.2% of respondents used compostable liners; 12.5% of respondents used a compost bin in their garden; and 15% of respondents did not use any food waste storage. Interestingly but also of concern, 3 respondents disclosed that they lived in a flat within Glasgow City Council (GCC) and they have not been provided with any of the above food waste storage, nor does it get collected. It can be highlighted, however, that these

respondents have disclosed that they did want to dispose of their food waste properly, they were not provided with the adequate equipment to do so by their local authority. Chapter 5 section 5.5 investigated the management strategies GCC and the Scottish Government have allegedly enforced to tackle the food waste storage problem.

## 4.2 Food Waste Management Behaviour

This section of Chapter 4 consisted of asking respondents who were in sole charge of food waste management, or played part of the role, within their household and asked six questions associated with their behaviour which can be identified on Appendix 1, Question 7 to 12. This included factors that influenced personal behaviours, and behaviours that were out of their control, for example, difficulties experienced with local authorities. The results therefore revealed that overall, respondents displayed satisfactory behaviour towards food waste management within their households.

### *4.2.1 How Often Respondents Emptied Food Waste*

***Figure 4.2*** established that over half of the respondents (53.8%) emptied their indoor food waste storage to an outdoor bin, both daily and weekly, which is a positive finding in relation to behaviour management which has indicated they were empowered and motivated adhere to correct processes. Furthermore, 80% of respondents reported that they carried out this process 2 to 3 times per week, bringing the overall total to 66.7%.

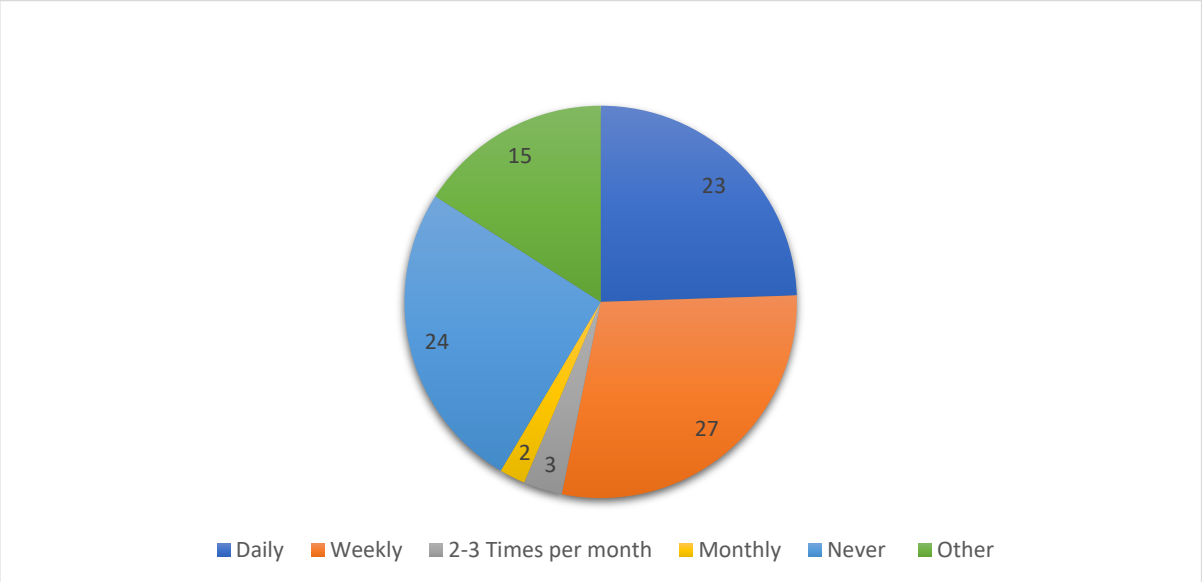



***Figure 4.2: How often respondents emptied their food waste caddy or compostable liner into the outside bin.***

A concern was identified however, as a significant proportion of respondents, 25.8%, answered never. Whereby this revealed that they did not correctly store or separate their food waste from general waste. Whilst there is an overall positive correlation between the number of respondents who reported separating their food waste, against how often it was emptied, the barriers need to be examined further as to why 25.8% of respondents were disinterested – was it of fault by the local authority or due to hygiene and contamination worries with the potential attraction of vermin or maggots? Chapter 5 explored any potential solutions that could be implemented to resolve this problem.

### *4.2.2 How Much Food Waste is Spoiled*

Overall, a positive relationship was established on ***Figure 4.3***. 72% of respondents reported that 'very little' of their food was wasted. This suggested that most households were efficient and effective at avoiding food waste through key prevention strategies, freezing food and eating leftovers as per ***Figure 4.8***.

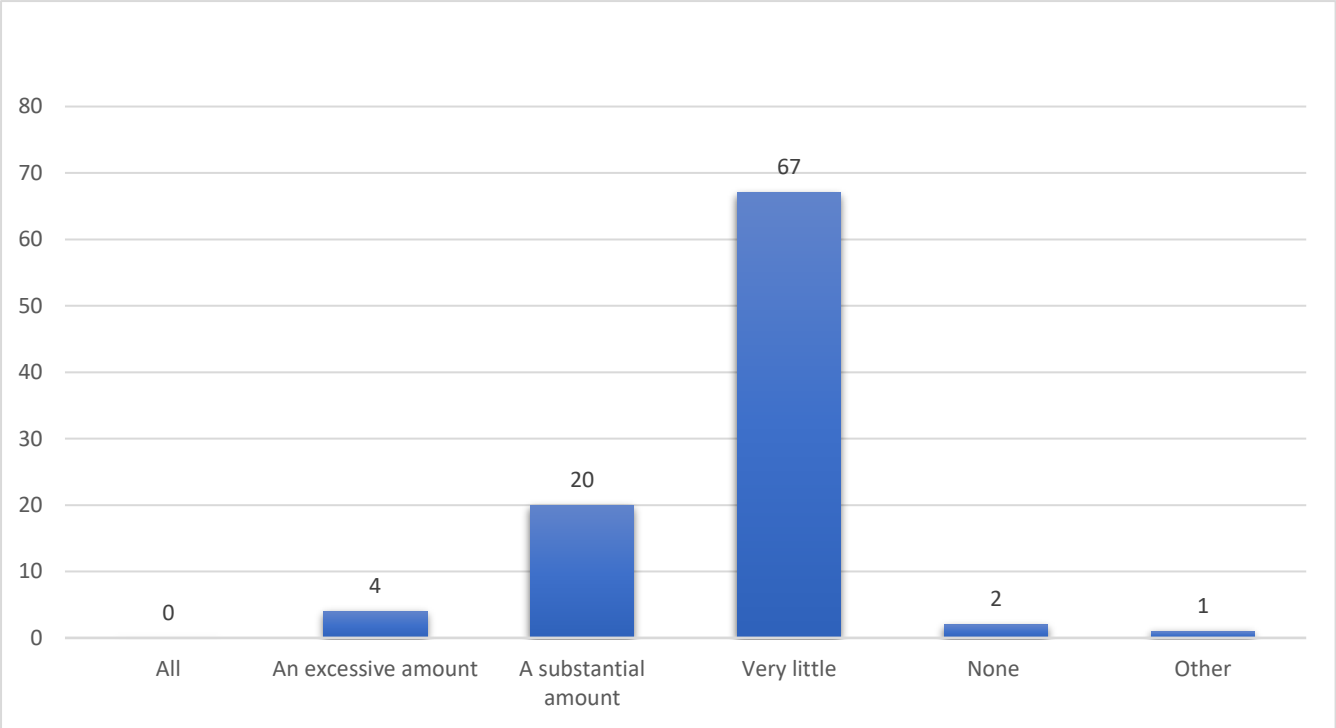



***Figure 4.3: How much of the food purchased by respondents that ended up spoiled and thrown out.***

Despite Zero Waste Scotland identifying that progress has been made so far that has prevented food waste (Zero Waste Scotland, 2019), ***Figure 4.2*** and ***Figure 4.3*** indicated that food waste was still being generated collectively across Scotland at

significant volumes. It was identified that Zero Waste Scotland were at the forefront of developing preventative measures, they had the authority and funding to enforce such measures and these will be explored further in **Chapter 5**.

### *4.2.3 Collection, Storage and Disposal Problems*

The most common problems identified from the results of the questionnaire was due to insufficient storage systems, lack of collection by local authorities, and the attraction of animals or vermin that created detrimental hygiene and contamination concerns. Although it has been identified previously, ***Figure 4.1; 4.2*** and ***4.3***, that respondents displayed positive behaviours related to utilising food waste management within their households, unforeseen difficulties have been identified that are presented in **Figure 4.4** and **Table 4.1** below.

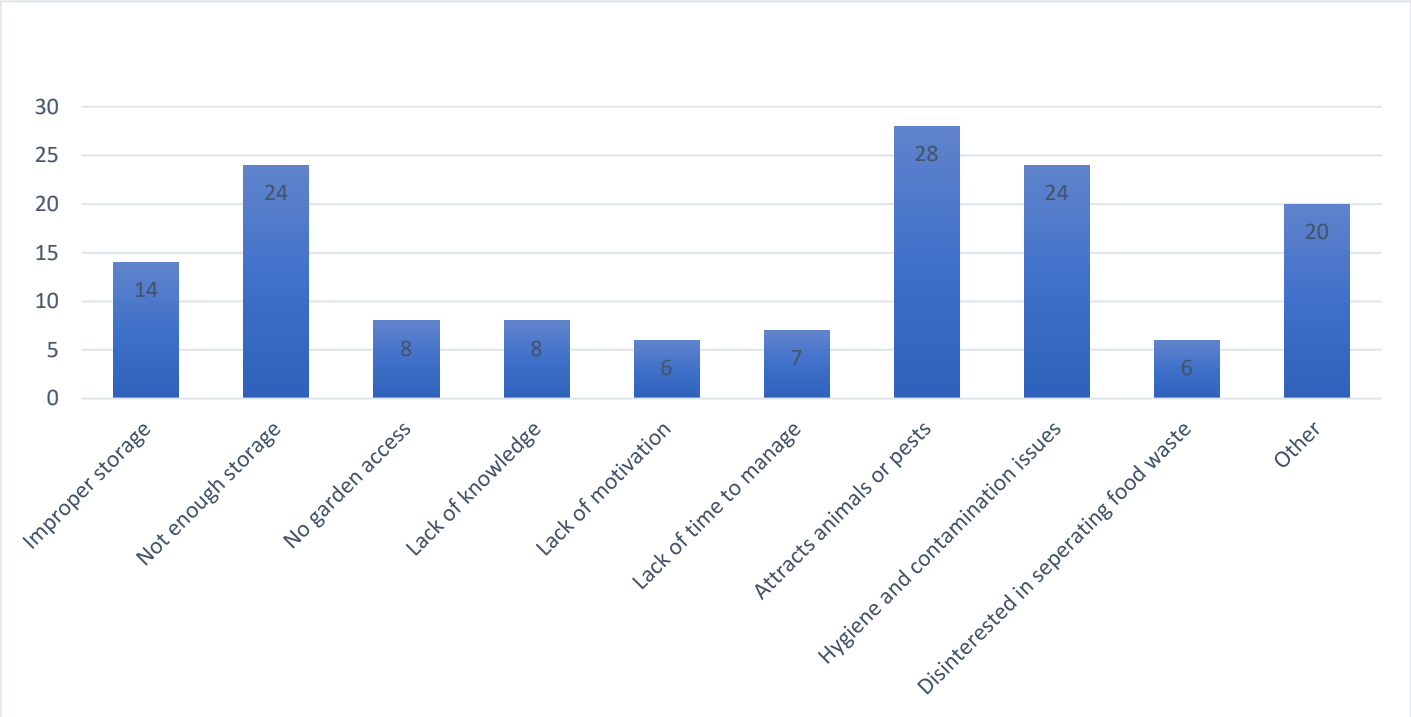



***Figure 4.4: The problems respondents encountered when collecting or storing their food waste within their home – the 'Other' responses are presented on Table 1 below.***

**Table 4.1: Personal difficulties foreseen by respondents when disposing of food waste at home ('Other' response of Figure 4.4)**

| Respondent ID | Response |
|---|---|
| ***1*** | *"The expense of caddy liners if council have a backlog in delivering orders"* |
| ***2*** | *"Live in a flat so bins are far away"* |
| ***3*** | *"Smells and attraction of flies etc"* |
| ***4*** | *"During the pandemic I would imagine many families may experience and surplus of wasted food due to panic buying"* |
| ***5*** | *"The time it takes to receive a new supply of bags"* |
| ***6*** | *"No difficulties, just quicker to dispose with the rest of the rubbish"* |
| ***7*** | *"I used to separate into a caddy for a long time until one day I had maggots in it during hot weather and it put me off. Now I put directly into my rubbish bin bag in kitchen and throw in main bin outside"* |
| ***8*** | *"My partner lacks knowledge in this area and I don't want to force any ideas down his throat"* |
| ***9*** | *"Smell"* |
| ***10*** | *"Only have recycling bin and green bin so don't have a food waste bin which means food isn't getting separated and has to get bagged into the green bin"* |
| ***11*** | *"I used to separate food waste more when I had a food caddy but when I moved house we didn't have that or a food waste bin outside so not sure how food waste can be collected in this area"* |
| ***12*** | *"My council will not pick up the food waste collection or provide the bags required to do so"* |

| | |
|---|---|
| ***13*** | *"Council did establish food recycling bins but failed to cope with the collection of these bins. They then became excessively heavy. Scheme was abandoned"* |
| ***14*** | *"I do not want food waste to remain inside my kitchen for any length of time. Attracts Too many fruit flies. Smells. Small flat. No extra room for recycling of food., Main Bin store is in a cupboard at entrance of flats. Yes inside actual building. Gets smelly in hot weather. Architect did not design building with proper refuge collection points. Bins therefore remain inside flatted area. Previously Had to clean maggots from bin with food, definitely not a pleasant experience., Council's strategy totally inappropriate, ineffective, infrequent. Caused major rat problems. Street Communal food bins got easily contaminated with other waste. Council should have swapped used bins with cleaned ones to prevent Residue decaying food remaining in communal ones. Too smart an idea. Large grey bins in back courts got too heavy for cleansing men to lift. Result they stayed there unemptied indefinitely. Rats were able to eat through plastic to reach food. The whole experience was a disaster, badly thought through for citizens living in flats. Recycling areas in city were poorly managed, place ended up looking like a slum"* |
| ***15*** | *"The only issue is if I forget to empty it smells but it's really not a big problem"* |
| ***16*** | *"If we were to be given a food waste bin I could foresee it getting full very quickly. There is limited space in the garden for bins and most of my neighbours recycle. The recycling bins are almost always full and often do not get picked up by the council as cars park in the access lane. There has also been problems with vermin in the area, I suspect this may be why there is no council food waste strategy in place. If they were unable to collect a food waste bin this could quickly lead to a vermin problem"* |
| ***17*** | *"Food waste bins no longer emptied by the Council since pandemic/lockdown 2020"* |
| ***18*** | *"No collection of food waste by Glasgow City Council"* |

| | |
|---|---|
| ***19*** | *"The bin doesn't get collected half the time"* |
| ***20*** | *"Maggots found developing in previous food waste unit, not a pretty thing to see"* |

**Table 4.1** presented the various reasons that impacted the respondent's ability to dispose of their food waste correctly and one of the main reasons identified was insufficient collection by local authorities. This was recognised within the Food Waste Reduction Action Plan and it was proposed that all key sectors should be ambitious in the fight to reduce food waste (The Scottish Government, 2019). Thus, it has been suggested there was a degree of non-compliance with local authorities and households. This was examined further in **Section 4.2.4** and **Chapter 5**.

### *4.2.4 Local Authority Collection*

**Figure 4.5** supported the investigation as to whether or not local authorities were to blame for the issues around the generation of food waste and lack of adequate disposal measures amongst households in Scotland.

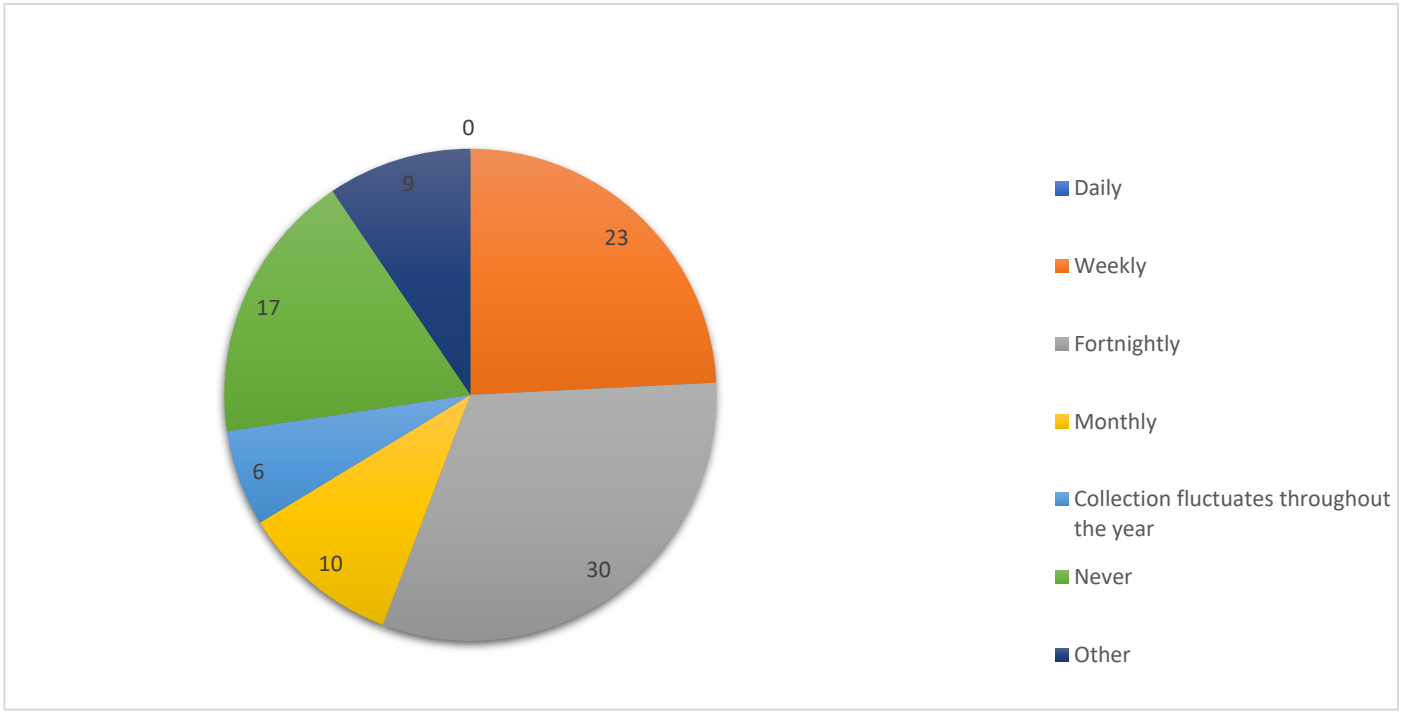



***Figure 4.5: How often respondents reported that food waste is collected by their local authority.***

Thus, ***Figure 4.5*** has identified that overall food waste collection by local authorities in Scotland was adequate and consistent. 32% of respondents reported their food waste is collected fortnightly and 24% reported weekly collection. This was expected and reinforced the guidance issued by the Scottish Government's Climate Change Plan that 80% of households across Scotland have access to food waste disposal and recycling services (Scottish Government, 2019).

Despite these positive findings, 18% reported never, 11% reported monthly collection and 6% voted that their collection fluctuates throughout the year. Thus, this suggested that some local authorities across Scotland were maybe part of the issue as to why respondents did not dispose of their food waste appropriately. A detrimental contributing factor, that was unexpected, was due to the COVID-19 pandemic in 2020 and 2021 so far and will be explored in Chapter 5.

### *4.2.5 Problems Encountered with Food Waste Collection*

It is important the reasons why respondents found food waste collection unsatisfactory were explored in order to find solutions to present to the relevant bodies to improve future collections and encourage prevention of food waste amongst households as per **Figure 2.1. Figure 4.6** below presented the problems reported by individuals at home:

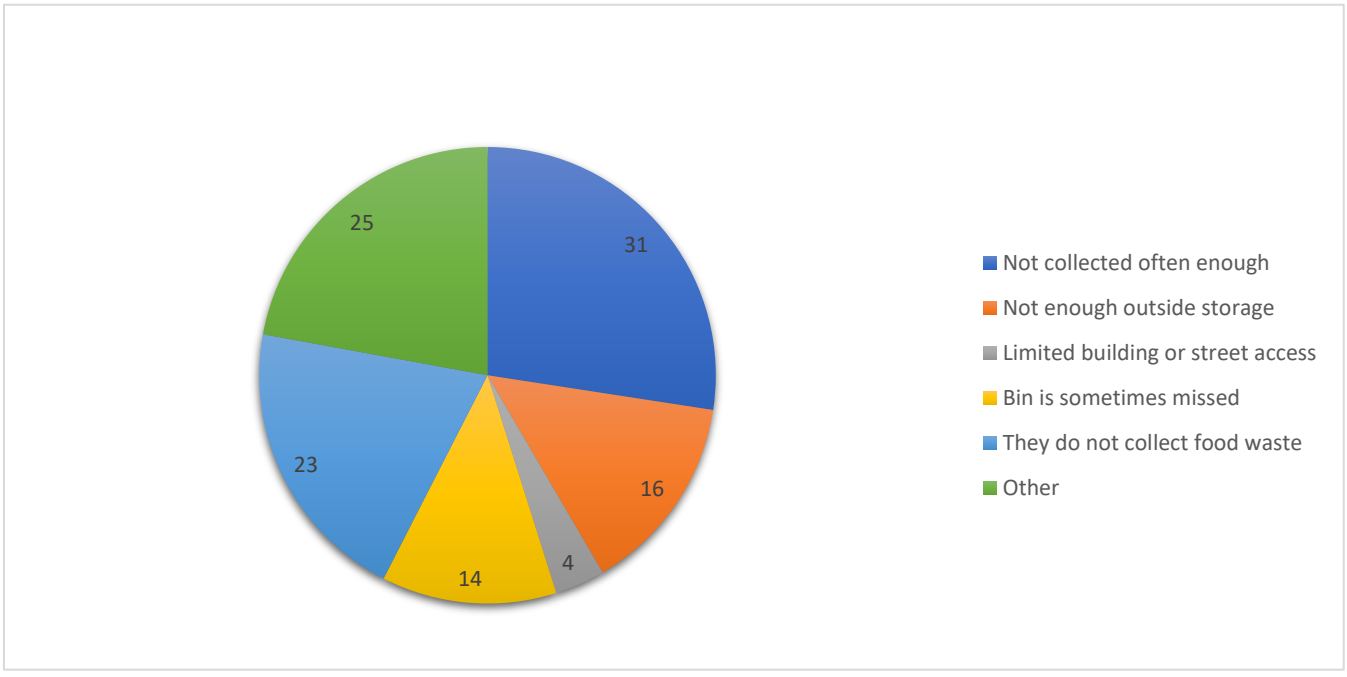



***Figure 4.6: The problems respondents encountered with the collection of food waste by their local authority.***

27% of respondents reported that food waste was not collected often enough and 14% have stated that there was not enough outside storage. Therefore, has the issue been with the local authority or the individual themself? This suggested that individuals could have been buying too much food or food did not get used before it was spoiled, thus increasing the amount that was expected to be collected by local authorities.

The main problem identified through the other response of ***Figure 4.6*** is that 22% of respondents reported that when they had significant volumes of food waste, compostable liners got full and split, leaving residues behind in the bins which started to rot and smell overtime and subsequently attracted vermin and other pests. Thus, innovative and sustainable solutions should be developed to minimise this issue and increase compliance to ensure individuals followed the correct food waste recycling procedures amongst households in Scotland. This will be explored further in Chapter 5.

## 4.3 Food Waste Management Attitudes

The main focus of questions 13 to 20, as per Appendix 1, concentrated on individuals' general attitudes displayed towards food waste management within their households. These questions allowed all respondents to participate equally and fairly, and consisted of why food got wasted within households; what motivated individuals to avoid food waste; where individuals believed food waste went after household collection; the factors they were most concerned about when they waste food; and what they believed could be done in future to improve or enhance their motivation to partake in adequate food waste prevention and disposal methods.

### *4.3.1 Determinants of Food Waste*

Acquiring a deeper understanding of the personal attitudes that have contributed to the generation of food waste within Scottish households was conducted by the Value-Belief-Norm theory that was key to finding the root of the problem, which then contributed towards finding better solutions going forward (Farr-Wharton et al., 2014). ***Figure 4.7*** emphasised the main determinants that contributed towards the food waste problem found within Scottish households.

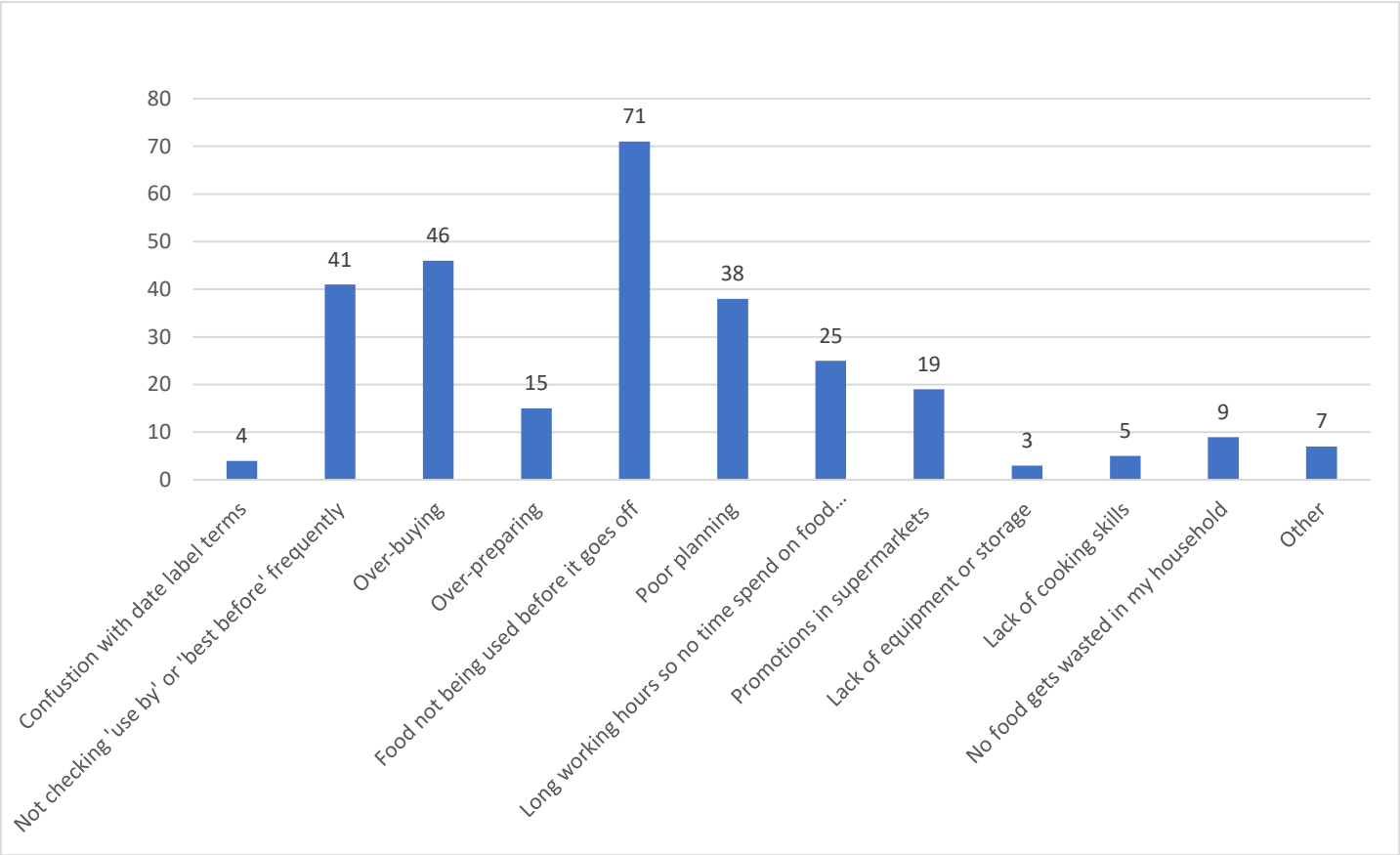



***Figure 4.7: The main reasons respondents reported why food waste occurred within their households.***

The results overall revealed that a shift in attitude was needed to ensure the respondents improved their food waste management prevention techniques. An integral, collective effort is needed if we want to protect the environment and reverse the effects of climate change in the future (Love Food Hate Waste Scotland [A], 2021). It can be viewed on ***Figure 4.7*** that the most common determinant as to why food waste occurred at home was due to food not being used before it expired, 71 responses were chosen, and a further 46 responses were selected by responders who indicated that they did not check best before and use-by dates frequently enough. Interestingly, 4 out of the 7 'other' responses were significant as these individuals identified that they have found it difficult to convince other members of their household to participate in adequate food waste management and prevention strategies. Therefore, it can be concluded that we need highly motivating and convincing solutions that would provide a positive change in attitude to this problem. This was explored in chapter 5.

### *4.3.2 Prevention Techniques*

Whilst a prominent issue in relation to poor behaviour management and poor attitudes around food waste within Scottish households was identified in previous sections of chapter 4 - whether it was a fault of personal choices, local authorities or hygiene and contamination issues - ***Figure 4.8*** has indicated that there was an emerging positive pragmatic relationship when it comes to the prevention of food waste going forward. Key prevention measures that individuals adopted within their households were identified below:

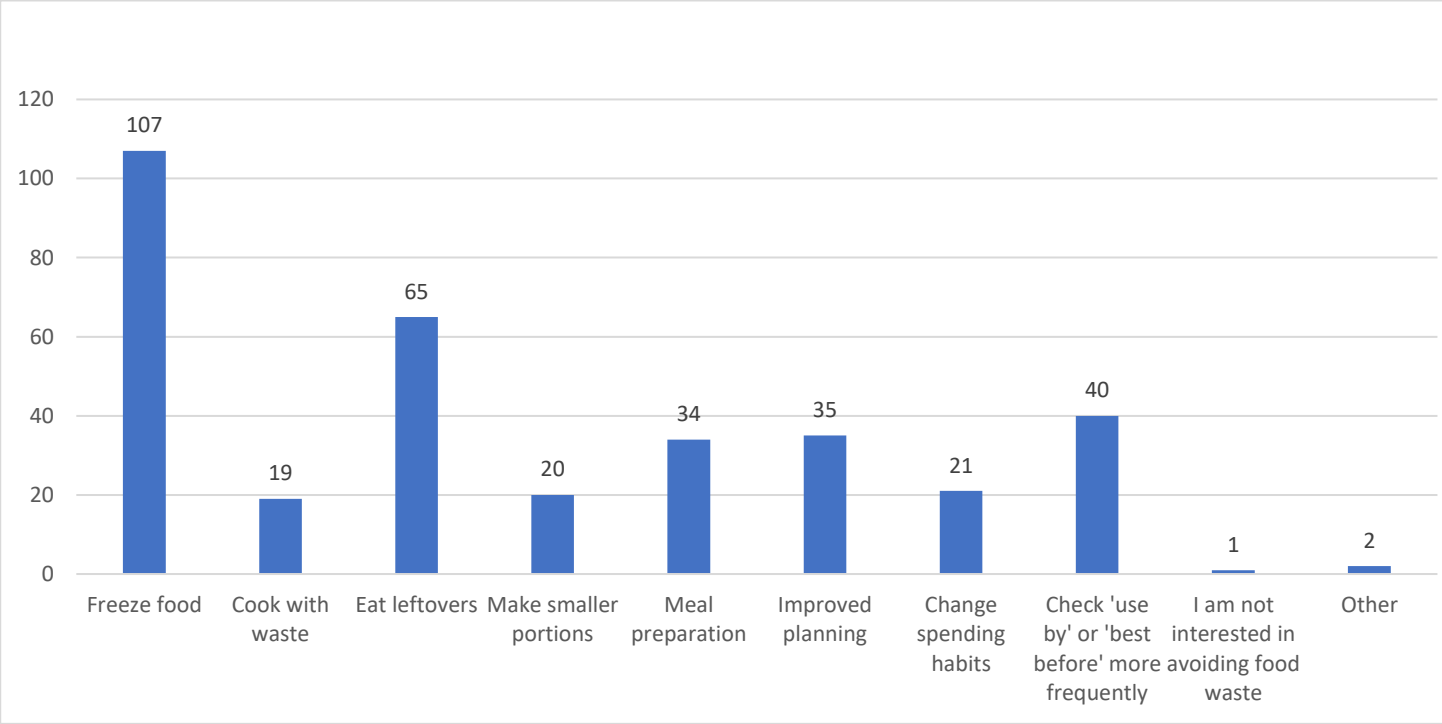



***Figure 4.8: What respondents did at home to prevent food waste from occurring.***

This graph portrayed that collectively, respondents remained conscious and hopeful that they could do the best they could in difficult situations to prevent food waste. It was highlighted that the two most significant responses were freezing food (31.1%) and eating leftovers (18.9%). Both responses (0.6%) for 'other' have reported that they ate meat and dairy free, and so they did not acknowledge the best before and use-by dates on labels – they continued eating food until it became visually. Only one individual (0.3%) was not interested in avoiding food waste which was very optimistic and suggested that change is happening in the right direction. Additional prevention techniques identified in ***Figure 4.8*** included: cooking with food waste (5.5%), reduced

portion sizes (5.8%), enhanced meal preparation (9.9%), improved meal planning to prevent buying unnecessary items (10.2%), changed spending habits (6.1%), and individuals checking dates more frequently (11.16%). It should be noted, however, that percentages were very low which meant that a significant amount of work is needed to be carried out to increase the effectiveness and probability of more individuals complying in future.

### *4.3.4 Concerns*

As an Environmental Management student, the most obvious concern would be the environmental implications of food waste, however, not all individuals possess this similar mindset and so the financial and moral concerns are also viable for this research. One of the aims for this project, is to increase the populations environmental knowledge and awareness, which in turn should improve behaviours and attitudes of food waste management within households.

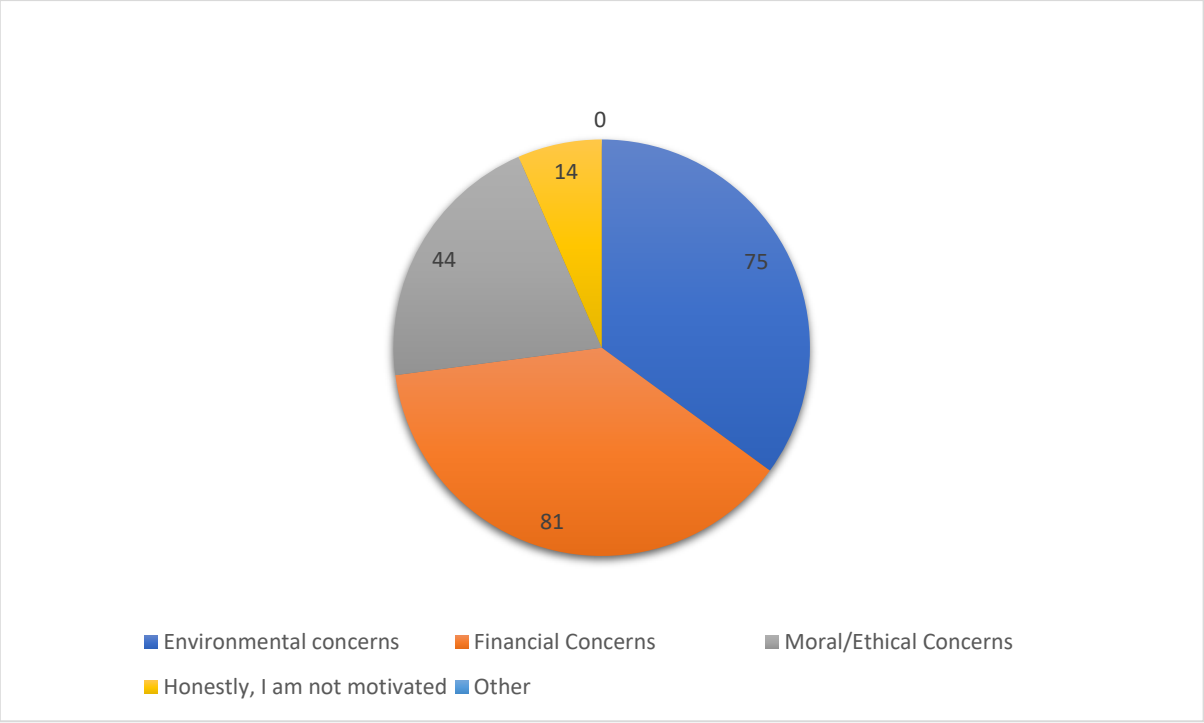



***Figure 4.9: What responders are most concerned about when wasting food.***

As expected, due to the behaviours and attitudes of food waste management identified previously in Chapter 4, ***Figure 4.9*** indicated that only 35% of respondents were most concerned about the environmental implications. Therefore, it was established that a significant number of respondents (59%) deemed that they believed the financial and moral implications were more important than the environmental factors. Furthermore,

6% of respondents admitted that they were not concerned nor motivated about the implications of improper food waste management.

### *4.3.5 Food Waste vs Food Waste Packaging*

This was an interesting proposition which helped further increase understanding of respondent's attitudes towards food waste management and the extent of their environmental mindset.


***Figure 4.10: What respondents reported should be most considered for improved management and reduced food waste at home***

Whilst only 35% of respondents on ***Figure 4.9*** highlighted that they were concerned about the environmental concerns around food waste; it was established on **Figure 4.10** that 59.7% of individuals believed we should be more concerned about the levels of food waste packaging being wasted as opposed to 40.3% who believed food waste is more of a concern.

### *4.3.6 Food Waste Knowledge and Literacy Skills*

The purpose of **Figure 4.11** and **Figure 4.12,** was to establish the levels of food waste literacy skills and knowledge amongst responders at household level by using the terms: landfill, anaerobic digestion, composting, reduce, reuse, recycle, disposal:

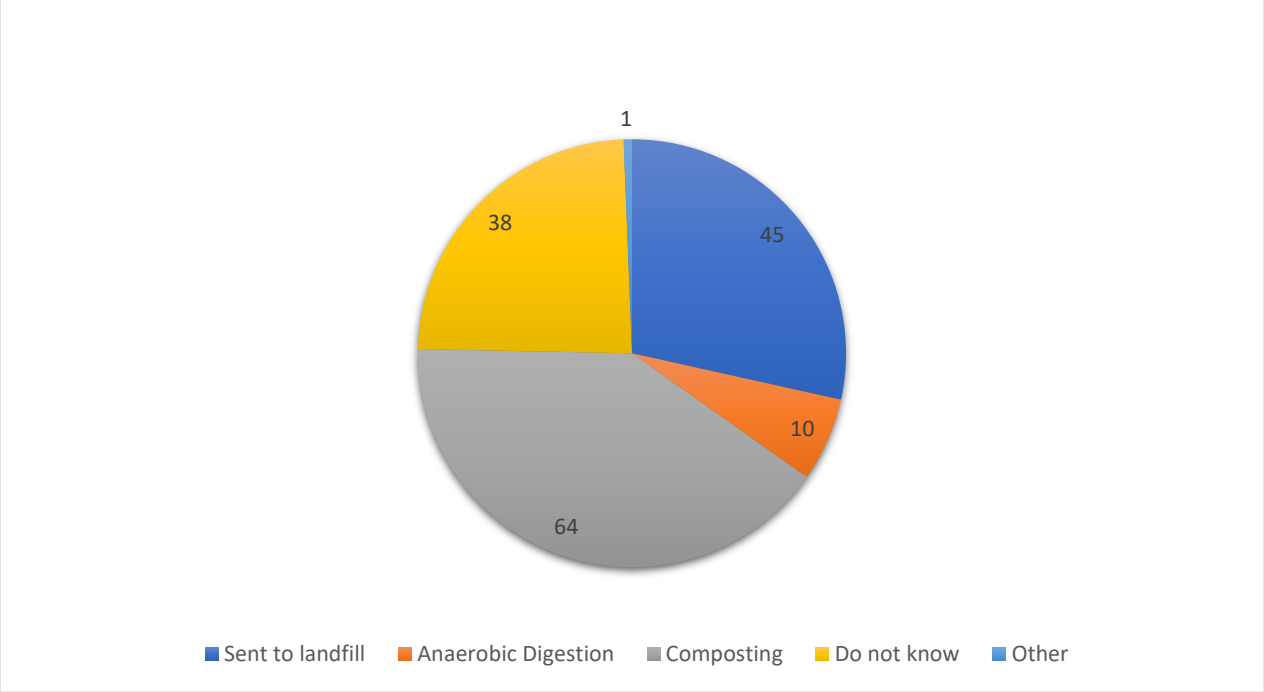



***Figure 4.11: What respondents believed happened to food waste after household collection.***

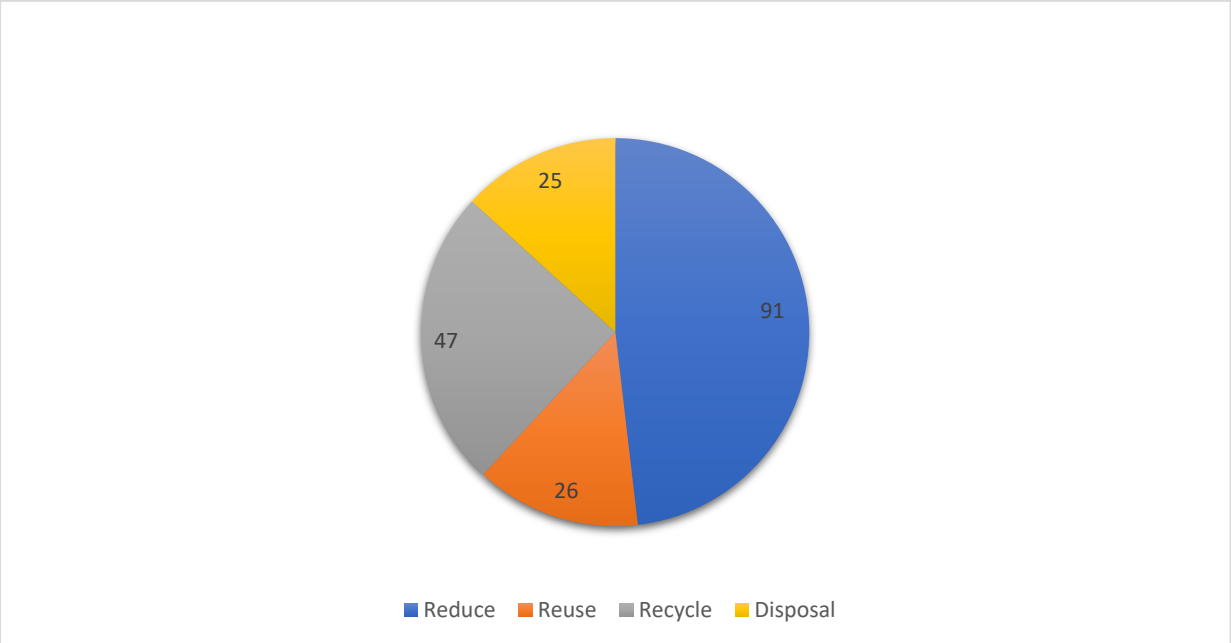



***Figure 4.12: What respondents believed they should have done to improve food waste management practices at home.***

Knowledge of food waste was a significant factor that reflected the outcome of an individual's attitude and behaviour towards food waste management (Fishbein and Ajzen, 1977). ***Figure 4.11*** highlighted that 24% of respondents reported they did not know where their food waste bin collection went after kerbside collection and 28%

believed it was sent straight to landfill which has indicated there was a degree of poor food waste knowledge.

In contrary, ***Figure 4.12*** highlighted that 48% of individuals believed 'reduce' is the best option to improve food waste management practices within their households. This was a positive finding as it was the correct answer and so it was concluded that food waste literacy and knowledge amongst participants from this questionnaire was fairly positive. Substantial work and effort are still needed to be enforced if an improvement was to be made. Educational solutions were explored in Chapter 5.

### *4.3.7. Cost of Food Waste*

**Please Note:** The correct answer intended for this research question was £430, however, this amount has since been revised and the updated figure now stands at £470 (Greener Scotland, 2021).

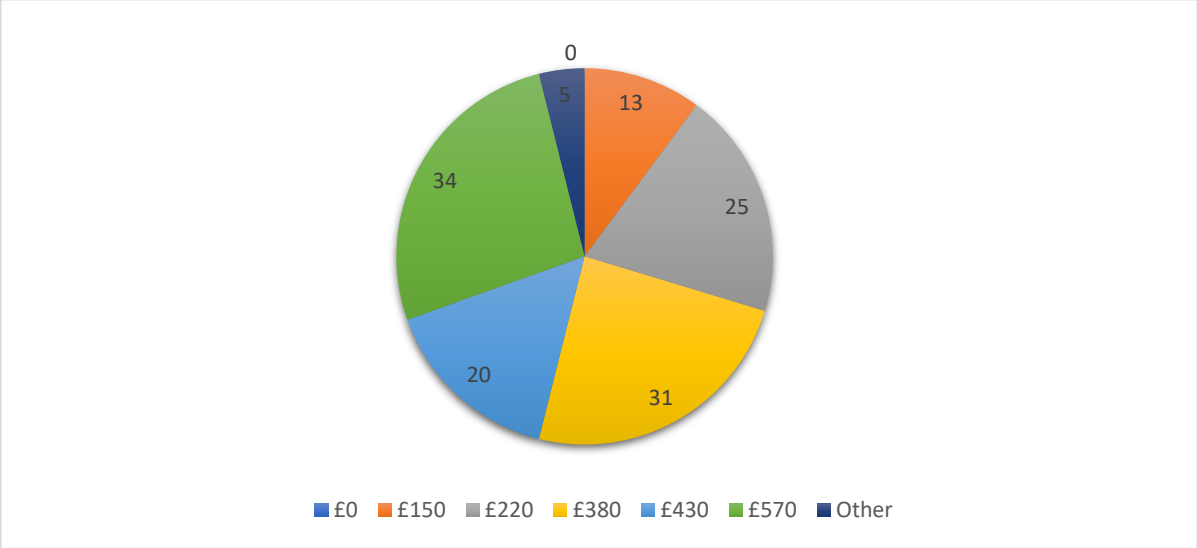



***Figure 4.13: The amount of avoidable food wasted in a year for the average household in Scotland responders believed was valued at (Zero Waste Scotland, 2009).***

Therefore (based on 2009 figures), only 16% of respondents were correct. Whilst this was a low percentage, it was reported that 31% of respondents believed this was much higher (£570 and 'other' responses combined). It should be highlighted that this does not cancel any wrongdoings; a significant proportion of the population in Scotland are still continuing to waste food and it is costing both the economy and environment a significant amount of money, annually. Methods to improve this and reduce the cost will be explored in Chapter 5.

# Chapter 5: Discussion of Results

## 5.1 Introduction

Chapter 5 analysed the findings from the data collected in Chapter 4 and compared these to Scottish Government policies and local authorities' initiatives that were implemented, determining the level of effectiveness of these in comparison as to what was reported by respondents. Furthermore, global and European level initiatives were explored to help determine if Scotland could adopt more sustainable practices or implement new and better solutions to improve food waste management within households.

## 5.2 Behaviour and Attitudes Towards Food Waste Management

The Scottish Government made it clear that all sectors and individuals involved within the FSC should exhibit effective and efficient food waste prevention, reduction, reuse and recycling strategies to improve food waste management and become more resilient and sustainable, most importantly within the household sector (Scottish Government, 2016). From the results illustrated on Chapter 4, it was established that overall attitudes and behaviours of food waste management from individuals whom participated in this research, was deemed as **satisfactory**. There were still several challenges identified and innovative solutions should be developed to ensure we successfully meet the 33% food waste reduction target by 2025. It was important that we identified the issues, recognised the successes and finally posed potential solutions to these problems to shift behaviours and attitudes in a positive manner.

## 5.3 Behaviour

It was established that behaviour towards food waste management was deemed as satisfactory based on how well respondents utilised their food waste storage within their households. **Figure 4.1** illustrated that only 17.9% of respondents did not use food waste storage provided by their local authority, which in turn, indicated that over 50% of respondents did use their food waste storage correctly. Moreover, **Figure 4.2** identified that the most common responses was weekly and daily, based upon how often respondents emptied their food waste to an external bin. Whilst this has portrayed satisfactory behaviour in terms of making consistent use of the correct food waste storage bins; this identified that food waste was still being generated at

significant volumes and collective actions are needed to be taken to ensure households meet the Scottish Governments 33% reduction target by 2025.

### *5.3.1 What Are the Issues?*

The overall issue identified was that not all individuals from the household sector were compliant with prevention measures, nor did they display adequate behaviour in terms of fully utilising food waste storage or following correct disposal procedures; as per ***Figure 4.1, Figure 4.2 Figure 4.3*****.** It was identified that significant volumes of food waste was still being generated and was not disposed of correctly which created contamination concerns within some households across Scotland. Thus, it can be established that individuals only displayed **satisfactory** behaviour towards food waste management as food waste was still being generated.

Two significant problems identified by respondents reported on ***Figure 4.6*** was that households were not provided with enough food waste storage or equipment by their local authority and collection services were poor, in particular from flatted and tenement properties within GCC. It should be noted that these respondents expressed interest to participate, however, the attraction of vermin and other animals from uncollected food waste had prevented them from displaying effective behaviour management. According to GCC's website, it was identified that supply of food waste storage and the collection from flats and tenements began in 2016, however the uptake of this was poor and inconsistent due to issues with access to backcourts and contamination concerns of households putting food waste alongside general waste. As a result, the operation was halted in the heavily impacted areas, which suggested why previous responses were reported. (Glasgow City Council [A], 2020).

An unexpected contributing factor of insufficient collection by local authorities was reported due to the COVID-19 pandemic throughout 2020. GCC reported that services were unexpectedly disrupted, therefore it can be understood why some respondents did not want to dispose of their food waste in a separate bin. If collections were temporarily halted then food waste would lay outside in bins attracting vermin and developing maggots. This was why respondents reported they found it easier to dispose of their food waste alongside their general waste. Furthermore, it was suggested that local authorities may have been struggling to keep up with this increased demand of food waste generation due to more people spending time at

home and purchasing more food. This was a considerable problem related to poor behaviour of shopping habits and also created further detrimental impacts to the environment.

### *5.3.2 What Successes Have Been Identified?*

Despite the issues identified previously, it was reported that The Scottish Government and subsequent Local Authorities across Scotland did supply adequate food waste storage facilities to households: 80% of households had access to food waste recycling (Scottish Government, 2019). Moreover, in 2017 the Scottish Government Household Survey established that 69% of South Lanarkshire's food waste was composted or recycled, either at home or transported to Deerdykes Bioreources Centre by the council to be processed (South Lanarkshire Council, 2018). Deerdykes confirmed that local authorities across the City transported more household food waste over the past 10 years than before and they had successfully processed over 155,000 tonnes of food waste and transformed it into a source of renewable energy. They saved 96,695 $m^3$ of carbon and generated 38GWh of green electricity, which was the same as powering over 10,000 homes (Scottish Water, 2020).

***Figure 4.1*** highlighted that there was considerable food waste storage provided, such as kitchen caddies, compostable liners and external bins, to households across Scotland. Moreover, ***Figure 4.3*** illustrated that 72% of respondents only disposed 'very little' food waste; thus, this indicated that behaviour management practices have been improved within households as people have started wasting less food. This satisfactory behaviour was reinforced by Zero Waste Scotland findings who reported that progress has been made over the past 10 years: emissions are falling, households and individuals have become more effective and efficient at reducing levels of food waste generated and compliant with processes and procedures to minimise any risk (Scottish Government, 2019). It was also reported by The Household, Recycling Charter with the Convention of Scottish Local Authorities that they have ensured food waste collection systems were made consistent and more frequent which has helped increase the number of people participating in disposing of their food waste correctly at home (Scottish Government, 2019).

In light of the concerns and complaints raised by members of the public in February 2020 about the insufficient or heavily delayed food waste recycling and collection

services within flats and tenements across GCC. GCC responded and devised action plans, which were reviewed in August 2020, whereby a new approach for storing and collecting food waste was introduced in the North-West of the city. This witnessed an additional 4500 food waste bins being provided to households and the collection of an extra 2000 tonnes of food waste. It was recognised that this was not fully successful, however, as it was reported that up to 30% of bins were still contaminated by other household items such as black bin bags. Contamination prevents food waste from being processed at Deerdykes, Lanarkshire, therefore it had to be processed as general waste which came with a burden of financial and environmental implications: councils experience additional costs to dispose, taxpayers are not getting their money worth, and waste was consequently sent to landfill increasing the chances of toxic greenhouse gases being emitted into the atmosphere, which is what we are at upmost trying to avoid. Recent findings reported that GCC have decided to seize 2500 food waste bins from addresses where contamination issues were still being experienced repeatedly and encourage residents to dispose of their food waste at nearby publicly sited bins (Glasgow City Council [B], 2020).

As of February 2021, Glasgow City Council announced that they have restored the food waste collection service amongst all flats and tenements across the city. An efficient and reliable service was resumed in the north of the city, with the South of the city next on the list to be targeted. GCC understood that food waste is carbon intensive and so action was enhanced to reduce carbon footprint collectively across the city. It is too early to determine if this has yet made an impact but compliance from all households and local authorities throughout the rest of 2021 should start to reverse this problem going forward (Glasgow City Council [A], 2021).

Furthermore, Falkirk Council were the first local authority in the United Kingdom whom introduced three-weekly residual waste collections, which included food waste. Since then, household recycling rates have increased significantly and have continued to be consistent which has improved consumers behaviours; more people were willing to participate which has led to this overall success. It cut costs overtime and other local authorities in Scotland have now began following lead (Scottish Government, 2016).

### *5.3.3 Innovative Solutions Going Forward*

It can be established that progress was made in relation to improved behaviour management towards utilising food waste storage and adhering to correct disposal methods within households, however, further favourable action must be taken to discover innovative solutions to further enhance positive behaviours and adherence to key prevention measures to meet to Scottish Government's 33% food waste reduction target by 2025 (Scottish Government, 2019). Table 5.1 presented some key solutions that could be adopted within households across Scotland to improve food waste management behaviours.

**Table 5.1 Six solutions individuals can enforce at home to reduce the production of food waste.**

| **Action** | **Outcome** |
|---|---|
| **Shopping lists** | Writing these prior to going to the supermarket will ensure individuals only buy what is necessary and needed. |
| **Check Shelf Life** | Choosing foods that have the longest shelf life is an important factor to consider as there is more chance these food items will get used rather than thrown away. |
| **Improve Home Storage** | This will ensure food is being stored in the correct locations and correct temperatures. This also make access to food items easier and there will be less chance they will be forgot about. Put newer food to the back and older food to the front. |
| **Optimise Freezer Space** | Forward planning will allow individuals to meal prep or save leftover food for a later date to ensure waste is kept to a minimum. Food can easily be defrosted making this an easy, convenient and cost-free meal after a long day at work. |

| | |
|---|---|
| **Use Existing Food First** | Before going to the shop to buy new food, plan meals with what is already in cupboard. There will more than likely the products there that have been forgot about. |
| **Learn New Recipes** | Love Food Hate Waste Scotland have devised a thoughtful recipe section on their website to help inspire individuals be creative with any potential food waste before it is thrown away. |

Love Food Hate Waste Scotland, a registered charity created WRAP, who suggested that if individuals simply changed and improved their food waste management habits at home then this would help significantly reduce the amount of food waste being disposed of and ultimately reduce problems associated with not enough storage being provided by local authorities, which in turn will foresee improved overall behaviour management (Love Food Hate Waste Scotland [B], 2021).

Whilst GCC's comingled food waste guide stated that all households across Glasgow have received an indoor caddy and a brown bin that is collected every two weeks from kerbside, households are only receiving a year's supply of compostable liners. Thereafter these must be purchased, or food waste can be taken to a publicly sited bin (Glasgow City Council [A], 2021). Whilst this has been an effective solution for 70% of households, this is clearly not feasible or easily accessible for all. Zero Waste Scotland have reported they will be working closely with local authorities between now and 2025 to improve food waste recycling within households (Scottish Government, 2019).

Going forward, GCC and other local authorities across Scotland should consider a rolling monthly or yearly supply of compostable liners, or when requested, free of charge. Whilst it has been recognised that compostable liners are relatively cheap, this could still be a financial burden for some individuals. Additionally, it may not be a priority and so individuals would be more likely to forget to purchase these. Thus, if a constant supply was provided it would encourage participation and the 30% figure of households not complying would be reduced in the future. Furthermore, another innovative solution could be by supplying households with a small compost bin and

provide education on how to use; a number of individuals expressed a desire to start composting but did not know how to. In addition, local community focus groups would allow for participation and engagement; it would provide individuals with a sense of empowerment to be part of future solutions.

## 5.4 Attitude

Overall, it was established that the general attitude towards food waste management within Scottish households was also **satisfactory**. It was highlighted that a greater number of individuals have, however, expressed greater intentions and desires to contribute towards preventing food waste from being generated within their households in future, thus action should be taken now for these to be effective. If attitudes can be changed, then changes to behaviour would also follow.

### *5.4.1 What Are the Issues?*

This research identified that, overall, food spoilage and the subsequent waste was a significant issue within Scottish households. ***Figure 4.7*** identified that the most common determinant of food waste was because individuals did not fully use up the food they had at home before it has gone out of date. This was also a problem as a result of over-buying; over-preparing; poor planning; long working hours; and being influenced by promotions in supermarkets. Respondents simply bought more food than was needed. The Food Standards Agency have reported that not checking best before and use-by labels was a major factor for the occurrence of food waste across households in Scotland (Food Standards Agency, 2021). It is reported that around 2Mt of food were wasted due to date label confusion or simply not getting into habit of checking labels frequently (O'Sullivan, 2018).

Therefore, it was determined that shopping habits is one of the most significant variables that resulted in poor attitudes in consumer food waste management within Scottish households (Schanes et al., 2018; Aydin and Yildirim., 2021). This was a common problem identified, not only within Scotland but across the globe, for several years. Key marketing techniques influenced shoppers to buy impulsively and buy in bulk (Ene, 2008). To resolve this issue, supermarkets in Scotland developed and enhanced targets and policy for food waste reduction. For consumers to waste less, they must buy less.

It is of concern that ***Figure 4.9*** highlighted 59% of respondents were most concerned about the financial and moral implications of wasting food. Therefore, it was highlighted that for respondents to develop 'better than satisfactory' attitudes and behaviours towards food waste management, they would need to have greater awareness and be more concerned about the environmental implications also. Understanding the environmental implications comes with food waste knowledge. ***Figure 4.11*** highlighted that not all respondents knew what happened to food waste after it was collected from kerbside, thus levels of knowledge was insufficient. Therefore, this has suggested why the general attitude and behaviours have only been found as satisfactory within this project. If individuals had substantial levels of food waste knowledge and literacy skills, they would be more conscious and encompass improved behaviours and attitudes towards food waste management (Farr-Wharton et al., 2014).

### *5.4.2 What Successes Have Been Identified?*

***Figure 4.7*** effectively allowed respondents to express reasons as to why food waste was generated in the first instance. This research question was conducted in line with the Value-Belief-Norm theory which highlighted that if the circumstances as to why these particular attitudes have occurred can be established; then this can help identify the root of the problem and new solutions could then be posed and developed to encourage a shift in change of positive behaviour (Farr-Wharton et al., 2014).

Major supermarkets within the UK have begun accepting responsibility and have recognised that they have contributed towards the substantial level of food waste generated at household level across Scotland. Tesco have been the most successful Supermarket in Scotland in their ploy which has contributed towards reducing and preventing food waste beyond retail. This has most notably been achieved through emptying shelves at the end of trade; marketing seasonal produce; and dramatically decreasing promotions of foods with low nutritional benefit and high environmental impacts (O'Sullivan, 2018). **Table 5.2** below highlighted this success and has identified a wide array of proposed methods that has contributed towards the prevention and reduction of food waste within households.

**Table 5.2 Key targets and policies Tesco introduced to contribute to reducing and preventing food waste by consumers (adapted from O'Sullivan, 2018).**

| Target or Policy | What has been achieved |
|---|---|
| **Publish Food Waste Data** | This led to an increase in donations from the general public to redistribute food items, that otherwise would have gone to waste, to local charities or food banks. As of 2016, Tesco were providing "FareShare", whom are a major redistribution charity, five million meals a year. Five years prior to that they were receiving nothing and so this has been a significant and successful ploy, creating more transparency. |
| **Minimise Supplier Waste** | Introduction of the Groceries Code Adjudicator to ensure fair code of practice was adhered to and ultimately treated suppliers fairly. This is achieved by avoiding last minute order cancellations or forecast changes by sufficient communication, to prevent food waste at earlier stage of the FSC. This was achieved by: whole crop purchasing; guaranteed orders for suppliers; improved forecasting; marketing seasonal produce; and relaxing cosmetic specification, incorporating the imperfect or wonky range. |
| **Relaxing Cosmetic Specification** | This allowed for increased amounts of wonky fruit and vegetables to be included within their range. It has helped farmers save more than 300 tonnes of carrot waste per year alone and there has been no negative customer feedback. |

| | |
|---|---|
| **Marketing Seasonal Produce** | At certain times of the year it was discovered that weather conditions influenced what consumers have and have not bought from supermarkets.<br><br>Supermarkets promoting produce during periods of glut ensured customers purchased food and was not wasted. In 2017 this saw an extra 220,000 cauliflowers being sold. |
| **Date Labelling** | Removed best before dates from most fresh, fruit and vegetables, produce altogether. For example, apples and onions, which encourages consumers to assess products themselves to prolong shelf-life. This resulted in fewer edible items from being discarded and informs customers that there is no rush to enjoy them. |
| **Removing Multi Buy Offers** | 'Buy one get one free' was removed from fruit and vegetable products in 2014 and introduced price cut promotions for better value all year round, increasing sales and reducing waste. |

Love Food Hate Waste Scotland have devised several key methods on how to avoid food waste to contribute to improving consumers attitudes and this is by planning ahead for meals; checking the fridge, freezer and cupboard before a food shop to use up older food first. They also reported that consumers should understand the differences between date labelling: best before is about quality and use-by is about safety for improved food waste management. Additionally, they provided advice on how to generally freeze and defrost food, but each product should be checked to ensure it is suitable for freezing and they provided recipe ideas for leftovers to help prevent food waste (Food Standards Agency, 2021). Expired, unforgotten food is not uncommon in Scotland, it was established that across the globe 25% of food waste comes from domestic settings (Farr-Wharton et al., 2014).

***Figure 4.8*** highlighted that respondents have begun recognising that their attitudes need to be changed and improved in order to prevent food waste from occurring. Individuals have started incorporating key prevention measures in order to help reduce the levels of food waste they could potentially generate. This included: freezing food, eating leftovers, checking best before and use-by labels more frequently. ***Figure 4.12*** also revealed that over 50% of individuals understood that to improve food waste management, reduction was a key prevention method. Finally, ***Figure 4.13*** identified that most respondents believed food waste was costing each household more than the actual average cost. Thus, this has suggested there are significant promising signs that attitudes around household food waste management have begun to be recognised and improved.

### *5.4.3 Innovative Solutions Going Forward*

Scientists and academics suggested that if there was major developments and advancements in active and intelligent food waste packaging systems to help increase shelf life then this would be an effective solution to reduce or prevent the generation of food waste within households in future (Poyatos-Racionero et al., 2018). Thus, it was identified that respondents also agreed with the science illustrated on ***Figure 4.10*** as they recognised that we should be more concerned about food waste packaging over food waste. This suggested that individuals possess environmental knowledge, to an extent, which should help improve their attitudes around food waste management within households going forward.

Influencing consumer behaviours and attitudes was not an easy task and there has been varied success and failures in the past. Providing educational insights and increasing individuals' knowledge on food waste has proven to be a successful measure contributing towards a shift in consumers attitudes to reduce overbuying and ultimately preventing food waste (Farr-Wharton et al., 2014). It can be established that an individuals' consumption attitude is heavily influenced by items being perceived as 'value for money' (Vermeir and Verbekev, 2006), thus by Tesco removing multi-buy offers, it has been a successful ploy in the contribution towards the prevention of food waste and increased consumers attitudes (O'Sullvian, 2018).

Furthermore, an innovative solution that could be carefully developed is by incorporating food waste management in with children's education. Children are more

susceptible to pick up skills and habits from a young age and continue to develop these beyond childhood. Much like when Children learn foreign languages at school from a young age, these skills were more likely to stay with them through adulthood. It was recognised that issues around sustainability and climate change did get taught at school to an extent, but it was not a mandatory part of the curriculum. Thus, if we could work with the Scottish Government to develop a designated area to the Curriculum for Excellence to educate children on wider sustainability issues. They would adopt improved behaviours and attitudes that, it would become the norm to be environmentally conscious. Moreover, they could potentially influence future generations.

## 5.5 How Effective Are Food Waste Management Strategies in Scotland?

The Scottish Government are key leaders in Scotland, who have been, and still are, at the forefront of the Scottish population to reduce food waste by 33% by 2025. They have the power to enact and enforce required changes to prevent significant levels of food waste from being generated and contributed towards the improvement of personal behaviour and attitudes of household food waste management. They devised and implemented several management strategies and key action plans that have contributed towards the success of innovative and sustainable solutions across all 32 LAs within Scotland.

### *5.5.1 Climate Change Plan 2018*

This plan has been highly effective and the backbone of supporting food waste management within Scottish households, with future targets set until the 2032 period. This plan has had many successes: it has resulted in the legal requirement for households to separate any intended food waste for collection from general waste, thus diverting the levels of food waste being sent to landfill. Moreover, the implementation of this plan had resulted in the levels of food waste being generated falling from 4.1 million tonnes to 3.7Mt in the space of three years, which suggested that individuals have become more compliant with prevention measures to reduce food waste at home. They have been willing to participate in better food waste management practices. This plan has also ensured that 1.95 million households now have access to food waste collection services which had significantly increased since it was first

reported in 2013 whereby the total number of households stood at 575,000. It was also reported that East Renfrewshire council were the first council in Scotland who reported exceeding 60% compliance rates with food waste prevention measures at home after this plan was implemented. Furthermore, this plan increased the capacity of food waste processing at anaerobic digestion and composting facilities to 365,000 tonnes from 230,000 tonnes in 2013. Overall, The Climate Change Plan has benefitted **the environment:** reducing waste and carbon emissions and decreasing dependency on having to use scarce natural resources; **the economy:** improving productivity and resilience, and **the communities':** greater access to services and a lower cost (Scottish Government 2018).

To further enhance the effectiveness of the 2018 Climate Plan, the Scottish Government introduced primary legislation in October 2019 which focussed on amending Scotland's waste emission targets: **The Climate Change (Emissions Reduction Targets) (Scotland) Act**. In response to this legislation, it was reported that more people have actively and willingly participated in improving food waste management practices at home. Moreover, the amount of waste sent to landfill recorded the lowest figure since records began. This has highlighted that people have become more compliant and have prevented food waste where possible. Whilst there are evidently many positives of this strategy, there is still many challenges. Emissions need to be reduced to 1.2Mt and levels of food waste still need to be significantly reduced to meet the 33% reduction target by 2025. The development of COVID-19 in 2020 was also an additional, unforeseen circumstance that has impacted food waste. Whilst the lasting impact of the virus is still unknown, the Scottish Government must work on radical and transformational green recovery measures to improve food waste management within Scotland's household sector in the recovery of a post-covid world (Scottish Government [B], 2020).

### *5.5.2 Food Waste Reduction Action Plan 2019*

This action plan was developed by Zero Waste Scotland in 2019, whom are a not-for-profit environmental organisation funded by the Scottish Government and European Regional Development Fund, that lead Scotland's resource efficiency and circular economy. They have recognised that the household food waste problem in Scotland alone created 2,240,000 tonnes of $CO_2$, which equated to 2.9% of the total carbon footprint. In 2016, it was reported that 1.15 million tonnes of biodegradable waste (food

and other organic waste) was sent to landfill which was a reduction of 43% from 10 years prior, however, this was still a concerning volume. Thus, this reduction action plan was implemented to enhance long-term management strategies within the household sector to help achieve the 2025 33% reduction target and ensured that every individual within Scotland were involved in fighting the food waste problem. This plan was, and is continuing to be, highly effective as it has allowed individuals to make changes to their attitudes and behaviours by providing an array of opportunities, which included:

- Developing skills, competency and knowledge of all individuals in Scotland on better food waste management practices.
- Bringing in everyone's area and different levels of expertise and developing a best practice approach.
- Abiding by the 'Target, Measure, Act' principles to ensure consistent and transparent reporting of food waste data and figures are published regularly.
- Collaborating with leaders and professionals to provide adequate and sufficient advice on how food waste can be reduced throughout the entire FSC.

The purpose of this action plan was to ultimately raise awareness and deepen people's understanding of the current food waste challenges, whilst engaging them in activities specific to addressing the problems. Furthermore, the plan created citizen advocates who have helped promote and fight food waste reduction. Additionally, it has boosted technological innovation (Scottish Government, 2019) Therefore it can be concluded that this was a highly effective strategy implemented within Scotland that should contribute to the reduction of food waste by 33% by 2025.

### *5.5.3 A Circular Economy Approach*

The Scottish Government's **"Making Things Last – A Circular Economy Strategy"** was a highly effective management strategy implemented in 2016, and developed alongside the 2018 Climate Action Plan, with the intentions to build a stronger economy, protect resources and ultimately support the environment. Thus, it can be established that this approach has helped Scotland become a Good Food Nation. With the Scottish Government projection of reducing food waste by 33% by 2025, this approach has allowed every household in Scotland to have access to food waste collection and recycling services by 2025: 80% of households have currently achieved

this which is a huge success, however, efforts are needed to be increased to ensure the additional 20% of households also have the same access. Furthermore, through this approach, a code of practice for the Household Recycling Charter was developed and signed which has increased public participation in household recycling; improved the quality of recycling and improved opportunities for households across all local authorities in Scotland. The Scottish Government created a budget of £20.4 million in the 2016 and 2017 for this approach to be implemented and therefore it was reported that this has successfully encouraged a greater number of households to prevent, reduce, reuse, recycle and dispose of food waste effectively and efficiently. This is illustrated in the figure below whereby emissions from landfills have significantly decreased since 2018, meaning food waste was diverted landfiil. It has been projected until 2032 that emissions should continue to decrease and reach 0.6 $MTCO_2e$ (Scottish Government, 2018).

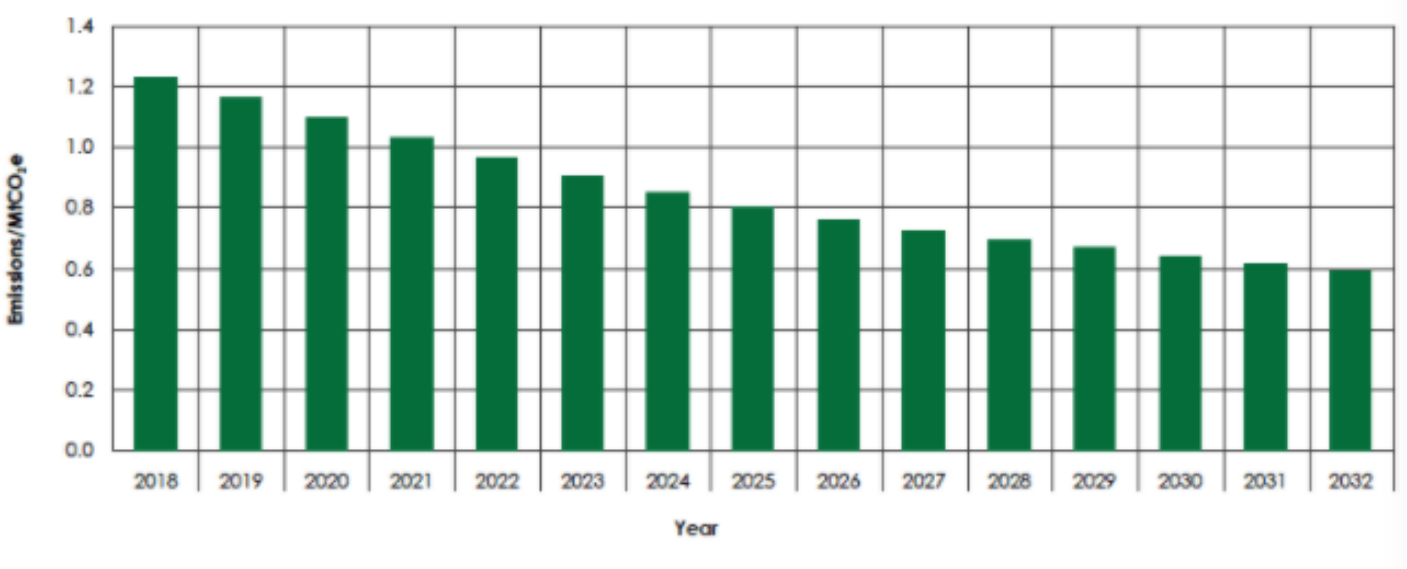



***Figure 5.1: Prediction of waste emissions from 2018-2032 from the Climate Change Plan (Scottish Government, 2018).***

### *5.5.4 "Making the Most and Wasting the Least"*

This was a highly effective management strategy developed by Zero Waste Scotland and Love Food Hate Waste Scotland, with an overall aim to encourage consumers to use food products and resources responsibly to prevent the generation of food waste. This was developed through a series of widely available newsletters that were designed to help influence and inspire consumers to change their behaviours and attitudes, to fight food waste and become more sustainable. Zero Waste Scotland

provided newsletters that were sent to email inboxes every two weeks called “Making the Most and Wasting the least” which have successfully educated and provided advice on how individuals can waste the least within their own households. Moreover, they devised a ‘Food Waste Action Challenge’ as highlighted on **appendix 2,** which allowed households to discover different ways food waste can be prevented at home. They also provided several, easy recipe ideas that has allowed individuals to utilise any leftover food they had. The newsletters successfully targeted key holidays periods throughout the year where food waste has been expected to be greater. For example, the most recent newsletter included ideas on what to do with excess chocolate and hot cross buns (Zero Waste Scotland, 2021). Whilst these newsletters have been widely available to the public, it is reported that individuals who have subscribed to an organisation’s newsletter would be more inclined to change their attitudes and improve behaviour management towards food waste as they would be more heavily involved, inspired and educated (Agrebi at al., 2007).

Whilst this was an effective management strategy in terms of information being sent conveniently to email inboxes, it was only deemed effective if it reached a wide audience and, in this case, it did not. Only those who subscribed will have received these newsletters, which implied it was only effective for a particular target audience; those who were interested in improved food waste management. It was found that people who have displayed poor attitudes and behaviour to food waste management need to be targeted, therefore it has been established these were not as effective as originally expected. If solutions to this problem could be developed then this would ultimately be an effective management strategy,

#### *5.5.5 Zero Waste Scotland Podcasts*

Zero Waste Scotland recognised that life is busy; not everyone has time to read 5000 words documents on how to reduce food waste and become more sustainable. Therefore, they recorded podcasts as a more convenient strategy for individuals that can be listened to on to go, in the gym, when cooking dinner or at any preferred time of choice. They enhanced effectiveness of this strategy by having famous people feature which was a clever tactic designed to attract more listeners. Thus, Zero Waste Scotland have involved Master Chef Winner and Scotland’s National Chef, Gary Maclean with their podcasts (Zero Waste Scotland, 2021). Much like the newsletters identified in section 5.2.4, these were only deemed as effective management

strategies for those who were willing to listen. Both newsletters and podcasts, however, have been identified as potential solutions that could contribute to the success of the impending food waste problem within Scottish households. If these could be promoted to a wider audience, they could provide valuable educational skills that would ultimately see attitudes and behaviours transforming, shifting towards a positive mind set and ultimately contribute towards the 33% food waste reduction target by 2025.

#### *5.5.6 Food Growing Strategy Action Plan*

The Community Empowerment (Scotland) Act 2015 required all LAs within Scotland to produce a food growing strategy to help divert the amount of food waste sent to landfill. South Lanarkshire Council devised and implemented this 2020-2025 strategy to prevent food waste and established more sustainable uses for food.

It can therefore be concluded that was a highly effective management strategy so far that involved a wide array of stakeholders within the wider community of South Lanarkshire Council, which included individuals from schools, local community groups and anyone who was generally interested to make change. It has been reported that the implementation of this has engaged a significant number of individuals, which has increased their knowledge on food waste and subsequent management strategies. The Food Growing Strategy has highlighted this has provided individuals with the opportunity to produce their own fruits and vegetables which has saw food miles reduced significantly, food is fresher thus it was less likely to get wasted and households have become more sustainable, clean and green. Individuals have also contributed to the circular economy through this strategy as they are educated on food waste recycling and how food waste can be turned into nutrient rich compost. Overall, this strategy was highly effective as it contributed towards to reduction of waste being disposed of and has contributed towards the success of the Scottish Government's ambition of being a good food nation.

## 5.6 Global Initiatives

Both "Save Food" and "United Against Food" were extraordinary initiatives that have been implemented across the globe to ensure the food loss and waste crisis is being fought equally, by everyone. These are successful initiatives, with Save Food having four basic pillars as a guide to continually follow and ensured they are meeting targets

through interim consultations; and United Against Food has had incomparable leadership across all sectors to motivate and inspire the general public to prevent food waste at home. These are key qualities that could be adopted in Scotland to ensure The Scottish Government reach their 33% reduction target by 2025. These are described in more detail below:

### *5.6.1 "Save Food"*

This initiative was developed by FAO in 2011 to situate the global food loss and waste issues on the political and economic agenda, and was continually under review to increase the knowledge gap and develop new and existing strategies to reduce food waste across the entire FSC including the household sector. Best before and use-by dates have been identified by the FAO as two main causes of food waste at household level globally - this is also the main issue identified within Scotland as per ***Figure 4.7***. This initiative was designed to encourage stakeholders, from both private and public sectors, to conduct and present research within their own area of expertise and collate this information to create and enabling environmental to target, measure and act on the food waste problem. This initiative ensured that food waste reduction was not a standalone goal; it was a fragment of the efficient value chains that made up the whole sustainable food system to mitigate against climate change and achieve food security (FAO, 2016).

**Table 5.3 Four basic pillars of the Save Food Initiative:**

| Pillar | Intention |
|---|---|
| **Awareness Raising** | This educated individuals on the impacts and solutions of food waste to enhance and strengthen management practices to become more resilient and sustainable. |
| **Collaboration and Coordination** | This incorporated a wide array of stakeholders from a variety of sectors on initiatives developed within other countries across the globe on their food waste and food reduction, to strengthen this overall global initiative. |

| | |
|---|---|
| **Policy, Strategy and Programme Development** | This pillar enhanced the effectiveness and efficiency of management strategies for food waste reduction. It includes the implementation of legalisation to make this initiative more viable, meaning that more people will be willing to comply as they will have a deeper understanding of the issues and possible solutions to prevent food waste within households. |
| **Support to Investment Programmes and Projects** | The public sector researched and provided guidance, whereas the private sector invested and acted. Both sectors then collaborated to devise and implement effective solutions and strategies that ensured food waste was reduced significantly within homes. |

### *5.6.2 "United Against Food Waste"*

In March 2018, The Netherlands launched similar ambitious food waste reduction targets to Scotland, however, they have intended to be the first European country to meet the UN Sustainable Development Goal 12.3 (Scottish Government, 2019) and cut food waste in half by 2030. It was developed by a group of companies; research institutes; civil society organisation and the government. Profound leadership across sectors within The Netherlands was the foremost reason why food loss and waste were effectively being tackled and on track to meet its target by 2030. They have recognised that this was a significant crisis that must be prioritised and full commitment from leaders was essential for this to be successful. This commitment, passion and motivation from leaders at government level is portrayed on to local communities which saw the citizens viewing food as something that strictly does not go unused or end up in landfill. Thus, people were highly educated on the environmental, social and economic implications of what could happen if they had piteous excuses, behaviours and attitudes around food and subsequent food waste. Whilst there is still ample work to be carried out to ensure The Netherlands reach their food reduction target, this was a highly reputable initiative that is on track to meet their target by 2030 (Messenger, 2018).

# Chapter 6: Conclusion and Future Recommendations

Overall, it can be deemed that food waste management within households across Scotland is **satisfactory**. Although attitudes are evidently stronger than behaviours based on the results from Chapter 4, substantial work is still needed to be implemented and enforced to improve overall food waste management. The Scottish Government's target of reaching 33% reduction in food waste by 2025 is ambitious but it is undoubtedly achievable if we are all committed and willing to do so.

There are many significant policies, legislations and actions plan already enforced in Scotland to strive towards this positive change. Therefore, if all individuals along the FSC comply, collaborate and display impeccable behaviours and attitudes towards food waste management, the prospect of individuals from the household sector becoming more resilient and choices is imminent.

## 6.1 Main Factors Contributing to Food Waste

It can be concluded that poor shopping habits has been identified as the most significant factor in relation to poor behaviours and attitudes. We are a nation who love to shop, however, not everyone is aware of the environmental consequences that occur from wasting food, as identified on ***Figure 4.9*****.** Thus, if we could increase education, this would raise awareness of the problems associated with wasting food going forward. Moreover, it was established that if individuals got into habit of shopping smarter and only buying fresh produce when needed, food waste would be drastically reduced.

Whilst problems have been identified with local authorities not collecting food waste often enough or not provided enough food waste storage bins, ***Figure 4.5*** and ***Figure 4.6***, services were ultimately provided as The Scottish Government reported that 80% of households in Scotland had access to food waste recycling. If individuals stopped over-buying and improved their attitudes and behaviours, then there would be less food being wasted.

## 6.2 Management Strategies

The Climate Change Plan and Food Waste Reduction Action Plan were two significant management strategies within Scotland. Despite several attempts to manage food waste in homes and improve behaviours and attitudes, more work was needed to be implemented and enforced to raise awareness. Intrinsic and incentive motivations should be utilised to encourage better management and prevention of food waste in domestic settings.

Generally, households across Scotland were compliant and displayed satisfactory behaviours and attitudes when following food waste processes and procedures. It was evident that a small proportion of the population still need to improve. Consumers may have an interest to be more sustainable and want to reduce their food waste within their households, however, there are several external factors which can impact this such as cost and lack of knowledge.

Exemplary management strategies enforced by The United Nations and The Netherlands, demonstrated fundamental leadership from governing bodies who exhibit passion and commitment. The Scottish Government should strive to be like this. Raising awareness amongst citizens and providing key education is what is needed to be enforced within Scotland.

## 6.3 What Role Do Retailers Play?

As recognised in Chapter 4, consumers were more inclined to overbuy due to promotions in supermarkets which resulted in bulk buying and substantial levels of food. Subsequently, this was often not eaten or forgot about, creating an abundance of food waste. Tesco have already accepted greater responsibility for contributing towards this food waste problem generated amongst households. Therefore, other retailers within Scotland should follow lead and work on implementing measures to reduce food waste. This could be by creating key marketing ploys or incentives to encourage customers to prevent food waste and only buy what is necessary. Furthermore, instead of bags for life, retailers could create compostable shopping bags whereby shoppers could then use these bags to dispose of any food waste.

## 6.4 COVID-19 and Food Waste

The COVID-19 pandemic at the beginning 2020 was a significant detrimental factor and subsequently caused an increase in amount of food waste generated in households throughout 2020 and 2021, so far. With lockdowns, many workplaces and educational establishments were closed, and a greater number of people have been at home for longer periods of time than usual. Thus, a greater amount of food had been purchased, consumed and wasted. Spending a significant amount of time at home influenced situational conditions and behaviours, such as cravings or desire for a particular food, thus explaining the increase in food waste (Schneider, 2008; Farr-Whalton et al., 2014). A “build back better” approach will be taken to foster a green recovery and the circular economy, building positive behaviours and attitudes life after Covid (UNEP, 2021).

## 6.5 Future Recommendations

New innovative solutions need to be developed to reach the 33% reduction target by 2025. Thus, solutions should be at the heart of the community. Involving local citizens by having focus groups would recognise problems and increase awareness. This was trialled on the questionnaire, appendix 1, shown on ***Figure 6.1*** below.

Chapter 5 recognised that making sustainability a mandatory area of the Curriculum for Excellence could be a potential effective solution to improving attitudes and behaviours of waste management and other climactic issues from a young age. Children would grow up and it would be the norm for them to be more environmentally conscious.

In addition, technological advancements could see fridges being installed with electronic alerts, whereby a message is sent via SMS or email, to individuals when products are due to expire. Moreover, cameras could be installed within bins to monitor consumer food waste behaviour and help local authorities identify where problems are generated. Alerts could then be sent to individuals and inform them of any wrongdoings and provide them with educational solutions to prevent it from happening in future.

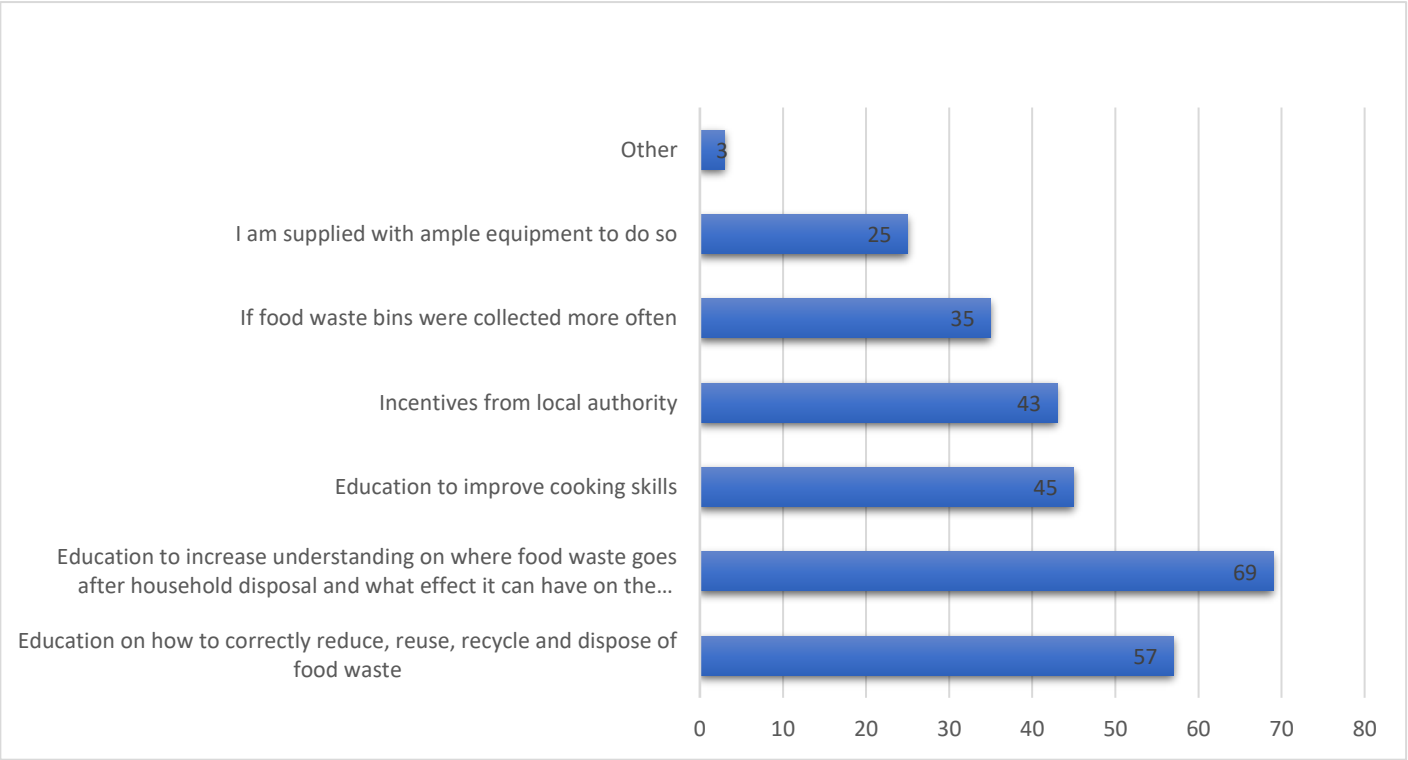



***Figure 6.1: Personal improvement respondents reported they would want to make at home to prevent and reduce food waste to encompass improved behaviours and attitudes in regard to management strategies.***

# References


1. Aydin, A.E. and Yildirm, P., (2021). Understanding food waste behavior: The role of morals, habits and knowledge. *Journal of Cleaner Production*, vol. 280, pp. 124250.
2. Bell, J., (2014). *Doing Your Research Project: A guide for first-time researchers.* McGraw-Hill Education (UK).
3. C40 Cities Climate Leadership Group., (2019). Why solid waste incineration is not the answer to your city's waste problem. [Online] Available: https://www.c40knowledgehub.org/s/article/Why-solid-waste-incineration-is-not-the-answer-to-your-city-s-waste-problem?language=en_US [Accessed: 25.2.21]
4. Farr-Wharton, G., Foth, M. and Choi, J.H., (2014). Identifying factors that promote consumer behaviours causing expired domestic food waste. *Journal of Consumer Behaviour*, vol. 13, no. 6, pp. 393-402.
5. Food Standards Agency., (2019). Best before and use-by dates. [Online]. Available: https://www.food.gov.uk/safety-hygiene/best-before-and-use-by-dates [Accessed: 01.04.2021]
6. FAO., (2016). Global Initiative on Food Loss and Waste Reduction – SAVE FOOD. [Online]. Available: http://www.unece.org.net4all.ch/fileadmin/DAM/trade/agr/meetings/wp.07/2016/FoodLossConf/02_MaryamRezaei_FAO.pdf [Accessed: 08.04.21]
7. Glasgow City Council., (2021). City wide food recycling service restored for flats and tenements. [Online]. Available: https://www.glasgow.gov.uk/article/26695/City-wide-food-recycling-service-restored-for-flats-and-tenements [Accessed: 01.04.21]
8. Girotto, F., Alibardi, L. and Cossu, R., (2015). Food waste generation and industrial uses: a review. *Waste management*, *45*, pp.32-41.
9. Glasgow City Council., (no date). Food Waste Recycling. [Online]. Available: https://www.glasgow.gov.uk/article/16560/Food-Waste-Recycling [Accessed: 19.3.21]
10. Glasgow City Council., (2020). Food Recycling Trial in Glasgow North West. [Online]. Available: https://www.glasgow.gov.uk/article/26138/Food-Recycling-Trial-In-Glasgow-North-West [Accessed: 19.3.21]

11. Godfray, H.C.J., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Nisbett, N., Pretty, J., Robinson, S., Toulmin, C. and Whiteley, R., (2010). The future of the global food system.
12. Greener Scotland., (2021). Shop Smarter and Reduce Food Waste. [Online]. Available:http://www.cleanerscotland.org/food-waste/how-to-reduce-food-waste/shop-smarter [Accessed: 11.04.21]
13. Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R. and Meybeck, A., (2011). Global food losses and food waste.
14. Ishangulyyev, R., Kim, S. and Lee, S.H., (2019). Understanding food loss and waste—Why are we losing and wasting food?. *Foods*, *8*(8), p.297.
15. JACK, B. and CLARKE, A.M., (1998(. The purpose and use of questionnaires in research. *Professional Nurse (London, England)*, vol. 14, no. 3, pp. 176-179.
16. Kummu, M., De Moel, H., Porkka, M., Siebert, S., Varis, O. and Ward, P.J., (2012). Lost food, wasted resources: Global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use. *Science of the total environment*, *438*, pp.477-489.
17. Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R. and Searchinger, T., (2013). Reducing food loss and waste, installment 2 of creating a sustainable food future. *World Research Institute Working Paper*, *40*.
18. Love Food Hate Waste Scotland [A], (2021). Why Save Food. [Online. Available: https://scotland.lovefoodhatewaste.com/why-save-food [Accessed: 10.04.21]
19. Love Food Hate Waste Scotland [B], (2021). Keep Crushing It [Online]. Available: https://scotland.lovefoodhatewaste.com/keepcrushingit [Accessed: 10.04.21]
20. Marshall, G., (2005). The purpose, design and administration of a questionnaire for data collection. *Radiography*, vol. 11, no. 2, pp. 131-136.
21. Messenger, B., (2018). Food Waste Reduction Goes Dutch. [Online]. Available: https://waste-management-world.com/a/food-waste-reduction-goes-dutch#:~:text=The%20Netherlands%20has%20launched%20a%20new%20scheme%20dubbed,research%20institutes%2C%20civil%20society%20organisations%20and%20the%20government. [Accessed: 09.04.21]
22. Oppenheim, A.N., (2000). *Questionnaire design, interviewing and attitude measurement.* Bloomsbury Publishing.

23. O'Sullivan, C., (2008). *The Food Waste Scorecard*. [Online] Available: https://feedbackglobal.org/wp-content/uploads/2018/06/Supermarket-scorecard_136_fv-1.pdf [Accessed: 01.04.2021]
24. Papargyropoulou, E., Lozano, R., Steinberger, J.K., Wright, N. and bin Ujang, Z., (2014). The food waste hierarchy as a framework for the management of food surplus and food waste. *Journal of cleaner production*, *76*, pp.106-115.
25. Parfitt, J., Barthel, M. and Macnaughton, S., (2010). Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical transactions of the royal society B: biological sciences*, *365*(1554), pp.3065-3081.
26. Poyatos-Racionero, E., Ros-Lis, J.V., Vivancos, J.L. and Martínez-Máñez, R., (2018). Recent advances on intelligent packaging as tools to reduce food waste. *Journal of cleaner production*, *172*, pp.3398-3409.
27. Quinn, I., (2020). UK retail food waste increases despite overall levels dropping. [Online]. Available: https://www.thegrocer.co.uk/food-waste/uk-retail-food-waste-increases-despite-overall-levels-dropping/601388.article [Accessed: 20.2.21]
28. Schanes, K., Dobernig, K. and Gözet, B., (2018). Food waste matters-A systematic review of household food waste practices and their policy implications. *Journal of Cleaner Production*, *182*, pp.978-991.
29. Scherhaufer, S., Lebersorger, S., Pertl, A., Obersteiner, G., Schneider, F., Falasconi, L., De Menna, F., (2015). *Criteria for and baseline assessment of environmental and socio-economic impacts of food waste*. BOKU University of Natural Resources and Life Sciences, Institute of Waste Management.
30. Schneider, F., (2008). Wasting food–an insistent behaviour.
31. Scottish Government[A], (2020). Managing Waste. [Online]. Available: https://www.gov.scot/policies/managing-waste/food-waste/ [Accessed: 10.2.21]
32. Scottish Government [B], (2020). Update to the Climate Change Plan 2018-2032. [Online]. Available: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/11/ Accessed: [05.04.21]
33. Scottish Government, (2019). Food Waste Reduction Action Plan. [Online]. Available:

https://www.zerowastescotland.org.uk/sites/default/files/Food%20Waste%20Reduction%20Action%20Plan.pdf [Accessed: 18.2.21]

34. Scottish Government, (2018). Climate Change Plan. [Online]. Available: https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/ [Accessed: 18.2.21]
35. Scottish Water, (2020). Milestone Anniversary For North Lanarkshire Food Waste Plant. [Online]. Available: https://www.scottishwater.co.uk/about-us/news-and-views/170920-deerdykes [Accessed: 10.04.21]
36. Scottish Water., (no date). Anaerobic Digestion. [Online]. Available: https://www.scottishwater.co.uk/about-us/energy-and-sustainability/renewable-energy-technologies/anaerobic-digestion [Accessed: 5.3.21]
37. Scottish Water., (no date). Milestone anniversary for North Lanarkshire Food Waste Plant. [Online]. Available: https://scottishwaternetzero.co.uk/milestone-anniversary-for-north-lanarkshire-food-waste-plant/ [Accessed: 5.3.21]
38. Scottish Water., (2019). BLOG: Tackling Food Waste to Combat Climate Change – Jamie Dolan. [Online]. Available: https://www.scottishwater.co.uk/about-us/news-and-views/081019-tackling-food-waste-blog [Accessed: 5.3.21]
39. SEPA., (2016). Food Waste Management in Scotland. [Online]. Available: https://www.sepa.org.uk/media/219841/wst-g-049-food-waste-management-in-scotland.pdf [Accessed: 05.04.21]
40. South Lanarkshire Council., (2018). Food Growing Strategy. [Online] Available: https://www.southlanarkshire.gov.uk/info/200166/getting_outdoors/68/allotments_and_food_growing/3 [Accessed: 10.04.21]
41. Stancu, V., Haugaard, P. and Lähteenmäki, L., (2016). Determinants of consumer food waste behaviour: Two routes to food waste. *Appetite*, *96*, pp.7-17.
42. Stefan, V., Van-Herpen, E., Tudoran, A.A. and LÄHTEENMÄKI, L., (2013). Avoiding food waste by Romanian consumers: The importance of planning and shopping routines*. Food Quality and Preference*, vol. 28, no. 1, pp. 375-381

43. Thi, N.B.D., Kumar, G. and Lin, C.Y., (2015). An overview of food waste management in developing countries: Current status and future perspective. *Journal of environmental management*, *157*, pp.220-229.
44. UNEP., (2021). Food Waste. [Online]. Available: Food Waste | UNEP - UN Environment Programme [Accessed: 21.04.21]
45. Venkat, K., (2011). The climate change and economic impacts of food waste in the United States. *International Journal on Food System Dynamics*, *2*(4), pp.431-446.
46. Vermeir, I. and Verbeke, W., (2006). Sustainable food consumption: Exploring the consumer "attitude–behavioral intention" gap. *Journal of Agricultural and Environmental Ethics*, vol. 19, no. 2, pp. 169-194.
47. Visschers, V.H., Wickli, N. and Siegrist, M., (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *Journal of Environmental Psychology*, vol. 45, pp. 66-78.
48. Watson, M. and Meah, A., (2012). Food, waste and safety: Negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review*, *60*, pp.102-120.
49. White, S. and S. Feiner., (2009). Situated visualization techniques for urban site visitsAnonymous *Proceedings of the SIGCHI conference on human factors in computing systems*.
50. Williams, A., (2003). How to… Write and analyse a questionnaire. *Journal of Orthodontics*, vol. 30, no. 3, pp. 245-252.
51. Williams, H. and Wikström, F., (2011). Environmental impact of packaging and food losses in a life cycle perspective: a comparative analysis of five food items. *Journal of Cleaner Production*, *19*(1), pp.43-48.
52. Zero Waste Scotland, (2009). The food we waste in Scotland. [Online]. Available: https://www.zerowastescotland.org.uk/sites/default/files/The%20food%20we%20waste%20in%20Scotland%20-%20executive%20summary.pdf [Accessed: 23.2.21]
53. Zero Waste Scotland, (2016). How Much Food and Drink Waste is There in Scotland? [Online]. Available:https://www.zerowastescotland.org.uk/sites/default/files/How%20much%20food%20waste%20is%20there%20in%20Scotland%20Final%20v2.pdf

https://www.zerowastescotland.org.uk/sites/default/files/How%20much%20food%20waste%20is%20there%20in%20Scotland%20Final%20v2.pdf
[Accessed: 08.02.21

# Appendices

**<u>Appendix 1:</u> Questionnaire on Microsoft Forms to determine household behaviours and attitudes towards food waste management within Scotland.**

**1. What is your age?**

- Under 25
- 25-40
- 41-65
- Over 65

**2. What type of housing do you live in?**

- House
- Flat
-

**3. How would you describe the size of your household?**

- One person
- Two people
- Three people
- Four or more people
-

**4. How would you describe your geographic living area?**

- Urban (City)
- Suburban (Outskirts of city)
- Rural (Countryside)

**5. What food waste storage do you have at home?**

- Outside Bin
- Kitchen Caddy
- Compostable Liners
- Compost bin in the garden
- Do not use any of the above

6. **Are you the main person within your household who manages food waste?**

- Yes
- No
- I play part of the role

7. **How often do you empty your food waste caddy or compostable liner into the main bin?**

- Daily
- Weekly
- 2-3 times per month
- Monthly
- Never

8. **How much of the food purchased ends up spoiled and is subsequently thrown out? i.e. past its use by or sell by date.**

- All
- An excessive amount
- A substantial amount
- Very little
- None

9. **How often does your food waste get collected by your local authority?**

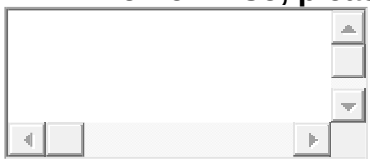
- Daily
- Weekly
- Fortnightly
- Monthly
- Collection fluctuates throughout the year
- Never

10. **What problems do you encounter when collecting/storing food waste at home**?

- Improper storage
- Not enough storage

- [ ] No garden access
- [ ] Lack of knowledge
- [ ] Lack of motivation
- [ ] No time to manage food waste - more of a hassle
- [ ] Attracts animals or pests
- [ ] Hygiene or contamination issues
- [ ] I am disinterested in separating my food waste
- [ ]

**11. Do you foresee any other difficulties when disposing food waste at home? If so, please briefly describe in the box below.**



**12. What problems do you encounter with the collection of food waste by your local authority?**

- [ ] Not collected often enough
- [ ] Not enough outside storage provided
- [ ] Limited building or street access for vehicles
- [ ] Bin is sometimes missed
- [ ] They do not collect food waste
- [ ]

**13. What are the main reasons why food gets wasted in your household?**

- [ ] Confusion with date label terms
- [ ] Not checking 'use by' or 'best before' dates frequently
- [ ] Over-buying
- [ ] Over-preparing
- [ ] Food not being used before it goes off
- [ ] Poor planning
- [ ] Long working hours so no time to spend on food management
- [ ] Promotions in supermarkets - saving you money in the long term but encouraging you to buy more than you need
- [ ] Lack of equipment or storage
- [ ] Lack of cooking skills

- [ ] No food gets wasted in my home
- [ ]

**14. What do you do to avoid food waste at home?**

- [ ] Freeze food
- [ ] Cook with waste
- [ ] Eat leftovers
- [ ] Make smaller portions
- [ ] Meal prep
- [ ] Improved planning to reduce overbuying
- [ ] Change spending habits. For example, top-up shops rather than one main shop
- [ ] Check 'use by' or 'best before' dates more frequently
- [ ] I am not interested in avoiding food waste
- [ ]

**15. What motivates you to avoid food waste?**

- [ ] Environmental concerns
- [ ] Financial Concerns
- [ ] Moral/Ethical Concerns
- [ ] Honestly, I am not motivated
- [ ]

**16. What do you think happens to food waste?**

- [ ] Sent to landfill
- [ ] Anaerobic Digestion
- [ ] Composting
- [ ] Don't Know
- [ ]

**17. What value, in terms of money, would you place on the amount of food wasted in a year for the average household in Scotland?**

- ○ £0
- ○ £150
- ○ £220
- ○ £380

- ○ £430
- ○ £570
- ○

**18. Should we be concerned about food waste or food waste packaging?**

- ☐ Food Waste
- ☐ Food Waste Packaging

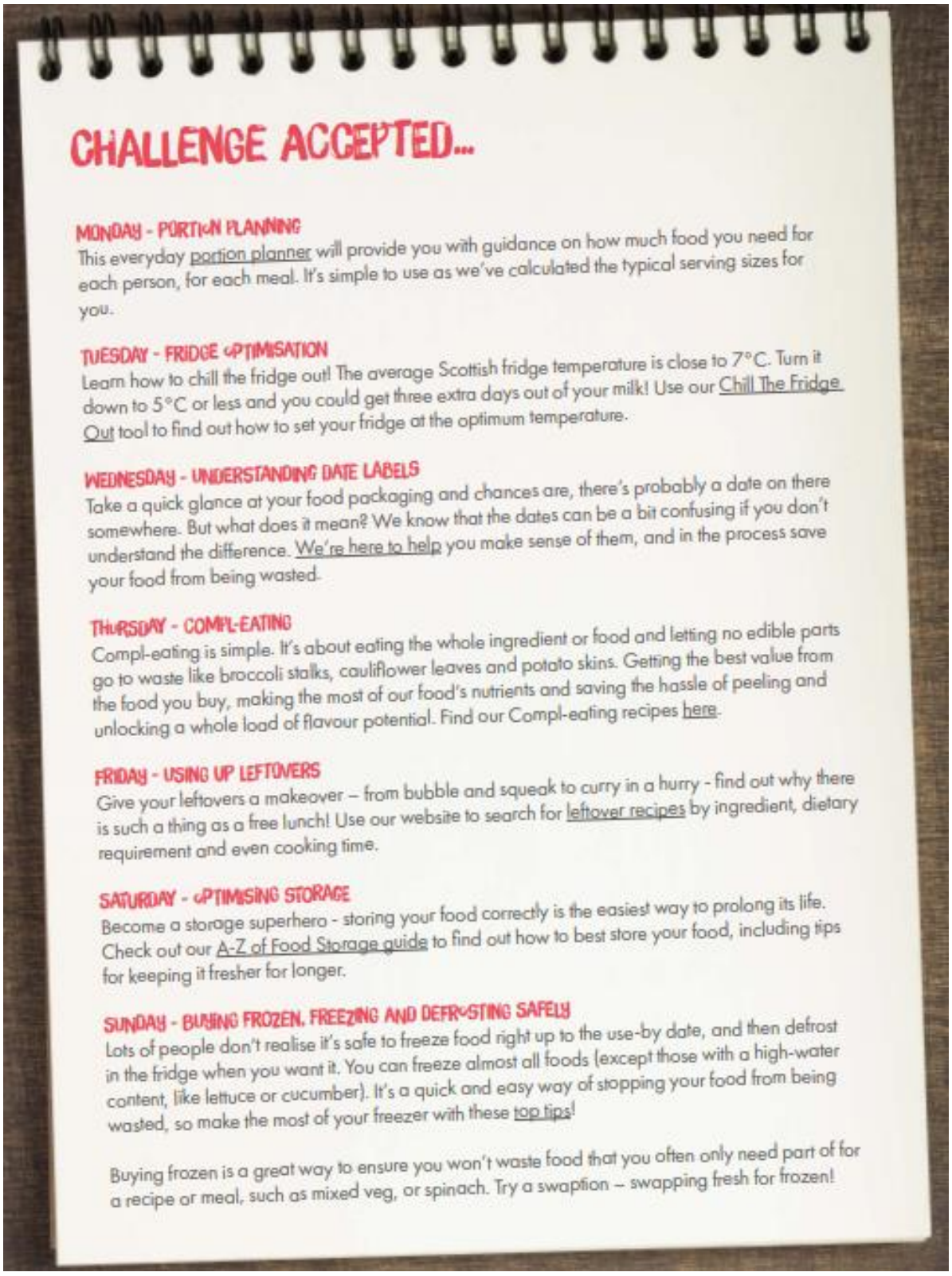
**19. What do you believe should be most considered for better food waste management?**

- ☐ Reduce
- ☐ Reuse
- ☐ Recycle
- ☐ Disposal

**20. What do you think would help or motivate you to manage food waste better? (Please also include any ideas in the 'other' box that would personally help you)**

- ☐ Education on how to correctly reduce, reuse, recycle and dispose of food waste
- ☐ Education to increase understanding on where food waste goes after household disposal and what effect it can have on the environment and economy
- ☐ Education to improve cooking skills and use leftovers to reduce what is thrown out
- ☐ Incentives from your local authority
- ☐ If food waste bins were collected more often
- ☐ I am supplied with ample equipment to do so
- ☐

**<u>Appendix 2</u>: Food waste prevention challenges that are easy and fun for all individuals and families to participate in at home to reduce levels of food waste generated (Zero Waste Scotland, 2021).**



# CHALLENGE ACCEPTED...

**MONDAY - PORTION PLANNING**
This everyday portion planner will provide you with guidance on how much food you need for each person, for each meal. It's simple to use as we've calculated the typical serving sizes for you.

**TUESDAY - FRIDGE OPTIMISATION**
Learn how to chill the fridge out! The average Scottish fridge temperature is close to 7°C. Turn it down to 5°C or less and you could get three extra days out of your milk! Use our Chill The Fridge Out tool to find out how to set your fridge at the optimum temperature.

**WEDNESDAY - UNDERSTANDING DATE LABELS**
Take a quick glance at your food packaging and chances are, there's probably a date on there somewhere. But what does it mean? We know that the dates can be a bit confusing if you don't understand the difference. We're here to help you make sense of them, and in the process save your food from being wasted.

**THURSDAY - COMPL-EATING**
Compl-eating is simple. It's about eating the whole ingredient or food and letting no edible parts go to waste like broccoli stalks, cauliflower leaves and potato skins. Getting the best value from the food you buy, making the most of our food's nutrients and saving the hassle of peeling and unlocking a whole load of flavour potential. Find our Compl-eating recipes here.

**FRIDAY - USING UP LEFTOVERS**
Give your leftovers a makeover – from bubble and squeak to curry in a hurry - find out why there is such a thing as a free lunch! Use our website to search for leftover recipes by ingredient, dietary requirement and even cooking time.

**SATURDAY - OPTIMISING STORAGE**
Become a storage superhero - storing your food correctly is the easiest way to prolong its life. Check out our A-Z of Food Storage guide to find out how to best store your food, including tips for keeping it fresher for longer.

**SUNDAY - BUYING FROZEN, FREEZING AND DEFROSTING SAFELY**
Lots of people don't realise it's safe to freeze food right up to the use-by date, and then defrost in the fridge when you want it. You can freeze almost all foods (except those with a high-water content, like lettuce or cucumber). It's a quick and easy way of stopping your food from being wasted, so make the most of your freezer with these top tips!

Buying frozen is a great way to ensure you won't waste food that you often only need part of for a recipe or meal, such as mixed veg, or spinach. Try a swaption – swapping fresh for frozen!