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Food Waste in UK Households: Attitudes, Behaviours and Marketing Implications

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**UNIVERSITY OF
PLYMOUTH**

**Food Waste in UK Households: Attitudes, Behaviours
and Marketing Implications**

by

Mihaela Bishop

A thesis submitted to the University of Plymouth in partial
fulfilment for the degree of

DOCTOR OF PHILOSOPHY

Plymouth Business School

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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Abstract

Food Waste in the UK Households: Attitudes, Behaviours and Marketing Implications

Mihaela Bishop

Food waste is generated in large amounts across the food chain, ensuing serious environmental, social and economic consequences. Although consumers are the single most significant contributors, little is known about the drivers of food waste in households. The study explores individual attitudes towards food waste, identifies associations between psychological factors and behaviour and establishes consumers' current understanding of food waste. This study employs mixed methods, starting with a qualitative stage using focus group discussions (7 focus groups, n=48) and following it up with a quantitative survey (411 questionnaires). The thematic analysis findings suggest that attitudes, social norms, perceived behaviour control and intentions have, to a greater or lesser extent, relevance to a more in-depth understanding of behaviour in this context together with the moral and environmental implications of domestic food waste. Structural equation modelling shows that most of the factors investigated are important antecedence of individual intention not to waste food in the home. In particular, Attitude (on its Waste Aversion dimension) and Self-efficacy were significant and negative predictors of Intentions, while Pro-environmental Identity (on its Self-identity dimension) and Moral Identity had a significant and positive impact on Intention. The Intention was also found to be a significant and negative predictor of Behaviour. Further, interesting results were revealed when looking in more depth at the Low and High FPM (Food Planning Management) groups of participants. Differences were noted between the two groups in terms of Social

Norms (on its Pressure dimension), which had negative significant effects on Intention for the Low FPM group, but was not significant in the High FPM group. In addition, PBC (on its Control dimension) and Pro-environmental Identity (on its NEP dimension) had significant positive effects on Intention only in the High FPM group, whilst not significant relationships were shown in the Low FPM group. Additionally, PBC (on its Capability dimension), showed significant positive effects on Behaviour in the High FPM group only. This study contributes to theory as it responds to the call for in-depth investigations into the issue of household food waste behaviours and motivations. The findings reveal that the extended Theory of Planned Behaviour can effectively be applied to intentions and behaviours related to household food waste in the UK. This study helps practitioners and policymakers develop a more in-depth understanding and an increased awareness of the implications of food waste, with the clear aim of reducing wasteful behaviour in the home. Further, the results of this study suggest that the prevention of food waste should take priority when devising any initiatives at the consumer level.

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List of Abbreviations

DEFRA – Department for Environment, Food & Rural Affairs

EU – European Union

FAO – Food and Agriculture Organisation

FPM – Food Planning Management

MI – Moral Identity

OECD – Office of Economic Cooperation and Development

PBC – Perceived Behavioural Control

SN – Subjective Norm

TPB – Theory of Planned Behaviour

TRA – Theory of Reasoned Action

UN – United Nations

WRAP – Waste and Resources Action Programme

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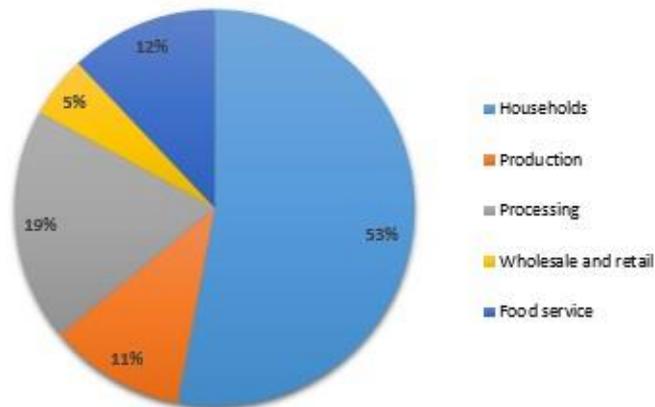
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Chapter 1 Introduction

1.1 Introduction

One of the global challenges of the twenty-first century is managing the food demand of a rapidly growing population, whilst reducing its many adverse impacts on the environment (Grizzetti *et al.*, 2013, Godfray *et al.*, 2010, Foley *et al.*, 2011). As a result, the expanse of food that is wasted has become a problem that cannot be ignored any longer. Food waste has substantial economic and environmental costs; it wastes natural resources, increases the costs of food production and generates additional and unnecessary burden for the environment, affecting biodiversity, climate and nutrient losses (Grizzetti *et al.*, 2013). Studies show that the economic impact of wasting food is very high for UK society (WRAP, 2014, WRAP, 2009c). The most recent report estimates that that EU member states (EU-28) households generated 47 million tonnes of food waste each year, the equivalent of 92 kilograms per person per year (Stenmarck *et al.*, 2016). This accounts 53% of the total EU food waste, with the remaining coming from processing 19%, food service industry 12%, production 11% and retail 5% (see Figure 1 for details). The costs associated with the wasting of food in the home are estimated at around 98 billion Euros, from which two-thirds are related with food waste from households (approximately 98 billion euros – the retail value of the food being thrown away).

Figure 1. Split of EU-28 food waste by sector



Source: Stenmarck et al. (2016)

At the same time, UK households throw away 7 million tonnes of food and drink annually, which represents 19% of the total food purchased by households (WRAP, 2013a). The annual financial cost is estimated at £12 billion or £480 per household (WRAP, 2014). And although some recent research has noted a slight reduction in the amount of food wasted between 2007 and 2012, the scale of the problem remains at high levels, with the amount of food wasted still equating to six meals every week for the average household (WRAP, 2014). In terms of the environmental impact, the effects are also severe. The increasing need for food is a significant driver for environmental changes, with estimations of 32% of all food produced worldwide being wasted (FAO, 2011, Tilman *et al.*, 2001). Food waste is biodegradable, being the most substantial source of methane, a greenhouse gas that contributes to a large extent to the problem of global warming (WRAP, 2009d, Adhikari *et al.*, 2006). The environmental impact has been measured as equivalent to 20 million tonnes of carbon dioxide emissions, the same impact as the emissions generated by 1/4 of the cars on

the UK roads (Evans, 2011b). At the same time, there is the problem of landfill availability, as the waste reduction is considered in terms of diversion from landfill to recycling or composting. The 1999 EU Landfill Directive, a policy that sets out to reduce the harmful effects of sending waste to landfill in relation to the environment and human health, has prompted not only new legislation in the UK, such as the 2002 Landfill Regulation, but also the decision to set up the Waste and Resources Action Programme (WRAP) (European Commission, 2008). However, studies suggest that there are limits to how further recycling can generate significant improvements in waste reduction (Bulkeley and Gregson, 2009, Shove, 2003). In addition, food waste has social impacts. In a global food industry, the demand in one part of the world indirectly affects resources in other parts of the world. Therefore a wasteful behaviour in the developed countries invariably affects food availability in the developing countries. Recently, Nisbet and Gick (2008a) argued this dichotomy in the landscape of food resources, whereby low-income countries face significant food shortages while mid- and high-income countries produce increasingly large amounts of food waste.

Historical consideration of the general handling of food and measures which were employed to overcome the wastage of food can be found in the literature as early as the 19th century (Atwater, 1895, Atwater and Woods, 1898). Traditionally, reducing waste and reusing materials were part of household practices in the UK, but during the second half of the twentieth century, these practices were largely abandoned, with households discarding more and more (Rathje and Murphy, 1992, Thompson, 1979, Douglas, 2003). Nonetheless, the issue of food waste is becoming more prominent in recent times, with researchers calling for a better understanding of the problem

(Evans *et al.*, 2013, O'Brien, 2008, Hawkins, 2006).

1.2 Research Problem

Many issues that pose a threat to environmental sustainability are rooted in human behaviour and therefore can be managed by changing the relevant conduct in order to reduce its environmental impacts, such as changing purchasing behaviour or adopting countervailing household actions (Gardner and Stern, 1996, DuNann and Koger, 2004, Steg and Vlek, 2009, Vlek and Steg, 2007). Behavioural change is at the base of the waste hierarchy, with policy requests to reduce, reuse and recycle. Several studies, however, argue that waste behaviour is a complex issue and present approaches are adopting a simplified view in their consideration of the problem (Barr *et al.*, 2011, Barr *et al.*, 2013, Tonglet *et al.*, 2004). Therefore, this study aims for a better understanding of food waste behaviour in the home as an important aspect of increasing the current knowledge.

Conventionally, food waste has been predominantly regarded as a practical issue that needs to be managed. Consequently, engagement has occurred under the umbrella of environmental policies and planning, with the emphasis being on questions of governing, evaluating waste policies and their consequences, as well as assessing the potential for recovering waste material through composting. One such approach is to increase consciousness about sustainability issues through the use of campaigns aimed at raising awareness and increasing general understanding about the problem (one example in the UK is WRAP's 'LoveFood HateWaste' campaign) (WRAP and Women's Institute, 2008, WRAP, 2010). Nevertheless, changing behaviour is perhaps

one of the most important pragmatic tasks, as inadequate individual behaviour often leads to problems for an entire group of individuals and have major societal and global implications. To this end, the literature suggests that changing individual behaviour can be made easier for the individual to perform the desired behaviour or more difficult to perform competing behaviours (Bagozzi, 1981), to convince individuals to perform the desired behaviour (Mosler *et al.*, 2001), and to influence social networks or dynamics (Tobias and Mosler, 2008). Some recent findings (McKenzie-Mohr, 2000, Oreg and Katz-Gerro, 2006) highlight the inconsistency between intentions and behaviours and argue that despite relative knowledge about food waste problems on individuals' part, everyday behaviours often do not reflect actual intentions.

Therefore, the problem addressed by the present study is to reach a better understanding of the factors that influence consumers' food waste generation behaviour. Although recommendations for prevention strategies at the household level will be included, taking into account the multidimensional perspective that should be undertaken to address the food waste prevention issue, the focus of this study is on the importance of a better understanding of food waste behaviours in the home, rather than behavioural change.

1.3 Defining the Concept of Food Waste

Researchers often use different definitions of food waste. For instance, some studies (WRAP and Ventour, 2009) focus on different types of food waste: avoidable, possibly avoidable (food that not all individuals believe that they can eat, such as bread crusts and potato peelings) and unavoidable (e.g. orange peel). Others

(Cederberg *et al.*, 2011, Gustafsson *et al.*, 2013, Kantor, 1998) choose to not include the unavoidable waste in their calculations. As a result, the diverseness of definitions makes it difficult, if not impossible, to convey across different studies (Parfitt *et al.*, 2010). The multitude of definitions of food waste and the disparity in an agreement is clearly shown in Table 1.

According to the (FAO, 2015), 'food waste' refers to the edible parts of the plants and animals that are produced or harvested for human consumption, but are not ultimately consumed by people and end up being discarded. Various definitions of food waste, as well as alternative terms, have been proposed – a summary of these definitions are presented in Table 1. This study will use Lipinski *et al.* (2013b) definition and consider food waste as '*... food that is of good quality and fit for human consumption, but does not get consumed because it is discarded – either before or after it spoils. Food waste is the result of negligence or a conscious decision to throw food away*'; all the participants in this study were provided with this definition of food waste.

Table 1. Food Waste Definitions

Year of Pub.	Author	Definition
1981	FAO	Food waste: '... wholesome edible material intended for human consumption, arriving at any point in the FSC (food supply chain) that is instead discarded, lost, degraded or consumed by pests.'
2002	Grolleaud	Food loss: '... the decrease in food quantity or quality, which makes it unfit for human consumption.'
2004	Smil	Food waste: As the definitions by FAO (1981) and Stewart (2009) '... but including over nutrition – the gap between the energy value of consumed food per capita and the energy value of food needed per capita.'
2009	Griffin <i>et al.</i>	Generated food waste: '... waste that is unwanted and uneaten (Gallo 1980) by the individuals who acquired the food. Generated food waste may be recovered through composting or donations to charities.' Disposed food waste: '... what remains after these food recovery activities – the food that is actually thrown'
2009	Stuart	Food waste: As the definitions by FAO (1981) but '... including edible material that is intentionally fed to animals or is a by-product of food processing diverted away from the human chain.'
2009	WRAP	Kitchen waste: '... food or drink disposed of, including associated inedible material, such as bones from meat, egg shells, and inedible parts of the vegetables, but excludes man-made packaging associated with food or drink, e.g. glass bottles, polymer film, aluminium cans.'
2010	Parffit <i>et al.</i>	Food losses and spoilage: '... food waste post-harvest (related to systems that require investment in infrastructure).' Food waste: '... at later stages of the FSC (food supply chain), generally related to behavioural issues.' Post-
2011	Gustafsson <i>et al.</i>	Food losses: '... The decrease in edible food mass through the part of the supply chain that specifically leads to edible food for human consumption.'
2011	Monier <i>et al.</i>	Food waste: '... is composed of raw or cooked food materials and includes food loss before, during or after meal preparation in the household, as well as food discarded in the process of manufacturing, distribution, retail and food service activities. It comprises materials such as vegetable peelings, meat trimmings, and
2012	Kummu <i>et al.</i>	FSC losses: '... Total losses and waste within the different steps of the FSC (food supply chain) (production, post-harvest, processing, distribution, and consumption)...' Food losses: '... those in the production, post-harvest, and processing of products.'
2013	Beretta <i>et al.</i>	Food losses: '... Food which is originally produced for human consumption but then directed to a non- food to use or waste disposal (e.g. feed for animals, biomass important to digestion planned, disposal in the municipal solid waste incinerator)'
2013	FAO and WRAP	Food loss: '... A decrease in mass (dry matter) or nutritional value (quality) of food that was originally intended for human consumption. These losses are mainly caused by inefficiencies in the food supply chains, such as poor infrastructure and logistics, lack of technology, insufficient skills, knowledge
2013	Gjerris & Gavani	Food waste: '... edible food that is discarded, lost, and eaten...'
2013	Lipinski <i>et al.</i>	Food loss and waste: '... the edible parts of plants and animals that are produced or harvested for human consumption but that are not ultimately consumed by people.' Food loss: '... food that spills, spoils, incurs an abnormal reduction in qualities such as bruising or wilting, or
2013	Nahman & de Lange	Food waste: '... losses that the rise for food reaches the end-user (pre-consumer food losses), as well as food that is discarded by consumers (post-consumer food waste). This definition includes both the edible and inedible (peelings, bones, etc.) portions of waste stream.'
2014	Garrone <i>et al.</i>	Surplus food: '... the edible food that is produced, manufactured, retailed or served but for various reasons is not sold to or consumed by the intended customer.' Food waste: '... the surplus food that is not recovered to feed people, to feed animals, produce new products
2014	HLPE	Food loss and waste (FLW): '... a decrease, at all stages of the food chain from harvest to consumption in mass, of food that was originally intended for human consumption, regardless of the cause.' Food losses (FL): '... a decrease, at all stages of the food chain prior to the consumer level, in mass, of food
2014	Papargyropoulou <i>et al.</i>	Food surplus: '... food produced beyond our nutritional needs... It consists of 'desired' food surplus that functions to guarantee food security, and 'undesired' excessive food surplus which results in food waste. Food waste: '... a product of food surplus, i.e. a result of food surplus beyond what is needed to ensure food security.'
2015	Grandhi & Appajah Singh	Food wastage at the household level: '... the food brought home or prepared at home not consumed...'

1.4 Aims and Objectives of the Study

The aim of the study to reach a better understanding of the factors that affect food waste behaviour within the home. As such, the study looks to enhance theoretical and practical understanding of the food waste-related behaviours in the household. This will enable marketing approaches recommendations for practitioners and policymakers to address the problem of food waste through attitude change and associated changes in behaviour.

Specific research objectives are as follows:

RO1. To establish the nature and incidence of food waste behaviours in the home.

RO2. To identify the factors influencing food waste behaviour in the home.

RO3. To establish the factors that have an impact on the intention to reduce food waste at home.

RO4. To better understand the factors affecting the gap between intention and behaviour that individuals exhibit related to food waste within the home.

1.5 Overview of Study

This study used a mixed-method approach (qualitative and quantitative methods). A sequential exploratory design strategy is used: the qualitative stage is followed by the quantitative stage, and then the findings of the two stages are interpreted consecutively. The idea of the mixed methods strategy is that in the first instance, qualitative results (focus group-based) are obtained, then the quantitative findings (questionnaire-based) are used to explain and verify the qualitative findings. The strength of this strategy is its straightforward design with clear and distinct stages, while the main weakness is the long timeframe necessary for the data collection process.

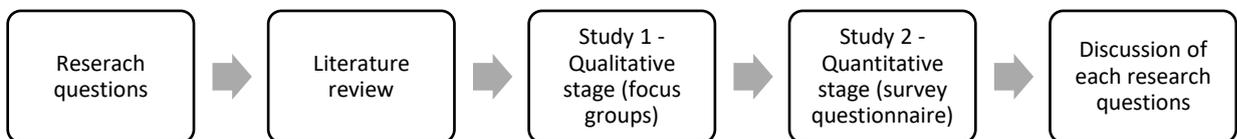
The mixed-method approach uses both qualitative and quantitative data to provide a clear understanding of the research problem (Creswell, 2003). The rationale for using a mixed-method approach for this study was its perceived ability to address the specific research questions central to this study. By mixing both quantitative and qualitative research and data, the researcher gains breadth and depth of understanding and corroboration, while offsetting the weaknesses inherent to using each approach by itself.

Here, the researcher used mixed methods to converge and validate the results from the different stages. As such, the findings for the focus group dialogues enabled not only the development of the questionnaire but also the chance to understand the issues raised during the qualitative discussions more in-depth. The mixed-method approach used in this study helps triangulate the measurement strategy by using different measures of the same concept to provide a more robust overall measure. This study utilised a sequential exploratory design (Creswell and Creswell, 2017, Creswell and Plano Clark, 2011) consisting of two phases, where the qualitative phase was the initial stage followed by the quantitative stage. A sequential exploratory design was utilised, so data from the questionnaire could help explain the focus group results for complementarity. The data was connected, and the qualitative phase helped inform the quantitative phase. This connection happened in two places. The first connection between the qualitative and quantitative phase was the use of the focus group results to create the questionnaire questions. The second connection was the mixing that happened after the quantitative data was collected and analysed; the results were connected to gain a better understanding of the findings from both phases.

1.6 Research Outline

In order to address the aim and objectives of the study, this study is divided into eight chapters that investigate the Theoretical Framework central to the study, the Research Methodology, followed by the Research Findings, and the Discussion, Conclusions and Further Research. Figure 2 shows the broader overall stages of this study:

Figure 2. The study's overview



In the first part, Chapter 2 covers the food waste problem to date, the patterns of food waste in the home, food waste prevention policies in the European Union and the UK, household influences on food waste behaviour and food planning management practices in the home. Chapter 3 reviews the behavioural theories and models relevant to the topic of this study. Furthermore, it conceptualises the causal relationships among the study's main constructs and identifies the research hypotheses.

Chapter 4 discusses the study's Research Methodology and covers the research philosophy and methods adopted in this study. This section discusses the research paradigms and mixed methods approach (qualitative-quantitative) and provides operational definitions of the study's variables. The focus group (the data collection tool for the qualitative stage) and questionnaire forms (the data collection tool for the quantitative stage) are also detailed.

The following two Chapters present the data analysis and associated findings chapters. In particular, Chapter 5 contains the qualitative findings, presenting the focus group method of data collection, as well as the analysis of the qualitative data. Chapter 6 presents the quantitative findings, including the questionnaire method used to collect the data, an illustration of the descriptive statistics of the data, the exploratory factor analysis, the measurement model and the structural model.

The final two chapters include an in-depth discussion of the findings and implications. Specifically, Chapter 7 presents the discussion of the findings, in which the qualitative and the quantitative results are combined to provide the overall findings of the study, in relation to the study's research objectives. It also discusses the study's implications for both theory and practice. Chapter 8 covers the conclusion of the study, as well as limitations and future research area.

Chapter 2 Food Waste Overview

2.1 Introduction

The rapid population growth is considered to be the main reason for the increasing demand on food, putting growing pressure on food security, with food waste being recognised as a crucial contributor (Mattar *et al.*, 2018, Yildirim *et al.*, 2016). Therefore, a clearer understanding of the household food waste problem to date is required. At the same time, individuals are becoming aware of issues related to food waste and increasingly recognise their own active role in preventing it (Romani *et al.*, 2018). This chapter presents details about the patterns of current food waste, as well as relevant food waste prevention policies which are currently being used in the UK and EU. Household influences on food waste behaviour, as suggested by research conducted in this area, are also detailed here, highlighting the most argued causes and barriers to its prevention.

2.2 Food Waste Problem to Date

The issue of food wastage has become more prominent in recent years, driven in part by the global economic recession, and also increasing concerns for the environment. Nevertheless, wasting food is not a new phenomenon if we consider that, historically, it has always been seen as culturally and socially acceptable to prepare food in excess of expected demand. This practice has however, transitioned from the small scale of celebratory feasts throughout the ages to virtual state-endorsed habits of dumping 'unacceptable' crops rather than risking rejection by consumers.

When the Food and Agriculture Organisation (FAO) of the United Nations (UN) was established in 1945, a reduction of food losses was a prominent topic within its mandate (Parfitt *et al.*, 2010). The first World Food Conference, held in 1974, identified a potential reduction in post-harvest losses as part of the solution of addressing global population hunger (FAO, 1974). FAO's report in 2011 exposed that one-third of all food produced for human consumption is lost or wasted every year (Gustafsson *et al.*, 2013). In Europe and North America, this equals up to 300 kg of food per capita per year along the food supply chain. Moreover, the published data revealed that about 50% of the total amount of food is wasted downstream, mainly at the household level (Diaz-Ruiz *et al.*, 2018). The most recent study focused on the European Union's 28 countries (EU, 2018) reports that 92 kg of food is discarded per person and year at households from which approximately 60% of its volume is edible food (Stenmarck *et al.*, 2016). Although food waste occurs along the whole supply chain, consumer food waste has been reported to be a hotspot and has received particular attention. Different studies have analysed consumer's behaviour, awareness and the causes of food wasted in countries such as Greece, Canada, Romania, Denmark, the United States, Italy, Singapore and New Zealand (Aschemann-Witzel *et al.*, 2018, Diaz-Ruiz *et al.*, 2018, Gaiani *et al.*, 2018, Morone *et al.*, 2018, Neff *et al.*, 2015).

Global Concern

UN evaluations (2004) predict that the global population will reach 9.5 billion by 2075, and, as a direct result, food resources available will come under extreme pressure. An increase in population numbers of this magnitude will inevitably put much stress on global food resources. Such a projection has not only vital

environmental consequences, but also vast social, economic and political implications that need to be addressed soon to ensure a realistically sustainable future for all. At present, research suggests that current practices in the food chain are wasting up to 50% of all the food produced (Fox and Fimeche, 2013b). Generally, most research nowadays focuses on how to produce more food in a world with limited resources, as well as how to make current food production more efficient. The current argument, however, is that the focus should instead be on developing more sustainable ways to reduce food waste across the whole food chain, from the producing farmers to the retailers and final consumers. Globally, there has been an increase in calls for initiatives needed to reduce the substantial quantity of food wasted each year, with some researchers (Fox and Fimeche, 2013a) calling on developed countries' governments to recognise the amount of food that is wasted and to work to make a substantial reduction in its quantity, by devising and implementing suitable policies that change consumers' expectations. One suggestion is that policies should discourage retailers from wasteful practices that lead to the rejection of food based on cosmetic characteristics and losses in the home due to excessive purchasing by the consumer.

UK concern

A study conducted before World War II showed that between 1% and 3% of food was wasted at that time in the UK (Cathcart and Murray, 1939). Following, a major study conducted in 1976 by the UK Ministry of Agriculture, Fisheries and Food and consisting of a survey of 672 households, revealed that food wastage has increased to around 6.5% (Osner, 1982). More recent UK findings (WRAP (WRAP and Women's Institute, 2008, WRAP and Ventour, 2009, WRAP,

2011a), have revealed that household food waste has reached unprecedented levels, with the amount of food wasted per year by households equivalent to 25% of the food purchased. In developing countries, around 50% of household income is spent on food (Fox and Fimeche, 2013b). In comparison, in the developed post-industrial nations such as the UK, studies suggest that only around 10% of average household income goes towards food purchases. Remarkably, this figure has decreased over the years, from 21% in the 1970s and 25% in 1950s, meaning that food is relatively cheap when compared to the past and also to other countries (DEFRA, 2012). Research in the UK has also argued that, besides relatively cheaper food in relation to income, another problem that could potentially have a severe impact on the amount of food wasted by households, is the government's recommendation that we should be eating 'five a day' in order to remain healthy (Slimani and Margetts, 2009). The authors argue that the evidence to support this recommendation is inconsistent and mostly results in a situation where shoppers buy with good intentions, and then they end up throwing away this particular type of food (i.e. salads).

Some studies point out that the UK, as well as the rest of the developed countries, has got used to buying food that looks nice, and not what it truly needs. At the same time, throwing food away has become very easy, while using it sensibly, especially the less attractive bits, not. As a result, the urge to 'bin and buy again', encouraged by advertising campaigns, has become less resistible in the last years because, despite recent price rises, for most households in the developed countries, food is still relatively cheap. Remarkably, some evidence suggests that many people are unaware that food production and distribution generates carbon emissions. Even more, they do not link food waste to

environmental problems (WRAP, 2007c); indeed, the research found that almost half of people (40%) do not consider actual food waste to be a problem and nearly three-quarters regard packaging as more of a problem than actual food waste.

2.3 Food Waste Prevention Policies

A variety of methods and tools have been identified in the literature to engage individuals and households in waste prevention behaviours. Nevertheless, none of them are radically different from the approaches used to increase recycling participation (i.e. doorstep campaigns, community outreach) (DEFRA, 2012). Some of the most common themes include the provision of specific guidelines on how to engage in waste prevention and also activities that break into routine habits to increase the visibility of waste prevention. When referring to the extent to which food waste prevention behaviours are practised, there is an important distinction that needs to be accounted for, given the fact that unlike recycling, food waste prevention is not a single behaviour but many (DEFRA, 2010). At the same time, beyond acceptance of top-level definitions, such as the OECD and the Waste Framework Directive (European Commission, 2008), there is no agreement in the literature on which specific behaviours constitute waste prevention. There is, however, an agreement that there is much less opportunity to influence food waste prevention through infrastructure as it was the case with recycling in the early days of adoption. As a result, it has been suggested that the main scope is to influence the service infrastructure that supports householders' prevention actions, such as home composting and better-informed food purchasing (European Food Information Council, 2012, DEFRA, 2009c).

Worldwide, the most recent and effective response to the global food wastage has been the partnership between the FAO and Messe Dusseldorf SAVE FOOD, global partnership on food loss and food waste reduction. The plan for this initiative rests mainly within four areas: (a) awareness raising, (b) collaboration, (c) policy, strategy and programme development and (d) support to investment programmes and projects (FAO, 2016). In the EU, there have been several schemes successfully used to manage municipal waste mostly based on economic, regulatory and incentives instruments (Husaini *et al.*, 2007). Economic instruments have been used and well accepted by consumers in numerous countries in the EU, such as Belgium, Italy, France, Germany, Sweden and Spain. They mainly refer to schemes based on charging an individual's behaviour in order to implement the 'polluter pays' principle, which puts the responsibility of waste management on the producer of waste (i.e. the household). The local authorities would charge householders established fees for managing their waste, including food waste. Known by different names in different countries, such as variable charging, unit-based pricing, and pay-as-you-throw scheme, economic instruments can be based on weight, volume or volume and weight (Husaini *et al.*, 2007). The rationale for economic instruments refers to the fact that the costs borne by households are proportionate to how much waste each produces, similar to other utilities. Charging by 'unit' of waste produced sends a direct signal to the household to recycle or prevent food waste from happening in the first place and can be seen to reward high recyclers and low waste producing households (DEFRA, 2010). However, in the UK there is a question as to whether the public may welcome this method, because of the general belief that waste collection is

already paid for through the council tax (Price, 2001) and the UK government has already ruled out a separate national tax as an alternative method (Treasury, 2003). Nevertheless, international experience endorses substantial positive prospective benefits for this option and suggests that waste prevention is more effectively tackled when a complimentary package of measures are in place, including prevention targets, producer responsibility, householder charging, public sector funding for pilot projects, and intense public awareness communication campaigns (DEFRA, 2009c).

Research argues that communication with consumers is of vital importance, and this needs to be based on a comprehensive understanding of the causes of food waste. In specific, the recommendation is that communication needs to be tailored to specific household types and the main focus should be on how to interpret use-by dates of products, how to plan food shopping, how to store food products and how to use leftovers (Barr, 2007). This specific communication would be accompanied by a more general awareness rising about the impact of food waste.

Food Waste Policies in the European Union

The issue of tackling food waste has been taken seriously by the European Commission (EC), with a wide range of initiatives explicitly aimed at the prevention and reducing of food waste happening at a national, regional and local level within the European Union (EU) member states. Indeed, food waste prevention is an integral part of the European Commission's new Circular Economy Package designed to stimulate Europe's transition towards a circular economy (European Commission, 2015). Through this document, the EU

publically called on all member states to take action not only to reduce food waste at each stage of the food supply chain and monitor food waste levels but also report back regarding progress made. Earlier on, in 2014, the Commission established a dedicated Working Group, with experts from member states, to facilitate the sharing of learning and best practice in food waste prevention. In particular, the working group was set up to help the Commission and member states to remove, wherever possible, any regulatory barriers existing either at EU or national level, which were alleged to be principal to food waste. More recently, in 2016, following establishment of the EU Platform on Food Losses and Food Waste (European Commission, 2016), member states have been invited to participate in this multi-stakeholder forum in order to facilitate exchange of experience, learning and best practice and accelerate the EU's progress towards the SDG food-waste related targets.

The European Commission is currently contributing to awareness-raising on food waste prevention through the production of communication materials available in all EU languages which provide practical tips on how individuals can limit food waste, with a particular focus on promoting a better understanding of the Best- Before/Use-By dates displayed on food packaging (WRAP, 2011a). Further, the Commission supports the exchange of best practices in food waste prevention through the EU Platform on Food Losses and Food Waste and its dedicated subgroup on action and implementation. A particularly relevant action is the Horizon 2020 REFRESH project (REFRESH, 2015), a website open to all relevant stakeholders who wish to share their experiences in food waste prevention. Here, the Community of Experts available is a virtual resource centre which allows users to easily find and share information about

food loss and waste prevention and reduction initiatives across the EU.

Among the member states there has been an assortment of good practices in food waste prevention and reduction such as research and innovation (see Table 2); awareness, information and education (see Table 3); policy, awards and voluntary certification (see Table 4); food redistribution (see Table 5); food waste measurement (see Table 6). A summary of the programmes and activities for each of the areas discussed above are presented in the tables below, and more details for each initiative can be found in Appendix 1.

Table 2. EU programmes and practices - Research and innovation

Initiative	Type of initiative	Main type of stakeholder targeted	Country	Geographical level of implementation	Year of implementation
'A la carte menu' menu	Logistical improvements	Hospitals	Denmark	Local	2008
Carrefour	Separate collection of food waste, Food	Businesses	France, Belgium, Spain, Brazil	International	Not specified
Cooperative framework for supply chain	Voluntary agreement, logistical	Manufacturers, retailers	Netherlands	National	2006
EUREST restaurant and food campaign	Waste measurement programme,	Businesses	Sweden	National	2010
EUROPEN	Packaging supply chain's best practices	Policy-makers/Packaging Supply Chain	National/European/global level	National/European/global level	2010
Fish Chips	Industrial use	Manufacturers	Denmark	National	2009
Food and Drink Federation's Five - fold	Multi-project	Businesses	UK	National	2007
Food Waste Recovery, 1st Edition	A book-guide (entitled "Food Waste Recovery: Processing Technologies and Industrial Techniques") for scientists and researchers to	Industries, National agencies, Universities and Institutes working in the field of food waste recovery and valorisation, either within biorefinery concept or following circular economy and	Global	Global	2015
Food Waste Recycling	Separate collection of food	Multi-stakeholder	Hong Kong, China	Local	2009
Personal Carbon	Multi-project	Households, retailers	UK	National	2012
Reducing the environmental impacts of food	Awareness raising /Waste data disclosure/Waste	Households	Netherlands	National	2011
Save Food from the	Information and education	Households	Netherlands	International	2009
Slow Food Chefs Alliance	Helps link local small-scale producers to local restaurants, so as to facilitate the timely delivery of products and thereby avoid post-production losses.	Farmers, chefs, consumers	Italy and the Netherlands	National	Since 2009, ongoing
Slow Food Presidia	Protection and promotion of food biodiversity and resource efficiency.	Farmers, producers, fishers	Different EU countries	Local	Since 2009, ongoing
Sodexo Campus Food Waste	Waste measurement	Multi-stakeholder	USA	National	2010
Tesco 'Buy One Get One Free Later'	Logistical improvements	Businesses	UK	National	2010

Source: (European Commission, 2016)

Table 3. EU programmes and practices - Awareness, Information and Education

Initiative	Type of initiative	Main type of stakeholder targeted	Country	Geographical level of implementation	Year of implementation
Anti-waste workshops - Cooking Classes	Training program	Households	Belgium	Local	2009
Appetite for action	Information and education	Schools	UK	UK and Ireland	2009
"Buon Fine"	Food redistribution	Hospitality	Italy	National	Ongoing since 2003
'Calling Time on Waste'	Information and education	Businesses	Ireland	National	Not specific
Coop Denmark	Awareness raising	Households	Denmark	National	2013
DiscoSoup / Schinppeldisko	A way of recovering discarded food and making something tasty out of it, whilst involving of hundreds of people in a festive	Citizens, farmers, decision makers	Different EU countries	Local	Since 2012
DIVE!	Awareness raising	Households	USA	National	2011
Do you have an amusement park in your fridge?	Awareness Campaign	Consumers	Sweden	National	2014-2015
Dutch Nutrition Centre: Information for consumer on food	Public information on food waste	Consumers	Netherlands	National	2009 and on
Eetmaatje (Measure cup)	Eetmaatje is a measuring cup for pasta, rice and couscous that	Consumers	Netherlands	National	2014
Eroski	Food redistribution	Hospitality	Spain	National	Ongoing
European Community of Consumer Cooperatives (EUCCOOP)	Information and education. Awareness raising	Households via Business	EU-wide	National	2010
European Week for Waste	Information and education	Businesses, Households,	EU	EU	2010
Every Crumb Counts Joint Stakeholder Initiative	Joint Stakeholder Initiative	EU and International Institutions and Food Supply Chain Partners	EU	European	2013
FoodSave: Information provision and direct support	Information and direct support	The catering and food production industry	UK	Regional	2013
Food Surplus Entrepreneurs Network	Network and learning community	Social innovators reducing food waste or valorising food	Belgium	Europe.	2014
FoodDrinkEurope: Preventing food wastage in the food and drink sector	Internal member survey	EU and International Institutions, Food Supply Chain	EU	European	2014
Food Waste Reduction: Case studies from the contract catering	Awareness-raising	Contract catering industry and other stakeholders	EU	EU	2014
FoodwasteTV	Information and	Households	Germany	National	2010
Foodwise	Information and	Households	Australia	National	2010
FORWARD	Training on food waste reduction and recollection – Awareness raising	Retailers and Charities	Italy, Czech Republic, Hungary, Greece, Germany, Lithuania, Netherlands, Poland	European Union	2010-2014
Koelkaststicker ja/nee (Fridge Sticker yes/no)	Ja/Nee Koelkaststicker is a sticker to stick inside the fridge to see where fruit,	Consumers	Netherlands	National	2015
Generation awake	Information and	Households	Europe	EU	2011
'Great Taste, Less Waste'	Awareness campaign	Households	UK	National	2009
Green Cook	Information and	Households	EU	EU	2010
HOTREC	Awareness campaign and	Hospitality establishments	EU	European	2017
International Food Waste Coalition (IFWC)	Value chain collaboration,	Schools	EU	Italy, France, UK, Belgium	2015

lo non spreco: adotta un nonno a pranzo	Food waste prevention programme -	Primary school students and grandad followed by the social	Italy	Municipality of Milan	Ongoing since 2014
lo non spreco: snack- saver bag	Food waste prevention programme -	Primary school students	Italy	Municipality of Milan	Ongoing since 2014
Love Food Hate Waste	Awareness campaign	Households	UK	National	2008
Love Food Hate Waste Australia	Awareness campaign	Households, Businesses	Australia	National	2010
Love Green	Information and	Households	Germany	National	2011
Menu Dose Certa	Promotion and awareness raising	Households	Portugal	Local	2008
Narrative Label	Narrative label	Producers, citizens	Across Europe (and beyond)	Across Europe (and beyond)	Since 2012
"Restaurant fines" Promotion and awareness raising	Promotion and awareness raising	Households	United Kingdom, Saudi Arabia, Denmark	Local	Not specified
Restos Glücklich	Restaurant and Organisation for Education	Restaurant is open for the general public, workshops are mainly for schools, cooking classes for	Germany	Mainly local, sometimes national	2015
Réduisons nos déchets	Awareness campaign	Households	France	National	2005
School waste heroes	Information and	Schools	UK	National	2011
SIG5 Food Waste Recovery	SIG5 is the biggest network worldwide in the field of food waste recovery. It has more than 500 subscribers (from >60 countries) of its Webinar Series and more than 1300 members in its LinkedIn group	Industries, national agencies, universities, institutes, researchers and individual professionals working in the field of food waste recovery and valorisation, either within biorefinery concept or following circular economy and	Austria	Vienna	2013
Slow Food Earth Markets	Farmer markets (following specific Slow Food criteria)	Farmers, producers, citizens	Austria, Bulgaria, Italy	Local	Since 2005
Still Tasty	Information and	Households	USA	USA	2009
Stop Food Waste	Information and education	Households	Ireland	National	2009
Stop Spild Af Mad	Awareness raising	Households	Denmark	National	2008
Taste the Waste	Awareness raising	Households	Germany	EU	2011
Teller statt Tonne	Recovery of discarded products and public event to raise	Citizens	Germany		Since 2011
The Co-operative Group	Industrial use	Multi stakeholder	UK	National	2012
The S Group	Logistical improvements &	Multi-stakeholder	Finland	National	Ongoing
The Spanish Confederation of Consumer and User Cooperatives (HISPACOOP)	Information and education. Awareness raising	Households	Spain	National	2012
Trash Hunger, Not Food: A Guide to End Campus Food Waste	Information and Education	Universities	International	National	2017
Waste	Awareness raising	Households	UK	International	2009

Source: (European Commission, 2016)

Table 4. EU programmes and practices - Policy, Awards and Voluntary Certification

Initiative	Type of initiative	Main type of stakeholder targeted	Country	Geographical level of implementation	Year of implementation
European Food Processing Implementation	Public policy	Public policy	Germany	EU	2010
European Waste	Public policy	Businesses, Schools,	EU	EU	2009
Green Business	Information and education	Businesses	Ireland	National	2010
Green Hospitality Award Scheme	Public policy	Hospitality	Ireland	National	2008
Green Seal Standards	Logistical improvements	Businesses	United States	National	1989
Green Your Restaurant	Logistical improvements	Businesses	United States	National	1990
Love your leftovers	Information and education	Households	UK	National	2011
New Irish legislation on separate food waste collection (SI 508 of 2009)	Public authority	Businesses	Ireland	National	2009
Phasing out of EU Commission	Public authority	Businesses	Europe	European	2009
Sustainable Restaurant	Multi-project	Businesses	UK	National	2010

Source: (European Commission, 2016)

Table 5. EU programmes and practices - Food Redistribution

Initiative	Type of initiative	Main type of stakeholder targeted	Country	Geographical level of implementation	Year of implementation
Approved food	Food redistribution	Households	UK	National	2009
Auchan Spa	Food redistribution; Separate collection of food waste	Households	Italy	National	From 2008
Bennet	Food redistribution	Retailer	Italy	Regional Nord/Italy	2004
'Buon Samaritano' (Good Samaritan)	Food redistribution	Schools, retailers	Italy	Local	2005
City Harvest London	Food redistribution	Charities	UK	Local - London	2014
Close Bakery	Food redistribution	Households	Germany	National	Not specified
'Daily Menus for	Food redistribution	Multi-stakeholder	Brno, Czech	Local	2010
FareShare	Food redistribution	Multi-stakeholder	UK	National	2004
Fondazione Banco	Food redistribution	Multi-stakeholder	Italy	National	Since 1989
Food Cycle	Food redistribution	Households	UK	National	2008
'Every Meal Matters'	Food redistribution awareness raising within the supply chain	Food manufacturers, retailers and wholesalers	Belgium	Europe	2016
'Happy Hour in bakery'	Food redistribution	Households	Germany	National	Not specified
HOTREC	Awareness campaign and industry	Hospitality establishments	EU	European	2017
Next Door Help	Item-sharing against food waste	Citizens	Italy	National	Since 2014, ongoing
OLIO	Hyperlocal food sharing network	Households	Global	Global with focus on Western countries	2016
Phenix	Food redistribution, creation of innovative value chains for unsold food products,	Retailers, Manufacturers, Event sector	France, Spain, Portugal and	National / International	2014
Qui Foundation Onlus	Food redistribution	Charities and food Retailers	Italy	National	2007
Siticibo	Food redistribution	Multi-stakeholder	Italy	National	Since 2003
SOLAAL	Distribution of fresh products given by	Farmers and food aid associations	France	National	2013
Lebensmittel sind kostbar	Awareness campaign, information and education, training, food redistribution programs, logistical	Households, businesses, schools, retailers, farmers, multi-stakeholders	Austria	National	2012
Team Austria	Food redistribution	Household	UK	National	2010
We Love Food	Food redistribution	Households	Germany	Local	2011

Source: (European Commission, 2016)

Table 6. EU programmes and practices - Food Waste Measurement

Initiative	Type of initiative	Main type of stakeholder targeted	Country	Geographical level of implementation	Year of implementation
Winnow	Reduction and prevention of food waste in the hospitality industry	The hospitality industry	International, HQ: London (UK); other	International: Presence in 17 countries in Europe, Asia and the Middle	2013

Source: (European Commission, 2016)

Food Waste Policies in the UK

Research in the UK focuses on particular waste collection scheme designs, such as alternate weekly collection and residual bin sizes. The argument that some studies put forward is that households would be further encouraged to think about waste prevention if the capacity for residual waste is restricted, and the options for recycling are maximised. Nevertheless, although alternate weekly collections have been linked to a reduction in total household waste, there is little evidence of relative contributions of source reduction (DEFRA, 2009h). Indeed, there is an apparent disparity between the number of EU based activities and those based in the UK (see Table 7), with a clear preference toward practices aimed at raising awareness and providing information and education in relation to individual food waste behaviours.

Table 7. Comparison between EU and UK based waste reduction practices

	EU based initiatives	UK based initiatives	EU – Household focused initiatives	UK – Household focused initiatives
Research and Innovation	16	3	3	1
Awareness, Information and Education	50	8	22	3
Policy, Awards and Voluntary Certification	10	2	1	1
Food Redistribution	22	5	9	3
Food Waste Measurement	1	1	0	0
Total	99	19	35	8

There are several policy measures that have been tried in the UK with a view to change wasteful behaviour in the home. In 2008, the Love Food Champions project, a pilot initiative between WRAP and the National Federation of Women’s Institute (WI), where WI members volunteered to run groups for people in their own communities. The project run for approximately four month and topics covered planning and shopping for meals, keeping food fresh for longer and using leftovers. The results showed an increase in participants’ numbers classified as ‘committed food waste reducers’ from 5% to 29%. The project did report an impact on participants’ attitude as well as behaviour – by the end of the project 96% of the participants said it bothered them a ‘great deal’ or a ‘fair amount’ to throw away uneaten food, while 92% said they put a ‘great deal’ or a ‘fair amount’ of effort into minimising the amount of food wasted. In 2007 ‘Love Food Hate Waste’ campaign is a UK-wide programme initiated by WRAP that aims to reduce the amount of food waste. The project intends to advise consumers about practical everyday things that they can do in the home to help reduce the amount of food thrown away. The programme is ongoing and relatively recent, so its impact is yet to be established. Waste Watch is a non-

profit organisation that aims to inspire, educate and enable consumers to waste less. Their scheme 'Better food for all' includes 'Revaluing Food for the Future', a community programme that aims to reconnect people with food and show how, by re-evaluating this relationship, can bring about personal, social and environmental benefits. The findings of this programme showed changes in what participants reported as being important, such as the importance of price and brands reduced and the importance of sustainability and health of food increased. Overall, the results showed that there was a definite increase in food waste reduction behaviours. Regarding the monitoring and evaluation of some of the proposed food waste instruments, (DEFRA, 2009e) identified several fundamental problems: participation cannot be observed visually as it can be with recycling; there is no absolute way of telling if prevention has happened even if the amount of food wasted falls, due to the possibility of diversion to other channels (e.g. household waste recycling centres); even when changes can be classified as waste prevention, it cannot be said with certainty if this was either accidental or rational.

The current academic literature (Hebrok and Boks, 2017, Romani *et al.*, 2018, Young *et al.*, 2017, Stöckli *et al.*, 2018) reports of several design interventions aimed at food waste reduction: some already tested, some merely suggestions for improvement, and others already on the market. The vast majority is found on packaging, refrigerator and freezer related interventions. Others relate to bins, plate sizes, written communication, mobile technology, social innovation, fruit and vegetables, potatoes and milk. Information-based interventions (Cohen *et al.*, 2014; Devaney and Davies, 2017; Dyen and Sirieix, 2016; Jagau and Vyrastekova, 2017; Kallbekken and Sælen, 2013; Lim *et al.*, 2017; Manomaivibool *et al.*, 2016;

Schmidt, 2016; Whitehair *et al.*, 2013; Young *et al.*, 2017) are where information was provided to change the behaviour of the target group – i.e. households (Devaney and Davies, 2017), hotel managers and diners, (Kallbekken and Sælen, 2013) and social media users (Young *et al.*, 2017). Various ‘delivery’ methods were used, including information campaigns (Manomaivibool *et al.*, 2016; Schmidt, 2016) and cooking classes (Dyen and Sirieix, 2016).

Overall, these interventions could be grouped into two main areas: interventions aimed at the storing portion of food and interventions aimed at increasing awareness of the food waste problem. They all seek to address various material and material drivers of food waste, however currently there is little knowledge of their actual or potential effects on the levels of food waste in the household. Table 8 shows drivers of food waste and interventions aimed at influencing them. These drivers connect to the perceived value of food, awareness and attitude, lifestyle and convenience, planning, leftovers, storage, food risk, policies and regulations. In particular, it illustrates three dominating categories of intervention: (1) technology that helps people plan, share, and keep an overview of the stock, (2) solution for packaging and storing that extend the shelf life and (3) information and awareness campaigns.

Table 8. Food Waste Drivers and Interventions

Information & Awareness	Technology & Planning	Leftovers &	Storage	Packaging	Food risk	Policy
Written message Social information Awareness and information campaigns Online advice	Smart fridge Grocery list Calendar event Expiration dates Fridge camera Smartphone connection Recipe suggestion Infantry Colour coding Apps Social shari ng platforms Online advice	Plate size Written message Food containers Food huggers Social platforms Measuring tools Awareness and information campaigns Online advice	Say food from the fridge Containers Food huggers Colour coding Freshness booster Packaging Storage guidance	Resealable Divided Smaller sizes Storage guidance Date labelling Self-dispensing Edible coating Modified atmosphere Oxygen scavengers Moisture	Expiration dates The Bump Mark Keep it Awareness and information campaigns Online advice	PAYT (Pay As You Throw) Landfill tax

Source: Hebrok and Boks, 2017

The success of these interventions is varied. A student-focused education campaign (Martins *et al.*, 2016) resulted in a 33% waste reduction in main dishes, while the Home Labs intervention (a collaborative experiment with 255 householders) led to an overall reduction in food waste generation of 28% (Devaney and Davies, 2017).

E-newsletter use resulted in a 19% reduction in self-reported food waste in the home (Young *et al.*, 2017). Schmidt’s information campaign resulted in a 12% perceived (self-reported) improvement in food 260 waste reduction in the home (Schmidt, 2016). Whitehair *et al.*’s information prompt resulted in a measured 15% food waste reduction in a university cafeteria, while portion advertising information also resulted in higher uptake of smaller portions (up to 6% from 3.5%) (Jagau and Vyrastekova, 2017). Technological solutions (Devaney and Davies, 2017; Ganglbauer *et al.*, 2013; 265 Lazell, 2016; Lim *et al.*, 2017; Wansink and van Ittersum, 2013; Williamson *et al.*, 266 2016a; Young *et al.*, 2017) involve the introduction or modification of 267 technologies and/or objects

that seek to alter the behaviours around food (waste). These included changes to the plate or portion sizes (Williamson *et al.*, 2016b) or the introduction of fridge cameras or food sharing apps (Ganglbauer *et al.*, 2013).

Only plate and portion size studies have quantified waste reduction. The most significant reported waste reduction (57%) was due to shifting to smaller plate sizes, although in this study there was also a 31% decrease in the amount of food consumed via the plate size shift (Wansink and van Ittersum, 2013). Other studies have reported a 19% reduction in food waste due to a reduction in plate size (Kallbekken and Sælen, 2013), and a 51% reduction in food waste was achieved by using permanent rather than disposable plates (Williamson *et al.*, 2016a). A 31% reduction in french fries waste was enabled by moving to smaller portion sizes (Freedman and Brochado, 2010). Policy/system/practice change (Cohen *et al.*, 2014; Dyen and Sirieix, 2016; Freedman and Brochado, 2010; Kallbekken and Sælen, 2013; Martins *et al.*, 2016; 281 Schwartz *et al.*, 2015) is where policies or systems are altered and the population 282 changes food waste behaviours (or practices). Two articles involved changing school dietary guidelines, which resulted in a 28% (Schwartz *et al.*, 2015) and 14.5% (Cohen *et al.*, 2014) vegetable waste reduction, while changing how 285 schools and students were taught about food waste resulted in a 33% waste reduction from main dishes (Martins *et al.*, 2016). These results indicate that diet reformulation and healthy eating can be part of food-waste reduction strategies

2.4 Summary

In this section, under the title of research background, global challenges and economic and environmental costs of food waste were detailed in the light of historical consideration with sample cases from EU countries and the UK. The research problem was stated as a better understanding of the factors that influence consumers' food waste generation behaviour with the view to recommending prevention strategies at the household level. Following, the main reasons for the food waste problem, including its historical development and prospective outcomes were emphasised. In the later part, the author discussed the current food waste prevention policies with a particular focus on past and current policies in EU countries and the UK. What is clear is that there is a clear difference between the ranges of programmes in the EU compared with those in the UK. This difference is particularly notable in the awareness, information and education aspect, where the UK has only 3 reported programmes in comparison to the 22 programmes in the EU.

Chapter 3 Theoretical Model and Hypothesis

3.1 Introduction

This chapter presents an examination of household influences on food waste behaviour, with a focus on both the causes of food waste in the home, as well as individual prevention activities. This is followed by a review of theoretical approaches such as the Theory of Reasoned Action and the Theory of Planned Behaviour which underpin this study. It further introduces the constructs of behaviour, behavioural intention, attitudes towards behaviour, subjective norms and perceived behavioural control concerning the standard Theory of Planned Behaviour (TPB) Model. This follows with the rationalisation of the constructs of self-efficacy, pro-environmental identity and moral identity regarding the extended Theory of Planned Behaviour. The chapter concludes with presentations of the study's conceptual model and proposed hypotheses.

3.2 Household Influences of Food Waste Behaviour

Food waste occurs in many different but interconnected practices of everyday life. Individuals are not aware of all drivers behind the food they waste because they are deeply entangled in the routines of everyday life (Quested *et al.*, 2013a). Sociological studies of food waste describe how food practices are socially organised around everyday life activities in households (Evans, 2011b, Evans *et al.*, 2013) but also explain how cultural, social, material and temporal aspect of food waste practices determine if the wastage of food is perceived as inevitable.

Causes of Food Waste in the Home

In the past years, each household maintained their stock of provisions, both fresh and preserved. This situation is still accurate in most of the developing countries; however, in the developed world, this responsibility has been transferred to the industrialised food chain. The result is that individuals in these countries are becoming nothing more than food consumers at the end of the food chain, increasingly removed from any early involvement in the food chain and having no knowledge of the food supply system. This has resulted in a culture with little understanding of the source, and the value of food and researchers have called upon the need to reduce this lack of association if food waste is to be reduced (Fox and Fimeche, 2013b, WRAP, 2008). Although food waste prevention is a high impact activity with little public resistance in principle, the difficulty in encouraging prevention is that there is a range of factors driving high levels of food waste but few motives for reducing it. Research has shown that consumers appear to be more concerned with the cost of food waste rather than the food waste itself and some authors argue that the current economic climate represents an opportunity to disrupt wasteful behaviour and instil new preventive practices before the economy starts to recover (DEFRA, 2009f). At present, there is no agreed consensus in the literature as to the relative importance of different motivations (DEFRA, 2009g).

Individual behavioural choices have been shown to cause food wastage at the household level through the interaction of various characteristics of each stage of the food's journey: planning, shopping, storage, preparation and consumption (Quested *et al.*, 2013a). A lack of planning at the shopping stage often leads to buying more than necessary, both intentional and unintentional, as well as to

impulse or bulk purchases (Koivupuro *et al.*, 2012), each shown as being substantial contributors to food waste (Pearson *et al.*, 2013). Gustafsson *et al.* (2013) argued that food is often purchased without much thought as to how it will be consumed. As food enters the home, it becomes waste due to individuals preparing too much food or even preparing food inadequately (Koivupuro *et al.*, 2012). Indeed, many people lack the skills to prepare food well or to reuse leftovers. Studies in the UK have shown that 40 per cent of household food waste is due to the preparation and serving of more food than could be consumed (Quested *et al.*, 2013b). Many find it difficult to estimate how much to cook and prefer to prepare too much food than not having enough (Pearson *et al.*, 2013). Food spoilage due to improper or suboptimal storage, poor visibility in refrigerators, and partially used ingredients all can lead to wastage (Gunders, 2012). A recent survey of UK households found 47% more fresh food was wasted compared to frozen foods because fresh food goes off faster (Martindale, 2014).

Studies have noticed however that both portion-sizes in the home (i.e. the size of plates used in the home) and serving sizes as presented in cookbooks, have been increasing, sometimes by as much as 42% (for example in the Joy of Cooking cookbook from recipes in the first 1931 edition compared to the latest 2006 edition) (Wansink and Ray, 2000). In addition, consumers' general confusion and misconceptions about food safety have also been suggested as contributors to food waste in the home. An earlier UK study (WRAP, 2009e) found that more than half of food waste occurs because the food was not used in time possibly due to confusion over 'use by', 'sell by' and 'best by' date labelling.

Household Food Waste Prevention

Numerous motives have identified by various studies; however, they do not provide the basis for a clear ranking. Some of the most mentioned motivations across the food waste prevention research are: individuals' values (Barr, 2007, DEFRA, 2009d, Tucker and Douglas, 2007) and attitudes (Barr, 2007, Tucker and Douglas, 2007), personal responsibility and habits (Barr and Gilg, 2007, DEFRA, 2009c, Tucker and Douglas, 2007), influence of reference groups or individuals (Barr and Gilg, 2007, DEFRA, 2009g, Tucker and Douglas, 2007) and costs (with studies showing that 68% tend to be more worried about the cost of food waste than its environmental impact) (Barr, 2007, DEFRA, 2009h, Tucker and Douglas, 2007, WRAP, 2009b, DEFRA, 2012). Others are also mentioned, such as: guilt (WRAP, 2014), making food waste visible (WRAP and Women's Institute, 2008), feeling empowered through discussing practical activities aimed at reducing the amount of food being wasted (WRAP, 2016), enabling learning from each other (WRAP, 2017) and following food waste prevention champions with good people skills and a pragmatic approach (WRAP, 2007b), fun and practical activities (WRAP, 2017), a belief that it is a waste of good food (WRAP, 2009a) and consumer identity (Barr and Gilg, 2007, Tucker and Douglas, 2007).

Food waste appears to be an area of waste prevention where there is little public resistance, at least in principle, with 9 in 10 people not opposed to the idea of reducing their food waste (WRAP, 2017). Nevertheless, the most significant issue emerging from the evidence is the lack of consumer understanding of both the idea of 'waste prevention' and of the actions that might be associated with it. There is, in particular, a general tendency to equate the idea of 'reduce

waste' with 'recycling'. Some studies suggest that it is only the most environmentally motivated or committed recyclers that undertake prevention behaviour, and there are indications in the evidence that kerbside recycling may get in the way of developing prevention habits. Thus, it cannot be assumed that prevention is the next 'natural step' from recycling. Importantly, researchers suggested that waste prevention behaviours are poorly correlated with recycling, and are sometimes even negatively correlated, such that recycling may become a reason to not doing more to reduce waste. Indeed, some studies also reveal a degree of confusion amongst the public between recycling and reduction of food waste, and the two terms are often converged in people's mind (Barr and Gilg, 2007, Tucker and Douglas, 2007). Unlike recycling, which is the most singular act, prevention encompasses many individual behaviours. Also, prevention behaviour tends to be private and invisible, for there is much less likelihood of a social norm developing (DEFRA, 2009f), with a 2007 study (Barr *et al.*, 2013) suggesting that access to a recycling collection appears to have a negative influence not only on intentions but also on the individual's willingness to reduce and reuse. Indeed, it has been recommended that the negative spill-over of recycling attitudes and habits could act as a possible block on participation in waste prevention. Therefore, recycling has been suggested to act as an inhibitor to the uptake of waste prevention behaviours (Thøgersen and Grunert-Beckmann, 1997, Tonglet *et al.*, 2004). At present, there is still a need to understand how waste prevention behaviours differ from recycling behaviours, and the suggestion is that there is a clear need to move beyond recycling as a proxy for how food waste is managed in the home (Barr *et al.*, 2013). The suggestion from the same authors is that the focus should shift on the ways in which households interact with

food waste through the changing nature of social practice. Lack of understanding is compounded by a lack of visibility. Waste prevention is usually a very personal behaviour, done imperceptibly (when shopping) or out of the sight of others (at home) so that there is no descriptive social norm to support it – as there is now with widespread recycling. Equally, there is no injunctive norm (the sense that something should be done) because many of the behaviours involve rethinking consumption.

Overall, barriers to food waste prevention behaviours are equally diverse as the motivations, both practical and deeply rooted in individuals' psychologies. Some of the most cited reasons for wasting food are: apathy, the belief that it is someone else's responsibility, inconvenience, cost, weak self-efficacy and a sense of powerlessness, subjective norms (DEFRA, 2009c), passed its date (WRAP, 2017, Hamilton *et al.*, 2005, WRAP and Women's Institute, 2008, Parfitt *et al.*, 2010, WRAP, 2011b); unwillingness or lack of knowledge when it comes to leftovers (Brook Lyndhurst, 2007, Hamilton *et al.*, 2005, WRAP, 2008, Van Garde and Woodburn, 1987). Other barriers suggested by WRAP (2017) include: buying more food than is needed, throwing away food that is still edible, letting food go off, lack of planning, buying bigger packs or 'buy one get one free' offers, high sensitivity to or a lack of understanding of 'use by' and 'best before' dates. WRAP and Women's Institute (2008) suggested that factors such as food that went mouldy as well as looked, smelled or tasted bad are further barriers to the prevention of food wastage. More recently, DEFRA (2012) also included forgetting about food, consumer identity (i.e. lifestyle and consumer priority), habits and a general lack of knowledge about the food waste problem to the list of potential barriers to food waste prevention.

A (DEFRA, 2008) study suggests that the external context (such as local facilitating conditions, real or perceived barriers, constraints and costs) determines the level of ease or difficulty in undertaking any particular behaviour. Further research (Tonglet *et al.*, 2004) supports this idea reasoning that, while overall waste prevention behaviour is influenced mainly by concern for the environment and community, contextual factors appear to play a role in prevention behaviour and also the ability to perform the behaviour. Other studies (Barr, 2007) consider contextual factors to moderate the impact of attitudes on behaviour and argue that neither behavioural manipulation (i.e. rewards) nor education is effective in changing behaviour, and instead enabling infrastructure (i.e. kerbside collection, compost bin promotion) is a more effective trigger. The level of convenience for any particular behaviour arises out of the local facilitating conditions for that particular behaviour, and research has suggested that this factor is one of the most important motivators for waste prevention behaviours, even more so than the desire to reduce waste (Tucker and Douglas, 2007). Tonglet *et al.* (2004) note that inconvenience or indeed, perception of inconvenience constraints waste prevention behaviours. At the same time, past experience of specific waste management behaviour is one of the factors that has been found to influence current participation in that behaviour. Further, (Barr *et al.*, 2005) argued that the reason why older people are more likely to undertake waste reduction behaviours is that they have lived through post World War II rationing and the 'make do and mend' culture.

Waste minimisation and prevention, in general, is influenced by a concern for the environment and for the community (Barr *et al.*, 2001, Tonglet *et al.*, 2004). Waste prevention behaviour is driven by a clear understanding of environmental

issues and also concern about the consequences of waste. Further studies (Barr, 2007, Defra, 2009a) have also associated the intention to reduce waste with a general concern about waste issues, the perception of the waste problem and a sense of threat to the self. Numerous studies also agree that individual knowledge about the need for action, but also behavioural options and specific information on how to carry out specific options, has an influence on waste prevention behaviours (Barr *et al.*, 2011, Brook Lyndhurst and Waste Watch, 2007). In a 2007 study, Barr and Gilg divide knowledge into two types: environmental knowledge (abstract knowledge about the state of the environment and related problems such as waste) and behavioural knowledge (concrete knowledge about action, and a significant prerequisite for pro-environmental behaviour) (Barr and Gilg, 2007). The findings suggest that the influence of knowledge is significant, but the effect of abstract knowledge is weak and, for reduction behaviour, policy knowledge is important (as opposed to concrete how-to knowledge, which is more critical for recycling). On the other hand, evidence on the success of *incentives* in motivating waste prevention behaviours appears to be limited to the success of subsidised compost bins to motivate the uptake of composting (DEFRA, 2009b). The authors of the report, however, stress that fact that composting does not equal prevention.

Socio-Demographic Aspects

Socio-demographic factors are unlikely to be a direct cause of food waste generation. However, identifying differences between socio-demographic groups may help understand the complexities of household food waste generation, how people act, and which factors influence their behaviour.

Exploring the differences between socio-demographic groups can identify best practices to support people to reduce their food waste. Several studies have studied the influence of socio-demographic factors on the quantity of food that household waste (Dowler, 1977, Wenlock *et al.*, 1980a, Wenlock and Buss, 1977, Hamilton *et al.*, 2005, WRAP, 2009b, WRAP, 2009c, WRAP, 2014) and some of these factors have been found to explain some of the variations in the amounts of food wasted at the household level.

Regarding household size, a recent WRAP (2014) study found that the average amount of food waste increases with the number of occupants, as larger households tend to buy and prepare more food. In terms of household size, it is generally agreed that there is a positive association between the number of people in a household and the total food waste generated. Nevertheless, larger households waste less per capita than smaller households, most likely due to the economies of scale achieved by the former (Wenlock *et al.*, 1980a). However, the largest amount of food wasted per capita was found to be higher in single occupancy households, with one explanation being that managing food in smaller households is more complicated.

The findings of the impact of the household income vary to some extent across studies. Early research found no significant correlation between income and the amount of wasted food. Yet more recent studies show that wealthier households generate more food waste than households with low income (Skourides *et al.*, 2008, Hamilton *et al.*, 2005).

When considering household composition, the findings in the literature suggest

that the presence or percentage of children in the household positively correlates with the quantities of food waste generated (Hamilton *et al.*, 2005, WRAP, 2009d, WRAP, 2007d, Quested *et al.*, 2013b). Indeed, several studies have suggested that children could be influencing the amount of food waste generated in the home (Cappellini, 2009b, Cappellini and Parsons, 2012, Evans, 2012). Moreover, evidence suggests that parents regularly buy more than is needed in order to provide a wide selection of food for the children, even if it means some of it may be wasted, and even intentionally cook more than needed, so that second helpings are always available (WRAP, 2014).

On the other hand, age has been shown to be negatively correlated with the quantity of food wasted (Van Garde and Woodburn, 1987, Brook Lyndhurst, 2007). Younger people have been found to waste the most whilst older people generate a smaller amount of food waste. Recent studies shows that although differences existed in the types of food wasted, in general younger people (18-34 years old) wasted more due to cooking, preparing and serving too much, whilst older people (over 65 years old) had a higher proportion of food being thrown away due to not being used in time (WRAP, 2017). Nevertheless and contrary to popular assumptions, older people were not found to be concerned about wasting food more than young people. However, they seem to be better equipped in terms of skills and knowledge, and have more time, to act on these concerns.

Not all studies agree on the effect of gender on the adoption of food waste behaviours. When researching intentions not to waste water, for example, women were found more environmentally conscious (Mainieri *et al.*, 1997). Yet

no such effects were found by Lam (2006) and Trumbo *et al.* (2001). Studies by (WRAP, 2014) found no relationship between gender and the levels of waste, although it was found that households that included female respondents had around 22% more food waste than those with only male respondents. Recent studies, however, argued that females are more concerned than men about

Food Planning Management

Empirical research shows that the amount of food wasted in the home is directly influenced by specific approaches to food planning management that the households undertake. Research has continuously shown the varying levels of influence that specific factors have on the way households go about their food shopping and preparation activities (WRAP, 2014, WRAP, 2009c). In this study, these drivers of food planning management in the home have been grouped in three distinctive areas, depending on the stage of a food planning activity (pre-shopping, shopping and post-shopping), with each one of these stages consisting of specific actions that individuals undertake. Further, the literature argues for specific behavioural factors which this study has included as possible antecedents to food planning management.

In the pre-shopping stage, households engage in behaviours such as checking their stocks, making shopping lists or planning their meals in advance, which research has shown to have a negative influence on the amount of food waste generated at the household level (WRAP, 2007d, WRAP, 2014). The pre-shop planning is essential, as people tend to conduct these activities in the environment of their own households. In this context, they are not influenced by

the in-store temptations, and they can be more rational when deciding what they need and when they are going to consume those items. If households plan their shopping trips, they might not be as tempted when they are in store, and thus end up buying less food, which in turn will have a direct effect on the amount being wasted.

People who do not check their food stocks before the shopping trip are put in the position of estimating their inventory, from memory, when they make the purchase decisions in the store. However, studies suggest that the process of estimating inventories is biased and could lead to either overstocking (in the case of stockout averse households) or stockout (in the case of overstock averse households) (Meyer and Assuncao, 1990, Chandon and Wansink, 2006). Overstocking is an important contributor to food waste since it increases spoilage of food in the overstocked categories. When faced with the need to estimate their inventories, Chandon and Wansink (2006) found that 28% of people underestimate their actual inventories, whilst 23% overestimate them. Overall, more people underestimate their stock, which makes them buy items they already have at home, increasing the spoilage rate of their food.

Preparing a shopping list before going shopping is another behaviour that can influence food waste, as the shopping list can help individuals to be more organised in-store and only buy what they need. Overall, 36% of people reported preparing a shopping list prior to shopping and sticking to it whilst they were in the shop (WRAP, 2007d); more recent analysis showed that households that use shopping lists tend to waste less overall (WRAP, 2014). When planning their meals in advance of the shopping trip, households can be more organised regarding the type and amount of food items that they need to buy in order to

have the necessary amount of food items required. Recent WRAP (2014) research suggests evidence of meal planning contributing to a reduction in food waste, particularly when seen as the result of another behaviour such as list making.

In the shopping stage, one of the critical factors leading to food waste is buying too much food. Some of the reasons given by individuals for their overbuying are the influence of retailers through promotions and discounts and the purchase of fresh food such as fruits and vegetables (Brook Lyndhurst, 2007, WRAP, 2007d, WRAP, 2009d). Another factor adding to the high amounts of food bought is the purchase of fresh food as part of households' attempts to eat healthier diets. A possible explanation for the higher amount of fresh food purchased by some households may lie in the fact that when making buying decisions for the more distant future, individuals usually tend to choose the so-called 'should' products, (e.g. vegetables and fruits), while, when they make a buying decision for the very near future, they are more likely to choose the 'want' products (e.g. ice-cream) (Milkman *et al.*, 2010, Rogers and Bazerman, 2008). As a result, households that buy fresh foods in one shopping trip for multiple days in advance are expected to buy more such products than the households needs, rather than shopping more often, and thus to generate more food waste.

There are also other reasons that may help explain why people buy too much, such as the effects of hunger whilst shopping and lifestyle choices. When people go shopping on an empty stomach, they tend to buy much more than they would otherwise (Read and Van Leeuwen, 1998, Loewenstein and O'Donoghue,

2004).

This is a manifestation of the projection bias that affects individuals' decision making, meaning that people have a tendency to exaggerate the extent to which their future tastes will be similar to their current ones (Loewenstein *et al.*, 2003). As individuals tend to think that their future taste for food will reflect such hunger, and therefore they end up buying more food than they would if they were not hungry at shopping time.

The frequency of shopping has also been shown to have an influence on food waste behaviours (WRAP, 2007a). Most of the UK households usually undertake a weekly main shop followed by two or three top-up shops. This pattern of shopping contributes to the highest amount of food waste according to a report by Brook Lyndhurst (2007). The study showed that some individuals feel that going shopping more frequently leads to less food waste because they only buy what they need for that specific day. On the other hand, frequent food shopping might lead to more impulsive buying, which in turn can lead to more wastage. Therefore, there is a trade-off between shopping daily and risking to be tempted by bargains in the store. An implication of the frequency of shopping is the fact that some people tend to seek more variety when they buy food for multiple days in advance than those who buy food in more frequent shopping trips. This is a manifestation of the 'diversification bias', meaning that individuals seek more variety in a simultaneous choice scenario than in a sequential choice one (Read *et al.*, 2001, Read and Loewenstein, 1995). On simultaneous choice occasions, people buy a greater variety of a particular product, thus they do not buy only their most preferred item. Purchasing a more extensive variety of products and

choosing not only the preferred flavours may contribute to higher amounts of food waste.

In the post-shopping stage, households engage in behaviours such as using meal leftovers, cooking and storing. In the UK, many people admit that they do not have the skills to cook or prepare only the amount of food that is necessary for their household and that they often prepare portions that are too large (WRAP, 2007d). Moreover, individuals perceive food waste as being a consequence of consumption that cannot be avoided. This, coupled with the difficulties they have in cooking and buying only the required amount, leads to higher amounts of food being disposed of. With food not being used in time and cooking and preparing too much food being the two main reasons for which people generate food waste, better cooking and shopping skills might lead to a decrease in the amount of food waste generated at the household level. As a result, increasing people's understanding of food and offering specific guidance and education could prove an essential factor in addressing this aspect of food management. A strong positive correlations were also found between households which use up leftovers and the amount of food waste generated (WRAP, 2014). Leftovers' consumption is regarded as an everyday thrift practice through which households 'produce excess value' and reaffirm family relationships (Cappellini, 2009b).

Food storage is also an important aspect of post-shopping behaviour. Evidence by Brook Lyndhurst (2007) states that storage space capacity was positively correlated with the amount of food wasted. In general, households with larger cupboard/fridge capacity tend to waste more in comparison with low storage

capacity households. This suggests that storage capacity is likely to lead to issues of storage management, as large storage capacity households often engage in the inefficient consumption of the purchased food items by neglecting or forgetting some of the food.

3.3 Behavioural Theories and Models of Food Waste

The issue of individual behaviour in regards to food waste generation in households has received attention from researchers of diverse disciplinary fields. Two broad social ontologies can be distinguished, psychology-oriented approaches, often rooted in the fields of consumer behaviour or environmental psychology, and sociology-oriented approaches, which look at behaviour as an outcome of complex interrelationships and shared social practice.

Psychology oriented approaches aim to identify and measure specific intrapersonal, cognitive, motivational and structural factors and processes that either drive or impede pro-environmental behaviour (Steg and Vlek, 2009). Prompted by (Wicker, 1969) argument that attitudes probably do not predict behaviour, social scientists have sought to improve their predictive power. As such, the primary method has been to develop integrated models of behaviour that include additional determinants of behaviour such as subjective norms or intentions (Olson and Zanna, 1993). Most widely researched of these models are the Theory of Reasoned Action and its extension, the Theory of Planned Behaviour. In particular, in the field of environmental psychology, the Theory of Planned Behaviour has been the predominantly applied theory when investigating food waste behaviour (Graham-Rowe *et al.*, 2015, Stancu *et al.*,

2016, Stefan *et al.*, 2013, Visschers *et al.*, 2016).

The Rational Choice Theory

Until the 20th century, there had been a relatively small number of theories of rational decision-making. However, this situation changed radically in the 20th century when the first models of rational behaviour emerged, first in the theory of operational research and then in the rational choice theory. The rational choice theory concerns rational human behaviour, where the principle of rationality is characterised by subjectivity and constraint. In comparison with the neoclassical direction, rational choice theory fundamentally changed the paradigm of rationality. Rational choice theorists renounced the useless 'demarcation' between rationality and irrationality and focused on the subjective determination of rationality (Homans, 1961, Blau, 1964, Coleman, 1973, Cook, 1977, Coleman, 1990). For example, a study suggested that if children prefer to watch TV instead of studying, they act subjectively and rationally, although they might have a different opinion in 10 years (Sveri, 1997, p40).

Rational choice theory resolved all rationality definition flaws and brought the rationality principle to its logical end, recognising the critical role that time, transaction costs, and other factors have in everyday life. Simon (1961) was the first to formulate the generic principle of bounded rationality that is applicable to all social sciences, although Stiegler (1961) was the one that suggested that an individual (consciously or unconsciously) maximises the amount of information collected, so the amount of information collected equates its final expenditure.

Rational choice theory is about what activity to choose; for the model of individual decisions, the starting point is selected by the individual from the set of

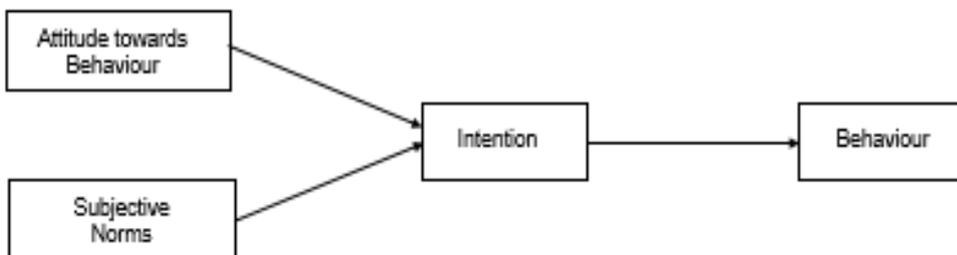
recognised possibilities. The theory gives a reasonable description of the selection process and states that the best is selected by the expected result of the activity. Essential to all forms of rational choice theory is the assumption that complex social phenomena can be explained in terms of the elementary individual actions of which they are composed (Scott, 2000). Individuals are perceived to act based on the information that they have about the conditions under which they are acting as well as within specific, given constraints; it posits that rational individuals choose the alternative that is likely to give them the highest satisfaction (Heath, 1976).

Rational choice theory is the idea that individuals make choices to maximise benefits whilst minimising costs. It postulates that when making a decision, individuals first weigh the expected positive benefits against the expected negative consequences, and then base their choice on what they think will ultimately benefit them the most. The theory assumes that generally, consumers use analysis in order to estimate the values of individual risk and time preference indicators. Nevertheless, its value for the social sciences has been long contested, with much time being spent on the common but rather ambiguous concept of rationality. There is, in fact, experimental evidence that humans are not very good at logical problems, especially when they are posed in abstract terms that involve probabilities (Sears and Funk, 1990a, b, Maxwell and Ames, 1979, 1981, Coughlin, 1991, Fiske, 1991, Monroe, 1996). Some researchers, however, such as Gintis (2007, p11) disregard this evidence, concluding that 'most individuals do not appear to have difficulty making and understanding logical arguments in everyday life'. Still, evidence from Wason (1986), Cosmides (1989) and Cosmides and Tooby (1994, a,b) suggest otherwise.

The Theory of Reasoned Action (TRA)

The Theory of Reasoned Action, developed by (Fishbein and Ajzen, 1974) in 1965, provides clues to the later development of the Theory of Planned Behaviour. Indeed, (Sheeran and Orbell, 1999) recognised the TRA as one of the most important psychological theories used for predicting and understanding behaviour. As a rational behavioural decision-making model, the roots of the TRA can be traced to Expectancy-Value Models (Edwards, 1954, Peak, 1955). However, the TRA differs from earlier expectancy-value theory in one crucial aspect: the recognition of the influence of an individual's subjective norm of behavioural intention, as well as the attitude. Similar to the 'hierarchy of effect' process model (Hastings and Fletcher, 1983), the TRA also incorporates cognitive, affective and conative components. The model is shown in Figure 3:

Figure 3. The Theory of Reasoned Action (TRA)



Adapted from: Fishbein and Ajzen (1974)

The TRA asserts that individuals consider the implications of their behaviour before acting. Indeed, the authors argued that 'people consider the implications of their actions before they decide to engage or not in a given behaviour', therefore reasoning their actions. The theory was brought about through Fishbein's study on the psychological theory of the relationship between

attitudes and behaviour, from which he drew several conclusions (1) an attitude towards an object is not the same thing as an attitude the act of buying that object, (2) measurement of attitudes have become inaccurate, some researchers measuring likes/dislikes beliefs instead, and (3) situational aspects and a person's perception of what others think about it that can influence behaviour. Using it as a conceptual framework (Ajzen and Fishbein, 1977) inferred that attitudes towards behaviours stem from underlying individual beliefs concerning those behaviours. Indeed, the TRA assumes that attitudes result from a combination of beliefs about the characteristics of particular attitude objects and evaluation of these characteristics. Behavioural intention also plays a critical role and is identified as the most significant predictor of whether or not an individual will complete the desired behaviour.

In response to the more general critique of rational choice theory, the TRA has the virtue of making explicit the antecedents in reference to attitudes, and more importantly, it acknowledges the social influence personal behaviour (Jackson, 2005b). Moreover, although the TRA has worked in a variety of settings (Eagly and Chaiken, 1993), there are questions about its generality, and the operation of certain variables included. At the same time, the model does not explain the research findings that the best predictor of future behaviour is past behaviour (Aiken, 2002). However, Ajzen and Fishbein (1980) clearly distinguished between four different elements involved in consumer behaviour: the target (brand or product), the action (buying, using, etc.), and the context (own use, gift, etc.) and the time horizon (today, next week, etc.), by stating that 'variations in each of these elements of consumer behaviour will similarly affect the consumers normative belief' (Ajzen and Fishbein, 1980). Therefore, an

advantage of the TRA over other models is its ability to address the attitudinal antecedents of these different elements.

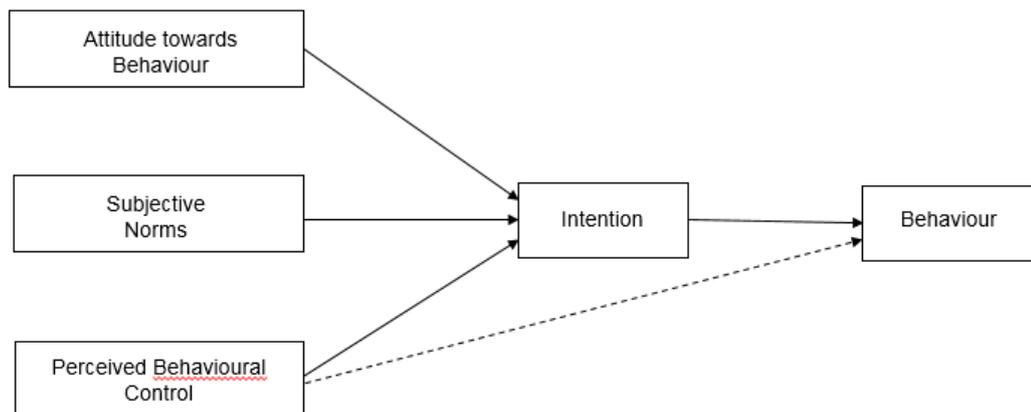
Several limitations have been highlighted following the development of the TRA such as the fact that the theory does not account for the variable times between forming attitudes and acting upon them, the fact that consumption situations vary, or that an attitude towards an object varies from an attitude towards behaving. The fact that the theory does not account for the role of beliefs earlier in the relationship, between beliefs evaluation and attitudes, has also been noted by Budd (1986), whilst Jackson (2005a) found that cognitive deliberation, the role of habit and the influence of affective or moral factors are not explicitly addressed by the model. Mainly, the TRA has been criticised because it is said to ignore the social nature of human action (Kippax & Crawford 1993). The model is inherently biased towards individualistic, rationalistic interpretations of human behaviour with a focus on the subjective perception that does not necessarily permit to take meaningful account of social realities. Even more, the TRA does not account for perceived behavioural control; this deficiency led to the updated extension of the model, namely the Theory of Planned Behaviour.

The Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour's main aim is to predict and explain the behaviour of people in specific contexts and asserts that the individuals' given behaviour is predicted by their intention to perform that behaviour. The TPB is, in fact, an extension of an earlier theory, the Theory of Reasoned Action (TRA); while the TRA was designed for the purpose of understanding human behaviour and identifying the determinants of intentions with respect to volitional

behaviours, the TPB extended this framework to include an additional construct (i.e. Perceived Behavioural Control), making it possible in this way to cover behaviours over which an individual has only incomplete volitional control. TPB posits that individual behaviour is driven by behavioural intentions where behavioural intentions are a function of an individual's attitude towards the behaviour, the subjective norms and the perceived behavioural control surrounding the performance of a particular behaviour (Ajzen, 1991). In general, the more favourable the attitudes and subjective norms, and the greater the perceived control, the stronger an individual's intention to perform that desired behaviour should be. Any other variables (such as values) are thought to influence intentions through attitudes, subjective norms, or perceived control (Maio and Olson, 1995). The model is shown in Figure 4:

Figure 4. The Theory of Planned Behaviour



Adapted from: Ajzen (1991)

Like the TRA, the TPB has as an underlying assumption the fact that people most often act in a sensible manner by using available information and considering the implications of their behaviour. Also similarly, it assumes that the most

critical determinant of human behaviour is the behavioural intentions. The additional construct added by (Ajzen, 1991) to the TPB, the Perceived Behavioural Control, is the second predictor of behaviour. The theory proposes that a positive attitude, subjective norms and perceptions of behavioural control will lead to a stronger intention to perform the desired behaviour, idea further supported by (Sheehan *et al.*, 1996) and (Thorbjørnsen *et al.*, 2007). In order to quantify these constructs, two possibilities are open. Firstly, researchers could use direct (or global) measures, such as seven-point semantic differential scale, to elicit information about behavioural intentions, attitudes towards behaviour, subjective norm and perceived behavioural control. Alternatively, researchers could choose to use indirect (or belief-based) measures for attitudes towards the behaviour, subjective norms and perceived behavioural control. The second method requires the multiplication of different measures in order to elicit a figure for the constructs, as beliefs are assumed to determine beliefs about the construct, not to be a direct measure of that particular construct. Such about behavioural beliefs are assumed to determine attitude towards the behaviour; they are not assumed to determine the direct measure of attitude. Similarly, normative beliefs determine the subjective norm, not the direct measure of the subjective norm; and control beliefs determine perceived behavioural control, not the direct measure of PBC. In order to compute an indirect measure of attitude towards the behaviour, behavioural beliefs strength and outcome evaluation are multiplied together and that the resulting product is summed over all accessible behavioural outcomes

Attitude towards a behaviour is defined in the TPB as the individuals' positive or negative feelings about performing a behaviour and is determined through

an assessment of the beliefs regarding the consequences arising from behaviour and an evaluation of the desirability of these consequences. Indeed, early research (Schwartz, 1977) suggests that an individual's attitudes, and, to a lesser extent, PBC and Self-efficacy, are key influences in forming intentions to participate in physical activity. Attitudes towards the behaviour reflect the extent that the behaviour is favourably or unfavourably evaluated. Regarding *Subjective Norms*, several authors have argued that this is the weakest component of the TPB (Sutton, 1994, Sutton, 2006, Cheema and Soman, 2006). The most likely explanation that research has offered for the poor performance of the subjective norm component lies in its measurement, as many authors use single-item measures, as opposed to more reliable multi-item scales, e.g. (Nunnally *et al.*, 1967). Studies suggest that individuals are more likely to follow a behaviour when they perceive such behaviour to be in accordance with the norms of their group, and as a result subjective norms may be able to provide a powerful mechanism to influence people's attitudes and intentions (Thorbjørnsen *et al.*, 2007, Bolman and de Vries, 1998). So far, however, investigations on subjective norms have mostly examined norms in the context of reducing negative behaviours (i.e. smoking or alcohol consumption) or changing general behavioural patterns (i.e. exercising more or participating in environmental conservation programmes) (de Vries and Mudde, 1998, De Pelsmacker and Janssens, 2007). Subjective Norms have also been defined by Brockner (1992) as a global perception of social pressure either to comply with the wishes of others or not. However, social pressure is rarely direct or explicit, leading a number of researchers to suggest alternative conceptualisations. The *PBC* element of the TPB reflects personal beliefs as to how easy or difficult performing the behaviour is likely to be and is assumed

to reflect external factors (e.g. availability of time or money, social support), as well as internal factors (e.g. ability, skill, information) (Brockner, 1992, Cheema and Soman, 2006, Berkowitz, 2005). When considering the influence of PBC on intention, Ajzen (1991) proposes that 'the relative importance of attitude, subjective norm and PBC in the prediction of intention is expected to vary across behaviours and situations'. That is, in situations where attitudes are strong, or where social norm influences are powerful, PBC may be less predictive of intentions. Indirect evidence for this claim has been demonstrated in studies that have shown that measures of attitude strength (Sparks *et al.*, 1992) and individual differences in sociability (Tilman *et al.*, 2001) increase the relative predictive power of attitudes and subjective norms, respectively. Nonetheless, earlier research has also supported the view that in general, individuals are more disposed to engage in behaviours that are believed to be achievable (Thaler and Shefrin, 1981).

The TPB has been shown to be suitable not only to predict behaviour but also to analyse behaviour retrospectively; evidence suggests that it can predict 20-30% of the variance in behaviour brought about via intervention, and a greater proportion in intention (Armitage and Conner, 2001a, Taylor *et al.*, 2006a). Strong associations have been consistently reported between behaviour and both the attitudes towards the behaviour and perceived behavioural control components of the theory, but generally weak relationships have been established between behaviour and subjective norms. Some criticism of the TPB is aimed at its apparent inefficiency regarding designing the type of intervention that will result in behaviour change. Nevertheless, research suggests that by using TPB to explain and predict likely behaviour, particular influences on behaviour may be

identified and targeted for potential change (Hardeman *et al.*, 2002, Taylor *et al.*, 2006a, Webb *et al.*, 2010).

Applications of the model have been used to explore environmentally significant behaviour (Stern, 2000), which includes areas such as the purchase of 'ecologically safe' products, predicting recycling behaviour, energy consumption, food choice and ethical investment (Amyx *et al.*, 1994, Staats *et al.*, 2003). Many of these studies, however, fail to measure actual behaviour and concentrate mainly on measuring the relationship between attitudes, intentions and the PBC. In addition, the model is only partially satisfactory as it tends to emphasise hedonic, self-interested outcomes, in contrast with the more societal centred viewpoint of ethical consumers (Shaw and Shiu, 2002). In an earlier application of the TPB, Csikszentmihalyi (1999) highlighted that the interaction between intentions and PBC should be independently predictive of behaviour. That is, under conditions where the intention is only weakly related to behaviour, increased PBC should enable the implementation of intentions into action. Following the lack of evidence for the interactive effects of PBC on the intention-behaviour relationship, Brockner (1992) argued for a direct relationship between PBC and behaviour. This is based on the rationale that increased feelings of control will increase the extent to which individuals are willing to employ additional effort in order to successfully perform a particular behaviour. In contrast, under conditions of very high volitional control, the behavioural intention should be the only predictor of behaviour. There is no doubt that PBC is an important variable for explaining intention, and existing research support this observation. Cheema and Soman (2006) argue that it is as important as an attitude toward the action, and the TPB seems to perform

quite well across behavioural categories with respect to explaining intentions. For the prediction of behaviour however, its efficiency varies. In their review of applications of the TPB, Dahlstrand and Biel (1997) found that type of behaviour was clearly linked to the strength of the intention-behaviour relationship. The authors speculate that the inability to enact individual intentions in some areas may result from various personal and environmental control factors.

Although criticised for a focus on rational decision-making, in particular, its apparent deficiency regarding the design of an intervention that will result in actual changes in behaviour, the Theory of Planned Behaviour is the dominant theory in the human behavioural context. This is shown by many empirical studies which testify to its original constructs explanatory power for understanding social behaviours in terms of attitudes, subjective norms, perceived behavioural control and behavioural intentions. One type of criticism is related to the theory's proposition that attitudes, subjective norms and perceived behavioural control are sufficient in predicting intentions and therefore, behaviours. The solution proposed by researchers is the additions of a number of variables that might be added to improve its predictive validity; the following section discusses in more detail some of the modifications proposed by researchers.

Modifications to the Theory of Planned Behaviour

The general theoretical framework of the TPB has allowed it to be very widely used, applied and extended significantly since its initial development. There has

been an extensive debate on issues such as whether or not the TPB further extended to include additional components (Abraham *et al.*, 1998, Sutton, 1998). Problems related to the statistical interpretation and analytical as opposed to only the status of the findings that the TPB generate has also been raised (Ogden, 2011, French and Hankins, 2003, Ajzen and Fishbein, 2004). There has also been a robust consideration of topics like the extent to which the PBC construct is necessarily the same as, or should be seen as strengthening or weakening the application of, Bandura's self-efficacy concept (Ajzen, 2002b). However for the purpose of this literature review, the key observation to make is that there is a large volume of research indicating that both the TPB and the TRA have utility in predicting waste-related behaviours, and that serve statistical relationship between their internal constructs based on behavioural, normative and control beliefs have a significance across a wide range of contexts (Armitage and Conner, 2001a).

During initial research on food safety and GM foods, 'self-identity' was added to the TPB to account for predispositions which are expected to be a significant influence on behaviour (Cheema and Soman, 2006, Cook *et al.*, 2002). The ensuing results showed that self-identity, attitudes, subjective norms and perceived behavioural control were all significant in determining intention. In addition, these elements were distinguished in terms of their relationships with age, gender, prior behaviour and the believability of statements by companies engaged in GM food production. In their investigation of decision-making processes of ethical consumers, (Shaw and Shiu, 2003) used TPB as a starting point, and added two additional measures: 'ethical obligation' and 'self-identity', with ethical concerns representing individual's internalized ethical rules, which

reflect their personal beliefs about right and wrong, similar to (Gorsuch and Ortberg, 1983a, Beck and Ajzen, 1991). Self-identity was added by rationalizing that as an issue becomes central to an individual's self-identity, then behavioural intentions are adjusted accordingly. The study's results showed that the measures of ethical obligation and self-identity, as well as perceived behavioural control, were more relevant to decision making than the original TPB measures of attitude and subjective norm.

Michaelidou and Hassan (2008) used the TPB to investigate the organic food market; their model consists of three determinants: 'health consciousness', 'ethical self-identity' and 'food safety concerns' that are antecedents of attitude, which in turn is an antecedent of purchase intention. Findings indicate health consciousness to be the least important motive in shaping attitude towards organic produce in relation to other motives. Additionally, food safety concern was found to be one of the most important predictors of attitude, but not of behavioural intention. More recently, Evans (2011a) investigated the trend of blaming the consumer by looking at the issue of current public debates about food waste for individuals' presumed wastefulness and 'imagined lack of culinary competence' and noticed that there has been an increased tendency for recommendations that target knowledge, attitudes and the behaviours that individuals choose to undertake, e.g. Stuart (2009) stresses the need to raise awareness of the 'non-financial cost of wasting food'; WRAP 'LoveFoodHateWaste' campaign (WRAP, 2014, WRAP, 2010). In an earlier study, (Holm, 2003) suggested that the concept of victim blaming has relevance in debates about political consumerism when individuals are expected to solve social problems by altering the ways in which they consume. Evans (2011b) later

supported this argument, highlighting that is overly simplistic to blame individuals or customise responsibilities; in specific, it emphasis some of the ways in which waste is a consequence of the ways in which individual food practices are socially organized.

The Standard Theory of Planned Behaviour (TPB) Model

The parsimony of the proposed predictors of human action and the range of applicability of these accounts are perhaps the most important strength of the TRA and the TPB (Sheeran and Orbell, 1999). A review of applications of behavioural theories by Taylor *et al.* (2006b) identified no evidence related to the scope to which the use of TPB informed interventions has contributed to a significant change in individual behaviour, over and above changes achievable via other theoretically or non-theoretically based interventions. The rationale is that so far most TPB-based studies have been mainly aimed at predicting and understanding behaviour. The suggestion from the literature is to include additional factors to improve the prediction of intentions and better understand and support the translation of intentions into desired behaviours (Abraham *et al.*, 1998, Conner and Armitage, 1998, Maddux, 1993, Hobbis and Sutton, 2005, Armitage and Conner, 2000, Ajzen, 2001, Sutton, 2006). Indeed, Ajzen (1991) has explicitly welcomed research which addresses such additional variables, stating that ‘the theory of planned behaviour is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behaviour after the theory’s current variables have been taken into account’.

In terms of this study’s Conceptual Framework, the Theory of Planned Behaviour

has been applied as the theoretical context for this study. As illustrated in Figure 4, the original framework of the TPB is created by five constructs in total, namely: attitudes towards behaviour, subjective norms, perceived behavioural control, behavioural intention and behaviour. Furthermore, as a means to extend the original TPB model in the context of household food waste, further measures of moral identity, self-efficacy and pro-environmental identity are investigated (see Figure 5).

The Construct of Behaviour

(Ajzen, 2002b) state that 'behaviour is typically viewed as a given factor that requires no further elaboration'. However, on closer examination, the definition is not as simple as it appears. Therefore it is essential for any research based on the TPB framework to identify and measure the behaviour that is to be understood, predicted or even changed. Both actual behaviours, for example, waste bin analysis (Tudor *et al.*, 2008, Tudor *et al.*, 2007) and self-reported behaviours, for example, recycling (McDonald, 2011), have been used by researchers; however, a discrepancy is often noted. Furthermore, the behaviour construct can be described in several ways: firstly, as a dichotomous variable in which the behaviour either happens or not (e.g. an individual either recycles or does not) and secondly, in terms of behaviour frequency, duration or intensity of the performance.

Compared to forming an intention, translating intentions into an actual behaviour is dependent on the proximal distance between these two constructs. Following Trope and Liberman (2010) Construal-level theory, proximity to behavioural

enactment increases the values of immediate consequences of that behaviour, whereas distance from behavioural enactment diminishes possible future consequences. Even more, Keer *et al.* (2013) suggest that when intentions are translated into behaviour, short-term consequences are salient, and therefore affect may be relatively influential. When performing an intention about a particular future behaviour, however, long-term consequences are relevant. Therefore cognitive consequences may be potentially influential.

The Construct of Behavioural Intention

Theories of behavioural decision-making, such as the Theory of Planned Behaviour (Ajzen, 1991), Theory of Reasoned Action (Fishbein, 1979a) and the Theory of Interpersonal Behaviour (Triandis, 1977), emphasise the role of intentions as the most immediate and important predictor of individuals' behaviour. The intention construct is undeniably central to both the TRA and the TPB. Behavioural intentions are assumed to capture the motivational factors that influence behaviour and to indicate how hard individuals are willing to try, or how much effort they would exert to perform the behaviour (Ajzen, 1991). The assumption is that people perform the behaviour they intend to perform. However, this notion has raised some questions in the literature, such as how well do intentions predict behaviours and what determines how well intentions predict behaviours (Sheeran, 2002a). Bhattacharjee and Sanford (2009) suggest that one potential explanation could be the so-called 'social desirability' effect, where individuals report favourable intentions towards a specific behaviour because they do not wish to portray themselves at odds with the rest of the participants. Perhaps a more compelling theoretical explanation

for the intention-behaviour gap stems from the 'attitude strength' concept in the social psychology literature (Krosnick *et al.*, 1993, Pomerantz *et al.*, 1995, Verplanken and Holland, 2002), which suggests that individuals with 'strong' attitudes demonstrate a stronger association between attitudes and behaviour, whereas those with 'weak' attitudes have a weaker association.

In order to better understand the intention-behaviour gap, studies have suggested helpfully to decompose intention consistency into a 2x2 behaviour matrix, positive intention vs negative intention and performance vs non-performance (McBroom and Reed, 1992, Sheeran, 2002a) (see Table 9). According to this model, intention-behaviour consistency can be attributed to two groups of participants - those with positive intention who subsequently act and participants with negative intentions who do not act. Those individuals who are inclined to perform a behaviour may either act consistently with this inclination and be characterised as inclined actors, or they may not, therefore, be characterised as inclined abstainers. Similarly, those individuals who are not inclined to perform the behaviour may either act in accordance with this and be characterised as disinclined abstainers or, if they act inconsistently, they can be considered disinclined actors. Importantly, it is also possible to see that those who are responsible for the intention-behaviour gap are in fact the two groups of participants who do not act according to their intentions: inclined abstainers and disinclined actors. The authors classified the participants as having a positive intention (inclined) if they scored 7 (maximum score) on the item 'I intend not to waste any food in the home in the next month', and as having negative intentions (disinclined) if they score 1-6 on this item.

Table 9. Decomposition of the intention-behaviour relationship

Subsequent behaviour	Intentions	
	<i>Positive</i>	<i>Negative</i>
<i>Acted</i>	Inclined actor	Disinclined actor
<i>Did not act</i>	Inclined abstainer	Disinclined abstainer

Adapted from: Sheeran (2002b)

Further studies mention the lack of consistency between intention and behaviour as being mainly due to individuals with positive intentions rather than those with negative intentions (Orbell and Sheeran, 1998, Sheeran and Orbell, 2000a, Sheeran and Orbell, 2000b, Sutton *et al.*, 1994, Gallois *et al.*, 1992, Stanton *et al.*, 1996), with the median percentage of intenders who failed to act their intentions being 47%, whereas the median percentage of non-intenders who subsequently performed the behaviour being 7%. Consequently, researchers argue that it is those participants who fail to act upon their positive intentions who are mainly responsible for the intention-behaviour gap (Sutton *et al.*, 1994, Stanton *et al.*, 1996, Sheeran and Orbell, 2000a).

Models based on the TPB regard forming an intention as the prerequisite of behavioural performance. Behavioural intentions are presumed to mediate the effects of superfluous variables, such as demographic characteristics, but also attitudes and subjective norms (Randall and Wolff, 1994, Sheeran and Taylor, 1999, Sheeran and Orbell, 1998, Sheppard *et al.*, 1988). The behavioural intention construct, therefore, provides a summary of the individual's motivational orientation towards performing a behaviour. Most social psychological models

agree on the suggestion that the most immediate and important predictor of an individual's behaviour is their intention to perform it. The assumption is that people do what they intend to do and not do what they do not intend. Nevertheless, this raises the questions of how well intentions predict behaviour and also what determines how well intentions predict behaviour (Sheeran, 2002a). One of the reasons for poor prediction and a possible explanation for the heterogeneity in the intention-behaviour correlation across studies, as discussed by Sutton (2006), is that intentions may change. The suggestion is that for maximal prediction, the measurement of the intention should be as close as possible in time to the observation of behaviour, also noted initially by Ajzen and Fishbein (1980). A distal measure of intention, with respect to behaviour, will be a poorer predictor of behaviour than a proximal measure of intention, as the longer the interval between the measurement of intention and behaviour, the greater the likelihood that unforeseen events will occur that lead to changes in intentions. Another possible explanation for the intention-behaviour gap might be explained by the 'social desirability' effect, where individuals report favourable intentions because they do not wish to portray themselves at odds with the others (Bhattacharjee and Sanford, 2009).

As many empirical studies based on TPB have argued, strong intentions are reliably observed to be realised more often than weak intentions (Ajzen and Driver, 1991, Conner and Armitage, 1998, Godin and Kok, 1996). However, the observed correlations between intention and behaviour are modest, and in many studies, intentions account for only 20% to 30% of the variance in behaviour. The weak intention-behaviour relation is primarily due to individuals having good intentions but failing to act on them (Orbell and Sheeran, 1998). For this reason,

Gollwitzer (1999) called for a better understanding of how good intentions can be made more effective, rationalising that once this is known, forming good intentions and effective ways to implement them can be suggested to individuals who are motivated to change their behaviour. Nevertheless, so far, only a few studies have examined the intention-behaviour relationship by looking at how accurately individuals can predict their own behaviour (Davidson and Beach, 1981, Orbell and Sheeran, 1998, Piliavin, 1991, Sutton, 2006), while others have shown that correlations tend to obscure the nature of the intention-behaviour gap (Orbell and Sheeran, 1998).

The Construct of Attitudes towards Behaviour

It is important to highlight here that Ajzen and Fishbein (1977) and Ajzen and Fishbein (1980) distinguish between two attitude conceptualisations: attitudes towards objects and attitudes towards behaviour. It has typically been assumed that an individual's behaviour towards some object is determined by their attitude towards that particular object. Opposing this traditional take on attitude, Ajzen and Fishbein (1977) clearly differentiate between attitude and the object of the attitude, by arguing that an individual's attitude towards behaviour is their positive or negative evaluation of performing the behaviour in question. Similarly, an individual's attitude towards an object (i.e. person, event) is their positive or negative evaluation of that object. For instance, an individual's attitude towards 'recycling' could well be different from the same individual's attitude towards 'performing recycling'. Hence an individual can be in favour of recycling but does not actually recycle at all times. Therefore, Ajzen and Fishbein (1980) concluded that if one wants to ultimately uncover

something about behavioural intentions or actual behaviours, it is not very informative to simply gather information on attitudes towards objects. For this purpose, the construct of attitudes in the TPB (Ajzen, 1991) exclusively refers to an attitude towards behaviours.

Attitudes towards behaviours are defined as 'the degree to which a person has a favourable or unfavourable evaluation of the behaviour in question' (Beck and Ajzen, 1991). Hence, the construct taps into a person's overall evaluation of the behaviour, and it is assumed to consist of two interactive components: individual beliefs about consequences of the behaviour (behavioural beliefs) and the corresponding negative or positive evaluation of these behavioural beliefs (outcome evaluations) (Francis *et al.*, 2004, Webb and Sheeran, 2006). To simplify the inherent subjectivity of the attitude terminology and to lessen the risk of inconsistency in attitude interpretations, Ajzen (2002b) suggested it helpful to distinguish between a higher-order construct of attitude (overall attitude) and separate components of attitude at the lower level. The higher-order construct is not measured directly from observable data but is indicated by the first-order constructs or rather sub-constructs derived from the observed data (Bollen, 1989). Following this line of logic, the higher-order construct of attitude is a result of its lower components (Rhodes and Courneya, 2003). This distinction between higher-order and lower-order constructs has received support from many empirical studies investigating environmental behaviours (Hagger and Chatzisarantis, 2006, Bagozzi *et al.*, 2001).

Finally, the construct of attitude towards behaviour can also be measured both directly and indirectly. Nevertheless, as the inference of both the TRA and the

TPB is that individuals' attitudes are formed after careful consideration of available information, in order to fully understand the overall attitude towards behaviour, the underlying cognitive factors should be explored (Ajzen and Fishbein, 1980). As many reviews of the TPB often consider attitude towards behaviour to be the best predictor of intentions, the attitudinal construct is usually measured indirectly through the multiplicative combination of the most important behavioural beliefs weighted with the respective outcome evaluations unless a superficial understanding of overall attitude is required (Francis *et al.*, 2004, Conner and Sparks, 2005).

The Construct of Subjective Norms

Subjective Norms tap into an individual's beliefs about whether significant others (i.e. family, friends) think they should engage in the behaviour (Conner and Armitage, 1998, Ajzen and Fishbein, 1980). Hence, subjective norms are an individual's own assessment of the social pressures to perform or not perform the desired behaviour. The construct of subjective norms is assumed to have two components that work in conjunction: beliefs about how significant others want them to act (normative beliefs) and positive and negative judgement towards acting in accordance with these normative beliefs (motivation to comply) (Ajzen, 2005).

Important at this stage is to note that Ajzen and Fishbein (1980) definition of subjective norms is much more restricted than the sociological view of norms. Generally, when speaking of norms, people refer to all those implicit rules guiding us in society, which inform us of right and wrong (Webster Jr, 1975).

However, in the TRA and the TPB, the construct of subjective norms refers firmly to the individual's perception that significant others expect the performance or non-performance of a behaviour. Significantly, this perception may or may not reflect what others actually believe, but the conclusion that the individual reaches will constitute the subjective norm of this person. Perhaps due to the construct's narrow focus, the support for the role of subjective norms in the TPB has been relatively weak. In fact, the subjective norm is consistently found to be the weak predictor of behavioural intentions (Ajzen, 1991, Terry and Hogg, 1996). There are however studies where subjective norms have been shown to have high explanatory power and to be predictive of behaviour (Cialdini *et al.*, 1990, Cialdini *et al.*, 1991, Reno *et al.*, 1993, Schultz *et al.*, 2007, Goldstein *et al.*, 2008). Nevertheless, the suggestion is that responses to normative behaviours are only likely for those individuals who valued the group identity and only relevant in specific contexts (Christensen *et al.*, 2004).

Social Identity Theory (Tajfel, 1982) and Self-Categorisation theory (Turner *et al.*, 1987) provide a complementary explanation of why group norms are likely to serve as behavioural standards. From a social identity perspective, normative behaviour represents a way of generating positive distinctiveness, while an individual's beliefs about appropriate behaviour should follow directly from their opinion as a group member. As such, the existing literature distinguishes between descriptive norms (the perceptions one has about the frequency of a particular behaviour among peers) and injunctive norms (the perceived social acceptability of that behaviour) (Ouellette and Wood, 1998, Bhattacharjee and Sanford, 2009, Cialdini *et al.*, 1990). The first type of subjective norm stems from Cialdini's principle of 'social proof', which implies that individuals usually see a particular

behaviour as being correct or appropriate if they see others engaging in that behaviour (Cialdini, 1988). The injunctive norm, on the other hand, refers to what is considered approved or disapproved behaviour and, as the norm of 'ought' behaviour, indicating what should be done in certain situations.

The Construct of Perceived Behavioural Control

Ajzen (1991) developed the additional construct of perceived behavioural control to explain behaviours occasionally outside the control sphere of the individual. This construct accounts for the perceived ease or difficulty of enacting one's intention (Ajzen, 2005). Thus, the PBC is specifically concerned with the distance between intention and actual behaviour, acknowledging that an individual's intention is not necessarily the one that always leads to action. More specifically, PBC refers to an individual's perception of their ability to perform a given behaviour (Ajzen, 2011). Hence, the inhibiting factors that the PBC construct comprises are all the external and psychological factors that may affect the individual's intention towards a given behaviour (Chang and Pan, 2011). Consequently, the propositions of this construct have received a great deal of attention within the domain of predicting health behaviours and not only within the TPB framework; it has indeed been applied within the Health Belief Model (Armitage and Conner, 2000) as well as the Protection Motivation Theory (Conner and Norman, 1996). For example, within the context of smoking, an individual might consider factors that may help or hinder quitting. The smoker may be determined to stop smoking, but they fear that the cravings would be unbearable if they proceed with their intention. Therefore, the intention to stop smoking is hindered by this psychological barrier (Chang and Pan, 2011). The

PBC construct in this situation becomes significant, as the intention to stop smoking is favourable, but it is not perceived to be within the control sphere of the smoker. In this example, the favourable intention to stop smoking becomes a poor approximation for behaviour, and only the construct of PBC helps explore the probability of this individual succeeding or failing in their intention to stop smoking (Armitage and Conner, 2000).

The relevance of PBC as a predictor variable becomes increasingly useful as it fits explicitly into all the real or perceived barriers to action. In certain situations where problems of self-control are so pronounced, the construct of PBC becomes independently predictive of behaviour (Armitage and Conner, 2001b) (as illustrated by the dotted line between the construct of PBC and that of behaviour in Figure 3). In this regard, the PBC construct is unique as it serves both as the predictor variable of intention and in some cases, as a direct determinant of behaviour (Ajzen, 1991).

Despite the overall success of the TPB, many have argued that the conceptualisation of PBC has been controversial (Kraft *et al.*, 2005, Trafimow *et al.*, 2002), with one indicator being, in fact, the inconsistency in the labels used for the PBC components (Rhodes and Courneya, 2003). Consequently, the importance of PBC varies depending on the situational context of the study. In some cases, the desired behaviour may be relatively straightforward, and the possibility of real or perceived barriers to action may be non-significant or even non-existent. In this case, the construct of PBC bears little relevance to the study (Ajzen, 1991). Nevertheless, it is suggested that the more self-confident and in control of the situation the individual feels, the higher the level of perceived

behavioural control, which decreases the influence of PBC as a predictor of intention and behaviour. Likewise, the less confident and in control a person feels, the lower the level of perceived behavioural control and the more predictive power the construct gains.

The Extended Theory of Planned Behaviour (TPB) Model

The Construct of Self-Efficacy

Consistent with Armitage and Conner (1999), self-efficacy is defined as 'confidence in one's own ability to carry out a particular behaviour' and is explicitly related to internal sources such as motivation. This definition differs slightly from the work of Terry and O'Leary (1995), where the self-efficacy scale includes an item that assesses the ease or difficulty of performing the behaviour and thus allowing the participants to decide whether ease/difficulty is related to internal or external control factors. Further, it also refers to the individual's capacity to produce the desired effects and therefore performs the actual behaviour. People acquire information about their self-efficacy for a given activity from their actual performances, indirect experiences, or different forms of persuasion they might come across.

As already noted, the difference between the TRA and TPB lies in the control component of the TPB (i.e. perceived behavioural control). In the initial development of the TPB, Ajzen (1991) argued that the PBC and the self-efficacy constructs are interchangeable. Nevertheless, several researchers have since argued that the two constructs are not entirely synonymous. In particular, Bandura (1992) and Terry (1993) support the idea that control and self-efficacy

are somewhat different concepts. The proposal is that self-efficacy is more concerned with perception based on internal control factors, while the PBC reflects more general, external factors. A 1990 study by Dzewaltowski and colleagues compared the TRA, the TPB and Social Cognitive Theory, and found that self-efficacy rather than the PBC has a direct impact on behaviour. Later on, Terry and O'Leary (1995) looked at the distinction between PBC and self-efficacy and provided support for a clear distinction between these two constructs (Terry and O'Leary, 1995, Manstead and van Eekelen, 1998). Indeed, several researchers advocate the use of measures of self-efficacy in addition to, or even instead of, the PBC in the prediction of intentions and behaviour (Bandura, 1992, de Vries and Mudde, 1998, Terry, 1993)

The Construct of Pro-Environmental Identity

Pro-environmental behaviour is defined as 'behaviour that harms the environment as little as possible or even benefits the environment' (Steg and Vlek, 2009). The construct is viewed in the literature as a mixture of self-interest (e.g. to pursue a strategy that minimises individual's own risk) and of concern for other people, the next generation or whole eco-systems (e.g. global warming) (Bamberg and Möser, 2007).

Whitmarsh and O'Neill (2010) defined self-identity as 'the label used to describe oneself and is influenced both by personal motivations (for self-esteem, self-enhancement, and self-understanding), as well as social interaction in the form of demands and expectations of others and the various roles we perform'. As a result, self-identity could serve as an important factor to help individuals

differentiate themselves from others, whilst supporting values, beliefs and behaviours consistent with a particular social group that they belong to. Specifically, Whitmarsh and O'Neill (2010) investigated the role of self-identity in the context of pro-environmental behaviour and concluded that self-identity could be used effectively with the other TPB variables in order to increase the predictive power of individual behaviour.

An analysis of the relationship between environmental self-identity and pro-environmental actions suggest that people with strong environmental self-identity are more likely to act in an environmentally friendly manner where there are no external incentives to do so. The provision of external incentives for pro-environmental actions has been suggested to even undermine the intrinsic motivation to act in an environmentally-friendly manner (Mellström and Johannesson, 2008). At the same time, external incentives may largely have short-term effects on individuals' behaviour to act pro-environmentally, whereas intrinsic motivation may have long-term effects as people may continue to feel morally obliged to do so (Bolderdijk *et al.*, 2013). Nevertheless, specific types of environmental self-identity appear to be related to a range of pro-environmental actions, including eco-shopping, energy conservation, recycling and environmental activism (Fielding *et al.*, 2008, Gatersleben *et al.*, 2012, Nigbur *et al.*, 2010, Whitmarsh and O'Neill, 2010). Being intrinsically motivated to act in an environmentally-friendly manner suggests that people with a strong environmental self-identity will perform pro-environmental behaviours without external rewards. Pelletier and Sharp (2008) argued that individuals who perform pro-environmental actions often exhibit a stronger intrinsic motivation to perform these actions than individuals who less often act in an environmentally-

friendly manner. However, their study focused on the pleasure derived from contributing to improving environmental quality (doing the right thing) and consequently reflecting obligation-based motivation. More recent work by Steg *et al.* (2012) and Steg *et al.* (2014) argue that individuals with strong hedonic values (those who strive for pleasure in life) are likely to refrain from pro-environmental behaviour, probably because these behaviours are not pleasurable or fun, or because they reduce comfort. Research in the environmental domain shows that individuals' self-identity is a critical predictor of environmental actions and also that many environmentally-friendly actions are associated with more effort and less pleasure.

In their investigation of decision-making processes of ethical consumers, Shaw and Shiu (2003) used TPB as a starting point, and added two additional measures: 'ethical obligation' and 'self-identity', with ethical concerns representing individual's internalized ethical rules, which reflect their personal beliefs about right and wrong, similar to (Gorsuch and Ortberg, 1983b, Beck and Ajzen, 1991). Self-identity was added by rationalizing that as an issue becomes central to an individual's self-identity, then behavioural intentions are adjusted accordingly. The study's results showed that the measures of ethical obligation and self-identity, as well as perceived behavioural control, were more relevant to decision making than the original TPB measures of attitude and subjective norm. Recently, Chen (2014) proposed that environmental values have a positive impact on intentions, and some researchers have found that positive relationships between values and lifestyles and ecological behaviour (Fraj and Martinez, 2006). Earlier studies support these views, like De Young (1985) showed that an austere and moderate lifestyle was positively related to glass

and paper recycling, Leivers *et al.* (1986) reported that people with conservative and religious values and lifestyles are more likely to contribute actively to the societal improvement, and Dunlap and van Liere (1984) found that liberal values were related to a major concern and worry about the environment.

The Construct of Moral Identity

The idea that 'to know the good is to do the good' has been discussed by early philosophers such as Socrates and Plato. Many studies thereafter agreed, with Kohlberg (1969) suggesting that morality is primarily about the reasoning individuals undergo as they decide whether certain actions are morally right or wrong. However, he did not account for how such a line of reasoning could lead in fact to moral behaviour. Rather, Kohlberg (1969) proposed that if the individual has a clear understanding of right or wrong, such understanding is sufficient to motivate moral action. One problem with this idea is that is all too often individuals would recognise what is right from a moral standpoint, but would not perform that behaviour. Further, although moral judgement has been found in empirical research as being consistently predictive of moral action, the associations are rather modest in size and differ somewhat depending on the type of action (Blasi, 1980). Hence, we have what many authors the 'moral judgement-action gap', which is, in fact, the inconsistency that emerges between what an individual would recognise as being right and what they would, in reality, end up doing (Walker, 2004, Frimer and Walker, 2008). The concept of moral identity emerged to understand this gap (Blasi, 1983, Walker, 2004, Hardy and Carlo, 2005) and refers the degree to which morality is an important part of an individual's identity. Most research approaches can be grouped into two

categories, character perspectives and social cognitive perspectives. From character perspectives, moral identity is concerned with the importance of moral ideals and traits to an individual's sense of self. Individuals see morality as central to who they are and so to behave immorally would constitute self-betrayal. Blasi (2004) and Damon and Colby (1992) have argued that, when a strong set of moral values are present, there is little conflict between what individuals know is morally right and what they want to do. Therefore, what these individuals want most is also what is considered moral, and they act morally without hesitation. In this case, moral identity formation is about the integration of two developmental systems: moral development and identity formation.

From social cognitive perspectives, moral identity is primarily concerned with individuals having moral schemas (Aquino and Reed II, 2002, Lapsley, 2004). Schemas are considered knowledge structures in the mind that represent various aspects of ourselves, our relationships and our experiences. Two schemas perhaps more relevant to moral identity are the moral prototype (i.e. an individual's understanding of what it means to be a moral person), and memories of morally relevant events from the past. Therefore, individuals who have a clear and salient idea of what it means to be a moral person may be more readily guided by this image in their interactions with others. Moreover, if the morally- relevant behaviour is repeated sufficient times, the repeated activity may even become part of a behavioural repertoire and part of his or her concept of self. In this case, moral identity development focuses on the building of rich networks of moral schemas. Becoming a moral person is like becoming an expert on morality (Lapsley, 2004). Those with a moral identity have cognitive structures (moral schemas) in place that allow them to more readily (sometimes

automatically) respond to moral situations. Such moral schemas might partially emerge due to social learning; others might develop through social behaviours.

Although the perceived moral correctness of a particular behaviour has long been understood as an important unmediated determinant of behaviour (Schwartz, 1977), empirical support for this claim has been lacking. Some research shows that moral norms predict intentions to act (Godin *et al.*, 2005); however, relatively few studies have demonstrated a direct impact of moral values on behaviour. Several studies of moral identity have shown that moral identity is associated with moral actions (Aquino and Reed II, 2002, Frimer and Walker, 2008, Hardy, 2006), moral emotions (Stets and Carter, 2006) or concern for out-group members (Aquino and Reed II, 2002, Hardy *et al.*, 2010).

In studies applying the TPB, a growing body of researchers support the role of the moral norm as a predictor of intentions even when attitude, subjective norm and perceived behavioural control have been taken into account (Parker *et al.*, 1996, Manstead and Parker, 1995, Manstead, 2000). Parker *et al.* (1996) examined how moral norms enhanced the prediction of intentions to perform various driving behaviours over and above attitudes, subjective norms and perceived behaviour control and concluded that. Similarly, in the application of the TPB to ecological behaviours, Harland *et al.* (1999) found that the inclusion of moral norm increased the proportion of explained variance in intention. Studies of moral norm in the context of TPB were reviewed by Conner and Armitage (1998), who estimated that across studies moral norms predicted an additional 4% of the variance in intention after controlling for TPB predictors and Godin *et al.* (2005), who showed that moral norm was a significant predictor of

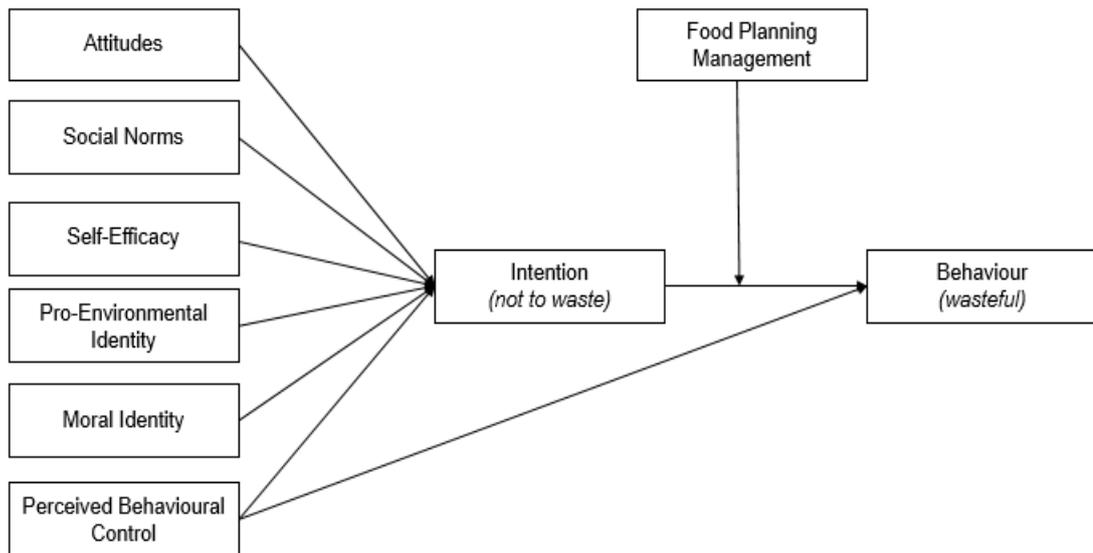
maintenance of regular condom use over a two year period, along with intention and attitude. However, so far, only one study (Godin *et al.*, 2005) has tested the idea that moral norms affect behaviour by having a moderating effect on the consistency between intention and behaviour. Their model proposed that intentions based on the moral correctness of the behaviour, i.e. morally aligned intentions, have greater motivational force than intentions based on the perceived consequences of acting, i.e. attitudinally aligned intentions, taking into account that moral considerations are more directly self-related than are considerations of behavioural outcomes. The study further argues that when intentions are formed on the bases of the perceived moral correctness of a particular behaviour, these intentions will better predict behaviour compared with intentions formed based on consideration of the outcomes of the behaviour.

3.4 Conceptual Model and Hypotheses

The TPB is the dominant theoretical model in the human behavioural context with decades of research, and countless empirical studies testify to its original constructs (i.e. attitudes, subjective norms, perceived behavioural control and behavioural intentions) explanatory power for understanding social behaviour. Although it has been criticised for its focus on rational decision-making, its apparent inefficiency regarding designing the type of intervention that will result in actual changes in behaviour, it has been widely used in numerous studies and has a rich history of use in the area of behaviour change with respect to social causes (Hardeman *et al.*, 2002, Webb *et al.*, 2010, Taylor *et al.*, 2006a, Wells *et al.*, 2011). Hence the TPB model will be applied to the area of food waste in the home. Following suggestions from the available literature, this study will further

investigate how its relevance could be potentially increased by the added measures of self-efficacy, pro-environmental identity and moral identity. The proposed model of food waste behaviour in the household is illustrated in Figure 5:

Figure 5. Study's Conceptual Model



Attitudes (A) towards a behaviour refer to the individual's positive or negative feelings about performing a behaviour and are determined through an assessment of the beliefs regarding the consequences arising from a specific behaviour and an evaluation of the appeal of these consequences (Ajzen, 1991). As a construct, an attitude reflects a favourable or unfavourable psychological tendency expressed by an individual towards behaviour and plays an essential role in forming individual intentions. Evidence for the importance of attitudes in the field of food waste is provided by studies focused on investigating wasteful consumption in the UK and Australia. Results showed the 60% of the Australian respondents (Hamilton *et al.*, 2005) and 49% of the British ones felt guilty when throwing food away, with an additional 23% of the UK respondents feeling

bothered when engaging in food waste behaviour (WRAP, 2014). Therefore, the following hypothesis is proposed:

H1: The higher the level of an individual's attitudes towards not wasting food, the stronger the intention to reduce the food waste in the home.

A subjective norm (**SN**) is a socially-oriented construct and signifies an individual's belief about the prevalence or social acceptability of a particular behaviour in relation to a reference group of peers. Individuals are more likely to follow a behaviour when they perceive such behaviour to be in accordance with the norms of their group, and as a result, subjective norms can provide a powerful instrument to influence people's attitudes and intentions (Thorbjørnsen *et al.*, 2007, Bolman and de Vries, 1998). However, so far investigations of subjective norms have mostly examined norms in the context of reducing negative behaviours, such as smoking or alcohol consumption, or changing general behavioural patterns, such as exercising more or participating in an environmental conservation programme (de Vries and Mudde, 1998, De Pelsmacker and Janssens, 2007). In the case of food waste, when individuals see the reference group of peers generating similar amounts of waste, they might find their own behaviour to be correct and socially acceptable. The fact that people generate high amounts of food waste might be the result of the influence of the descriptive norms. In contrast, the effect of the injunctive norms, the more general societal disapproval towards wasting food, would imply that the amount of food being wasted should decrease. Therefore, the following hypothesis is proposed:

H2: The higher the level of an individual's subjective norms, the stronger the intention to reduce the food waste in the home.

Perceived behavioural control (**PBC**) reflects personal beliefs as to how easy or difficult performing the behaviour is likely to be and is assumed to reflect external factors (such as the availability of time and/or money, social support), as well as internal factors (including ability, skill, information) (Cheema and Soman, 2006, Brockner, 1992, Berkowitz, 2005). Earlier research has also supported the view that individuals are generally more disposed to engage in behaviours that are believed to be achievable (Thaler and Shefrin, 1981). Recent research about the relationship between individual behaviour and climate change has also argued the importance of perceived behavioural control as an antecedent to consumption in environmental contexts (Wells *et al.*, 2011). In the case of food waste, individuals' self-belief in their ability to reduce waste in the home would contribute towards not only forming a strong intention to reduce waste in the future but may have a direct influence on the actual behaviour. Therefore, the following hypotheses are proposed:

H3: The higher the level of an individual's perceived behavioural control, the stronger the intention to reduce the food waste in the home.

H7: The higher the level of an individual's perceived behavioural control, the lower the level of food waste behaviour in the home.

Self-efficacy (**SelfEff**) is considered as a person's self-reliance or self-esteem in their capability to accomplish a specific task or an assumed behaviour. It is assumed to be affecting perception, task determination, conveyed interest, and the level of difficulty for performance (Bandura, 1977, Gist, 1987). Furthermore, Godfray *et al.* (2010) suggest that a person's perception about the difficulty of carrying out a behaviour as well as the other related factors may

either facilitate or hinder his or her performance. Thus, it is expected that individuals' intention to reduce the amount of food they waste in the home is positively associated with the level of self-efficacy. Therefore, the following hypothesis is proposed:

H4: The higher the level of an individual's self-efficacy, the stronger the intention to reduce the food waste in the home.

Pro-environmental behaviour (**ProEnv**) is viewed in the literature as a mixture of self-interest (to pursue a strategy that minimises individual's own risk) and of concern for other people, the next generation or whole eco-systems (Bamberg and Möser, 2007). Extending this argument to the field of food waste, and applying the theory of self-identity to food waste behaviour, it is argued that the intentions not to waste food in the home are dependent upon the degree to which individuals express a strong level of environmental self-identity. As such, it is predicted that individuals' intention to reduce the amount of food they waste in the home is positively associated with the level of their pro-environmental identity. Therefore, the following hypothesis is proposed:

H5: The more positive the level of an individual's pro-environmental identity, the stronger the intention to reduce the food waste in the home.

Perceived moral identity (**MI**) is the degree to which an individual is morally obliged to perform a particular behaviour, and so it may be relevant in cases where consumers consider the effect of their decisions upon others (e.g. donating blood, drink-driving) (Lam, 2006). Indeed, Gorsuch and Ortberg (1983b) tested the effect of moral obligations and found that these enhanced the TPB model in morally relevant situations. Extending the argument of moral identity to the area

of food waste, it is assumed that people who have a clear and salient idea of what it means to be a moral person, and are actively avoiding generation of large amounts of food waste, may be more willingly guided by this belief in their interactions with others in the home. Over time this could become part of the concept of self, with individuals realising specific food waste-related moral norms. As such, it is predicted that individuals' intention to reduce the amount of food they waste in the home is positively associated with the level of their individual moral identity. Therefore, the following hypothesis is proposed:

H6: The higher the level of an individual's moral identity, the stronger the intention to reduce food waste.

Theories of behavioural decision-making emphasise the role of intentions (**I**) as the most immediate and important predictor of individuals' behaviour, the assumption being that people perform the behaviour they intend to perform. As previously discussed, many studies mention the lack of consistency between intention-behaviour as being primarily due to individuals with positive intentions rather than those with negative intentions (Orbell and Sheeran, 1998, Sheeran and Orbell, 2000a, Sheeran and Orbell, 2000b, Sutton *et al.*, 1994, Gallois *et al.*, 1992, Stanton *et al.*, 1996). Therefore, the following hypothesis is proposed:

H8: The higher the level of an individual's intention not to waste food, the lower the level of food waste behaviour in the home.

Research has continuously shown the varying levels of influence that specific factors have on the way households go about their food shopping and preparation activities (WRAP, 2014, WRAP, 2009c). As discussed previously (see Section 3.2), in this study the drivers of food planning management (**FPM**)

in the home have been grouped in three distinctive areas, depending on the stage of a food planning activity (pre-shopping, shopping and post-shopping), with each one of these stages consisting of specific actions that individuals undertake. As such, it is predicted that food planning management has the potential to moderate the intention – behaviour relationship. Therefore, the following hypothesis is proposed:

H9: Food planning management moderates the impact of intentions on behaviour.

A summary of the study’s hypotheses is illustrated in Table 10:

Table 10. Study’s Hypotheses

Hypothesis	Statement
H1	The higher the level of an individual’s attitudes towards not wasting food, the stronger the intention to reduce the food waste in the home.
H2	The higher the level of an individual’s subjective norms, the stronger the intention to reduce the food waste in the home.
H3	The higher the level of an individual’s perceived behavioural control, the stronger the intention to reduce the food waste in the home.
H4	The higher the level of an individual’s self-efficacy, the stronger the intention to reduce the food waste in the home.
H5	The more positive the level of an individual’s pro-environmental identity, the stronger the intention to reduce the food waste in the home.
H6	The higher the level of an individual’s moral identity, the stronger the intention to reduce food waste.
H7	The higher the level of an individual’s perceived behavioural control, the lower the level of food waste behaviour in the home.
H8	The higher the level of an individual’s intention not to waste food, the lower the level of food waste behaviour in the home.
H9	Food planning management moderates the impact of intentions on behaviour.

3.5 Summary

In this chapter, household influences on food waste behaviour have been examined by looking at both the causes of food waste generation in the home, as well as prevention activities. The enquiry suggests that individual behavioural

choices at each stage of the food' journey (i.e. planning, shopping, storage, preparation and consumption) need to be considered. As such, individuals' motivations and barriers that individuals exhibit are equally diverse; barriers like apathy, the belief that is someone else's responsibility, inconvenience, cost, weak self-efficacy and a sense of powerlessness, subjective norms and management of food planning were explained.

The study's supporting theoretical approach has also been introduced in this chapter. Five constructs that are: attitudes towards behaviour, subjective norms, perceived behavioural control, behavioural intention and behaviour in the light of the Theory of Planned Behaviour were explained as the theoretical context for this study. Furthermore, the original framework of the TPB was extended in the context of household food waste, by considering further measures of moral identity, self-efficacy and pro-environmental identity. Finally, the conceptual model was developed, and hypotheses were proposed in light of the present literature.

Chapter 4 Methodology and Research Design

4.1 Introduction

This chapter introduces the research philosophy, research approach and research methods for this study. Details are presented here regarding the difference between the positivist and post-positivist approaches. The study's approach to research methods are discussed, with a view on the inductive, deductive and abductive approaches, whilst also presenting the justification behind the mixed methods approach adopted by this study.

4.2 Research Philosophy

Methodology, seen as a philosophical approach governing research practices is, in fact, referring to the way in which the researcher goes about finding out what they believe needs to be discovered in order to answer the research question. The search for scientific knowledge ranges far back to ancient times. Philosophers recognised early on that an essential distinction should be drawn between two kinds of scientific knowledge: descriptive knowledge and explanatory knowledge. It is indeed this explanatory knowledge that provides a scientific understanding of the world (Salmon, 1990). Science and philosophy have been closely related from the very beginning of the scientific revolution in the 16th century, and scientists were often referred to as 'natural philosophers', given that science was only a branch of philosophy and not a discipline of its own standing. Later on, however, this situation changed, when philosophy became dominated by Hegel's idealism, who argued that the external world does not exist unperceived and only reason is real (Hegel, 1977).

More and more, studies of the social dimensions of scientific knowledge encompass the effects of scientific research on the human life and social relations, the effects of social relations on scientific research and the social aspects of enquiry itself. Some of the factors that have combined to make these questions salient to contemporary philosophy of science include: the emergence of social movements, like environmentalism and feminism, critical of mainstream science, concerns about the social effects of science-based technologies and epistemological questions, made significant by big science.

An understanding of the distinctions between the subjective and the objective, the perceptions of reality, knowledge, truth and theory also needs to be examined at this point. Therefore, a comprehensive discussion of the main philosophical paradigms is necessary in order to understand these fundamental distinctions.

Reality can be defined as being the totality of all things, structures (actual and conceptual), events and phenomena, observable or not. It is related to knowledge and can be separated entirely from the mind or be the construction of the mind. The truth may be interpreted as 'reflections of reality based on evidence which is determined by an understanding of reality' (Howell, 2013). This, in turn, will provide the researcher's ontological and epistemological position. Knowledge is defined as 'justified, true belief', according to Plato's Theory of Knowledge (Plato, 1976). In order to know, humans rely on emotions, reason, and perception, however truth is the objective requirement for knowledge. Explanations and understanding of theory and reality, interpretations of facts derived from data as well as abstract comprehension of the phenomenon, all

are part of knowledge. The exact nature of knowledge differs according to different philosophical viewpoints: for the positivists, knowledge is all about established laws, while post-positivists are more disposed towards probable laws. On the other hand, the critical theory approach relates knowledge to historical insights, constructivism with the reconstruction of a consensus, whilst the participatory approach trusts on practical knowledge. There is also a distinct difference when looking at the issue of knowledge accumulation, although there is no dissimilarity with positivists and post-positivists, as they all assume generalisation comes from building knowledge, with cause and effect theory being essential in building knowledge. The critical theory approach is more inclined towards historical revision and generalisation through similarity; whilst constructivism is recognised as adopting a more informed and sophisticated style in order to accumulate knowledge, with reconstruction and vicarious experiences playing an essential part in the process. Finally, from a participatory viewpoint action, transformation and experiential methods are central to the build-up of knowledge.

The theory provides ways of explaining or giving meaning to understandings that have been extrapolated from the data. It is, in fact, a means of reflecting reality, with the clear objective of being able to choose one theory over another while at the same time avoiding cognitive bias. The falsifiability is related to the criterion proposed by Popper as demarcating a scientific theory from a theory like astrology: both 'explain' observations. However, the scientific theory takes the risk of making predictions that decide whether it is right or wrong (Popper, 1959a). On the other hand, Kuhn argued that changes in scientist's views of reality not only contain subjective elements but also result from group dynamics,

'revolutions' in scientific practice and changes in 'paradigms' (Kuhn, 2012). Trying to further explain what theory is, Kant proposed that a 'collection of rules, even of practical rules, is termed a theory if the rules concerned are envisaged as principles of a fairly general nature and if they are abstracted from numerous conditions which, nonetheless, necessarily influence their practical application' (Reiss, 1991).

When a researcher is engaged in an investigative project, there are always underlying beliefs in regard to what already exists (ontological assumptions), what criteria are appropriate for evaluating knowledge claims (epistemological assumptions) and also what types of research design are considered appropriate for generating new knowledge (methodological assumptions). Easterby-Smith et al. (2008) suggest that all researchers have their own philosophy (often subconsciously), demonstrated by the way they collect facts and information. Such philosophies are labelled paradigms, and these provide a framework by which researchers and scientists can collate their perceptions of the world into generalised and consistent theories (Collis and Hussey, 2014). Therefore, paradigms of inquiry need to be understood in order for the researcher to adopt the one that is best suited for the study.

The first paradigm, the Positivism paradigm, argues that it is possible to build social sciences based on the same principles as those in natural sciences and it is in his time that there is a move in the social sciences towards the ontology of naïve understanding. This supports the idea that an external reality, which can be discovered and entirely understood, does exist. As a result, the researcher and the external world are entirely separated, and objectivity is pursued through

the scientific procedure; indeed, the truth can be found, and human behaviour can be objectively quantified. Undeniably, positivists' theory provides sets of immutable laws, derived from numerous scientific experiments. The fundamental belief system of positivism is embedded in realist ontology, in the belief that there is an external reality that is driven by immutable natural laws, and the ultimate purpose of science is to predict and control natural phenomena. As a direct result of adopting a realist ontology, the positivist researcher is constrained to practice an objectivist epistemology. Given the possibility of bias, as well as nature's predisposition to confound, the only acceptable answer for positivists is to use empirical experimentalism, a manipulative methodology that controls for both.

The second is the post-positivism paradigm - as positivists argued the immutable laws that social science should establish, post-positivists disputed that just because one event follows another on one occasion, and it does not automatically follow that it will happen again. The emergence of post-positivism challenged the previous positivist immutable laws by reasoning that if a single case exists, that refutes a given law, as long as the case is reported accurately, a scientific law is refuted. Popper (1959b) proposes that falsification offers a solution to the problem of immutable laws and rational foundations, as falsification is not looking to test, but to test to falsify; later Russell (1980) identified the link between the philosophical position and methodology. Ontologically, post-positivists are concerned with criticising the existing reality, as although reality still exists, it may only be imperfectly understood. Perhaps the most critical principle of post-positivism is that 'although a real-world driven by real natural causes exists, it is impossible for humans truly to perceive it with their imperfect sensory and

intellective mechanisms' (Cook *et al.*, 1979) And although the researcher can never be sure that the ultimate truth has been uncovered, there can be no doubt that reality exists. Epistemologically, post-positivism recognises that it is not possible for a researcher to be completely impartial. It is noticeable at this point the change in thought that the researcher and the world are entirely separated, and although objectivity is still pursued, there is recognition of the fact that total separation is not possible. To overcome these problems, the emergence of modified objectivity is clearly noticed. This modified objectivity still holds objectivity as a 'regulatory ideal' but recognises that it cannot be achieved in any absolute sense. However, it can be achieved reasonably closely by striving to be as neutral as possible. Methodologically, post-positivism provides two responses to growing challenges. In the first instance, the emphasis is placed on critical multiplism (Cook, 1985), which is, in fact, a form of triangulation (Denzin, 1978). Even further, post-positivism argues that although objectivity can never be entirely attained, relying on many different sources makes it less likely that biased interpretations will be made. Secondly, post-positivism recognises that positivism, in its pursuit of objectivity, it has allowed many imbalances to emerge. (Guba, 1990b) states that there are four imbalances: internal and external validity; quantitative and qualitative methods; emphasis on the theory as the product rather than the precursor of the inquiry; discovery is merely a precursor rather than an integral part of the scientific process, whose sole purpose is solely verification (falsification).

With the emergence of the third paradigm, phenomenology, there is a noticeable move towards the subject and at the same time, recognition of the relationship between mind and world. Ontologically, the reality is both shaped by history and

formed by values that are crystallised over time (in the case of critical theory), or even locally constructed and based on experience although shared by many (for constructivism and participatory viewpoint). It is also at this time that we notice a breakdown of a clear distinction between ontology and epistemology (Lincoln and Guba, 2011). The epistemology becomes subjective, as the researcher and the researched are linked, and the findings are created as the investigation proceeds.

Guba (1990a) provided a further distinction within phenomenology, between critical theory and constructivism, as explained further. At an epistemological level within the critical theory, Guba considers that it appears a logical disjunction, as realist ontology is linked with a subjectivist epistemology. At the methodological level, the main aim of the inquiry is to transform the real world by raising the consciousness of the participants. As a result, critical theorists take a dialogic approach that seeks to eliminate false consciousness and rally participants around a common point of view.

In regard to the fourth paradigm, constructivism, Guba (1990a) reasoned that constructivist researchers feel that the previously accepted positivist and post-positivist paradigms are severely flawed, and as a result, they must be replaced in their entirety. Some of the arguments for this point of view include the theory-ladenness of facts, the under-determination of theory, as well as the interactive nature of the researcher and the researched. Ontologically, realities are multiple, and they exist in people's minds whilst epistemologically, the constructivists choose to take a subjectivist position, considering that if realities exist only in individuals' minds, the only way to access them is through subjective interaction.

Methodologically, the constructivists proceed in ways that aim to identify the variety of constructions that exist and bring them into as much consensus as possible. Consequently, constructivists intend neither to predict and control the real world nor to transform it, but to reconstruct the world in the mind of the constructors. Ultimately, this paradigm considers that it is the mind that is to be transformed, not the real world.

In trying to relate this with consumer behaviour in the field of food waste, the approach is of a post-positivist nature, with the researcher accepting that different theories, alongside the researcher's background knowledge and values, can influence what is observed; objectivity will still be pursued in a similar way to the positivist perspective, by recognising the possible effects of biases. It is critical to note at this stage that post-positivism is not a rejection of the scientific method, but rather a restructuring of positivism; post-positivism reintroduces the underlying assumptions of the positivism, such as ontological realism, the possibility and desirability of objective truth and the use of experimental methodology.

One of the post-positivistic perspectives postulates that although questions can be asked, final answers can never be gained on an absolute level. As such, the world is seen as continuously shifting in meaning and therefore, the understanding of this world comes from making links and interpreting contexts since the meaning is made rather than discovered as a fixed entity. In fact, post-positivist research principles emphasise meaning and the creation of new knowledge and are able, according to Schratz and Walker (1995), to support committed social movements (i.e. activities that seek to change the world and

contribute towards social justice). Specific characteristics include the idea that research is broad rather than specialised and also that the theory and the practice cannot be kept separate, as we cannot afford to ignore the theory for the sake of 'just the facts'. At the same time, the post-positivist philosophical inquiry assumes that social reality is constructed by the individuals who participate in it, as opposed to the positivist view that the physical and social reality is not dependent of those who observe it. As a result, explaining the reality is fundamentally about establishing valid causal relations (McLennan, 2006), and post-positivism accepts that social science cannot, and even more, has no need to produce universal covering laws. Instead, the procedure of social explanation is 'quasi-experimental' (Runciman, 1983), involving suggestive contrasts between alternative possibilities in an effort to identify the important antecedents that bring about a social event. Post-positivism reasons that although the reality or the truth exists, it can only be understood imperfectly or probabilistic. Ontologically, post-positivism perceives reality external to humanity, but considers human intellectual capabilities unable to understand it fully; a phenomenon identified by Howell (2004) as 'critical realism'. The post-positivist researcher, in effect, recognises that there is a reality independent of our thinking about it that science can study; the difference between the positivist realist and the post-positivist critical realist is that the latter recognises that observations are fallible, and theory is revisable. The nature of reality assumed by positivism is realism, whereby a reality is assumed to exist; in contrast, post-positivism assumes that this reality is only imperfectly and probabilistically apprehendable (Guba and Lincoln, 1994). Epistemologically, a greater emphasis has been placed on the fact that there is no neutral knowledge – knowledge cannot be detached from ontology (being) and personal

experience; this particular study follows the above approach. At the same time, post-positivism has shown that there are inadequacies of dualistic thinking (i.e. either/or), as such, post-positivistic values in research are not about being either subjective or objective, nor do they prefer subjectivity over objectivity, but emphasise multiplicity and complexity as hallmarks of humanity.

This study adopts a post-positivist approach, which, according to Howell (2013), includes qualitative methods and pursues falsification of hypotheses. When accounting for the research design, post-positivist researchers move away from the positivist view that the inquiry must focus on the determination of the general trends of a defined population, towards the opinion that the scientific inquiry must focus on the study of multiple social realities (i.e. diverse realities created by different individuals as they interact in a social environment) and the main focus changes from generalisation to transferability. For the post-positivist researcher, an understanding of the research focus evolves during the study (Morris, 2006) - developing the focus of the study, data analysis and collections are interwoven activities that inform each other: an area of interest is stated, an interview is carried out, or an observation is made, the data is analysed, and the area of interest is refined and focused. This process is repeated throughout the study so that the researcher identifies the components of the area of interest, describes them and develops explanations for them.

At the same time, because post-positivism still pursues objectivity and separation, this leads to a methodology that deals with hypothesis falsification (Howell, 2013). (Popper, 1959a) advanced the idea of falsification as a replacement of the logical positivist idea of verifiability. As a concept, falsification

argues that it is impossible to verify that a belief is true, though it is possible to reject false beliefs. Kuhn (2012) idea of paradigm shifts offers a further critique of the logical positivism, arguing that is not only individual theories, but the whole worldview that must occasionally shift in response to new evidence. Nevertheless, Howell (2004) suggests that this is not about the discovery of immutable truth, but about the discovery of approximations of the truth. A new theory may deal with some difficulties, but will invariably open many new problems and indeed, if the theory provides significant progress, then 'the new problems will differ from the new problems: the new problems will be on a radically different level of depth' (Popper, 1996). As a result, theory development is opened to criticism and consequently through falsification badly fitting theory can be eliminated 'before it overrides investigation and undermines objectivity' (Popper, 1996). Hypotheses are seen as simple procedures by which a large number of theoretical questions can be investigated. The use of hypothesis testing method relies on the assumptions that firstly, people often know how they would behave in an actual situation of choice and secondly, the subject has no further particular reason to disguise their true preference (Myers, 2008).

4.3 Research Approach

Morris (2006) emphasised that, within the post-positivist approach, one can never step entirely outside human experience to study it, and it takes an inductive exploratory simultaneously to understanding an objective reality. Since, epistemologically, post-positivism abandons the total separation between the researcher and the researched, whilst still pursuing objectivity and separation, this leads to a methodology that deals with multiple modified scientific

experimentation and hypothesis falsification. The research method is a strategy of enquiry, which moves from the underlying assumptions to research design and data collection (Myers, 2008). Data collection and design for the post-positivist researcher focuses on the study of individual cases, through the use of analytic induction: the researcher will explore the data in stages and then deduce that certain events or accounts are instances of the same underlying themes or patterns. Some of the methods employed in investigating the role of food in history, as well as food waste influence are: (1) ethnographic approaches, such as interviews and participant observations (DeVault, 1994) and food-centred life histories (Counihan, 1999); (2) analysis of cultural symbols and meanings (Bordo, 2003, Douglas, 2003); (3) analysis of mass media (Parasecoli, 2008); (4) psychotherapy methods (Bruch, 1973); (5) historical research (Brumberg, 2010, Williams-Forson, 2006).

There are generally three research approaches: deductive, inductive and abductive. A deductive approach is defined as 'the inference by reasoning from the general to particulars' (Rothschild, 2006) and it relates mainly to test a theory, with a theory and hypotheses developed, and a specific strategy designed to test these hypotheses (Bryman and Bell, 2015). The emphasis, in this case, is on arguing from the general to the particular, in other words, the emphasis is on a priori theoretical considerations (Goetz and LeCompte, 1984, Patton, 1990). The deductive approach includes three main characteristics (Saunders *et al.*, 2009). First, it uses hypotheses to explain the causal relationships among variables, in most cases, by using quantitative methods. Secondly, it requires concepts to be operationalised in order that they can be measured quantitatively. Thirdly, the sample must be large enough

to allow the statistical findings to be generalised to the overall population. Deductive logic is the reasoning of logical implications, similar to the logic used in mathematics. The deductive method, supported by Popper (1959b), conditions that one of the first priorities for any kind of research is to generate a hypothesis, which in turn will guide observations and experiments. Popper (1996) further argued that observation is selective and that science is, in fact, a combination of inspiration and deduction – his reasoning is that inspiration is needed by the researcher initially in order to suggest the hypothesis, which in turn directs the process of testing. For him, the deductive method is a method of falsification, in that it can falsify a hypothesis, but it can never prove one. This method has come to enjoy wide acceptance amongst social scientists, mainly because it legitimises the idea of unobservable theoretical constructs, such as ‘attitudes’ (MacCorquodale and Meehl, 1948). The strength of the deductive method is that researchers are sure of their results; the weakness is the hypotheses by themselves are abstract constructs, removed from the physical world.

On the other hand, an inductive approach involves theory being developed in a ‘data-driven manner’ using qualitative data. In this case, the theory is understood as a ‘set of propositional statements linking the key concept in the theory to one another’ (Mantere and Ketokivi, 2013). An inductive approach is more concerned with building a theory, and the idea is that once developed, theories can be tested through statistical inference. The researcher starts by collecting data and then make sense of these data in order to understand the nature of the problem; as the researcher infers the implication of the findings for the theory that prompted the study. By assuming an inductive approach,

the observer makes a set of observations and seeks to explain what they see and so forms a hypothesis in an attempt to explain what they have observed. The reasoning is that if a hypothesis has survived a sufficient number of tests and also seems to be consistent with other established scientific theories may be promoted to a theory. Adopting an inductive approach, the researcher will build up from facts, and once the facts are collected and ordered, and inductive generalisation can be made. The rationale of induction needs to justify statements such as 'All observed Xs are Ys, so all Xs are Ys'. Philosophers of science have traditionally distinguished between the logic of discovery and the logic of justification, and most have concluded that no logic of discovery exists. Even more, Saunders *et al.* (2009) argue that a rational model of discovery is impossible, and in fact, the argument is that scientific discovery is irrational, and there is no reasoning to hypotheses. As a result, a new abstraction paradigm emerged, that was aimed at unifying the different perspectives, abduction. This approach is what researchers use to generate a likely hypothesis or an initial diagnosis in response to a phenomenon of interest or a problem of concern.

The starting point for an abductive approach is empirical data – social scientists interpret it by both decontextualising and recontextualising it, which allows the researcher to arrive at new ideas. As Peirce (1907) noted, researchers 'turn over [our] recollections of observed facts; [we] endeavour to rearrange them, to a few of them in such new perspective that the unexpected experience shall no longer appear surprising'. Indeed, abduction begins when the human actor is taken by surprise, and it ends when the surprise is replaced by understanding and the ability to make predictions (Aliseda, 2005, Reichertz, 2010). Abduction

corresponds to the distinction between necessary and non-necessary inferences. In deductive inferences, what is inferred is necessarily true if the premises from which it is inferred are true, whilst inductive inferences could be characterised as those inferences that are based purely on statistical data. Abduction has both logical inferences but also generates new knowledge (Reichertz, 2004).

The choice of research approach enables the researcher to decide on the research design, as well as the techniques for collecting the necessary data and the procedures for its analysis. Furthermore, it helps to select the appropriate research strategy and research methods. Although there are significant differences between the two approaches described, it is not only possible to combine both in the same study (Williams, 2002), but it is often beneficial to do so (Saunders *et al.*, 2009). Therefore, this study combines both deductive and inductive approaches. The inductive approach is used to collect the participant's opinions, ideas and understanding of the food waste problem, whilst the deductive approach is used to test the conceptual framework of this study and the statistical results used to support the generalisation of the findings.

4.4 Research Methods

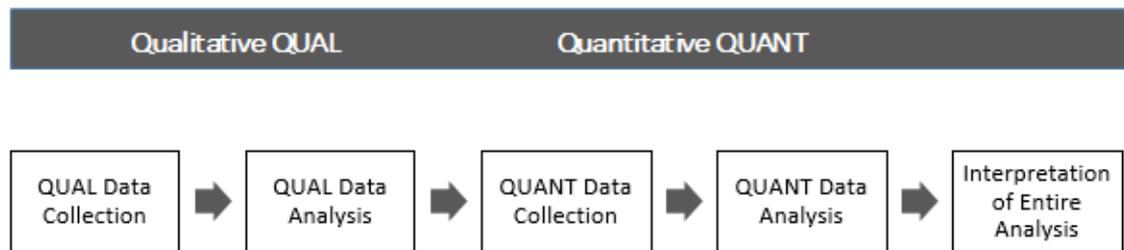
There are three fundamental research methods that are generally used in social science research: quantitative, qualitative and mixed methods (Clark and Creswell, 2008). Quantitative research takes the view of social reality as an external objective reality and entails a deductive approach to the relationship between theory and research. By contrast, qualitative research emphasises

words rather than quantification in the collection and analysis of data and entails an inductive approach to the relationship between theory and research. Quantitative research methods were initially developed in the natural sciences to study natural phenomena, whereas qualitative research methods were developed in the social sciences to enable the study of social and cultural phenomena. However, neither the quantitative nor the qualitative methods are intrinsically better than the other; their suitability needs to be decided by the purpose, nature and context of the research study in question. Flick (2009) notes that quantitative research has been used for the single purpose of isolating 'causes and effects, operationalizing theoretical relations and measuring and quantifying phenomena', and as such 'allowing the generalisation of findings' (Flick, 2009). Yet, the post-positivist researchers (Guba and Lincoln, 1994) argue that reality can only be approximated and never fully understood. The term mixed methods stands for research that integrates quantitative and qualitative research within a single project and can substantiate the research findings. An essential aspect of this approach is to consider how the quantitative and qualitative components are related to each other from the outset. In practice, a mixed-method could involve using different sources of data, complementing qualitative findings with quantitative findings, using qualitative data to aid the interpretation of the relationship between quantitative variables, or using different methods for different purposes within a single study (Saunders *et al.*, 2009). Post-positivism relies on multiple methods as a way of capturing as much of reality as possible and, at the same time, it emphasises the discovery and verification of theories (Denzin and Lincoln, 2005). As argued by Howe (2004) and further by Teddlie and Tashakkori (2002), the mixed methods approach takes qualitative methods out of the critical, interpretative framework and divides the inquiry into

dichotomous categories such as exploration versus confirmation. Therefore, qualitative research methods are assigned to the first category, namely exploration, and quantitative methods to the second (i.e. confirmation) (Teddlie and Tashakkori, 2002). At one level, qualitative and quantitative refer to the distinction between the nature of knowledge: how the researcher understands the world and what is the ultimate role of the research. At another level, it refers to research methods, in particular to the ways that the data is collected and analysed, and the types of generalisation and representations derived from the data.

As suggested by Creswell and Creswell (2017), the intent of the sequential exploratory design is to study a problem by first exploring it through qualitative data collection and analysis (see Figure 6). Once this first stage is completed, a second phase involves the collection and analysis of quantitative data. The findings of these two phases are then integrated during the interpretation phase. This mixed-method design is appropriate when testing elements of an emerging theory resulting from the qualitative phase (Morgan, 2008). Further, Morse (2003) suggest that the sequential exploratory design can be used to the distribution of a phenomenon within a chosen population. Creswell *et al.* (2003) also recommend that sequential exploratory designs are used to identify or narrow the focus of the possible variables in one study.

Figure 6. Sequential Exploratory Design



Source: Creswell and Creswell (2017)

For this study, initially a review of the literature and prior research relating to the nature and extent of food waste in the home has been undertaken; this explored not only factors associated with the growth of home-generated food waste on a macro scale but also household and individuals' influences. Next, a qualitative phase using seven structured focus groups with a total of 48 participants was undertaken in order to probe attitudes towards food waste and identify associations between personal characteristics and behaviour. Finally, a quantitative confirmatory analysis of multiple influences on behaviour has been completed using multivariate statistical methods on new data collected through an online consumer survey. This stage included 411 participants, details of which will be provided in the next chapters.

4.5 Summary

This chapter introduced the research philosophy utilized in this paper and discussed the difference between positivist and post-positivist view. Within the title of Research Approach, post-positivist approach, methods employed in investigating the role of food in history and deductive and inductive approaches

were defined. Mixed methods were utilized to collect data in this research, and it was explained in detail in the section of research methods. Justification for this approach has been discussed within this section, with details about the sequential exploratory design that this study has adopted for data collection. The following two chapters discuss, in turn, each of the qualitative and quantitative data collection process, analysis and findings.

Chapter 5 Qualitative Study - Analysis and Findings

5.1 Introduction

In this chapter, the method for qualitative data collection and analysis are detailed. Initially, the justification for the focus groups discussions are included, followed by specifics about sampling, data collection design and analysis procedure. The qualitative findings are divided into several sections. First, the level of current knowledge among participants is investigated, alongside individuals' understanding and level of awareness of the food waste problem at home. Following, the participants' Attitudes, Social Norms and Perceived Behavioural Control aspects are discussed. Next, findings related to environmental and moral considerations of food waste are presented, followed by current household Food Planning Management aspects. Also, at this stage, participant views on several food waste reduction programmes are highlighted. Finally, the last section provides details of relevant socio-demographic characteristics.

5.2 Focus Groups

Following the essentialist interpretation paradigm (Wilkinson, 2004), the researcher was interested in hearing the voices of individual participants who may speak with, or in contrast to, other participants. A qualitative approach is appropriate for this study due to the overall investigative nature of its aim; focus group data, in particular, allows a closer understanding of the essential meaning of participants' lives compared to data generated by other research methods.

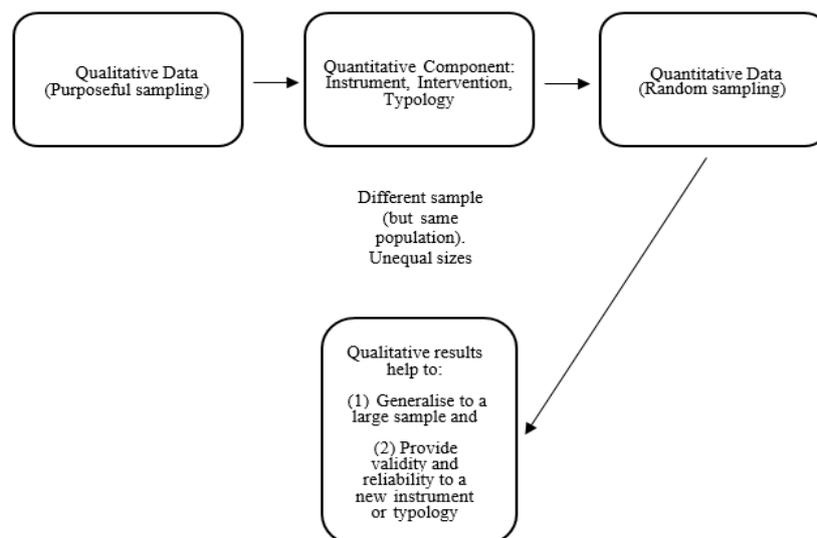
Within this framework, focus groups offer valuable means of understanding the individual and social context (Rubin and Rubin, 2011) and enable researchers to examine how such understandings differ by social groups. In addition, they allow exploration of epistemological assumptions about the subject and offer a more critical and reflective framework for research on attitudes (Waterton and Wynne, 1999). The focus group interview works because it taps into human tendencies. Individuals, as products of their environment, are influenced by people around them and for that reason, focus groups are particularly suitable for exploring issues such as food waste behaviour in the home, 'where the complex patterns of behaviour motivation are evident' and 'where diverse views are held' (Conradson, 2005). Attitudes and perceptions are developed in part by interaction with other people, as individuals may need to listen to the opinions of others before forming their own personal viewpoint. Topic dependent, an individual may be reluctant to discuss contradictions during an in-depth interview where the main dynamic occurs primarily between the researcher and the participant. However, when the interaction occurs mainly between participants themselves, such as a focus group setting, participants are likely to be more open about differences and the motives why this might be. Recently, Krueger and Casey (2014) argued that the permissive group environment gives individuals a licence to divulge emotions that rarely emerge in other forms of questioning. Even more, the interaction that occurs in a focus group 'accentuates empathy and commonality of experiences and fosters self-disclosure and self-validation' (Madriz, 1998). Focus groups provide a deeper understanding of how practices are interconnected and how they affect food waste (Hebrok and Boks, 2017). Therefore, a study using seven focus groups was undertaken in order to probe respondents' attitudes and beliefs towards food waste and identify associations

between these personal psychological factors, intentions and behaviour.

Sampling

In an exploratory sequential design, as this study follows, the sample for the quantitative phase should be different from the sample for the initial qualitative phase of the study. As suggested by Creswell and Creswell (2017), qualitative data collection needs to be purposeful and the quantitative sample as randomly selected as possible (see Figure 7). Because of the exploratory nature of the first phase, the sample drawn is based on a small number of individuals intentionally selected to help explore the problem. Given that the quantitative test in the second phase is intended to determine whether the qualitative themes in the first phase can be generalised to a large sample, the two data collections need to be from at least the same population.

Figure 7. Sampling in a Sequential Exploratory Design



Source: Creswell and Creswell (2017)

A purposive sampling method representing a mix of characteristics was employed, to encompass diversity and compose a structured rather than random sample, guided by the particular research questions which the study is addressing. Using a probability sample to find out what people's actual concerns were would have been very difficult, and it would have been expensive to obtain a sample large enough to be meaningful. Also, due to the subject matter, people might be dishonest about what their concerns and behaviours were, through feeling they should be more concerned. Hence a sampling bias would be produced, meaning the sample would not be representative. It was considered important to include demographic diversity and to make particular efforts to include the voices which might be otherwise excluded. This decision follows Patton (2005), who argued that the purposive sampling method 'adds power' to focus groups research because it selects 'information-rich cases' which can best generate the desired data. Therefore, this study adopts a purposive sampling for selecting participants for the focus group discussions.

Further to the decision on what type of sampling to use comes the decision of how large the sample size needs to be. This is dependent on 'the nature of the population and the purpose of the study' (Bailey, 2008), as well as 'the degree of accuracy we require for the sample' (de Vaus, 2002). The recommendations from Denzin and Lincoln (2005) is for 30-50 interviews, while Bailey (2008) suggests 'around 30 cases seems to be the bare minimum'. In the end, 48 participants attended seven focus groups; such small sizes are common in qualitative research and have proven useful for interpretive studies that seek, as this study does, to explore the participants' practises and their significances (Bock and Sergeant, 2002, Crouch and McKenzie, 2006,

Patton, 2005, Spiggle, 1994), whilst also being appropriate where the overall aim is to gain more understanding of a particular phenomenon (Üstüner and Thompson, 2012). Participants were recruited using a recruitment questionnaire to ensure that all final participants have an awareness of environmental issues (see Appendix 2 for an example of the focus groups recruitment questionnaire).

Consideration has to be given to the purpose of the study when looking for the characteristics that need to be included in order to define the quota sample. The literature research shows that similar characteristics were found among those people shown to be more concerned about the problem of food waste in the household. The sampling frame for this study was defined by age, gender, household size and employment status (see Table 11 for details about focus group participants). Several studies suggest that focus groups are best conducted when participants are similar to each other, given that homogeneity within each group allows the researcher to capitalise on participants' shared experiences (Kitzinger, 2005, Krueger and Casey, 2014, Kuzel, 1992). As the rule for selecting the focus group participants for this study was commonality not diversity, this homogeneity was reinforced in the introduction to the group discussion.

Table 11. Focus Groups Participants Sample Details

Focus group no.	Location	Age range	Gender	Working status	Marital status	No. of Children	Level of environmental concern
1	Plymouth	18-21	All male	Student	Single	No	High
2	Bristol	35-50	Mixed	Working FT and/or PT	Single	Yes	Mixed
3	Cardiff	35-50	All male	Working FT and/or PT	Married	Yes	High
4	Plymouth	65-75	Mixed	Retired	Mixed	No	Mixed
5	Bournemouth	21-35	All female	Working FT and/or PT	Mixed	No	Mixed
6	Southampton	25-45	All female	Working FT and/or PT	Married	Yes	Mixed
7	Plymouth	21+	All female	Student	Married	Yes	High

Interview design and data collection

The discussions were semi-structured following Patton (2005) and (Krueger and Casey, 2014) recommendations for the use of open-ended questions to allow the respondents to choose the manner in which they respond. Before the sessions commenced, participants were required to read the study information sheet, which contained information on the study procedure, confidentiality and the right withdrawal; if participants opted to continue, they were asked to sign a consent form. The focus group instrument was based on Ajzen (1991) and Francis *et al.* (2004) recommendations of questions to ask in a focus group leading to a future questionnaire based on the theory of planned behaviour theoretical constructs. The enquiries were guided in the following areas: general food planning activities, general views on societal food waste, and thoughts and feelings regarding throwing food away in their own households (for a complete interview guide see Table 12). The prepared questions were used only as a guide or to elicit further discussion of specific topic areas, if and when appropriate. The topics of discussion in the focus groups were arranged in a

predetermined order and followed a natural, logical sequence. Discussions lasted one and a half hours on average and were recorded and transcribed verbatim, as suggested by Poland (2002)

Table 12. Focus Group Discussion Guide

Type of question	Time (min)	Type of question	Initial question	Follow-up question/ Moderator notes
Opening	5	Individual	Please tell us a few things about yourself.	
Introductory	20	Individual	I will start by asking you to share a few things about your food shopping habits...	Where do you normally do your food shopping? How often do you go? Do you go on your own or with others?
		Group	Imagine that you are preparing to go shopping. How do you plan for your food shopping? Now you are in the shop/in front of your computer. What influences your shopping decisions? A few days have passed since your food shopping what you do with the purchased food.	
		Group		
Transition	10	Individual	When you hear the word 'food waste', what comes to mind?	Participants are allowed one minute to write down their answers, then share with the rest of the group
		Individual	Given that everyone wastes some food, what do you waste? What are some of your reasons for wasting food?	
		Group	Are there any particular times when you tend to waste more food?	
Key	20	Individual	How do you feel when you waste food?	How much do you identify with these individuals? What would be their reasons to encourage you to change? What would be their main reasons for their disapproval? Can you share any specific examples? Participants are allowed one minute to write down their answers, then share with the rest of the
		Group	How do you think society, in general, thinks about food waste?	
		Individual	Do you have any friends or family members that hold strong views regarding food waste?	
		Group	To what extent would your family/friends approve of you changing your food waste behaviour?	
		Group	To what extent would your family/friends disapprove of you changing your food waste behaviour? Are there any factors that currently make it difficult for you not to waste food?	
Individual	What factors or circumstances would enable you to reduce the amount of food you currently waste?			
Individual	What factors or circumstances would make it difficult or impossible for you to reduce the amount of food you currently waste?			
Group	Suppose you were trying to encourage a friend to reduce the amount of food they were wasting. What would you say to them?			
Ending	20	Individual	Now here is a magic wand. I shall pass it around the table, and when you receive it, you will give your one magical solution to the problem. By waving your wand, your solution will come true. Take the wand and tell us your solution. Here are some initiatives that are currently happening in the UK and around the world. What is your opinion on each? Love Food Hate Waste' campaign, Food caddies, 'Stop Wasting Food' (Denmark), 'Think.Eat.Save' campaign, Disco Soup, Tesco food waste campaign.	Participants are allowed five minutes to look at the initiatives, then share with the rest of the group
		Group	Have we missed anything?	
		Group		

Interview validity and reliability

Interviews should be as valid and reliable as other data collection methods. For internal consistency and content validity, pilot interviews were conducted in order to try out questions and find out which questions are confusing and need rewording. The isomorphism between the data collected during focus groups and the reality from which they are derivative is a suitable determinant of validity (Merriam and Tisdell, 2015). For this reason, the discussions were recorded and transcribed verbatim to get close familiarity with data and to reflect the complexity of participants' behaviour in a contextual framework on behalf of internal validity. This also helped the reality of the interview to be interpreted in a holistic way (Mathison, 1988). External validity is concerned with the generalization of the study (Merriam and Tisdell, 2015). To enhance the possibility of generalization of the interview results, the participants were provided sufficient explanation about the procedures and process so that they will be able to decide how closely their situations match the research situation so that the findings could be transferred. Reliability relates to whether the same findings would be produced if another researcher undertook the study using the same techniques (Lincoln & Guba, 1985, Emory & Coer 1991, Yin, 1994). Therefore, if focus group discussions were to be replicated with the intentions of identifying the most important influences on food waste behaviour in the home, similar findings should be produced (Zikmund, 1991, Sekaran, 1992). Finally, the research was conducted in an ethical manner to guarantee validity and reliability.

Analysis

Transcripts were coded using analytical procedures to identify thematic categories underpinning consumers' attitudes, beliefs and behaviours with regard to household food waste. Thematic analysis is referred to as a method for identifying, analysing and reporting patterns or themes within the data (Braun and Clarke, 2006) and is perceived as a foundational method for qualitative analysis (Minichiello *et al.*, 2008, Braun and Clarke, 2006). As suggested by Padgett (2004), and later by Braun and Clarke (2006), thematic analysis can be flexibly applied within any of the major ontological, epistemological and theoretical frameworks underpinning qualitative research. It involves 'searching across the data to find repeated patterns of meaning' (Braun and Clarke, 2006). Coding plays a significant part in the thematic analysis, where the researchers need to perform initial and axial coding in order to deconstruct data, code it up and find links between the data. Open coding was undertaken in this study to assign initial conceptual labels to the text. New instances in the data were compared to the data already assigned to codes and when similar conceptual labels were assigned. These were compared with existing codes to assess consistency, develop an understanding of the core meaning of each concept, and to help refine the labels attached to these concepts. Secondary, axial coding was used to connect initially identified open codes and allowed to find themes in the data, following recommendations from Minichiello *et al.* (2008) of employing axial coding as a way of organising the data together by making connections between the primary category and its subcategory (key themes and constructs are summarised in Table 13).

Table 13. Key themes and constructs

Theme	Construct	Categories	Example quotations
Attitudes	Unhappy	Anger Shame Guilt Wasted utility	'I get angry actually when I'm throwing money away because I think of how much I spent on that and I feel like that's money essentially going into the bin. And sometimes it's quite a bit of money. When I just throw like half of the fridge away of stuff I think '...ahhh...' (FG1) 'I suppose apart from feeling guilty, I'm quite annoyed with myself for not using it, because I specifically planned to use it. It gets a bit annoying.' (FG7)
	Not concerned	Don't think about it Waste of other resources	'I don't have feelings and such, I just make a mental note, "Don't buy bread next week, we'll have bread rolls", so I don't feel guilty or anything, I just noticed it.' (FG2) 'I used to feel like that, but then with the supermarket waste and stuff, nobody wouldn't be getting it anyway, so I feel bad for myself because I've wasted it, because they weren't getting it in the first place. I know that's probably quite selfish!' (FG2)
Subjective Norms	Family/ Friends	Supportive Unsupportive	'I think the children would be really up for it. They would be supportive, because they would want to be doing well. Definitely!' (FG7) 'I think my husband would, but I don't know about my son.' (FG2)
	Society	Does not care It's inevitable Someone else's fault	'Some of it is class and [upper class] just don't care! ... when you have to actually pay for the stuff, you are going to making more effort to not waste, and so it's a bit of kind of all things.' (FG5) 'I reckon a load of rubbish, that. It's propaganda sometimes by the media!' (FG5)
Perceived Behavioural Control	Enablers	Composting availability Increased awareness Moral factors	'Well they [individuals] could buy compost bins, which would be a good start.' (FG7) 'Do something about making people aware. At my kids' school a couple of years ago what they did I found is really good' (FG2)
	Barriers	Lifestyle Situational Financial Supermarkets	'Definitely portion sizes perhaps. If they [supermarkets] sell - it's always about six, isn't it? - six salad tomatoes in a pack!' (FG2) 'Money. I'm not thinking maybe about globally aware, first thing I think about is it's a waste of money. I bought it, I need to eat and I haven't got loads of money. I need to plan and think about my meals, I'm on a budget so first thing comes to mind would be definitely money.' (FG1)
Understanding of food waste	Knowledge Awareness	Lack of knowledge Lack of education Level of awareness Level of understanding	'Recently, I've done some work for at the charity [local food reduction charity], I can see that the food waste retail side of it is one thousand times worse than anything we ever do [in our homes]. It's more at the point of manufacture. Before working there though, I would never have thought about it that way, but now it's different!' (FG5) 'I would say food waste stands for...the habits of my housemates... One of them for example will cook something, like a big pan, and leave it for a couple of days. But he doesn't put it away...he just leaves it there on the side. And then he leaves and he comes back home 2 days later! It just kind of gets left and then in the couple of days there's mould all over it. And so there is a lot of food waste in my house!' (FG1)
Food waste considerations	Environmental considerations Moral considerations	Awareness of environmental impact Moral concerns	'I have a picture of... it was quite famous before... a child dying. That picture comes to mind every time! And my family would always be 'Don't waste food! Don't waste food, because there are people out there starving!' But sometimes we still do it, and it's quite upsetting' (FG7) '...using all the leftovers in the world it's not really going to change the huge amount of waste that they are nowadays! So I think it's a much more of a huge scale than just us, however, it I feel it's my responsibility as well, try and do my bit and so on...' (FG5) 'Where does it go? Where does it ALL go? Where does it end up?' (FG1)

5.3 Findings

Individual Awareness of Food Waste

The ability to act on the desire to control food waste behaviour is exacerbated by individuals' conceptual limitations of wasting food, and their direct responsibility for its incidence. Lipinski *et al.* (2013a) consider food waste as food that is of good quality and fit for human consumption but is not consumed because it is thrown away before it becomes inedible. The focus group participants highlighted the overall lack of consensus on the definition of what constitutes food waste. When asked to define food waste, the majority cited the associated visual and olfactory aspects, with things such as 'mould', 'bad smell' and 'messy' being mostly mentioned. Once questioned about their own understanding of food waste, the majority of participants disassociated themselves from the issue and looked at supermarkets, restaurants and other food-producing companies as being the main culprits. Indeed, supermarkets were mentioned across all the focus groups as generating the bulk of food waste nowadays:

'...recently, I've done some work for at the charity [local food reduction charity], I can see that the food waste retail side of it is one thousand times worse than anything we ever do [in our homes] It's more at the point of manufacture. Before working there though, I would never have thought about it that way, but now it's different!' (FG7)

Other people (i.e. fellow housemates) were also blamed for a general lack of awareness, which in turn tended to generate the majority of food waste within a household:

'I would say food waste stands for...the habits of my housemates... One of them,

for example, will cook something, like a big pan, and leave it for a couple of days. But he doesn't put it away...he just leaves it there on the side. And then he leaves, and he comes back home 2 days later! It just kind of gets left and then in a couple of days there's mould all over it. And so there is a lot of food waste in my house!' (FG1)

Some mentioned the lack of individual understanding of what actually happens with the waste and, in specific, the household food waste is contributing to the more significant environmental problem:

'Where does it go? Where does it ALL go? Where does it end up?' (FG4)

As such, participants proposed that developing cognitive understanding and increasing awareness of the implications of food waste might lead to changes in behaviour:

'In order to change people's way of thinking, it's not enough to make small changes in a way which could work in the home. The best way to get people to make a large number of changes for the rest of their life is to get them to learn a different path in their behaviour, and that stems from self-learning.' (FG3)

'I think awareness is the key. Because I don't think enough people know... I know because I'm a university student and we are made aware of the things for studies and stuff. Whereas just for general everyday people going about their business... they don't have a clue!'(FG7)

Attitudes and Food Waste

A commonly held belief amongst participants was that wasting food would increase an individual's feelings of guilt about the environmental aspect of the problem. Many participants mentioned feeling various degrees of guilt when food

that could have been eaten ended up in the bin. However, when this was explored further, it was evident that there was a general perception that the financial loss aspect, and not the environmental concern, was the trigger of the guilty feelings:

'Yes, I get cross with myself because I've wasted food that was perfectly good because it costs money, and definitely then I feel guilty...' (FG6)

Indeed, the thought of money being wasted as a consequence of discarding food that they had paid for resulted in some of the participants experiencing negative feelings, alternating from feeling angry at the situation to feeling annoyed with themselves:

'I get angry actually when I'm throwing money away because I think of how much I spent on that and I feel like that's the money essentially going into the bin. And sometimes it's quite a bit of money.' (FG1)

'It does annoy me. To feel like I'm just wasting money and I just throw it away' (FG3)

Others, whilst still admitting to an initial feeling of guilt, confessed to getting over the sentiment rather quick with the realisation that waste is always going to happen:

'I think I feel guilty for it for a time and then I realize I can't eat that, it's unavoidable. It's always going to happen, no matter if you plan in advance. To a certain degree, some things are always going to come up, your day is not going to go as you planned, something's going to happen, and you realise it, when it comes to the end of the day you just think 'Actually, I realise I should have eaten that, but well...' (FG1)

Another reason to keep food waste to a minimum came from a concern of wasted utility, in so much as some of the households felt that to throw food away, rather than eat it, and meant that the food had not fulfilled its intended purpose. As a consequence, some admitted to feeling shame at disposing of still perfectly edible food whilst they are so many people starving around the world:

'I feel it's a horrible thing to do... All those people starving...' (FG1)

'I do feel bad, and I do feel guilty. I grew up in a country where there are a lot of starving people. So, you do feel very guilty about throwing food away. How many people there are who are starving to death in the world?' (FG6)

Subjective Norms and Food Waste

As suggested by existing literature, the motivation to comply with the expectations of significant others, like friends and family, is an important factor in changing individual behaviour (Ajzen, 1991; Conner, Smith, & McMillan, 2003). Several focus group participants recognised that the beliefs and attitudes held by family members sometimes positively influence their own beliefs and behaviour. A common theme was that parents and grandparents generally hold strong views regarding food waste:

'I think my grandparents used to be very much 'waste not, want not'. If there would be leftovers [these] would be turned into something else, whether it would be bubble and squeak or a Sunday roast, or minced up bits of meat in a pie or something on the next day. We wouldn't waste anything!' (FG6)

Mothers, in particular, were seen as the ones most likely to actively engage, by trying to reduce food waste at home, mostly by means of using leftovers and not taking into account any of the use-by and best-before dates:

'My mom, she has no [food] waste at all, everything is used - definitely nothing goes to waste and if she thinks it goes to waste she will be upset with herself, so she definitely checks for everything.' (FG2)

'It's like when you go home for dinner - you expect a nice sort of dinner like vegetables, potatoes and chicken... then you've got waffles, you've got fish, you've got salad then you've got vegetables, right? My mum would be like 'We just needed to empty the fridge and we knew you were coming!'' (FG1)

However, the retired participants (FG04) believed they understood the consequence of food waste better amongst the family members, and also the only ones that were actively doing something towards reducing it:

'It's a different generation. It's what they call a throwaway society isn't it?' (FG4)

Interestingly, partners were seen as being both supportive and unsupportive:

'... my wife, she'd say 'Yes, Yes' but we would just keep doing things as we were, and everything around us would stay the same...' (FG3)

'... my wife – it's only us two! She tends to buy in case somebody is coming in. And then you get a lot of waste because she bought so much!' (FG4)

An understanding of societal views towards the issue of food waste was also explored. The vast majority of participants reported their beliefs that there is a general lack of care about the environment and, largely, society does not care about the problem of food waste, maintaining that people are only concerned with themselves. Again, the retired participants (FG4) held the strongest views, stating that overall, we are a *'blasé'* society that *'... doesn't give a damn'*, with the overall consensus being that we are *'... a divided nation...'*

one half couldn't care less and the other half is starving... [It's a] sad state of affairs...' (FG4).

The student participants also expressed strong views, stating that other people: *'... are only concerned themselves, they don't consider the bigger picture' (FG1),* and that *'... society [does not] care that much about food waste ... as long as you've got enough to eat I don't think society as a whole care.'* (FG1). Whilst others think that

'... we're possibly a bit more conscious because we've got perhaps limited funds. I know a lot of people in that situation. But still, at the end of the day, we have so much around us and everything is so available and we're never really hungry.' (FG7)

Perceived Behavioural Control and Food Waste

Many participants cited various lifestyle factors (such as time constraints, dieting requirements, lack of cooking skills and more general knowledge about food) as barriers towards a more sustainable behaviour towards food waste:

'[It's] social life for me. If you plan all your meals and leave them in the fridge, and then it's like... "We're going out!" or "Friends are coming over tonight!", and therefore I don't cook what I planned...' (FG6)

'...It's just sometimes a busy lifestyle. If you're trying to plan the meals, and then things happen, and you don't have that [planned] meal and the stuff starts to go out of date...' (FG6)

Lack of cooking skills, as well as the availability of ready meals, were seen as one of the main contributors to the problem of food waste by the retired

participants:

'M: I think there's a decline in cooking skills. You've talked about ways of using your bananas and you know, things that you can sort of make, like bubble and squeak and everything. I don't think my daughter makes that ...- well, she knows how to do it, but she doesn't do it!

J: But they [younger generation] don't do it, do they?

M: I don't think they say, 'I've got so and so in the fridge. I've got to do something with it.' I think that's all media, sort of 'Buy this product'. And so they tend not to cook from scratch.' (FG4)

The student participants (FG1, FG7) also recognised the lack of cooking skills as an important barrier to reducing the amount of food wasted at home:

'The other thing that I noticed is that people's level of cooking. I've been taught you can use that bit of the veg; you don't need to throw it away! There's a question of how much people now cook and use their ingredients. Even I thought I throw that away and my mates went like 'What are you doing? You can use that' and I've been like 'Really?' they just like 'Yes, it just looks a bit scraggy, it's fine...'
(FG1)

'I think ... to compare it when our parents were younger - they wouldn't throw anything away, they would cook everything together and make up with what they have in the fridge and then make – I can't remember the name of it, but anyway, they wouldn't waste anything, they knew how to find a purpose for it even if it was a bit off.' (FG7)

Several others mentioned long working hours as being the main cause for waste, and many admitted to feeling too tired at the end of the working day to start

cooking and using the food that has been bought. Instead, they opted for ready meals or takeaways, and the food that was meant to be consumed ended up in the bin:

'...I always buy fresh fish with the intention of eating it and then suddenly I will be at work until nine o'clock at night and then I get home and I am like, 'I cannot be bothered to cook' and by the time I go to open it I am like, 'Ugh'. You know when it has got THAT smell and I am like, 'That is going in the bin'. Because you cannot risk it. But it annoys me so much when I do it, but I do not like to buy frozen fish, so it is tricky.' (FG5)

'That is a really good point though about work, because I work in [...] as well, so by the time I have travelled all the way back and if it's been a late finish, that lovely fresh meal that I had planned at the beginning of the day is out the window and it is frozen chips you know. So that does cause a lot of waste.' (FG5)

At the same time, situational factors proved to be just as important, with lack of storage space and lack of planning mentioned as the most important when considering the actual behaviour of not throwing good food in the bin. Confusion about the use-by and best-before dates used by food producers and retailers to label food products had a direct effect on the amount of food wasted. Although some did not care about these dates, several admitted to using them as a guide when deciding whether or not food is still safe to eat. Indeed, mothers admitted to purposely not feeding their children food with labels near these dates but confessed to sometimes still eating these foods themselves. Food producers, and generally supermarkets, were also blamed for continuously running too many, and often very confusing, offers on food products (i.e. buy one get one free, bigger packets). Indeed, many individuals cited supermarket offers as being one

of the most important contributing factor to food waste within the household.

When asked about enabling factors that could help reduce the household food waste, a vast majority of participants stated that supermarkets could help individuals more by providing clear information on portion size, use-by dates and storage capabilities. Composting availability was also mentioned as having the potential to encourage people to think more about the household waste. At the same time, some expressed the need for increased awareness from local governments:

[Local governments should] ... do something about making people aware (FG6)
'...could you imagine if the council showed us how much [food] waste they collected... we would all be horrified!!' (FG6)

Environmental and Moral Considerations Regarding Food Waste

In addition to the belief dimensions of attitudes that affect behaviour in this context, the focus group results suggest a range of other considerations that broaden the field of influences on wasting food in a domestic setting. For most participants, feelings such as anger and guilt were associated with food waste from an environmental viewpoint, when asked to express what came to mind on hearing the words 'food waste'.

'I feel bad for not feeling guilty about the environment' (FG6)

Many argued that everyone should care more about the environment, although overall, there was general concern amongst participants for well-known environmental issues (i.e. climate change):

'I think all in all throughout the whole world people need to start caring a little bit

and about a lot of things about the environment and what they use and recycling and food and things like that.' (FG7)

In line with the literature, those participants with strong environmental self-identity confessed to being more likely to act in an environmentally friendly manner and actively try to minimise the amount of food wasted at home, without any motivating external incentives. In particular, these findings indicate that emotional attitudinal feelings, potentially revealing moral identities, can contribute to behavioural intentions:

'I went through a stage, when I was really sad. Because it's really difficult sometimes, you try to make the best with what you've got, but that doesn't work out' (FG3)

'I have a picture of... it was quite famous before... a child dying. That picture comes to mind every time! And my family would always be 'Don't waste food! Don't waste food, because there are people out there starving!' But sometimes we still do it, and it's quite upsetting' (FG3)

'...using all the leftovers in the world it's not really going to change the huge amount of waste that they are nowadays! So, I think it's a much more of a huge scale than just us. However, I feel it's my responsibility as well, try and do my bit and so on...' (FG4)

Moral concerns were mentioned by many participants as being somewhat important influencing factors in reducing wasteful behaviour. For example, several recognised that the increased awareness about current societal issues, such as homelessness, has made them think about their own wasteful behaviour, as well as specific ways to change it (i.e. by donating food that otherwise might

be thrown in the bin to local food banks). Broader issues, such as the increased realisation (through mass media) that there are many countries in which hunger is a daily reality, was also mentioned as being a catalyst for changes in day-to-day behaviour regarding food in the home. However, participants admitted that these initial behaviours were not sustained over a long period of time, with households generally regressing to previous more wasteful behaviour.

Food Planning Management

When trying to understand when most of the waste occurs within the home, the analysis revealed that there is no particular time when this is more prevalent. Indeed, some participants admitted to throwing food in the bin just before going food shopping, whilst others on returning and realising that they already had some of the products that they recently bought, and so faced with the dilemma of having too much of the same product and having to discard some of it – either due to lack of space or products being too close to their use-by all best-before dates.

‘When I get back from my shopping trip I realize I already just bought something that I already had. Almost always is fresh stuff (FG1)

‘I find it when I open the fridge to make me dinner or like that. I will find something and I think it looks a bit funny and then it goes to the bin.’ (FG1)

‘Before I go shopping I look in the fridge and I throw some stuff if it’s gone off. Or sometimes when I get back from shopping.’ (FG3)

I think it's cleaning out your cupboards. Every three months I go through my cupboards and I'll be shocked at things that have gone out of date. And it's like ... out with it!’ (FG6)

At the same time, other participants admitted to just throwing food in the bin every day if they thought it looked or smelled off.

'Every day really, at tea time, or at breakfast time, a quick look in there to see and if I am on the way out, just why not rid of it there and then.' (FG2)

'My wife - she'll go for the fridge and empty things out. I said, 'What you taking that out for?' She said, 'They are no good. We have to go shop and buy these things up again.' So, yes we do waste before we go shopping. She'll refresh it, as she calls it.' (FG4)

A few participants recognised their seasonality of waste behaviour, with some likely to throw away more food in the autumn, whilst others found that winter was the time when a particular type of food (i.e. salad) was more likely to end up in the bin.

'I think sometimes I get fussy and I waste a bit more food during the winter, potatoes especially can be a pain.' (FG2)

'We usually tend to waste more in the latter part of the year - the autumn time when the harvest is coming in - that sounds very bizarre. When the fruits coming up from the garden that's when the wastage occurs.' (FG4)

'I think for me it is times like at Christmas when you have got lots of family coming and you do not know what people are going to want to eat and you make lots of special kind of festive foods and then people are like, 'Oh no I do not want pudding' or 'No, I do not want cake'. Then you have got enough food to feed an army and everyone has got loads of it at Christmas and you do not really know what to do with it, so sometimes things get wasted then.' (FG5)

Regarding the type of food that was most likely to be wasted the analysis

identified that bread, vegetables and fruits were most likely to end up in the bin, as well as salad and milk (and other dairy products, such as your goods, cream, cheese). Overall, there were no noticeable differences between respondents' sociodemographic classification and the particular type of food that was most likely to end up being wasted.

'I forget I got the cucumber in the bottom of the fridge and when I find it... and lettuce, I don't eat enough of it, but I still buy it and throw it away. I don't know it's good for you I suppose. I'm not very keen on salad, so maybe just have one and I got too much of it. And milk, I won't have it. I won't touch it if it's a day over.'

(FG4)

Current Food Waste Reduction Programmes

In this part, participants' suggestions to encourage their friends and families to reduce the amount of food they were wasting are presented. The participants were encouraged to suggest a 'magical' solution that would potentially solve the food waste problem in the home. Further, they were shown six different food waste reduction programmes, namely the 'Love Food Hate Waste' campaign, food caddies initiatives run by several UK local councils, the 'Stop Wasting Food' movement initiated in Denmark, the 'Think.Eat.Save' campaign, the Disco Soup movement and an example of a Tesco food waste campaign.

Proposed Solutions

Many of these suggestions followed previous recommendations found in the literature, such as using local businesses like greengrocers and butchers, thinking about the financial implications of wasting food, consider other global

issues such as world hunger, and make regular trips to shops instead of several big shops. Additional suggestions were offered by the focus group participants, such as feeding animals with any surplus food, eating less, growing your own fruits and vegetables and perhaps seek advice about current consumption habits.

'I would say compost and then grow your own food, veg, not as individuals, but as communities. You do strawberries, I'll do tomatoes and that, and you do whatever you do' (FG3)

'If you're talking magical and it could be out there and not realistic, but if everyone could only go shopping once a week.' (FG5)

'I'd say plan meals and grow more of your stuff. We'd never waste anything we've grown ourselves' (FG3)

Others stated that people should prepare weekly plans and actually plan all of their meals at home whilst also allowing for the times when eating out, write shopping lists and, most importantly, follow these lists when shopping for food:

'Plan ahead if you can, it's not always possible. When you get home, freeze things you know you can't use straight away. Try to find recipes for using leftovers, because sometimes you end up using the same thing for leftovers. If I could find some more interesting recipes to use leftover food, then maybe some of it wouldn't go to waste.' (FG3)

'Write a list, stick to it, don't buy so much and don't get tempted by the offers. Freeze it sooner and give it away if you've got more than you can use. So I suppose writing a list and sticking to it it's kind of a magical solution. If you've done enough planning, you could be military about it and kind of maybe that would help.' (FG5)

'...I've got a meal planner. I mean don't get me wrong, sorry. Now sometimes

you do like deviate like something might go wrong. You don't know what's going to happen in a week, I mean something might go wrong. And it's been awful and we're going to have a takeaway tonight, sod that. But then, generally' (FG6).

A significant number of focus group participants stressed that we should only buy what we need, and try not to be tempted by any purchase offers whilst shopping. Many also suggested that we should all limit fresh food purchase and check dates (i.e. use-by and best-before) while shopping:

'One follows the other. So for instance, plan A, or your weekly menu, and then shop accordingly. Don't give into temptation of offers, as in shop within your means. If you're only a small family, and you see this massive family pack, you know you're not going to use it, for instance. Just because it is an offer, don't go for it' (FG3)

'Supermarkets as well, instead of doing the three for two or buy one get one free they should rather just offer for half price. You know what I mean? So they stop encouraging people to buy extra. Sometimes I'm really tempted to get more and I have to really think 'Actually, I only need one this week.' (FG6)

'I suppose it is all about buying less, that's what everyone needs to do because you're never going to stop. There's always food in your cupboard or your freezer that you can get. People are wasting a lot of fresh stuff each week, binning it. You see these programs and everyone is like 'Yeah, we don't need this, bin it...' (FG6)

'I don't take any notes of the dates. Just use it if it smells okay and it looks okay. And don't buy too much just buy what we are going to use so you don't waste any food' (FG2)

Many of the participants thought that people should use cookbooks and generally

learn to cook more, use up ingredients in new ways, share their meals with other people (i.e. friends, neighbours), and generally use left-overs more:

'I just put down one line. Learn to cook' (FG4)

'Have a cook. There we go, have a cook. That's a magical answer' (FG6)

'I think we can minimize it a lot. Whether you can stop it altogether, maybe you could. I think we need to - instead of wasting things - I think we need to start making more home cooked food and use things that they would throw away and find another recipe that you could put it into and make something, freeze it and have it for a meal another day. And educate people on how to use it all, like every single bit of it (educate people on how to use the food that they buy). And perhaps get a couple of meals out of it and do a lot of home cooking instead of just buying microwave meals and things like that. I don't know if you can reheat microwave meals. I don't know if you can reheat them or anything. So if you don't eat the whole meal you can throw it away. But if you do a lot of home cooking and then you can use bones from whatever, chicken to make chicken stock and you can use all parts of the chicken and things like that. If they were educated about how to cook and how to make different meals, that's how I think.' (FG7)

Several mentioned that perhaps more people should learn how to preserve foods, but also how to compost, and why it would be useful to freeze fruits and vegetables and re-use food products that have past their prime (for example to make banana cakes or bread and butter pudding). Other suggestions included adding up the cost of items that will be thrown away to get a clear idea of the actual costs involved in throwing food in the bin. More simple solutions included giving leftovers or any food that would be considered to be surplus to neighbours or storing the food in a correct way in post-shopping stage:

'Use the leftovers afterward. You would put in the freezer for future use' (FG4)

'I like to try and work everything out what's in my fridge and freezer and I get in the cupboard as well especially when it's' at the end of the month. But I am on a budget so I think like 'What can I make today?' and I constantly put things that don't really go together and just go, 'That's what we are having!' and that's the end of it' (FG2)

'I think for me, trying to freeze things and seeing if it works or not. So I've tried mashed potato, and I said if it doesn't work, I won't do it again. With meat, if I've got leftover then I'll make some gravy so it doesn't dry out and try it. And I said if it doesn't work, I won't do it again. And it's just trying things and if it works brilliant like celery, all I need are a couple of sticks for a stew and I'm left with the rest of it. And my neighbour said 'Well, just chop it up in the freezer bag, put it in the freezer.' I went 'Really?' And again, she'll freeze it!' (FG5)

'Refrigeration and freezing, the technology advanced, didn't it? That's why we're eating smoked, salted, pickled and preserved. I pickle all of my stuff, I get massive gluts of chillies, I'm a big chilly grower, at the end of the year I've got masses, I've given them away to as many people as possible. And then I give these as Christmas presents' (FG3)

'I think if you've got something in your fridge and you know you don't have time to eat it, then cook it into something else and then freeze it. Turn it into something else. Like my bananas. Make a cake and freeze it. Use it for something else. Turn it into something else' (FG4).

'Or you can just have a student (living in your house), like an all-around student because I have a student and he actually eats the left overs because he doesn't have a lot of money to spend on food!' (FG2)

Other participants suggested that animals could be fed the food that would otherwise end up in the bin and that people should cook up in advance and utilize most of what they have in their fridges:

'Yes, exactly, you can feed animals, you can use it for fertilisers and stuff like that so just because food goes off it doesn't actually mean it's completely useless' (FG2)

'I think that it varies across the different food groups. It depends what food we are talking about wasting. However, I would say where you can cook up in advance - if you know and make a batch of it, like batch cooking and freeze it into a container so that you've got your homemade ready meals. But that doesn't apply to everything really. You could apply it to meat and vegetables. That's dealing with it before it gets to the point where it goes off and that's obviously going to be you being more organized and being on the ball with what produce you have in your house.' (FG2)

The vast majority of participants agreed that people need to be educated more on the actual issue of food waste in the home, as having a high level of awareness on the problem is key to solving this issue. Being encouraged to eat seasonally was also seen as an important aspect of raising awareness and increasing knowledge:

'... a bit more education' (FG1)

'Especially in schools. It's there where I learned how to make a bacon sandwich on top of the pizza' (FG2)

'And educate people on how to use it all, like every single bit of it (educate people on how to use the food that they buy' (FG7)

'I think awareness is the key. Because I don't think enough people know and unless you're university students were made aware of these things for our studies

and stuff. It comes to light where it's just general everyday people going about their business and... Raising awareness, I think it's the key!' (FG7)

'Encourage people to eat seasonally because then you've got different foods different times. More of a variety' (FG2)

'It used to be, supermarkets used to do seasonal vegetables, so I think it would work' (FG1)

Several participants in focus group suggested that governments should run non-profit supermarkets, and also that supermarkets should reduce the prices of food earlier in the day rather than at night, thus enabling people to buy and consume more of the food that otherwise would be wasted.

'I want state owned supermarkets which are run not for profit. So the state owns the supermarket. Fair trade supermarkets essentially so farmers get paid fair price, people can buy it per cost.' (FG1)

'I don't know, but I'm just thinking, maybe should therefore a company should be looking at reducing things earlier. I remember going up to M&S for some reason. They were reducing the cost of bread at 6 o'clock at night, just an hour before the shutting. Wouldn't it be better to reduce it at three o'clock?' (FG3)

Others recommended that people should be paid weekly, as this could enable individuals to better prepare and account for food purchases:

'I get paid monthly and by the third week and especially the fourth it's tight so we do budget. It's what we got in the cupboards and stuff you know what I mean, but you know you're right if you get paid weekly you got it there every time so that waste continues. So I say go monthly.' (FG2)

Some participants in the group discussions also suggested that food that has been wasted could be used in different ways, for example, to produce energy: *'And one other way that it can be used - I'm not exactly sure the details of it, but you can use it to make energy can't you?' (FG)*

Considerations on Existing Waste Reduction Programmes

During the focus group discussions, participants were also asked to discuss their views on several current food waste reduction programmes. After reviewing these initiatives, many participants suggested that people would like to have the food distributed more evenly, namely the supermarkets should have a more significant ratio of healthy food to junk food. Other also suggested that perhaps the government should introduce an actual wastage tax. It was even suggested by some participants that people should not be allowed to buy what they want, with the view that individuals should potentially be allowed to waste only a certain amount of food per week.

'I don't really worry about that - junk food doesn't get wasted; because it's like pizzas or whatever in the freezer they stay there forever. However, the healthy food goes off a lot faster than the junk food. For years I ate nothing but junk food and I was fine. I don't feel that you shouldn't allow the people what they want as long as like just make sure that they can buy it.' (FG1)

'Possibly you can have a wastage tax so you have to monitor how much you waste and if you say you waste 10 kilos a week you get taxed on 10 kilos worth of wastage.' (FG1)

'But maybe people have those food waste bins and obviously if it gets over

a certain amount, then tax that amount because they're going to be more conscious about what they're throwing away and will be like 'Why throw it away so I could use it.' So I think that would possibly work (FG1)

The overall sentiment during these discussions was that very few of the programmes mentioned by the researcher were well-known. Several participants recalled having heard of some of these movements, in particular, WRAP's 'Love Food Hate Waste' campaign, however, nobody felt suitably confident to discuss in any detail any of the programmes suggested. Nevertheless, all participants agreed to a degree that any type of food waste reduction initiatives would be well received by the general population. And whilst some recognised that perhaps not one particular programme could be considered the perfect solution to the problem of food waste by household, the general consensus was that a combination of many of these activities would enable individuals to envisage individual ways of reducing the amount of food that ends up in the bin.

'It's a positive thing, I didn't say it's a solution. At least it's a positive' (FG2)

Nevertheless, there were also some participants who expressed their lack of trust in some of the ways in which some of these programmes are being delivered, questioning the expected results:

'Actually I believe that's where we in UK fall down. We stick a poster up and expect that to change the world, change how we do things...that's never going to really work!' (FG4)

Sociodemographic Factors

The focus group analysis did not highlight any significant differences for either household size or household income. During discussions, children's influence within the home appears to be very important. Some admitted to children being the main driver for raising awareness about the issue of food waste within their own households:

'...my daughter, she's the voice of our conscience around our house. Yes, she's very active and gets very upset about waste. When she does come shopping with us, it's all a very ethical problem! I mean, she's the main driving force...' (FG3)

Others felt that children were not helping reduce the waste generated by the household:

'... My son is not that good [with food waste] ...it depends. Sometimes he'll clean-up his plate, sometimes he'll eat half and go "I'm full!" And you think ...well, you don't want to force them to eat. You know, teach them that they must shove food in their face. You know what I mean? If you're full, you're full...' (FG6)

The focus group discussions support previous research, recognising that younger individuals' food waste behaviour occurs mainly due to over-preparation and not using the leftovers, whilst the older one admitted to not being comfortable using food that *'smelled or looked off'* (FG4). Nevertheless, during the focus group discussions, all age groups seemed equally passionate in debating the growing environmental concern that food waste poses at present. The main differences in this regard were that the younger participants' discussion leaned toward the future aspect of the global environmental impact, whilst older participants were more interested in devising solutions that would have an immediate

impact. Throughout the discussions, female participants seem to be more aware of the actual amount of food waste generated within the household, as well as of who precisely within the household was mostly responsible for this. Nevertheless, regarding environmental awareness and concern, both male and female participants seemed equally aware of the potential effects on the greater environment.

5.4 Summary

This chapter includes qualitative data collection and analysis. Focus group discussion was used to collect qualitative data by means of semi-structured interview questions to gain a closer understanding of the essential meaning of participants' lives. For the sampling of focus group discussions, the researcher benefitted from a purposeful sampling technique. Then, interview design, data collection procedure for qualitative processes, interview validity and reliability were elucidated. It was mentioned that thematic analysis was conducted to analyse the qualitative data. The qualitative data analysis revealed that they mostly associated food waste with visual and olfactory aspects such as 'mould', 'bad smell' and 'messy' and most of them disentangled themselves from the issue and looked at supermarkets, restaurants and other food-producing companies as being the main culprits when the participants were inquired about their knowledge, understanding and awareness of food waste at home. When their attitudes towards food waste were investigated, the participants revealed that wasting food would increase their feelings of guilt about the environmental aspect of the problem and, therefore, had negative feelings like feeling angry and feeling of guilt. However, they confessed to getting over the sentiment rather

quick with the realisation that waste was a normal part of the household life. The participants in the focus groups also discussed their subjective norms concerning the food waste and they said that they complied with the expectations of significant others, like friends and family who were important factors in changing their behaviours, beliefs and attitudes positively influence their own beliefs and behaviour. It was also established that the retired and student participants expressed strong views. In terms of the relationship between perceived behavioural control and food waste, the participants cited various lifestyle factors, lack of cooking skills, long working hours, lack of storage space, lack of planning and food packaging as barriers towards a more sustainable behaviour towards food waste. For most participants, feelings such as anger and guilt were associated with food waste from an environmental viewpoint. The participants declared that they had food planning and management problem like throwing food in the bin just before going food shopping, realising that they already had some of the products that they recently bought either due to lack of space or products being too close to their use-by all best-before dates. It was realised that younger ones wasted food due to over-preparation and not using the leftovers, whilst the older ones admitted to not being comfortable using food that 'smelled or looked.

Chapter 6 Quantitative Study - Analysis and Findings

6.1 Introduction

This chapter presents the quantitative data collection method and analysis as the second stage of the mixed-method study. It begins with justification for the survey questionnaire method, design and specific measures included. Following, the descriptive statistics and shows relevant information pertaining to the lives of 411 participants. Specifically, it focuses on a combination of personal characteristics and food management behaviours. The chapter moves to the Exploratory Factor Analysis (EFA) of the study's variables and depicts the exploratory factor analysis conducted in SPSS. Confirmatory Factor Analysis (CFA) of the measurement model comes next. A structural model conceptualising the causal relationships amongst the study's main constructs is then presented.

6.2 Questionnaire Survey

The questionnaire survey is the most commonly used data collection method in food waste research. According to their administration method, questionnaires can be divided into two main types: self-administered and interviewer-administered. For the interview-administered questionnaire, the interviewer records the participant responses. This can take the form of a telephone questionnaire (i.e. the interviewer telephones the participant and completes the questionnaire based on their answers) or an interview questionnaire (also called 'interview schedules', where the interviewer

completes the questionnaire while face-to-face with the participant) (Saunders *et al.*, 2009). The self-administered questionnaire is usually completed by the respondents and includes three subcategories: the internet-mediated questionnaire (via email or a website), the postal questionnaire (hardcopy with a cover letter, sent by post), and the delivery and collection questionnaire (hand-delivered, then collected later). Web surveys tend to be used to study large groups of online users; these invite potential participants to visit the website where the questionnaire can be found and completed online. One of the advantages of a web survey over an email survey is that it can employ a much wider variety of embellishments in terms of appearance. Also, the questionnaire can be designed so that when there is a filter question, it skips automatically to the next appropriate question.

Given the above discussions, a structured questionnaire was developed to measure the factors of concern following-on from the interpretation of focus group findings and to establish their generalisability to a larger population. The questionnaire construction took into consideration the guide on 'Constructing a TPB Questionnaire' (Ajzen, 2002a) to ensure standard topics and measures were covered. The aims of the survey were to establish the nature of participants' food waste behaviour, as well as their attitudes and intentions to behave in a non-wasteful manner. Sources used to operationalise the questionnaire came from the relevant literature and from the focus group discussions (see Table 14). Respondents were screened through a filter questionnaire to ensure they were at least partially (i.e. 'responsible for most or some of it') responsible for the food shopping (Q1 'To what extent, if at all, are you responsible for food shopping in your home?') and food preparation (Q2

'To what extent, if at all, are you responsible for the preparation / cooking of food in your home?') in the household before completing the main questionnaire (see Appendix 3). Those respondents who were not responsible for any food shopping, or food preparation in the house were not allowed to continue answering the questionnaire.

Questionnaire design

Given the widespread of the population of interest, an online survey was selected as the most efficient method of distributing the questionnaires. For this purpose, the researcher used an account membership with Qualtrics, an online questionnaire and survey tool. The membership allows to ask unlimited questions, receive unlimited answers and distribute an unlimited number of surveys. Another useful attribute is the ability to have the program randomise the questions for each respondent but deliver the dataset in the right order. This enhanced the internal validity of the questionnaire, as the respondents were not answering the questions concerning a specific construct all at once, which would otherwise have been tiresome.

Survey questions can take three possible structures: open-ended, closed and contingency or filter questions. Open-ended questions give participants the chance to supply their own answers. They are exploratory in nature and generate fixed-answer questions to be used in future research. When using this type of questions, the researcher allows for new and unexpected responses. However, they are time-consuming for both interviewer and respondent, code and require more effort from the participant. Closed questions, on the other hand, are quicker to complete and generally, have a better response rate and less missing data.

Even more, as they can be pre-coded, they are easier to process and offer better inter-coder reliability. Nevertheless, as closed questions have a restrictive range of answers, there can be no spontaneity or creativity on the part of the respondents. Further, it is very difficult for the researcher to make a fixed-choice answer exhaustive. Contingency questions are a particular case of closed questions; also called filter question they are directed at a subcategory of respondents and seek extra or more detailed information about the previous question (Siniscalco and Auriat, 2005).

Section one of the questionnaire collected both demographic data and data concerning the participants' habits and attitudes towards their food waste at home. The very first section of the questionnaire included data concerning responsibility for food shopping, the preparation/cooking of food in their homes, age, marital status and the number of adults and children living in their houses. Food Planning Management and behaviours, including participants' food shopping habits, type of main food shop, and the frequency of shopping, type of 'top-up' food shop, were also addressed. Questions concerning the pre-shopping habits, quantity and frequency of monthly wasted food, the quality of shopping plans, reasons to waste food, eating plans and types of the food stored in the freezer were also involved. This enabled possible relations between personal demographics, habits and food waste at home to be identified and analysed. The second section aimed to collect data about the participants' Attitudes, Subjective Norms, Perceived Behavioural Control, Self-efficacy, Pro-environmental Identity, Intention and Moral Identity with the help of semi-structured and Likert type questions. The data collected from these questions identified the constructs of behavioural theories and models. The final section

surveyed demographics like gender, employment status, annual household income, the level of participants' education, description of their homes and their ethnic groups.

Measures

The questionnaire contained items designed to measure the constructs in the Theory of Planned Behaviour and the additional constructs that extend the TPB, as well as a section dealing with the issue of Food Planning Management. The eight primary theoretical constructs (Food Waste Behaviours, Intention to reduce the amount of food waste in the home, Attitudes towards this behaviour, Subjective Norm, Perceived Control over reducing the amount of food waste, the level of Self-Efficacy, individual Pro-Environmental Identity and Moral Identity) were each assessed by means of several direct questions. The items used were modelled after previous similar research, as well as findings from the focus group discussions (see Table 14). Although few constructs, such as behavioural intention, have been shown to be highly reliable (Valois *et al.*, 1992), past studies suggested that it is preferable to assess a social cognitive construct with three or more items as this allows the use of a more stable average composite score (Godin and Kok, 1996).

Table 14. Survey Questions Sources

Items		Source
Behaviour	<p>In the last month, how often have you wasted food at home?</p> <p>"In the last month, I have wasted food at home ...</p> <p>"The number of times that I have wasted food at home in the last month is...</p> <p>Over a month, how much food do you waste at home?</p> <p>"The amount of food that I currently waste at home in a month is ...</p> <p>To what extent do you currently waste food at home each month?</p>	Focus Groups
Intention	<p>I intend not to waste any food at home in the next month</p> <p>I will try not to waste any food at home in the next month</p> <p>I plan not to waste any food at home in the next month</p>	Focus Groups
Attitudes	<p>I want to reduce my impact on the environment.</p> <p>Wasting food is about wasting other resources (e.g. water, money, etc.)</p> <p>I think that wasting food in the home is ...'</p> <p>'I think that wasting food in the home is ...'</p> <p>It's a chance for me to save money.</p> <p>I want to manage my home efficiently.</p> <p>Wasting food at home makes me feel ashamed.</p> <p>I don't feel guilty if I waste food at home.</p> <p>Wasting food at home makes me feel sad</p> <p>Wasting food at home makes me feel like I've failed.</p> <p>I feel cross with myself when I waste food at home.</p> <p>I don't worry about wasting food</p> <p>I would feel guilty if I were to waste the same amount of food at home from now on</p> <p>I think that wasting food in the home is ...'</p> <p>Wasting food at home is inevitable.</p> <p>There are food shortages everywhere else in the world.</p>	<p>Giles <i>et al.</i> (2007)</p> <p>Paris & van den Broucke (2008)</p> <p>Focus Groups</p> <p>Focus Groups</p> <p>Giles <i>et al.</i> (2007)</p> <p>Giles <i>et al.</i> (2007)</p> <p>Paris & van den Broucke (2008)</p> <p>Focus Groups</p> <p>Focus Groups</p> <p>Giles <i>et al.</i> (2007)</p> <p>Giles <i>et al.</i> (2007)</p>
Subjective Norms	<p>People whose opinions I value think I should reduce the amount of food waste at home</p> <p>It is expected of me to reduce the amount of food waste at home</p> <p>People whose opinions I value would approve of me reducing the amount of food waste at home</p> <p>My children support my efforts to reduce the amount of food waste at home</p> <p>My spouse/partner supports my efforts to reduce the amount of food waste at home</p> <p>I feel under social pressure to reduce the amount of food waste at home</p> <p>Many people in our society do not care how much food they waste at home</p>	<p>Sparks & Guthrie (1998)</p> <p>Focus Group</p> <p>Hagger & Chatzisarantis (2006),</p> <p>Tonglet <i>et al.</i>, (2004)</p> <p>Murelo-Portela <i>et al.</i>, (2013)</p> <p>Shaw <i>et al.</i>, (2000)</p> <p>Focus Groups</p> <p>Focus Groups</p>
Self-Efficacy	<p>If I wanted to, I could easily reduce the amount of food currently wasted at home</p> <p>I trust I can reduce the amount of food waste at home</p> <p>Whether or not I reduce the amount of food I waste at home is entirely up to me</p> <p>If it were entirely up to me, I am confident that I would be able to reduce the amount of food at home in the next month</p>	<p>Sparks & Guthrie (1998)</p> <p>Murelo-Portela <i>et al.</i>, (2013)</p> <p>Shaw <i>et al.</i>, (2000)</p> <p>Armitage & Conner (1999)</p>
Perceived Behavioural Control	<p>I believe I have the ability to reduce the amount of food I waste at home in the next month</p> <p>To what extent do you see yourself as being capable of reducing the amount of food waste at home in the next month?</p> <p>How confident are you that you will be able to reduce the amount of food waste in your home, in the next month?</p> <p>How much control do you feel you have over reducing the amount of food waste at home in the next month?</p> <p>How much personal control do you feel you have over reducing the amount of food waste in your home, in the next month?</p>	Armitage & Conner (1999)

<p style="text-align: center;">Pro-Environmental Identity</p>	<p>I think of myself as an environmentally friendly consumer I would not want my family and friends to think of me as someone who is concerned about environmental issues I think of myself as someone who is very concerned with environmental issues I would be embarrassed to be seen as having an environmentally friendly lifestyle Reducing the amount of food waste at home is an important part of who I am I think of myself as the type of person who would try to reduce the amount of food waste at home Humans have the right to modify the natural environment to suit their needs Nature is strong enough to cope with the impacts of modern industrial nations Humans were meant to rule over the rest of nature The balance of nature is very delicate and easily upset Humans are severely abusing the planet Plants and animals have the same rights as humans to exist</p>	<p>Whitmarsh & O'Neill (2010), Sparks & Shepherd (1992), Cook <i>et al.</i>, (2002)</p> <p>Hagger & Chatzisarantis (2006)</p> <p>Dunlap (2008)</p>
<p style="text-align: center;">Moral Identity</p>	<p>It would make me feel good to be a person who has these characteristics Being someone who has these characteristics is an important part of who I am A big part of my emotional well-being is tied up in having these characteristics I would be ashamed to be a person who has these characteristics Having these characteristics is not really important to me Having these characteristics is an important part of my sense of self I strongly desire to have these characteristics The types of things I do in my spare time (e.g. hobbies) clearly identify me as having these characteristics Having these characteristics is reflected by my membership in certain organisations The kind of books and magazines that I read identify me as having these characteristics I am actively involved in activities that show others that I have these characteristics</p>	<p>Aquino & Reed (2002)</p>
<p style="text-align: center;">Food Planning Management</p>	<p>Where do you mostly go for your main food shop How often do you go for your main food shop? Where do you mostly go for your main food shop? Where do you mostly go for your 'top-up' food shop? On average, how many times do you eat your evening meal outside of your own home? (e.g. at restaurants, friends' or parents' house) Please think about the last time you did a main grocery shop (this might include shopping in a supermarket, grocery store or on-line). Before that particular shop, did you check what you already had at home for each of these items Please think about the last time you did a 'top-up' grocery shop (this might include shopping in a supermarket, grocery store or on-line). Before that particular shop, did you check what you already had at home for each of these items To what extent do you plan your food shopping trips? To what extent do you decide what you are going to eat for your main meal Generally, to what extent do you stick to your shopping list Over the last month, what percentage of the following did you throw away because they had gone over the best-before date on the packaging? Over the last month, what percentage of the following did you throw away because they had gone past the use-by date on the packaging? Which of the following items have you stored in the freezer in the last month?</p>	<p>WRAP (2013), Focus Groups</p>

For this study, **Food Waste Behaviour** was self-reported and measured by a total of six items drawn from the focus groups, with three of these measuring behaviour frequencies and three measuring the quantity of food wasted by each household. Participants indicated, on a 7-point Strongly Agree – Strongly Disagree scale, how often they have wasted food at home in the last month, as well as how much of their household food ended up being wasted in the last month.

Behavioural **Intention** signals an individual's readiness to perform a given behaviour or action and considered by Ajzen (2005) to be the immediate antecedent to behaviour. Intention not to waste food was measured as a more ordinary way of expressing intentions towards food waste, as wasting food is considered an abnormal purposeful behaviour. Three items assessed individuals' intentions to perform the desired behaviour. Participants indicated, on a 7-point Strongly Agree – Strongly Disagree scale, to what extent they intend to, will try to, and plan to reduce the amount of food wasted in the home. The phrasing of the items was based on Ajzen (1991) and Francis *et al.* (2004) recommendations for TPB questionnaires, and the findings from the focus group discussions.

Regarding the individual **Attitudes** towards food waste, first, the instruments existing in the literature were reviewed and then compared to individual statements made by the focus group participants to ensure contextual fit before item development. The scale was adapted from the Attitudes towards the Act scale used by Ajzen and Driver (1992), Giles *et al.* (2007) and Paris and Van den Broucke (2008). Seven items, using a 7-point Strongly Agree – Strongly Disagree scale, assessed the attitudes towards food waste. Answers to the items were summed to obtain the overall attitude score; the higher the score, the more positive the attitude towards reducing the food waste in the home.

Items used to measure the **Subjective Norm** component are clearly directed in the literature that should include both injunctive and descriptive items (Ajzen, 2002b). Injunctive items are those that measure whether important

people (i.e. referents) approve or disapprove of wasteful behaviour towards food in the household, whereas descriptive items capture significant referents' food waste in the household adherence. For this study, the scale for subjective norms was adapted from Taylor and Todd (1995), Sparks and Guthrie (1998), Hagger and Chatzisarantis (2006), Tonglet *et al.* (2004), Mulero-Portela *et al.* (2013) and Shaw *et al.* (2000). A 7-point Strongly Agree – Strongly Disagree scale was used to obtain the subjective norm component. Responses to each of the seven items were summed to obtain the overall subjective norm score; the higher the score, the greater the importance others played in the participant' commitment to reducing the amount of food waste in the home.

The direct measure of **Perceived Behavioural Control** is directed by the TPB to understand the participant's confidence that they are capable of reducing the amount of food waste generated by the household. According to previous literature, some items capture the difficulty of achieving the desired outcome, whereas others demonstrate the likelihood that reducing food waste in the home is attainable. For this study, the scale for the perceived behavioural control was developed by adapting items from the perceived behavioural control scale used by Armitage *et al.* (1999), Madden *et al.* (1992), Taylor and Todd (1995) and Weiss and Anderson (1992). Five items, using a 7-point Strongly Agree – Strongly Disagree scale, was developed to measure participants' perceived behavioural control. The items reflected an individual's confidence that they are capable of performing the targeted behaviour (i.e. reducing the amount of food wasted in the home), as well as their beliefs about the controllability of the behaviour (i.e. whether performing the behaviour is up to them). Responses

to each of the five items were summed to obtain the overall perceived behavioural control score; the higher the score, the greater the perceived behavioural control to reduce the amount of food waste in the home.

The notion of **Self-Efficacy** was measured by tapping into an individual's level of confidence in knowing how to reduce the amount of food waste in the household. This was assessed by asking participants to report how difficult it is to perform the behaviour and how confident individuals are that they can perform the expected behaviour. Four items, using a 7-point Strongly Agree - Strongly Disagree scale, was developed to measure participants' understanding of their self-efficacy level

In relation to the **Pro-Environmental Identity** construct, several ways of measuring people's environmental attitudes and underlying environmental worldviews have been developed since the 1970s. Studies have argued that those individuals with more positive general environmental values and attitudes are more likely to have higher levels of less wasteful behaviour. Some examples of environmental values scales include the Ecological Attitude Knowledge scale (Maloney and Ward, 1973), the Environmental Concern Scale, the Ecocentric Anthropocentric scale (Casey and Scott, 2006, Schultz and Zelezny, 1999) and the New Environmental Paradigm (NEP) (Dunlap, 2008). However, given that many individuals in society are aware of the need to sympathise verbally with environmental issues, it is perhaps not surprising that such studies report very high scores in such scales. This poses the question of whether there is a genuine discrepancy between high environmental values and moderate levels behaviour, or whether participants have aspired to be more concerned with the state of the

environment that they really are. For this study, a total of 12 items were used to measure Pro-Environmental Identity, using a 7-point Strongly Agree – Strongly Disagree scale. Six of these items reflected an individual's pro-environmental self-identity, with statements adapted from Whitmarsh and O'Neill (2010), Sparks and Shepherd (1992), Cook *et al.* (2002) and Hagger and Chatzisarantis (2006). The remaining six items was developed by adapting items from the NEP scale used by(Dunlap, 2008), and consisted of three items measuring the Dominant Social Paradigm (DSP) ('Humans have the right to modify the natural environment to suit their needs', 'Nature is strong enough to cope with the impacts of modern industrial nations' and 'Humans were meant to rule over the rest of nature') and three items measuring the New Ecological Paradigm (NEP) ('The balance of nature is very delicate and easily upset', 'Humans are severely abusing the planet' and 'Plants and animals have the same rights as humans to exist').

Regarding the **Moral Identity** construct, it has been argued that those who hold strong moral and personal norms are likely to behave in a less wasteful manner when given the opportunity to do so and when such moral obligations are activated by the perception of a positive outcome and a personal responsibility to act. The internalisation subscale of Aquino and Reed II (2002) moral identity instrument was used to measure this construct. According to the authors, this subscale captures the degree to which a person's moral identity is rooted at the core of an individual being. As suggested by Aquino *et al.* (2007), this scale appears to be the most robust predictor of morally relevant behaviour. To complete this measure, participants were asked to read a list of nine characteristics that might describe a person (i.e. caring, compassionate, fair,

friendly, generous, helpful, hard-working, honest, kind) and then to visualise 'the kind of person who has these characteristics and imagine how that person would think, feel and act'. These nine characteristics have been shown by Aquino and Reed II (2002) to capture lay constructs of the moral prototype (i.e. a person who is moral). Important to note at this stage is that the word 'moral' has not been used in the instrument. After being asked to think about someone who possesses these traits, participants were presented with eleven items on a 7-point Strongly Agree – Strongly Disagree scale. The items were averaged to determine the moral identity centrality score for each participant.

Various aspects regarding the level of **Food Planning Management** in the home was also investigated. Initially, participants were required to identify the frequency of their food shopping activities, both for the main shop and any additional top-up shops. Data was collected to understand where participants were most likely to purchase their food in both situations. Following, questions were asked to establish current behaviours during each of the three identified pages of food shopping (i.e. pre-shopping, during shopping and post-shopping). Several questions also investigated the current behaviours related to specific groups of food products in relationship to current food labels (i.e. use by and best before dates).

In addition to addressing the main variables of the study, the questionnaire included further questions relating a number of socio-demographic characteristics of the individuals and households, such as gender, employment status, household income, level of education, type of home and access to out-of-home facilities (such as garden, compost bin, local authority food waste

collection). These factors have been shown to have a relationship with actual behaviour.

Data Collection Procedure

The participants were directed to the questionnaire by means of a link and first presented with an introductory text containing information about the purpose, confidentiality, voluntary participation and restrictions of the survey (see Appendix 4 for details). Furthermore, they were told that participating would take approximately 15-20 minutes. Agreeing with these terms allowed all participants to continue and start with the first part of the survey. Each of the questions instructed the participants to state their opinion about various aspects of their household-based food waste by agreeing or disagreeing with the seven statements in this scale. In the final part of the questionnaire, the demographic questions had to be answered. Eventually, participants were thanked for their participation and informed about the objectives of the study by means of a debriefing (see Appendix 4 for details). By reporting their email address to the researcher, the opportunity to receive a more detailed debriefing, receive insights into the results of the study or ask any other questions was given.

Sampling

The sample must be large enough to allow the statistical findings to be generalised to the overall population. Therefore, the quantitative element is tested with a large sample, and for this reason, random sampling technique was used to collect the quantitative data in order to attempt to give all members of the target population an equal opportunity of being selected for inclusion in the

sample studied. In other words, each person in the population had an opportunity to take place in the sample (Cochran, 2007). Thus, equal weighting was assigned to each person in the calculations. In the simple random sampling technique, the selection process is not difficult where the population units are relatively homogeneous (Cohen *et al.*, 2007). Finally, this sampling technique gave a complete picture of the population of interest.

Pilot Study

A pilot test was conducted prior to the full-scale survey to avoid the issue of potential errors in interpretation. The aim of the pilot study was to identify any issues regarding content, layout and the operationalisation of variables. This enabled the researcher to refine the questions, instruments and procedures of the study and thereby make improvements that would be beneficial in the final analysis (Blumberg *et al.*, 2008).

In order to secure reliable and internally consistent measures, appropriate items in the formative stage of the questionnaire were selected, as suggested by Webb and Sheeran (2006). As recommended by Francis *et al.* (2004), the online questionnaire pilot study included some questions developed from focus groups. All the construct from Ajzen's TPB model were represented in addition to the proposed new constructs (self-efficacy, pro-environmental identity and moral identity).

Following recommendations by Dillman (2011), participants were not required to enter answers to questions. Forcing participants to answer questions in a

pilot study has been found to have a detrimental effect on participants' motivation, measurement and the likelihood of completing a survey. Instead, following the advice of Francis *et al.* (2004) series of questions were employed to evaluate the questionnaire. For example, participants were asked to identify ambiguous items or items that were difficult to answer. No specific issues related to the TPB scale or the additional scales (self-efficacy, pro-environmental identity and moral identity) were identified. Furthermore, 80% found the questionnaire layout easy to follow, and 70% said the questions easy to understand/mostly easy to understand. However, 45% of participants thought the questions were repetitive or too similar, and 45% thought the questionnaire, in general, was too long. Although it was foreseen that respondents would find the seven-point scale problematic, no inconsistencies were identified, and no questions were consistently missed.

While some of the pilot studies participants found the behavioural intentions statements repetitive, the researcher kept three of the four questions in the final survey instrument following Ajzen (2005) and Armitage and Conner (2001a) recommendations of using a minimum of three items for adequate internal consistency.

Analysis

The programme IBM SPSS Statistics 24 was used to assess the data. For this purpose, the data was downloaded from the Qualtrics programme and then analysed. In order to assess the sociodemographic background of the sample, descriptive summaries were computed. To evaluate whether the most important demographic variables, as well as the independent (Attitudes, Subjective

Norms, Perceived Behavioural Control, Behavioural Intentions, Self-Efficacy, Pro-Environmental Identity, Moral Identity and Food Planning Management) and dependent variables (self-reported food waste Behaviour), were related to each other, correlations were computed. Structural Equation Modelling using IBM Amos 24 was conducted to test all the hypothesised effects.

6.3 Findings

Descriptive statistics

In this section, descriptive statistics are used to investigate the sample characteristics, with a particular focus on participants' age, gender, marital status, household composition, education level, income, employment status, and type of home living arrangements. Further, the sample behavioural characteristics are also examined, in particular key themes including where and how do people shop, how often do they shop, and what are their characteristics in terms of food planning management, during three distinct stages: pre-shopping stage, during shopping stage and post-shopping stage.

Sample Characteristics

This section provides an overview of the personal characteristics of respondents using output generated in SPSS Statistics 24. Specific attention is given to participants' age, gender, marital status, number of adults and children within the household, education, income, employment, ethnicity, and household ownership. For many characteristics, the differences between respondents are also compared by age groups (18-24, 25-44, 45-64, 65+). Detailed sample characteristics are summarised in Table 15.

Age

Participants ranged in age by 56 years; the youngest aged 18 and the oldest 74 years old. The mean age of the sample was approximately 33 years. The variable used to measure age was re-coded into one of four categories in keeping with the UK national census: 18-24, 25-44, 45-64 and 65+. In total, 13.6% of participants were between 18-24 years old, 28.7% of participants were between 25-44, 37.2% of participants were between 45-64 and 20.4% were 65 years old or older. This classification was closely related to the wider population in England and Wales for two age groups (18-24 and 45-64) but different for the remaining two age groups (for more details see Appendix 5).

Gender

The sample consisted of 189 males (46%), 220 females (53.5%) and 2 participants in the 45-64 age group, which have identified themselves as other (0.5%). There are also differences in the ratio of men to women, in that the proportion of male participants was significantly higher in the 65+ age group (32.3%). The proportion of female participants, however, is higher for all the remaining age groups: 21.4% (in the 18-24 age group), 35% (in the 25-44 age group) and 33.2% (in the 45-64 age group). This also corresponds with the National Statistics (for more details, see Appendix 5).

Marital Status

A total of 56% of participants reported being married or living as a couple. As expected, there was a higher percentage of either single, separated or widowed participants, in the 18-24 and 65+ age groups. Overall, there was a good

distribution of participants living by themselves or with a partner.

Household Composition

A total of 27.98% of participants reported that they lived in a single adult household, with the rest reporting at least two adults. Those that reported living on their own were mostly unemployed (45.2%), while households with two or more adults had a fairly equal distribution amongst the various employment status. The number of households that have at least one child is disproportionately low (24.8%) compared to those households where there are no children (75.2%).

Level of Education

The most common highest level of qualification was a college-level qualification (25.1%) closely followed by graduate qualification (24.6%). At the opposite end of the spectrum, a much smaller percentage of respondents stated that they hold a professional qualification (1.9%). Age was also related to qualification levels, with the youngest participants (18-24) reporting mostly college-level and graduate qualifications. For the 45-64 age group, a large proportion of participants hold non-UK qualifications (49.3) compared to any other age group; whilst the 65+-year-olds hold the most professional qualifications (62.5%). With regard to gender, there is a clear difference between professional qualifications (males 87.5%, females 12.5%). However, females had significantly more qualification both at the graduate (60.4%) and college-level (58.3%).

Income

Three income categories (i.e. between £10,000 and £39,999) were the one that the majority of participants (66.9%) selected as relevant, with a further 11.4% reported that they and between £40,000 and £49,000. However, household income has relatively low information of value if presented in isolation, and it is often subject to the number of people in the household as well as their employment status. Those living alone reported a lower household income than those who were 'Not-Single', most probably as a result of lower combined employment, pensions and benefits provisions. This was most evident in two categories the £10,000-£19,000 where most of the single households recorded their income at (36.5%) and the £50,000-£74,000 where there is a clear difference (12.2% for the 'Not-Single' households compared to 2.2% for the 'Single' households).

With regard to age and employment status, as expected, participants that are in full-time employment reported higher incomes than any other employment categories. The remaining participants were mostly in the £10,000-£19,000 income category (PT employment 31.7%, retired 36.2%, stay at home 37%, students FT 33.3%). Those participants that are in the 24-44 years category reported the highest levels of income (i.e. £30,000-£39,999), with the rest three age categories reporting incomes of £10,000-£19,000.

Employment

Each participant was classified based on their current occupation. Of interest to this study was the chief employment situation, employed (46.7%) or retired (28.2%). Differences were noted between full-time and part-time status, for both employment and education characteristics. Further differentiation was made

between those who consider themselves to be unemployed (7.5%) and those recorded a 'stay at home' status (9.7%).

Household Ownership

Home-type ownership was also recorded to understand participants' characteristics better. The participants in the 18-24 age group reported the highest proportion of both semi-detached houses (35.7%) and flat/apartment (23.2%) living. In contrast, the 65+ age group reported the highest proportion of detached house living (31%), whilst the 25-44 age groups reported living in terraced houses.

Access to Various Food Waste Recycling and Collection Points

Overall, 43.55% of the sample had access to a local authority collection of food waste. This is close to the 61% reported local authorities in the UK that currently collect food waste from households. However, the number of participants that reported having access to either a garden (25.54% including a shared garden) or a compost bin (14.36%) is low.

Table 15. Sample characteristics

	M	SD		Frequency	Percent %
Age	2.64	.96	45-64	153	37.2
			25-44	118	28.7
			65+	84	20.4
			18-24	56	13.6
Number of adults	1.72	.45	2 or more adults	296	72.0
			1 adult	115	28.0
Presence of children	1.75	.43	No	309	75.2
			Yes (2, 3, 4+)	102	24.8
Marital status	1.44	.50	Yes	230	56.0
			No: single, separated, widowed	181	44.0
Gender	1.55	.51	Female	220	53.5
			Male	189	46.0
			Other	2	0.5
Income	3.46	1.62	£10,000 - £19,999	104	25.3
			£20,000 - £29,999	87	21.2
			£30,000 - £39,999	84	20.4
			£40,000 - 49,999	47	11.4
			Up to £9,999	35	8.5
			£50,000 - 74,999	32	7.8
			£75,000 or more	22	5.4
Education level	5.91	3.01	Degree	101	24.6
			Foreign (non-UK) qualifications	73	17.8
			NVQ L4-5	48	11.7
			Higher Degree (PhD, MA, PGCE)	38	9.2
			NVQ L1	38	9.2
			Other vocational	29	7.1
			NVQ L2	23	5.6
			NVQ L3	19	4.6
			No qua qualifications l	14	3.4
			5+O	13	3.2
			Professional qualifications	8	1.9
			Apprentice	5	1.2
			2+ A	2	0.5
Employment type	2.89	1.74	FT	151	36.7
			Retired	116	28.2
			PT	41	10.0
			Stay at home	40	9.7
			Unemployed	31	7.5
			Student FT	27	36.7
			Student PT	5	28.2
Access to food waste recycling points	4.55	2.08	Local Authority LA collection	179	43.6
			Garden	86	20.9
			Compost bin	59	14.4
			'None'	34	8.3
			Patio	33	8.0
			Shared Garden	19	4.6
			Allotment	1	0.2
Home Type	2.41	1.17	Semi-detached house	125	30.4
			Detached house	100	24.3
			Terraced house	92	22.4
			Flat/apartment	89	21.7

Sample Behavioural Characteristics

In the previous section, a summary of the participants and their characteristics were provided. In addition to looking at these demographic characteristics, the questionnaire also established several statistical measures of participant shopping behaviour relating to matters such as where and how do people shop, and how often do people shop. Details of the statistics relating to the main shop frequency are given below (see Table 16). Both choices of food purchase (main and 'top-ups') had missing data, with only 384 cases available for the participants using a main shop, with 27 missing. Similarly, for the participants using a 'top-up' shop only 201 cases were available, with 210 missing. This reflects the preferences for a main or 'top-up' food shopping trip.

Table 16. Main Shop Frequency

	Frequency	Percent (%)
Once a week	260	63.3
Once a fortnight	51	12.4
More than once a week	48	11.7
Once a month	25	6.1
Total	384	93.4

Table 17. Preference for Main or Top-up Food Shopping

	Frequency	Percent (%)
I buy almost all of my food in a main shop	210	51.1
I buy some food in a main shop and some in 'top-ups' shops	174	42.3
I mostly buy food in smaller, 'top-up' shops	27	6.6
Total	411	100.0

Regarding preference for main or top-up food shopping (Table 17), it can be seen that the majority of respondents participated in the main shop (51%) with slightly less (42.3%) also went for a top up shop. The vast majority of those that prefer to have a main shopping trip to purchase almost all of their food (82%), the

supermarkets are the preferred grocery store type, with a small percentage (10.9%) preferring the online supermarkets over the physical store. For those participants that reported using 'top-up' shops either in addition to the main shop or on their own, supermarkets were also the main choice, although to a lesser degree (31.6%). However, very few participants reported using online supermarket facilities for 'top-up' food shopping.

The majority of participants reported that they did a main shopping trip for food once a week (63.3%) (Table 15). A smaller number, i.e. 12.4% shop less by visiting the store once a fortnight, with 11.7% of those visiting the store more than once a week and 6.1% only go shopping for food as a main shop once a month. Almost half of the participants reported eating outside the home less than once a month, with 33.3% eating out either once or several times a month.

The questionnaire also examined the participants' behaviour related to food planning management, at different stages of the process (i.e. before shopping for food, during the shopping trip and after the shopping). Almost half of the participants reported checking the amount of food in the house before going shopping (42.3%), with others admitting that they were engaging in various planning activities such as writing a shopping list before going food shopping (15.3%) or even keeping a 'running list' during the week in preparation for the food shopping trip (13.4%). Only a very small number of participants admitted to not planning in any way (0.5%) (see Table 18). In terms of planning the meals for the household, more than half of the participants knew what most or a few of the main meals would be for the following week, with 18.2% planning every main meal. Nevertheless, there were still 103 participants (25.1%) who did

not like planning.

Table 18. Pre-shopping: Planning Activities

	Frequency	Percent (%)
I check food in the house	174	42.3
I write a shopping list to take	63	15.3
I keep a 'running list' during the week	55	13.4
I have a clear list in my head	51	12.4
I have some ideas of what to buy	45	10.9
I plan the meals	16	3.9
I shop online	5	1.2
None of above	2	0.5
Total	411	100.0

The majority of participants reported that they use the shopping list well and usually purchase most or some items that they have planned for (67.9%). However, there are also participants who recognise that they buy some extra items not included in the list (23.8%). Only a small percentage (2.4%) admitted that they mostly decide what to buy as they shop, and a similar number (2.7%) admitted to not using a shopping list in the first place as they usually buy the same things each time they go food shopping. Based on 401 cases and 10 missing, participants reported using the freezer mostly for storing any food that is at or near their best before the expiration date, followed by home-made meals and any meal leftovers.

Participants were asked about their behaviour regarding the use by and best before expiration dates; the questions included an explanation of what these concepts mean. For both types (i.e. use by and best before a large majority of participants reported that frozen items is the one food category most likely to be thrown away because they have gone past the use-by (87.1%) or best-before (84.4%). In comparison, participants tended not to use the use-by and best-

before instructions for several food categories, i.e. fresh fruit, dried goods, milk and precooked meat (for the use-by date) and bread or other bakery items, milk, precooked meat and fresh meat (for the best-before date) (see Table 19).

Table 19. Post-shopping: Best-before and Use-by date

	Best-before		Use-by	
	Frequency	Percent (%)	Frequency	Percent (%)
Frozen items	347	84.4	358	87.1
Ready meals	34	8.3	28	6.8
Fresh vegetables	4	1	2	0.5
Dried goods	3	0.7	3	0.7
Fruit juices	3	0.7	2	0.5
Fresh meat	1	0.2	1	0.2
Pre-cooked meat	1	0.2	1	0.2
Milk	1	0.2	1	0.2
Bread or other bakery items	1	0.2	1	0.2
Total	395	96.1	397	96.6
Missing	16	3.9	14	3.4
Total	411	100.0	411	100.0

Having established the basic shopping behaviour of the sample population, this chapter moves on to look at the factors that influence these shopping behaviours through the multivariate statistical methods of exploratory factor analysis, confirmatory factor analysis and structural path analysis.

Structural Equation Modelling

Exploratory Factor Analysis

An exploratory factor analysis (EFA) analysis is usually performed with the aim of deriving one or more 'best' models for the relationships between the observed variables and potential underlying factors. The objective is to attain the solution in which factors are highly related within and unrelated between (Kline, 2011), but also to enhance the interpretability of retained factors. The EFA analysis seeks to identify which variables measure which underlying 'pure' factor of latent

variables, and interpret the meanings of these factors as this is an exploratory procedure designed for model building and describing the relationship between variables. Observed items 'load' to an unobserved latent factor (Kline, 2011). Factor loadings are the Pearson's (r) correlation between observed items and a latent factor, with higher factor loadings suggesting a stronger relationship, therefore, a more valid solution. The factors are extracted until no more common variance remains.

Limitations and Assumptions

First assumptions are sample size, and missing data as EFA will only function when all data is present; otherwise, cases are deleted *leastwise* and therefore reducing the effective sample (Tabachnick and Fidell, 2007). (Comrey and Lee, 2013) suggested that any sample with over 200 cases is considered fair; as this study's dataset has 411 cases with full information, neither sample size nor missing data were considered a problem.

Method for Analysis and Rotation

At this stage, all scales were evaluated by means of an Exploratory Factor Analysis (EFA) using SPSS. The goal was two-fold: (a) identifying underlying latent factors with the goal of reducing the data and (b) eliminating items with poor loadings and cross-loadings, which are typically good candidates for removal (Hair *et al.*, 2007).

The initial step for the researcher is to decide whether they wish to apply Principal Component Analysis, which defines the factor as a linear combination of observed items, or Factor Analysis, which entails extensive analysis of variance (Kline, 2011). Factor Analysis is particularly suited to the role of scale

development, as well as defining the substantive content or meaning of the factors that account for the variation among a larger set of items (DeVellis, 2016); therefore Factor Analysis was preferred in this context. Within the factor analysis, extraction of underlying themes can be achieved by employing several methods, however, information about the comparative strengths and weaknesses for each of these techniques is the relatively scarce (Costello and Osborne, 2005). The general advice suggests maximum likelihood for normally distributed data, however, if the assumption of multivariate normality is 'severely violated', Fabrigar *et al.* (1999) recommend one the principal factor methods. For this study, due to the expectation of correlation between factors within each scale, the Direct Oblimin oblique rotation was employed (Abdi, 2003).

For each scale, the procedure was as such. First, fit was evaluated by means of the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test of sphericity (Hair *et al.*, 2007). Second, individual items were evaluated through the Measure of Sampling Adequacy (MSA) as indicated in the anti-image matrices, and those under the 0.50 threshold were removed following Hair *et al.* (2007) advice. Third, the optimal number of factors was determined following Kaiser's criterion (>1 eigenvalue), scree-plot, and variance extracted. Finally, items which exhibited poor loadings (< 0.30) or cross-loadings within the factorial structure were removed, and the analysis repeated iteratively until the optimal solution was achieved (Hair *et al.*, 2007). Factor loadings are the correlation between each variable and the common factor (component). The recommendation for factor loading is that he needs to be greater than 0.4 before the variable is set to belong to the factor (Stevens, 2002). Tabachnick and Fidell (2007) also suggested that factors only tenable if items underlying them are

feasible in practice. Therefore, items retained in the factor should be substantively explainable and share more than just variance with other items.

Behaviour (B)

The Behavior scale exhibited a KMO of 0.912 and the Bartlett’s test of Sphericity ($\chi^2 (15) = 3731.972, p < 0.001$) was significant, indicating good fit. No candidates for removal were identified through MSA. A single factor was extracted, explaining 88.29% of variance. Cronbach’s Alpha for the extracted factor was computed at 0.972, indicating very good reliability. Table 20 summarizes the loadings for this scale.

Table 20. Behaviour: EFA with oblique rotation

Item	Factor Loading 1
Behaviour_Quant_3	0.960
Behaviour_Quant_2	0.960
Behaviour_Frequency_3	0.955
Behaviour_Frequency_2	0.948
Behaviour_Quant_1	0.923
Behaviour_Frequency_1	0.890

Note: standardized loadings from Direct Oblimin rotation are reported.

Intention (I)

The Intention scale yielded a KMO of 0.718 and the Bartlett’s test of Sphericity ($\chi^2 (3) = 875.139, p < 0.001$) was significant, indicating good fit. MSA did not suggest any candidates for removal. A single factor was extracted, explaining 84.59% of variance. The three items resulted in a Cronbach’s Alpha of 0.908, indicating very good reliability of the scale. Table 21 summarizes the loadings for this scale.

Table 21. Intention: EFA with oblique rotation

Item	Factor Loading
	1
I_Intention	0.949
I_Try	0.918
I_Plan	0.891

Note: standardized loadings from Direct Oblimin rotation are reported.

Attitude (A)

The first iteration of the Attitude scale exhibited a KMO of 0.885 and a significant Bartlett's test ($\chi^2 (120) = 3105,094, p < 0.001$) indicated good fit of the data. This initial extraction identified 4 factors with a cumulative explained variance of 65.17%. Analysis of the anti-image matrices suggested no removal of items. Further analysis of the pattern matrix indicated potential issues with items A_Inevitable_1, A_Env_otherresources, A_Env_issue, and A_Feel_guilty_2, due to low loadings or cross-loadings. They were removed and the model re-iterated.

The second iteration yielded a KMO of 0.845 and a significant Bartlett's test ($\chi^2 (66) = 2495.093, p < 0.001$), again indicating good data adequacy. In this iteration, no candidates for removal emerged during MSA analysis. Three factors were extracted, explaining a cumulative 67.70% of variance. Unpredictably, reverse-coded items (A_Feel_worry and A_Feel_guilty_1) exhibited positive loadings in a factor comprised mostly by true-scored items. The presence of these items with a positive loading made semantic interpretation of the contents impossible, and thus it was opted to exclude these items from the analysis. Similar issues with reverse-coded items have been noted in the literature (Spector *et al.*, 1997). After the removal of these items, the model was re-evaluated. Table 22 summarizes the loadings for this scale.

Table 22. Attitudes: EFA with oblique rotation

Item	Factor Loading		
	1	2	3
A_Feel_ashamed	0.904		
A_Feel_failed	0.877		
A_Feel_sad	0.865		
A_Feel_cross	0.746		
A_Feel_pleasant		0.950	
A_Env_good		0.946	
A_Inevitable_2			0.823
A_Env_reduceimpact			0.819
A_Ec_efficienthome			0.768
A_Ec_savemoney			0.693

Note: standardized loadings from Direct Oblimin rotation are reported. Loadings under .30 are omitted.

Factor 1 contains items thematically related to negative feelings, and was thus labelled “A_WasteAversion”. Factor 2 contains items measuring unpleasantness of wasteful behaviour, and was labelled “A_WasteDisagreeableness”. Finally, Factor 3 contains items relating to efficiency aspects, and was labelled “A_WasteEfficiency”. Cronbach’s Alphas for factors 1 through 3 are 0.875, 0.900, and 0.780 respectively, all indicating reliable scales.

Subjective Norm (SN)

The first iteration of the Subjective Norm scale exhibited a KMO of 0.755 and the Bartlett’s test of Sphericity was significant ($\chi^2(21) = 228.123, p < 0.001$), indicating good fit. MSA analysis suggested SN_Social_2 as a candidate for removal (MSA = 0.453). As such, this item was immediately removed and the model re-iterated.

The second model yielded a KMO of 0.802 and Bartlett’s test maintained

significance ($\chi^2(15) = 214.677, p < 0.001$). In this iteration, no candidates for removal emerged on the MSA analysis. As such, two factors were extracted explaining 72.48% cumulative variance. Table 23 summarizes the loadings for this scale.

Table 23. Subjective Norms: EFA with oblique rotation

Item	Factor Loading	
	1	2
SN_FamSupport_partner	0.943	
SN_FamSupport_child	0.858	
SN_Fam_approve	0.804	
SN_FamExp_2	0.789	
SN_Social_1		0.867
SN_FamExp_1		0.768

Note: standardized loadings from Direct Oblimin rotation are reported. Loadings under .30 are omitted.

Cronbach's Alphas for factors 1 and 2 were 0.877 and 0.574, respectively. While the first is quite good, the second is low by the commonly accepted thresholds. However, the low Alpha might be due to the scale being comprised of only two items, and thus should be considered inconclusive. Semantic analysis of the items yielded further insight into the nature of the factors. The items under factor 1 relate mostly to the themes of support, and thus, this factor was labelled "SN_Support". For factor 2, the items appear to be related to the theme of external pressure or expectations, and thus the factor was labelled "SN_Pressure". This dichotomy is, in some ways, similar to the dichotomous nature of intrinsic versus extrinsic motivation.

Perceived Behavioural Control (PBC)

The analysis of this scale resulted in a KMO of 0.721 with a significant Bartlett's

test ($\chi^2 (10) = 664.632, p < 0.001$), indicating good fit. MSA analysis suggested that no items were to be removed. Following this, two factors were extracted with a cumulative explained variance of 75.66%. No low loadings or cross-loadings were identified in the factorial structure, and thus no further iterations were conducted. Table 24 summarizes the loadings for this scale:

Table 24. Perceived Behavioural Control: EFA with oblique rotation

Item	Factor Loading	
	1	2
PBC_Capability	0.883	
PBC_Ability	0.868	
PBC_Confid	0.863	
PBC_Cntrl_1		0.872
PBC_Cntrl_2		0.852

Note: standardized loadings from Direct Oblimin rotation are reported. Loadings under .30 are omitted.

Factor 1 items relating to perceived capability and was thus labelled “PBC_Capability”. Factor 2 overall alludes to the theme of control locus. In light of this, this factor was labelled “PBC_Control”. As for the Cronbach’s Alphas, they were of 0.837 for Factor 1 and 0.658 for Factor 2. While the former is indicative of good reliability, the latter presents some issues. No further removals were conducted at this stage.

Self-Efficacy (SelfEff)

The first iteration of the self-efficacy scale resulted in a KMO of 0.663 and a significant Bartlett’s test ($\chi^2 (66) = 2059.062, p < 0.001$). MSA analysis indicated no candidates for removal. This iteration identified a single factor solution with an explained variance of 48.34%. Interestingly, SelfEff_3 had very low loadings into the single factor, suggesting its removal. This was done

and the model re-iterated. The new model had a KMO of 0.667 and a Bartlett's test with significance ($\chi^2 (3) = 236.252, p < 0.001$). Again, one model was extracted but with an improved 63.60% variance explained. The following table (Table 25) summarizes the findings.

Table 25. Self-Efficacy: EFA with oblique rotation

Item	Factor Loading 1
SelfEff_2	0.831
SelfEff_1	0.794
SelfEff_4	0.766

Note: standardized loadings from Direct Oblimin rotation are reported.

Cronbach's Alpha for the reduced scale yielded a score of 0.709, indicating a reliable scale.

Pro-environmental Identity (ProEnv)

The first iteration of this scale resulted in a KMO of 0.852 with a significant Bartlett's test of Sphericity ($\chi^2 (66) = 2059.062, p < 0.001$). MSA analysis suggested that no items needed to be removed. This iteration identified 3 factors with a cumulative explained variance of 64.58%. However, analysis of the pattern matrix revealed issues with some of the items; notably, PROENV_NEP_3 exhibited cross-loadings into all factors, while PROENV_NEP_2, PROENV_NEP_1, and PROENV_DSP_2 exhibited cross-loadings into two factors. As such, these items were removed and the model re-iterated. The second iteration yielded a KMO of 0.756 and a significant Bartlett's test ($\chi^2 (28) = 1213.861, p < 0.001$). MSA analysis maintained no recommendations for removal. In this iteration, two factors were identified with a cumulative explained

variance of 62.45%. No issues emerged in the factorial loadings, which are reported in the following table (Table 26):

Table 26. Pro-environmental Identity: EFA with oblique rotation

Item	Factor Loading	
	1	2
PROENV_EnvselfID_3	0.878	
PROENV_EnvselfID_1	0.828	
PROENV_selfID_1	0.798	
PROENV_EnvselfID_4	0.787	
PROENV_DSP_3		0.802
PROENV_DSP_1		0.778
PROENV_EnvselfID_2		0.704
PROENV_selfID_2		0.681

Note: standardized loadings from Direct Oblimin rotation are reported. Loadings under .30 are omitted.

The interpretation for these factors is quite linear. Factor 1 contains the items representing a pro-environment perspective and thus was labelled “PROENV_ProEnvironment”. Factor 2 contains items representing an anti-environment perspective, and was labelled “PROENV_AntiEnvironment”. Cronbach’s Alphas for these scales was 0.844 for Factor 1 and 0.736 for Factor 2, thus confirming the reliability of the scales.

Moral Identity (MI)

Analysis of the Moral Identity scale yielded a KMO of 0.889, and a significant Bartlett’s test of Sphericity ($\chi^2 (55) = 2565.745, p < 0.001$). MSA analysis did not suggest the removal of any of the items. This iteration resulted in a two-factor solution explaining 66.17% of variance. However, analysis of the pattern matrix revealed that item MV_3 cross-loaded into both factors. As such, this item was removed and the model re-iterated. The second iteration resulted in a KMO of

0.860 with a significant Bartlett's test ($\chi^2 (45) = 2159.208, p < 0.001$). MSA analysis confirmed that no removals were required at this level. Again, two factors were extracted with an explained variance of 66.35%. Analysis of the factorial structure identified only low cross-loadings, and thus, this solution was retained. The factorial structure is summarized in the following table (Table 27):

Table 27. Moral Identity: EFA with oblique rotation

Item	Factor Loading	
	1	2
MI_1	0.784	
MI_4 *	0.783	0.376
MI_5 *	0.730	
MI_2	0.727	0.387
MI_6	0.710	0.376
MI_7	0.679	0.332
MI_9		0.850
MI_10		0.804
MI_11		0.777
MI_8		0.755

Note: standardized loadings from Direct Oblimin rotation are reported. Loadings under .30 are omitted. Inverted items identified by an asterisk ().*

The extracted structure also has a simple interpretation. Factor 1 contains items related to internal identification with the model person, and thus was labelled "MI_Internal". Factor 2 contains items which relate to external identification, in the sense that the individual relates to the model person based on third parties and activities rather than through an internal compass; as such, it was labelled "MI_External". As for Cronbach's Alphas, factor 1 exhibited 0.849, indicating good reliability, resonating with the also good reliability of factor 2 with an Alpha of 0.838.

Food Planning Management (FPM)

Analysis of the scale revealed that the items represented mostly count data, thus being unsuitable for an EFA analysis. Attempting an EFA confirmed this decision, with a KMO of 0.495 and all items under the MSA threshold.

In line with the goal of the overarching analytical effort, a composite FPM measure was developed in the following manner. FPM_Pre_MS, FPM_Post_BestBefore, FPM_Post_Use_By, and FPM_Post_Freezer were items representing counts of items checked or stored. It was considered that higher counts represented a higher planning effort. For each of these dimensions, a “Yes” was counted as 1 and any other response as 0. Higher counts indicate higher planning behaviours. FPM_Post_BB and FPM_Post_UB were stated as percentages thus the average for each of these dimensions were calculated, e.g., the average percentage of food items thrown away, and divided by 10 in order to obtain a 0-10 scale. Finally, the sum of these calculations was computed in order to obtain a composite Food Planning Management score, in a higher-is-better format. The composite score obtained in this manner ranged from 2 to 29.90 ($M = 14.34$, $SD = 4.28$), and exhibited normal distribution, rendering it suitable for usage in path analysis.

Reliability

Table 28 shows the values of Cronbach's alpha for the factors resulted from the exploratory factor analysis. It also shows the Cronbach's alpha if the item was deleted and corrected-item-total correlations. Most values of Cronbach's alpha are above 0.70, and corrected-item-total correlations are above 0.35, which demonstrates the reliability and validity of the constructs (Field, 2013). However, some of the Cronbach's alpha are below the threshold; this is acceptable as those measurements have high composite reliability and low items in the construct which can cause lower values (Kock, 2015). None of these values are well below the threshold, therefore the internal consistency of the measurements can be regarded as reliable.

Table 28. Reliability statistics for EFA components

Items	Cronbach's alpha	Cronbach's alpha if Item Deleted	Corrected Item-total Correlation
Behaviour frequency 1		.974	.847
Behaviour frequency 2		.966	.923
Behaviour frequency 3		.965	.931
Behaviour quantity 1	.972	.969	.891
Behaviour quantity 2		.964	.938
Behaviour quantity 3		.964	.938
Intention not to waste		.814	.879
Intention try not to waste	.908	.911	.764
Intention plan not to waste		.873	.814
Attitude – feeling ashamed		.830	.662
Attitude – feeling like I failed		.831	.657
Attitude – feeling sad		.830	.667
Attitude – feeling cross		.833	.639
Attitude – feeling (un)pleasant		.850	.427
Attitude – environmentally good	.854	.850	.447
Attitude – food shortages		.841	.554
Attitude – want to reduce impact		.844	.533
Attitude – efficient home		.841	.553
Attitude –save money		.848	.459
SN - Family Support (partner)		.774	.690
SN – Family Support (children)		.787	.629
SN – Family approve		.780	.672
SN – Family expectation 1	.823	.829	.435
SN – Family expectation 2		.754	.777
SN - Social pressure		.837	.385
Self-efficacy 1		.632	.524
Self-efficacy 2	.709	.560	.581
Self-efficacy 4		.664	.488
PBC - ability		.676	.629
PBC - capability		.683	.606
PBC - confidence	.755	.640	.697
PBC – control 1		.767	.340
PBC – control 2		.759	.368
PROENV - Environmental self-identity 1		.757	.581
PROENV - Environmental self-identity 2		.770	.502
PROENV - Environmental self-identity 3		.770	.502
PROENV - Environmental self-identity 4		.762	.579
PROENV – self-identity 1	.793	.766	.529
PROENV - self-identity 2		.772	.488
PROENV - DSP 1		.780	.439
PROENV - DSP 3		.783	.428
Moral Identity 1		.733	.364
Moral Identity 2		.705	.566
Moral Identity 4		.788	-.043
Moral Identity 5	.747	.812	-.160
Moral Identity 6		.707	.560
Moral Identity 7		.715	.493

Confirmatory Factor Analysis

In the previous section, several scales were assessed for. In this section, all scales are tested in specific edition of the hypothesised model, in line with the research design process presented in Chapter 3. This follows the advice for the scale validation procedures for new (Churchill Jr, 1979, DeVellis, 2016) and existing scales (Kline, 2011, Anderson and Gerbing, 1988). Confirmatory factor analysis (CFA) was used to test how good the measurement model is, by specifying the number of factors and the ways in which the various indicators are related to them (Brown, 2015). Confirmatory factor analysis is often using the latter stages of skill development, usually following EFA. At the same time as CFA is a pre-cursor to structural equation modelling. As such, the model was defined at the outset. If the measurement itself is a poor fit to the data (i.e. the variables are not particularly good measures of the underlying factors), then any extension of it which hypothesises relationships between those factors is unlikely to fit the data well either.

Therefore, at this stage, a confirmatory factor analysis was conducted (using IBM AMOS 24) in order to confirm the factorial structure for some of the factors and conduct additional fine-tuning in preparation for the path analysis. The CFA was conducted using Maximum Likelihood estimation, the most common estimator which is known to have robustness to deviations from normality (Arbuckle, 2007). Multiple criteria were used to evaluate model fit: chi-square goodness-of-fit test (McIntosh, 2007), corresponding χ^2 statistic (Bentler, 2009), χ^2/df index (Arbuckle, 2007), comparative fit index (CFI (Bentler, 1990), parsimony-adjusted comparative fit index (PCFI), root mean square of approximation (RMSEA) (Steiger *et al.*, 1985), Akaike Information Criterion (AIC) (Anderson *et al.*, 1998),

Browne-Cudeck Criterion (BCC).

The analysis was conducted for each scale independently since they are not part of one single instrument, and thus, some degree of independence is to be expected (Anders and Gerbing, 1988). The procedure conducted for each analysis was as such. First, the initial measurement model was specified in accordance with the EFA structure. After estimation, model fit was computed. Following, Modification Indices (MI) (Bollen *et al.*, 2014) were analysed in order to determine the potential for fit improvement. The threshold for considering a MI as valid was a value of 11 or higher, corresponding to a type I error probability of 0.001. In an iterative manner, covariances between error terms for manifest variables were drawn whenever they belonged to the same latent variable, and the net MI gain was positive. After each such step, the model was re-specified, and this process was repeated iteratively until fit attained satisfactory levels. During this process, possible cross-loadings (presenting as positive MI gains by drawing covariances in error terms for manifest variables belonging to different latent variables) were also looked for, as these represent a potential need for item elimination. Finally, items with loadings under 0.50 were removed due to poor validity, unless it was determined that the construct would be weakened by such a removal.

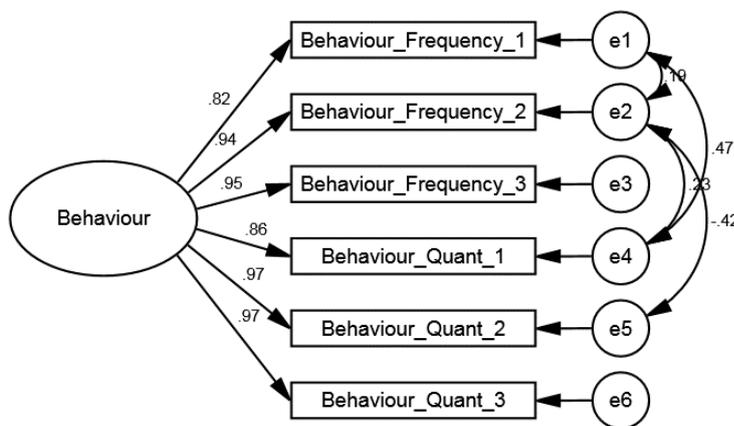
Behaviour (B)

The initial iteration of this scale exhibited bad fit ($\chi^2/df = 18.594$; CFI = 0.958; PCFI = 0.575; RMSEA = 0.207; $P[\text{rmsea} \leq 0.05] < 0.001$; AIC = 203.347; BCC = 203.972). Following the analytic guidelines established in the beginning of this section, the model was respecified in accordance to the MI's, with four

covariance paths between error terms being added to the model.

The fit for the respecified model was considered satisfactory or good depending on the index ($\chi^2/df = 4.182$; CFI = 0.996; PCFI = 0.332; RMSEA = 0.088; $P[\text{rmsea} \leq 0.05] < 0.05$; AIC = 64.911; BCC = 65.676). Factorial loadings were high on all manifest variables. Figure 8 represents the model.

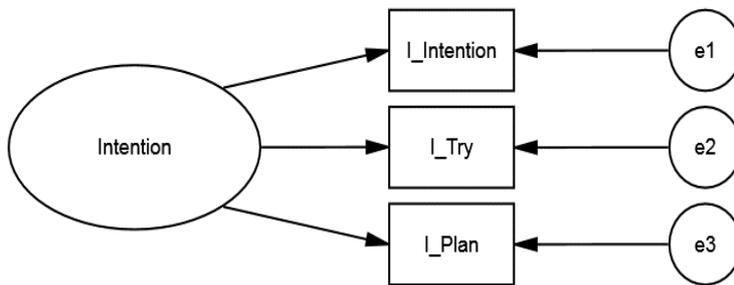
Figure 8. CFA for the Behaviour scale



Intention (I)

This scale only has 3 manifest variables. As a result, the specified model lacks sufficient degrees of freedom to allow probability testing, thus precluding the availability of fit indices and MI's. However, the factorial loadings are very good (see Figure 9).

Figure 9. CFA for the Intention scale

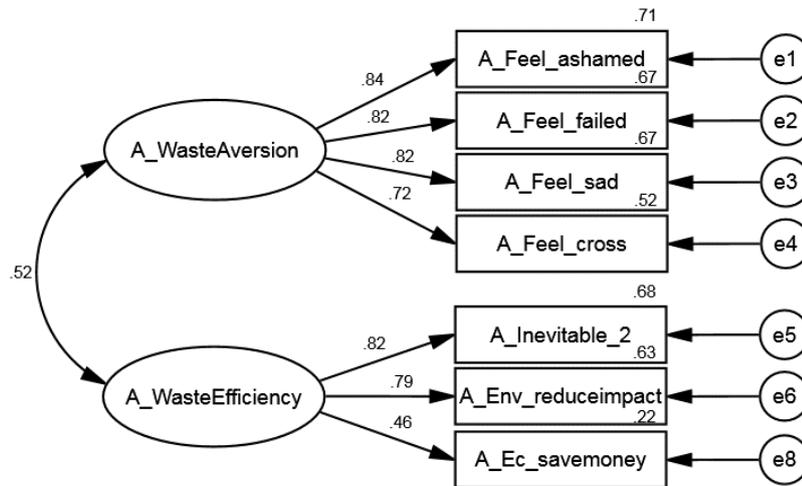


Attitude (A)

The initial three factor model of Attitude exhibited adequate fit ($\chi^2/df = 3.566$; CFI = 0.959; PCFI = 0.682; RMSEA = 0.079; $P[rmsea \leq 0.05] < 0.001$; AIC = 160.115; BCC = 161.383). However, potential for significant improvements were observed through MI analysis; furthermore, the latent variable A_WasteDisagreeableness indicated possible cross-loadings into the error terms of other factors.

During the respecification process, the A_WasteDisagreeableness term was removed entirely due to poor factorial loading into it (0.48), and the A_Ec_efficienthome manifest variable was removed from the A_WasteEfficiency latent. The A_Ec_savemoney variable exhibited a sub-par loading (0.46) in the final model, but it was considered that it should not be removed as the number of manifest variables in the A_WasteEfficiency latent variable was already too low. The respecification process resulted in dramatic gains to model fit ($\chi^2/df = 1.407$; CFI = 0.996; PCFI = 0.616; RMSEA = 0.031; $P[rmsea \leq 0.05] = 0.814$; AIC = 48.289; BCC = 48.886), with the fit now being considered excellent by most indicators. The respecified model is represented in Figure 10.

Figure 10. CFA for the Attitude scale

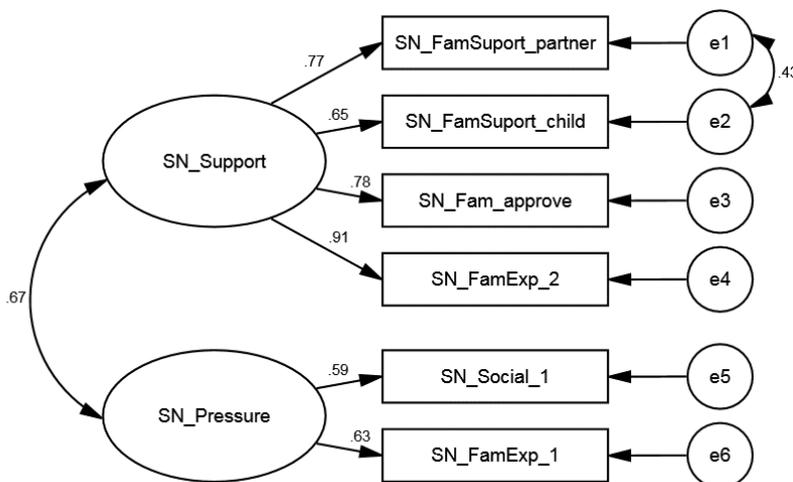


Subjective norms (SN)

Due to a large amount of missing data on the SN_FamSupport_child and SN_FamSupport_partner variables (expectedly, due to individuals without children or partners), this CFA was run on a database with only non-missing data, as this is a requirement for the analysis. No issues were noted during the CFA procedure as a result of this.

The initial two factor model of Subjective norms exhibited good fit ($X^2/df = 2.303$; CFI = 0.950; PCFI = 0.507; RMSEA = 0.125; $P[rmsea \leq 0.05] = 0.053$; AIC = 56.421; BCC = 59.876), but it was determined that a single added covariance would improve the fit even further. This minor change was implemented resulting in further gains to fit, now considered excellent ($X^2/df = 1.049$; CFI = 0.9998; PCFI = 0.466; RMSEA = 0.024; $P[rmsea \leq 0.05] = 0.535$; AIC = 47.342; BCC = 50.978). Factorial loadings were all in the acceptable range. As such, the final model is represented in Figure 11:

Figure 11. CFA for the Subjective Norms scale



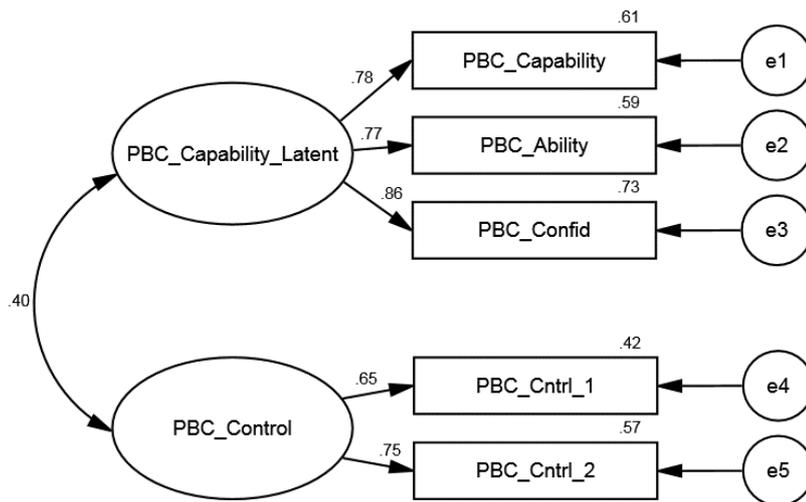
Perceived Behaviour Control (PBC)

The two factor structure specified based on the literature (Armitage & Conner, 2001) exhibited excellent fit on its initial iteration ($\chi^2/df = 1.653$; CFI = 0.996; PCFI = 0.398; RMSEA = 0.040; $P[\text{rmsea} \leq 0.05] = 0.5513$; AIC = 38.611; BCC =

= 39.086) and no respecification options were available by means of MI analysis.

The following figure (Figure 12) summarizes the model.

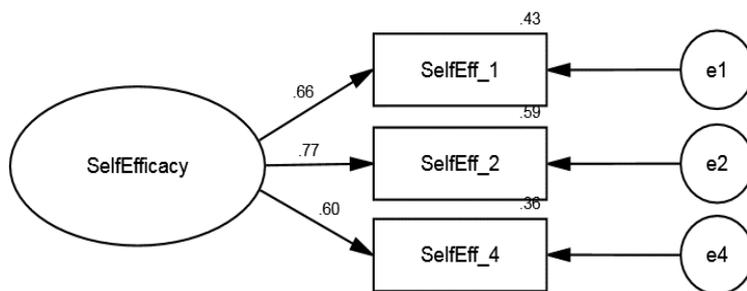
Figure 12. CFA for the Perceived Behavioural Control scale



Self-Efficacy (SelfEff)

This scale only has 3 manifest variables, and thus, the model lacks sufficient degrees of freedom to allow probability testing. As such, the analysis was limited to the observed factorial loadings. The Self-Efficacy scale was specified in accordance with the literature (Armitage and Conner, 2001b) Merriam and Tisdell, 2015 . The loadings were all within the acceptable range; as such, no further changes were carried out to the scale, which is represented in the following figure (Figure 13).

Figure 13. CFA for the Self-Efficacy scale

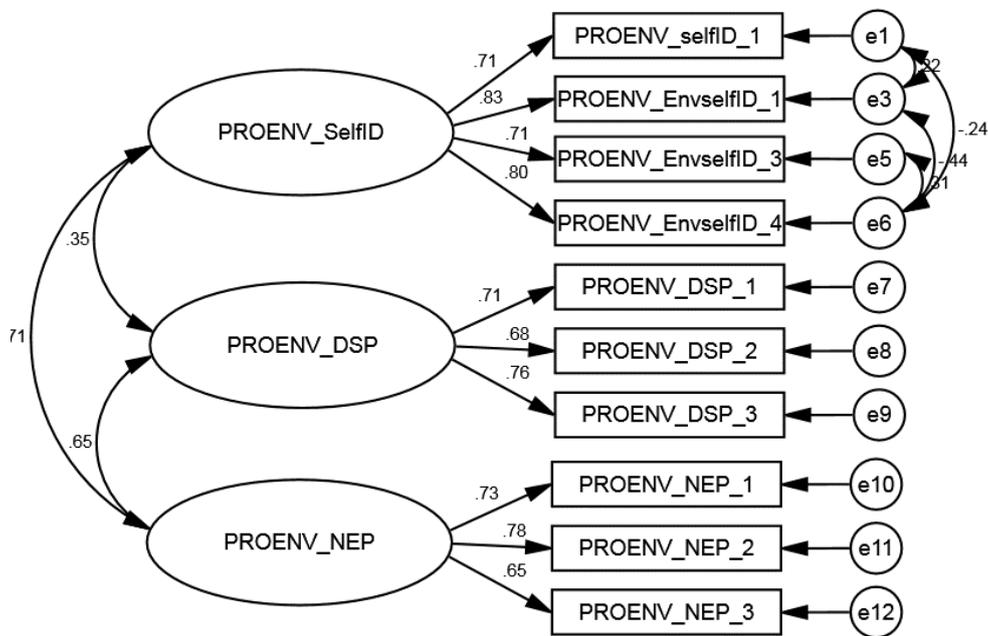


Pro-environmental identity (ProEnv)

The first iteration of this scale's model was specified based on previous validation exercises in the literature (Albrecht *et al.*, 1982, Cook *et al.*, 2002, Whitmarsh and O'Neill, 2010) resulted in a bad fit ($\chi^2/df = 8.470$; CFI = 0.811; PCFI = 0.549; RMSEA = 0.135; $P[\text{rmsea} \leq 0.05] < 0.001$; AIC = 485.973; BCC = 487.742). This resulted in the need for model respecification through MI evaluation. In a first iteration, only major (>40) MI changes were implemented. These largely concerned the reverse-coded items in the SelfID sub-scale, which also exhibited low loadings (< 0.40). These were removed and the model re-iterated. On a

second iteration, it was noted that there still a few viable MI changes, relating to error term covariances. These were implemented and the model again re-specified. The final iteration revealed a model with an adequate fit ($\chi^2/df = 2.873$; CFI = 0.969; PCFI = 0.603; RMSEA = 0.068; $P[\text{rmsea} \leq 0.05] < 0.05$; AIC = 134.431; BCC = 135.920). The following figure (Figure 14) summarizes the final model.

Figure 14. CFA for the Pro-Environment scale

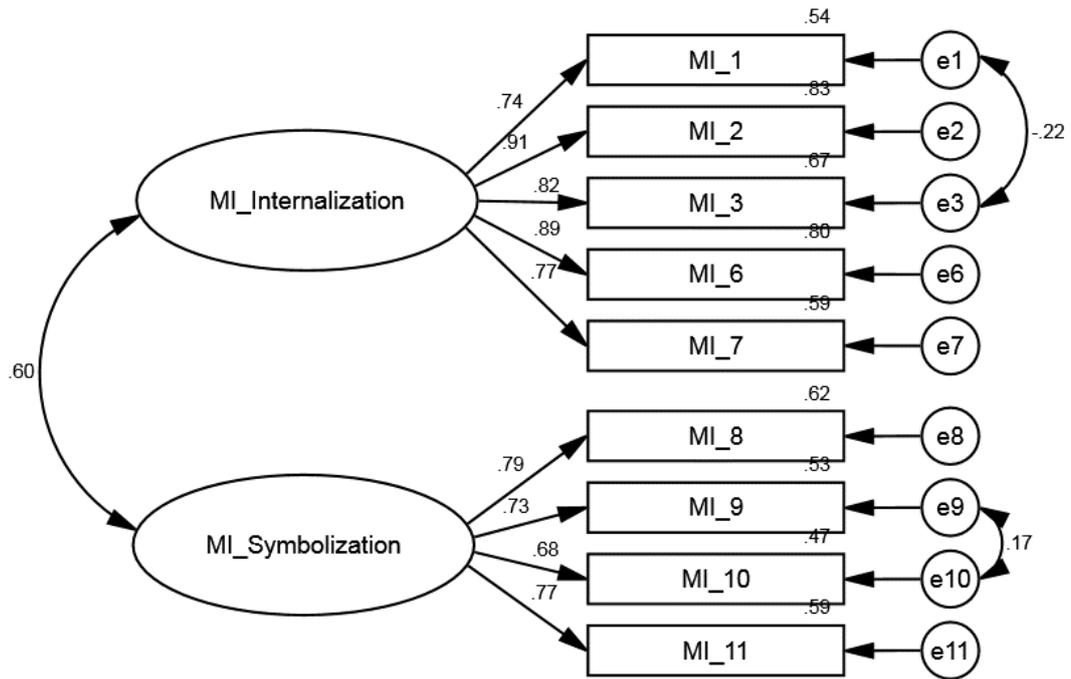


Moral Identity (MI)

The first iteration of the Moral Identity model replicated the structure obtained through the original article (Aquino and Reed II, 2002) and exhibited bad fit ($X^2/df = 7.124$; CFI = 0.896; PCFI = 0.566; RMSEA = 0.122; $P[\text{rmsea} \leq 0.05] < 0.001$; AIC = 352.317; BCC = 353.704). Respecification began by removal of the inverted items, MI_4_INV and MI_5_INV; not only were their loadings under the 0.50 threshold, but they were also accounting for a great deal of the MI recommendations. Further, covariances between error terms were specified whenever it was sensible to do so. The model was re-iterated, and MI's were evaluated again.

The new MI recommendations were largely based on cross-loadings, and could not be implemented as they would require specifying covariances between error terms related to different latent variables, or alternatively deleting of items. As the model fit was already satisfactory ($X^2/df = 2.970$; CFI = 0.979; PCFI = 0.652; RMSEA = 0.069; $P[\text{rmsea} \leq 0.05] < 0.05$; AIC = 113.272; BCC = 114.322), it was opted to maintain the model as it is rather than removing further items. Factor 1 contains items related to internal identification with the model person, and thus was labelled "MI_Internalization". Factor 2 contains items which relate to external identification, in the sense that the individual relates to the model person based on third parties and activities rather than through an internal compass; as such, it was labelled "MI_Symbolization". The final model is shown in the following figure (Figure 15).

Figure 15. CFA for the Moral Identity scale



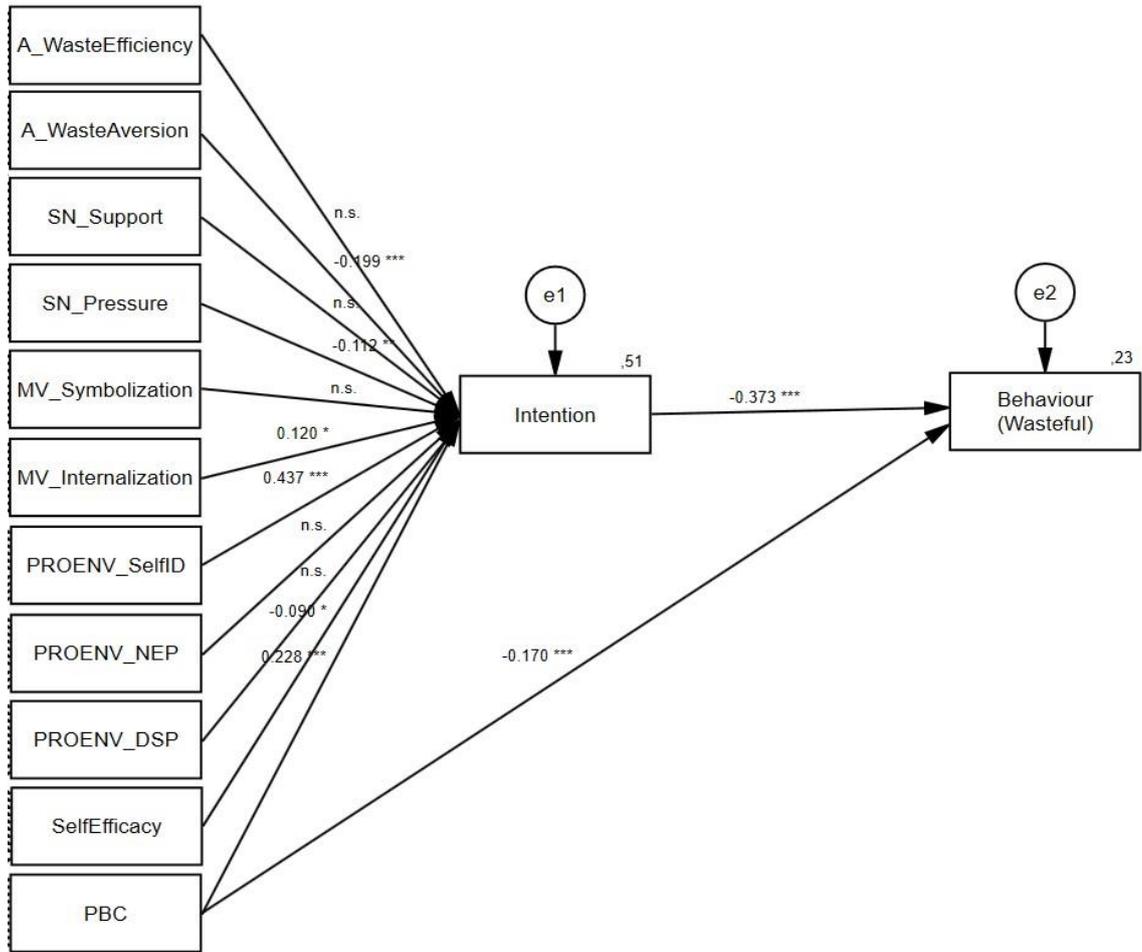
Path Analysis

Structural Equation Modelling (SEM) combines factor analysis and causal modelling, and it's often more complex than multiple regression in that it incorporates both latent factors and observed variables (Hox and Becher, 1998). As suggested by Schumacker and Lomax (2016), SEM follows an almost identical procedure to CFA, in that it incorporates specifications, estimation and modification stages. However, when the CFA measurement model has been effectively derived, modification to the measurement aspects (i.e. measurement parameters) of the model (i.e. factor loadings, error residuals, intercepts) do not need to be adjusted, as any changes are reserved for the structural parameters (i.e. the factor regressions between constructs) (Schumacker and Lomax, 2016).

In this analysis, the structural model to be tested was specified. Composite scores were computed based on the factorial weights extracted from the previous CFA analysis (DiStefano *et al.*, 2009). Only the second-order variables were considered, as the lower level factors added little to the analysis while significantly increasing its complexity. The procedure was as such. Initially, the conceptual model was specified; Maximum Likelihood (ML) was employed for this exercise as it is the most common and robust estimation method (Kline, 2011). The model assumed the possibility of indirect effects between PBC and Behaviour, which were tested using the bootstrap method (Kline, 2011).

After the initial model was specified, a further analysis was conducted to evaluate the moderating effects from the FPM variable. The FPM variable we used for grouping was a dummy type variable, with “1” indicating Low FPM groups and “2” indicating High FPM groups. This variable was computed using the procedure described in the EFA section, and discretization was conducted using the 50th percentile as a cutoff for the low and high groups. This allowed a multi-group analysis to be performed, with the goal of evaluating the moderating effect of FPM. The resulting model is represented in the following figure (Figure 16).

Figure 16. Path analysis for both groups (High and Low FPM)



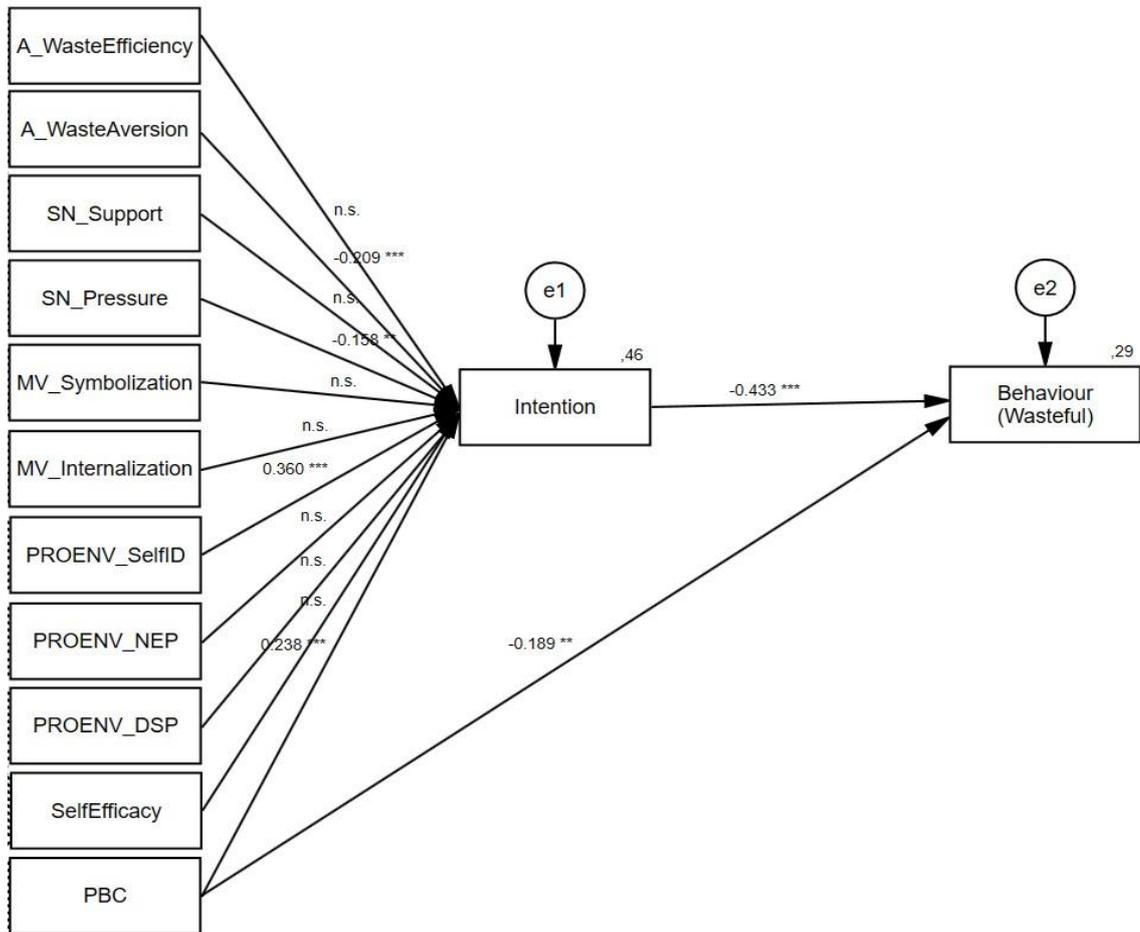
*Note: values indicate standardized regression coefficients. Latent variables “e” indicate disturbances. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

From this analysis, it is possible to observe that a considerable number of predictors have significant paths. Attitude, on its Waste Aversion dimension, is a significant and negative predictor of intentions ($B = -0.199$, $p < 0.001$). Although this may sound counter-intuitive, it can be a manifestation of social desirability bias (Picken, 2005). Self-identification with pro-environmentalism has a significant and positive impact on intentions ($B = 0.437$, $p < 0.001$). Self-efficacy is also significant, with a negative coefficient ($B = -0.090$, $p < 0.05$). Subjective norms (on their peer pressure aspect) is significant, with a negative coefficient ($B = -0.112$, $p < 0.01$). Moral Identity, on its Internalization dimension,

also exhibits significance with a positive coefficient ($B = 0.120, p < 0.05$). PBC is a significant predictor of intentions ($B = 0.228, p < 0.001$) and a negative predictor of Behaviour ($B = -0.170, p < 0.001$). Behaviour is coded in a manner where higher scores indicate more wasteful behaviour, thus explaining the negative coefficient. Intention is also a significant and negative predictor of Behaviour ($B = -0.373, p < 0.001$). This accounts for all direct effects. For indirect effects, i.e., the mediation effect, there is a significant indirect effect from PBC to Behaviour ($B = -0.085, p < 0.01$), that is – increases in the Intention score due to the PBC variable cause an indirect decrease of wasteful Behaviour.

The analysis proceeded to compare the Low and High FPM groups. First, let's observe the Low FPM mode, in the following figure (Figure 17).

Figure 17. Path analysis for the Low FPM group

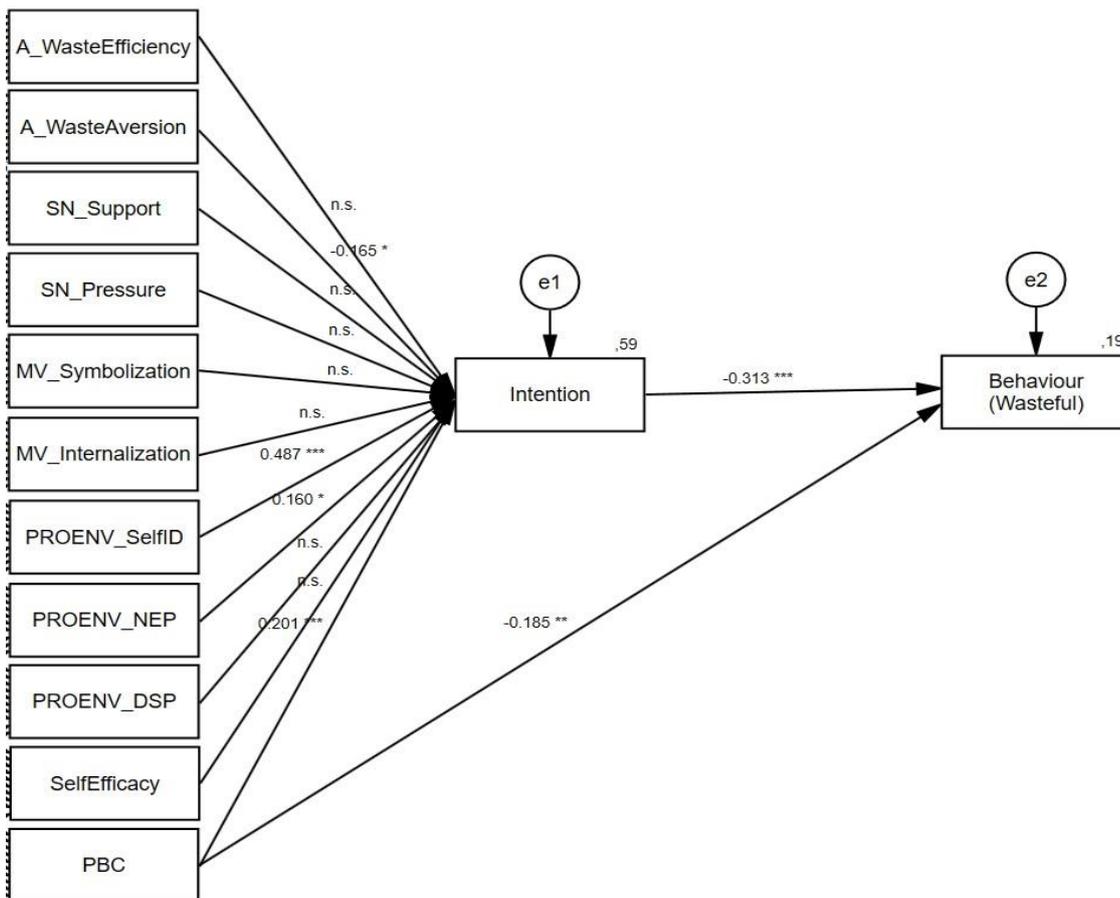


*Note: values indicate standardized regression coefficients. Latent variables “e” indicate disturbances. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

It is possible to observe that in the Low FPM group many of the trajectories are not significant. The notable ones are impacts from Attitude (Waste Aversion) on Intention ($B = -0.209$, $p < 0.001$), from Subjective norms (Pressure) to Intention ($B = -0.158$, $p < 0.05$), from PROENV_SelfID on Intention ($B = 0.360$, $p < 0.001$), from PBC on Intention ($B = 0.238$, $p < 0.001$), from PBC on Behaviour ($B = -0.189$, $p < 0.01$), and finally from Intention on Behaviour ($B = -0.433$, $p < 0.001$).

Next, the High FPM group model was analyzed: this is presented in the following figure (Figure 18).

Figure 18. Path analysis for the High FPM group



*Note: values indicate standardized regression coefficients. Latent variables “e” indicate disturbances. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

Again, notable differences can be observed from the path trajectories. Attitude (Waste Aversion) maintains its negative effect on Intention ($B = -0.165$, $p < 0.05$). PROENV_SelfID has a more pronounced impact ($B = 0.487$, $p < 0.001$). PBC has a positive impact on Intention ($B = 0.201$, $p < 0.001$) and a negative impact on Behaviour ($B = -0.185$, $p < 0.01$). Intention maintains a negative effect on Behaviour ($B = -0.313$, $p < 0.001$).

Regarding the mediation effect of Intention on PBC to Behaviour, it is still significant both on the Low FPM group ($B = -0.103$, $p < 0.01$) and High FPM group ($B = -0.063$, $p < 0.01$). Regarding the moderating effect of FPM on the Intention

to Behaviour path, the trajectory coefficient was tested for significant differences between groups using the critical ratios method. Calculating the Z-score for the differences between groups on this trajectory reveals that FPM does not have a moderating effect on the impact of Intentions on Behaviour ($Z = 0.773$, $p = 0.439$). At the model level, no significant trajectories can be detected between groups regarding the various path coefficients.

Regression Analysis

A final analysis was conducted on the Intention – Behaviour path in order to evaluate the effects of potential moderator variables, by means of an ANCOVA (Hair *et al.*, 2007) with interaction terms. This was conducted in a two-step manner; first, the model was specified with all variables concomitantly in order to identify significant interactions terms. For this evaluation, the omnibus test was considered. Following this, nested models were specified using the significant interaction terms in order to identify the relative differences between the levels of interaction. The results for the first level of analysis are reported in the following table (Table 29):

Table 29. Determinant effects on Behaviour

<i>Variables</i>	<i>df</i>	<i>F</i>	<i>p</i>
HomeType	4	3.228	0.013
Age	3	1.454	0.227
Gender	1	1.466	0.227
Income	6	1.082	0.372
Married	1	0.176	0.675
Child	1	0.640	0.424
Intention	1	10.054	0.002
Home_Type * Intention	4	2.690	0.031
Age_1 * Intention	3	0.399	0.754
Gender * Intention	1	0.950	0.330
Income * Intention	6	1.214	0.298
Married_1 * Intention	1	0.256	0.613
Child_1 * Intention	1	1.918	0.167
R²		0.445	

Based on the previous analysis, we can see that the only moderator with a significant interaction term is HomeType ($F(4, 376) = 2.690, p < 0.05$). The direct effects, expectedly, are also significant, both for HomeType ($F(4, 376) = 3.228, p < 0.05$) and Intention ($F(1, 376) = 10.054, p < 0.01$). The analysis proceeded with a nested-models ANCOVA using HomeType and Intention, which is shown in the following table (Table 30):

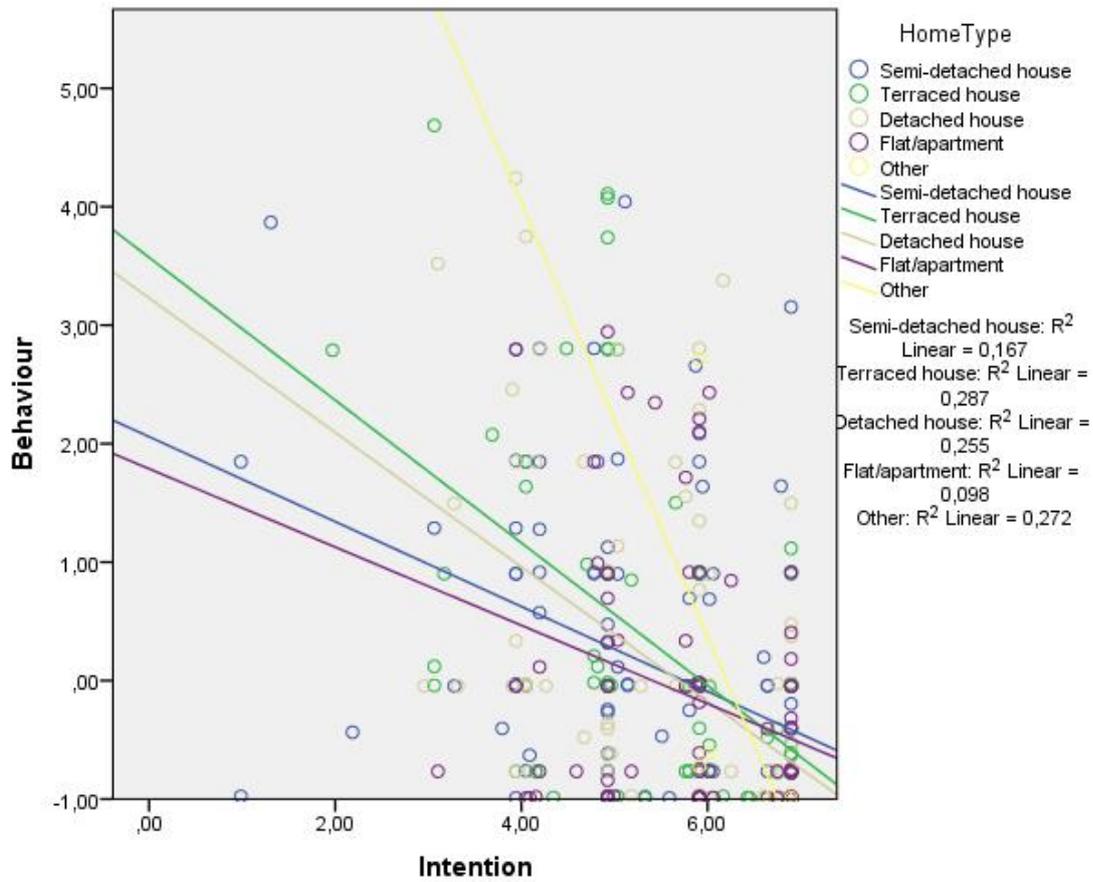
Table 30. Effects of Intention on Behaviour by home type nested models

<i>Variables</i>	<i>Coefficient</i>
HomeType	
Semi-detached house	11.357 (7.465)
Terraced house	3.572 *** (0.559)
Detached house	3.230 *** (0.560)
Flat/Apartment	1.788 ** (0.711)
Other	2.058 *** (0.416)
Intention * Semi-detached house	-1.831 (1.189)
Intention * Terraced house	-0.602 *** (0.096)
Intention * Detached house	-0.568 *** (0.096)
Intention * Flat/Apartment	-0.331 ** (0.118)
Intention * Other	-0.358 *** (0.073)
R ²	0.222

*Notes: *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors are shown in parenthesis.*

This analysis shows that the relative effect of Intention on Behaviour, although consistently negative, varies by the type of house. For participants in semi-detached houses, intention does not impact behavior at all ($t(5) = -1.540$, $p = 0.124$). All other models exhibit significant effects. Participants living in Terraced houses and Detached houses have the strongest effect of intention on behaviour ($B = -0.602$ and $B = -0.568$, respectively). The effect of Intention on Behaviour is less strong on participants living in flats or apartments ($B = -0.331$) and other types of houses ($B = -0.358$). The regression slopes by housing type can be observed in the following figure (Figure 19):

Figure 19. Scatterplot showing Intention versus Behaviour by home type



Note: it is important to consider that the “Other” category is only comprised of five participants, which accounts for the wildly differing slope of the regression line.

6.4 Hypotheses results

Based on the previous path analysis, the cause-effect relationships between latent constructs proposed in this study can be either accepted or dismissed. The previous analysis was divided into the assessment of the measurement model and that of the structural model, with the aim to conclude whether the proposed conceptual framework can be empirically confirmed. The following table (Table 31) provides an overview of the theorised hypothesis and whether these can be supported or not. Further, Table 32 offers an overview of the same hypotheses for each of the two groups, High and Low FPM.

Table 31. Hypothesised results

Hypothesis	Statement	Actual relationship between constructs
H1	The higher the level of an individual's attitudes towards not wasting food, the stronger the intention to reduce the food waste in the home.	H1a Waste Efficiency = N.S. H1b Waste Aversion = -ve
H2	The higher the level of an individual's subjective norms, the stronger the intention to reduce the food waste in the home.	H2a Support = N.S. H2b Pressure = -ve
H3	The higher the level of an individual's perceived behavioural control, the stronger the intention to reduce the food waste in the home.	H3a Capability = N.S. H3b Control = +ve
H4	The higher the level of an individual's self-efficacy, the stronger the intention to reduce the food waste in the home.	-ve
H5	The more positive the level of an individual's pro-environmental identity, the stronger the intention to reduce the food waste in the home.	H5a Self-identity = +ve H5b NEP = N.S. H5c DSP = N.S.
H6	The higher the level of an individual's moral identity, the stronger the intention to reduce the food waste.	H6a Symbolisation = N.S. H6b Internalization = +ve
H7	The higher the level of an individual's perceived behavioural control, the lower the level of food waste behaviour in the home.	H7a Capability = -ve H7b Control = +ve
H8	The higher the level of an individual's intention not to waste food, the lower the level of food waste behaviour in the home.	-ve
H9	Food planning management moderates the impact of intentions on behaviour.	N.S.

Table 32. Hypothesised results – High FPM and Low FPM groups

Hypothesis	Statement	High Actual relationship between constructs	Low Actual relationship between constructs
H1	The higher the level of an individual's attitudes towards not wasting food, the stronger the intention to reduce the food waste in the home.	H1a Waste Efficiency = N.S. H1b Waste Aversion = -ve	H1a Waste Efficiency = N.S. H1b Waste Aversion = -ve
H2	The higher the level of an individual's subjective norms, the stronger the intention to reduce the food waste in the home.	H2a Support = N.S. H2b Pressure = N.S.	H2a Support = N.S. H2b Pressure = -ve
H3	The higher the level of an individual's perceived behavioural control, the stronger the intention to reduce the food waste in the home.	H3a Capability = N.S. H3b Control = +ve	H3a Capability = N.S. H3b Control = N.S.
H4	The higher the level of an individual's self-efficacy, the stronger the intention to reduce the food waste in the home.	N.S.	N.S.
H5	The more positive the level of an individual's pro-environmental identity, the stronger the intention to reduce the food waste in the home.	H5a Self-identity = +ve H5b NEP = +ve H5c DSP = N.S.	H5a Self-identity = +ve H5b NEP = N.S. H5c DSP = N.S.
H6	The higher the level of an individual's moral identity, the stronger the intention to reduce the food waste.	H6a Symbolisation = N.S. H6b Internalization = N.S.	H6a Symbolisation = N.S. H6b Internalization = N.S.
H7	The higher the level of an individual's perceived behavioural control, the lower the level of food waste behaviour in the home.	H7a Capability = +ve H7b Control = -ve	H7a Capability = N.S. H7b Control = -ve
H8	The higher the level of an individual's intention not to waste food, the lower the level of food waste behaviour in the home.	-ve	-ve

As it can be noted in Table 31, a number of hypothesised relationships were supported by the model. The Waste Aversion aspect of Attitudes has a negative, significant effect on an individual's intentions not to waste food. This can not only be a manifestation of the social desirability bias as mentioned earlier but also be explained as being the result of attitudes having been expressed as negative (i.e. feelings of shame, anger, etc.). Therefore, negative attitudes are expected to show an inverse relationship. A similar negative relation is also shown between the pressure aspect of Social Norms and intentions, which contradicts the theorised relationship. The results here suggest that the higher the social pressure from significant others to perform, the less likely that individual intention to reduce the amount of food waste will increase. Another relationship that did not behave as expected is captured by H4. It was expected the Self-efficacy would directly and positively influence individuals' intentions not to waste food in the home, however, the model shows that the influence is significant but negative.

When the participants were grouped according to their level of FPM, into High and Low groups, there were several differences in the theorised relationships. One such difference was the lack of Social Norm influences on individuals' intention not to waste in the High FPM group, and of the PBC influence on intentions not to waste food in the home for the Low FPM group. In terms of the indirect effect, the Capability aspect of the PBC was not significant for the Low FPM group but positive and significant for the High FPM group. A similar situation holds for the Self-identity aspect of the Pro-environmental Identity factor.

Regarding the moderating effect of FPM on the Intention to Behaviour path, the trajectory coefficient was tested for significant differences between groups using the critical ratios method (Maroco, 2003). Calculating the Z-score for the

differences between groups on this trajectory reveals that FPM does not have a moderating effect on the impact of Intentions on Behaviour ($Z = -0.767$, $p = 0.443$). At the model level, the only trajectory which exhibits significantly different trajectories between models is the PROENV on Intention trajectory ($Z = 2.343$, $p < 0.01$), which, as previously noted, is much stronger on the High FPM than on the Low FPM group.

6.5 Summary

In this chapter, the justification for the quantitative data collection has been included. The design of the survey has also been detailed, as well as the measures to collect the necessary data, with a focus on several constructs: food waste behaviour, behavioural individual, attitudes towards food waste, subjective norms, perceived behavioural control, the notion of self-efficacy, the pro-environmental and moral identities. Quantitative analysis indicated the participants' assessments concerning their place, style and frequency of shopping and planning management in pre-shopping, shopping and post-shopping stages were examined in terms of their behavioural characteristics. It was seen that the majority of respondents did main shop rather than top up shop or online supermarkets mostly once a week. It was found out that the participants some of them planned before shopping, stored in a freezer and considered the use by and best before expiration dates. Results of SEM indicated that the scale of Behaviour had a single factor that measures quantity and frequency, Scale of Intention also had a single factor that measures Intention, Try, and Plan, Scale of Attitude had two factors, Waste Aversion and Waste Efficiency, Scale of Subjective Norms had two factors, Pressure and Support,

Scale of Perceived Behavioural Control had one factor measuring PBC Capability, Scale of Self-Efficacy had single factor, and Pro-environmental Identity had two factors, Pro-Environment and Environment and Scale Moral Identity had two factors Internal and External while Analysis of the scale of Food Planning Management revealed that the items represented mostly count data and so it was unsuitable for an EFA analysis. In addition, CFA revealed that factor loadings for all scales were very good, and they were all in the acceptable range. On the other hand, Path Analysis showed that Waste Aversion dimension of attitude was a significant and negative predictor of intentions while Self-identification with Pro-environmentalism had a significant and positive impact on intention. Self-efficacy also had a significant negative effect and Moral Identity, on its Internalization dimension, exhibited a significant positive effect on Intention while Behaviour was a negative coefficient. The Intention was also a significant and negative predictor of Behaviour.

The quantitative analysis was also conducted to compare the Low and High FPM groups. In terms of Low FPM mode, Waste Aversion, Pressure had negative significant effects on Intention while Pro-environment had a positive effect on Intention. The analysis also indicated that PBC and Intention had a negative significant effect on Behaviour. On the other hand, Waste Aversion and Pro-environment had a negative effect on Intention whereas PBC had a positive effect on Intention and negative effect on Behaviour, and Intention maintained a negative effect on Behaviour. Finally, regression analysis was conducted by means of an ANCOVA on the Intention – Behaviour to evaluate the effects of potential moderator variables. It was found out that the only moderator with a significant interaction was Home Type.

Chapter 7 Discussion of Findings

7.1 Introduction

In the literature review for this study, a conceptual model was derived to explain the factors affecting food waste behaviours in the home. The model was supported using qualitative data and tested quantitatively. The quantitative procedures included exploratory and confirmatory factor analysis, structural equation modelling and regression analysis, to evaluate the effects of potential moderator variables. This chapter integrates the qualitative with the quantitative findings and discusses the factors affecting household food waste behaviours contained in the conceptual framework: attitudes, social norms, perceived behavioural control, self-efficacy, pro-environmental identity, moral identity, intentions and behaviours. In specific, this chapter is structured to provide a discussion surrounding each of the research objectives. As such, attention is first given to establishing the nature and incidence of food waste behaviours in the home (Research Objective 1). Secondly, the proposed model is discussed with an emphasis on recognising the factors influencing food waste behaviours in the home (Research Objective 2) and those that have an impact on the intention to reduce food waste at home (Research Objective 3). Following, the discussion is looking to offer a better understanding of the factors affecting the gap between intention and behaviour that individuals exhibit related to food waste within the home. (Research Objective 4).

7.2 Research Objective 1

The first research objective proposed for this study is looking at establishing the

nature and incidence of food waste behaviours in the home. The data collected in this study indicate that the factors that influence food waste behaviour in the house differ noticeably across and between households. Whilst some participants stated that the most important aspect is the lack of individual understanding of what actually happens with the food that is wasted, others blamed fellow housemates for a general lack of awareness, and viewed these individuals as actually responsible for creating the majority of food waste within a household:

'I would say food waste stands for...the habits of my housemates... One of them, for example, will cook something, like a big pan, and leave it for a couple of days. But he doesn't put it away...he just leaves it there on the side. And then he leaves, and he comes back home 2 days later! It just kind of gets left and then in a couple of days there's mould all over it. This happens all the time. And so there is a lot of food waste in my house!' (FG1)

Ofei *et al.* (2015) also found that both external and internal awareness were significant factors regarding the levels of food waste generation. In addition, Parr (2013) suggested that a higher level of awareness contributes directly to the large amounts of food that end up being wasted (Heval, 2016; Quested *et al.*, 2013). The role of information in producing knowledge has been shown to raise the levels of awareness, which in return can change human behaviour in particular circumstances (Schwartz, 1977; Denisov & Christoffersen, 2001; van Birgelen *et al.*, 2009). Therefore, if new relevant information is provided, this might change an individual's level of awareness concerning the outcome of their behaviour, which may place a certain level of pressure on the person to conduct the behaviour (Godfrey, 2012). Indeed, this study's findings support

previous research which suggests that people with a strong awareness of the waste problem are actually more likely to display a willingness to decrease their waste at home (Barr, 2007).

On the other hand, Law (2013) put forward that there was no evidence to support this argument that people who have a higher level of awareness generate less food waste. It was also indicated by Moh and Manaf (2014) that people would not, in fact, exhibit a greater level of waste recycling behaviour, and waste less food, even if they had a clear understanding and a high level of awareness. The argument here is that food waste reduction activities are initiated by ongoing, intricate processes, therefore raising individuals' level of awareness may not alter these processes in practice (Meah and Watson, 2013).

In terms of age, there was no difference in this study participants' views regarding cooking skills and the amount of food waste generated by the household. Retired participants emphasised that the lack of cooking skills is perhaps one of the main contributors to the problem of food waste, alongside the availability of ready meals:

'I think there's a decline in cooking skills. You've talked about ways of using your bananas and you know, things that you can sort of make, like bubble and squeak and everything. I don't think my daughter makes that ...- well, she knows how to do it, but she doesn't do it! She doesn't say, 'I've got so and so in the fridge. I've got to do something with it.' I think that's all media, sort of 'Buy this product'. And so they tend not to cook from scratch.' (FG4)

The student participants also contemplated the lack of cooking skills as having a potentially significant effect on the amount of food wasted at home:

'The other thing that I noticed is that people's level of cooking. I've been taught you can use that bit of the veg; you don't need to throw it away! There's a question of how much people cook now and use their ingredients. Even I thought I would throw that away and my mates went like 'What are you doing? You can use that', and I've been like 'Really?' they just like 'Yes, it just looks a bit scraggy, but it's fine...' (FG1)

Several other studies support this study's finding that lack of knowledge on using food efficiently, like cooking with available ingredients or making the most of leftovers, may increase the food waste home (Monier *et al.*, 2010). Romani *et al.* (2018) also associated cooking more efficiently with a lower level of food waste at home. Notably, in the post-shopping stage in the UK, many people confessed that they are not good at cooking, so they have a clear difficulty cooking or preparing only the amount of food that is needed for their household, and so they frequently end up cooking portions that are too large (WRAP, 2007). Moreover, individuals see food waste as being a result of consumption from which they cannot refrain from. This, coupled with the difficulties they have in cooking and buying only the required amount, is one aspect of what leads to higher quantities of food being thrown away. When food is not used timely, cooking and preparing too much food causes people to create food waste. Therefore, better cooking and shopping skills will probably lead to a decrease in the amount of food waste generated at the household level.

Some participants revealed that long working hours was the leading cause for waste, and others confessed that they felt too tired at the end of the working day to use the food that had been bought specifically for cooking with. Instead, they

chose to eat ready meals or takeaways, and therefore, the food that was planned to be consumed inevitably ends up in the bin:

'...I always buy fresh fish with the intention of eating it and then suddenly I will be at work until nine o'clock at night and then I get home and I am like, 'I cannot be bothered to cook' and by the time I go to open it I am like, 'Ugh'. You know when it has got THAT smell, and I am like, 'That is going in the bin'. Because you cannot risk it. But it annoys me so much when I do it, but I do not like to buy frozen fish, so it is tricky.' (FG2)

'That is a really good point though about work, because I work in [...] as well, so by the time I have travelled all the way back and if it's been a late finish, that lovely fresh meal that I had planned at the beginning of the day is out the window and it is frozen chips you know. So that does cause a lot of waste.' (FG5)

Yildirim *et al.* (2016) support this study's results that everyday life and working conditions could be directly related to food wastage. Their study suggested that working conditions are significant factors that shape individuals' behaviour and attitudes towards food waste, and consequently affect the amount and frequency of wasted food in the home. Owing to the fact that individuals that work long hours can have a more consumerist mindset with a faster pace of life, they might buy more food than they need, and therefore they waste more than others.

Furthermore, it was found in this study that situational factors, such as lack of storage space and lack of planning, are critical factors that do cause food waste at home. Raquel *et al.* (2018) indicated the lack of storage as one of the main factors with a bearing on food waste at home. WRAP (2007) included lack of planning as one of the main reasons of food waste at home, and Koivupuro *et*

al. (2012) suggested that is the lack of planning at the shopping stage often leads to buying more than needed, both intentional and unintentional. Additionally, the lack of planning frequently causes either overstocking or overpreparation of food (Hebrok & Boks, 2017). Indeed, if a person plans his or her meal, he or she may also plan shopping and cooking better; therefore, less food may be wasted (Romani *et al.*, 2017; Quested *et al.*, 2013).

Another outcome of the study concerning food waste at home is the apparent confusion about the use-by and best-before dates, used by food producers and retailers to label food products. This confusion has been shown here to have a direct effect on the amount of food wasted at home. While some of the participants said that they did not care about dates concerning consumption, many others admitted as often using them as an only guide when deciding whether or not the food was still safe to eat. For example, mothers in the study disclosed that they did not purposely feed their children food with labels near these dates; nevertheless, they confessed they still ate these foods themselves. In a study by Williams *et al.* (2012), it is also stated that the participants wasted food because they passed the best before date. However, some of the participants in this study stated that they wasted food less due to best before dates. One of the reasons might be that those participants smell, taste and try the food to a greater extent, or it might be due to better planning. In addition, Quested and Johnson (2009) focused on household food and drink waste in the UK and underlined that food and drinks were disposed of due to a date label (e.g. use by, or best before date). This may be because consumers keep the food in the fridge or storage too long and subsequently, it becomes unsuitable for eating (Yildirim *et al.*, 2016). It may also be due to the fact that

consumers may have difficulty in understanding complex 'use by' or 'best before' food dates labelling.

Food producers and most supermarkets were also accused of constantly running too many, and often very confusing, offers on food products like 'buy one get one free' or 'buy bigger packets'. Actually, several individuals specified that supermarket offers were one of the most important contributing factors to food waste within the household. The views of participants allude to social marketing approach and describe systematic procedures, which are based on commercial marketing techniques that try to 'sell' behavioural change (Kotler and Lee, 2008) as if they are a material object. These approaches have a widespread appeal for representatives and shareholders as they should set measurable goals and develop promotional tools for diverse target audiences (Landis, 2005). Social cognitive learning (Bandura, 1977) suggests that people can learn by means of observation, imitation, and reinforcement. In light of this suggestion, it can be concluded that repetitive and constantly marketing campaigns reinforce people's consumption behaviours through wisely targeted promoting, advertising, training and persuasion (Kotler and Lee, 2008), and therefore many individuals usually buy more than they need, which causes them to waste food more by default.

During the focus group discussions, it was further highlighted that children's influence within the home appeared to be very important. Some of the participants stated that children were the primary drives for the rest of the household to gain awareness about the issue of food waste within their own households:

'...my daughter, she's the voice of our conscience around our house. Yes, she's very active and gets very upset about waste. When she does come shopping with

us, it's all a very ethical problem! I mean, she's the main driving force...' (FG3)

Gearhardt and Brownell (2013b) and WRAP (2013) also argued that the presence of children is, in reality, a much stronger influencer of food waste at home than previously recognised. This study differs from previous research in that children were also seen as having a positive effect (such as driving the levels of awareness in the household about the food waste problem); the model tested in this study showed no moderation effect for children. Yet, some participants, in particular the retired ones, admitted to purposely buying more food than necessary when they knew that grandchildren were visiting. Previous evidence suggests that parents and grandparents often buy more than is required in order to offer a wide selection of food for the children, even though it means some of it may be wasted, and many times intentionally cooking more than needed, so that second helpings are always available (WRAP 2014).

It was recognized in this study that younger individuals' food waste behaviour occurred mostly due to over preparation and because they did not use leftovers, whilst the older ones admitted that they were not comfortable using food that 'smelled or looked off'. In parallel with the above view, van Garde and Woodburn(1987) and Brook Lyndhurst (2007) found that age was negatively correlated with the quantity of food wasted. Younger people were found to waste the most, whilst older people generated a smaller amount of food waste. Contrary to popular opinion, research (WRAP, 2007; WRAP & Women's Institute, 2008) seems to suggest that older people waste as much food as younger people on per capita basis, although they might appear to waste less due to smaller household sizes. Further studies in the UK (Brook Lyndhurst, 2007; Dowler,

1977) and also Australia (Hamilton, Denniss & Baker, 2005) suggests that young people waste more than older people, given the fact that generally older people live alone or with few people. The model tested in this study showed no moderation effect of age.

7.3 Research Objective 2

The second research objective for this study looks at identifying the factors that may influence food waste behaviour in the home. Within the scope of Research Objective 2, participants' statements concerning their food waste behaviours are presented and discussed, taking the present literature into account. From the analysis, it was established that most respondents participated in the main shop once a week to purchase almost all of their food. A few participants went for a top-up shop to supermarkets or local shops, while only a small percentage preferred the online supermarkets over the physical store. Similar to the findings of this study, most UK households usually undertake a weekly main shop, followed by two or three top-up shops. The frequency of shopping is essential, as studies have shown that it has an influence on food waste behaviours (WRAP 2007). Equally, other studies indicate that frequent food shopping may encourage more impulsive purchasing, thus leading to more wastage because people who shop daily are tempted by market campaigns more often. A report by Brook Lyndhurst (2007) also recognised that the pattern of shopping is associated with the amount of food waste at home, however, it suggested that shopping more often causes less food waste, as individuals only buy what they needed for an exact day. In conclusion, consumers are tempted by special offers to buy too much food or by other food due to top-up

or spontaneous shops, which increases the possibility that food will reach its use by date and therefore end up being thrown away.

Another inference concerning the main shopping is that some people tend to buy more variety of food products when they go food shopping for multiple days in advance, compared to people who buy food more frequently. This is supported by the view that people search for more variety in a simultaneous choice scenario than in a sequential choice situation (Read and Loewenstein, 1995, Read *et al.*, 2001). Further, if people purchase a more extensive variety of a product on simultaneous choice occasions, the amount of food waste amounts has been shown to increase.

The analysis also highlighted that nearly half of the participants check the amount of existing food in the house before going food shopping. Others mentioned that they wrote shopping lists and purchased most or some items in the list, while few of participants admitted that they did not use a shopping list and instead decided what and how much to buy while shopping. On the other hand, some of the participants also recognised that they bought some extra items which were not on their shopping list. It is suggested by this study that, largely, shopping lists prevent buying too much and help to decrease food waste. Consistent with this study, Yildirim *et al.*, (2016) found that the participants threw food in the bin because they bought too much of the items which were not on the shopping list. Evans (2011) also suggested that many consumers regularly buy too much food every week and then attempt to consume all of the food that they have bought. Furthermore, studies have shown that buying too much food leads to food being thrown away (Nordsvén, 2017, Lannsjö and Viggedal, 2012, Koivupuro *et al.*,

2012). Also, people are inclined to buy too much food when they have friends or family coming for dinner, because they are afraid that there might not be enough to eat and therefore end up not being considered a good host (Law, 2013). Earlier, Cox and Downing (2007) argued that people buy too much of the same food because they are tempted by special offers, which can turn into a situation where much of the food will reach its use by date, and this inevitably increases the likelihood that food will end up in the bin.

A few participants recognised their seasonality of waste behaviour, with some likely to throw away more food in the summer, whilst others found that winter was the time when a particular type of food (i.e. salad) was more probable to end up in the bin. Similar to views expressed by this study's participants, Chan (2018) asserts that there might be differences in terms of seasonality. That is, a food waste analysis may yield a different composition of food groups that are thrown away depending on whether it is the summer or winter. Comparable results came from a project on food waste by WRAP (2009) conducted in the autumn months (between September and November). This particular study recognised that seasonality had some impact on the results of food and drinks purchases.

Seasonality had the main impact on certain types of fresh produce (e.g. soft fruit such as strawberries) which is, in fact, a significant proportion of the total food wasted by UK households. It is also highlighted by several studies that seasonality was one of the significant factors that had a primary influence on food waste quantity at home because it primarily affects consumption patterns. For example, particular types of food are eaten on holidays like Christmas (Mitaftsi, 2008). Similarly, garden waste production might naturally increase in the

spring and summer period when it is compared to the winter, which is returned in the amount and composition of waste at home (DEFRA, 2004).

Concerning the type of food that was most likely to be wasted, the analysis identified that bread, vegetables and fruits were most likely to end up in the bin, as well as salad and milk (and other dairy products, such as your goods, cream, cheese). There is, however, a substantial lack of research with regard to what type of food is mostly wasted in households, there have been a few attempts to identify the type of food that is wasted most by households. For example, and similar to comments by participants in this study, fruits like bananas and apples, and vegetables like tomatoes and potatoes, were the most wasted vegetables amid the other types of food (Cronjé *et al.*, 2018). Quested *et al.* (2013) identified that the types of food wasted most in the home were bread, apples and meat. Recent research by Nordsven (2017) showed that bread, vegetables and fruits were the most common product categories that were wasted at home during a standard week. Indeed, the majority of participants in this study stated bread as one of the most wasted food type. It was also suggested by this study's participants that sometimes people throw away fruits and vegetables because the shelf-life is affected extensively by inaccurate storing circumstances. When stored inappropriately, the growth of mould and bacteria inevitably causes food to deteriorate (Lannsjö & Viggedal, 2012, Silvennoinen *et al.* 2014).

This study did not find any noticeable differences between respondents' sociodemographic classification and the particular type of food that was most likely to end up being wasted. Likewise, Chan (2018) concluded that socio-

demographic variables such as gender, marital status, ethnicity and income status do not have an impact on the type of food wasted at home. Koivupuro (2011) noticed no correlation between food waste behaviour and demographical variables investigated, like the age of the eldest person in the household; region, form and type of residence; educational level and shopping, food preparation and eating habits. On the other hand, Stewart (2011) argued that sociodemographic factors, in specific age, gender, ethnicity and education, account for food waste behaviour. Similarly, WRAP (2006) identified that younger families commonly wasted more food at home than other age groups, in terms of food that was already prepared (i.e. leftovers).

7.4 Research Objective 3

This study's third research objective was to establish the factors that have an impact on the intention to reduce food waste in the home. Specifically, the aim was to investigate if Attitude, Moral Identity, Subjective Norms, Pro-Environmental Identity, Self-Efficacy and Perceived Behaviour Control had an effect on the individuals' intention to not waste food in the home, and ultimately their behaviour. It was established that Attitude, on its Waste Aversion dimension, Self-efficacy and Subjective Norms were significant and negative predictors of intentions.

Attitude was found in this study to have a significant negative effect on Intention, which was explained as a manifestation of social desirability bias by Pickens (2005). Supporting the outcome of this study, earlier research by Schwartz (1977) also proposed that an individual's attitude is one of the main predictors of

Intention. Indeed, the results of several previous studies indicate that Attitude determines Intention not to waste food in the home (Ayob *et al.*, 2017; Cheema and Soman, 2006; Cook *et al.*, 2002; Parker *et al.*, 1995; Manstead and Parker, 1995; Manstead, 2000; Parker *et al.*, 1996). Other researchers have also put forward that the more favourable the Attitudes towards a particular behaviour, the stronger an individual's Intention to perform that behaviour (Maio & Olson, 1995). Overall, this means that strong personal attitudes opposing food waste are related to a higher intention to avoid food waste (Visschers *et al.*, 2016), given that an attitude reflects a favourable or unfavourable psychological tendency stated by an individual in developing personal intentions. The indication of the significance of attitudes concerning food waste is provided by studies investigating wasteful consumption in the UK and Australia. The results of these studies suggested that the majority of the Australian respondents (Hamilton, Denniss *et al.* 2005) and some of the British participants (WRAP, 2014) felt either bothered or guilty when they threw food away when they engaged in food waste behaviour. In this study, the waste aversion aspect was found to affect intentions not to waste food in the home. In particular, those individuals who felt ashamed, sad or even cross with themselves when throwing food in the bin were the ones found to have a higher level of intention not to waste. Similarly, those individuals who felt that they failed when wasting food that has not been consumed in time exhibited a high level of intention not to waste food in the home.

Subjective Norm was found to be a significant predictor of the Intention on its peer pressure aspect, in specific the family expectations and social pressures. This applies to all participants in the study, however when individuals were split according to their Food Planning Management score (i.e. High and Low), this

result only applied to the Low FPM group. For those participants who exhibited higher planning efforts during the three stages of FPM (i.e. pre-shopping, during shopping, post-shopping), social norm influences were not found to be relevant in the food waste reduction behaviour context. This could be explained as a result of this group already having strong food planning habits in place, therefore, are less likely to be influenced by their significant others. On the other hand, those individuals who exhibit a low level of food planning could be more easily influenced by pressure from their reference circle. The interesting point here is that the analysis suggests a negative influence, which might be explained as due to an innate reluctance to listen and follow friends' and family' advice if this is perceived as pressure. The results seem to suggest that the higher the social pressure from significant others to perform, the less likely that individual intention to reduce the amount of food waste will increase.

Earlier studies did suggest that Subjective Norm was consistently a weak predictor of behavioural intentions (Ajzen 1991, Terry & White 1996). Furthermore, various research established that Subjective Norms were frequently found to hold the weakest relationship with behavioural Intention in the application of the Theory of Planned Behaviour (Klein & Boster, 2006; Dohnke *et al.*, 2011). Nevertheless, and contrary to this study's findings, the suggestions from both Cheema and Soman (2006) and Cook *et al.* (2002) highlight that Subjective Norms were significant in determining intention. As a broadly accepted opinion, it is implied that the more favourable the subjective norms with respect to a behaviour, the stronger should be a person's intention to do the behaviour under consideration (Ajzen, 1991), which will result in intention to influence behaviour through the subjective norm (Ayob *et al.*, 2011).

The extended TPB model accounted for a significant amount of the variance in intention with Subjective Norm as a linear predictor (Graham Rowe, Jessop & Sparks, 2016). Maio & Olson (1995) also indicated that Subjective Norms influence Intentions, as the TPB proposes that Subjective Norms will lead to a stronger Intention to perform the desired behaviour (Sheehan *et al.* 1996 and Thorbjørnsen *et al.*, 2007) and, even further, might be able to provide a powerful mechanism to influence individuals' Intentions (Thorbjørnsen *et al.*, 2007, Bolman and de Vries, 1998). Contrary to this study's outcomes, Terry *et al.* (1999) found out that Subjective Norms were positively associated with intentions – except only for people who identify strongly with the group, where the influence of subjective norms on intentions was moderated by social identity.

This research yielded Self-efficacy as a significant negative predictor of intention overall. Likewise, previous research indicated that Self-efficacy has a significant effect on intention (de Vries *et al.* 1988, Bandyra, 1992, Terry 1993). In fact, Godfrey *et al.* (2012) further proposed that a person's view about the difficulty of conducting a behaviour, alongside other related factors, might either facilitate or hinder his or her performance of the desired behaviour. Consequently, it is estimated that people's intention to reduce the amount of food that they waste in the home is related to their individual level of self-efficacy. Self-efficacy influences individuals' perceptions based on internal control factors; therefore, their self-esteem in their own ability to reduce the amount of food wasted in the home positively facilitates the person's performance. In this study, individuals strongly believed that, if they wanted to, they could easily reduce the amount of food currently wasted in the home, however, this

decision is dependent on individual confidence in own ability. The findings of this study, however, seem to suggest an inverse relationship. The more confident individuals feel in their own ability, the less they intend to reduce food waste in the home. This could be explained as these individuals simply avoiding the intention stage, as they would not consider the food waste, but simply perform the behaviour.

On the other hand, the PBC Control, the Self-identity aspect of the Pro-environmental Identity, and Moral Identity on its Internalization dimension exhibited a significant and positive impact on Intentions to reduce the amount of food waste.

For this study, the Control aspect of the Perceived Behavioural Control was the one factor to have a positive and significant effect on the individuals' Intentions to reduce the amount of food waste in the home. This was shown to be the case for the whole group of respondents; however, when investigated further, it was revealed that this was only the case with the High FPM group. Therefore, this suggests that those individuals who already have strong food planning habits in place are more inclined to firmly believe they have a significant amount of personal control over reducing the amount of food currently being wasted by their household. On the other hand, those individuals who admitted to lower food planning activities do not see themselves as being capable of reducing the amount of food waste at home. Supporting the outcome of this study, research by Schwartz (1977) suggests that Perceived Behavioural Control is one of the main predictors of individual Intentions. Additionally, Cheema and Soman (2006) and Cook *et al.* (2002) found that Perceived

Behavioural Control was significant in determining Intention.

In addition, a recent study by Lorenz *et al.* (2017) also put forward that behavioural Intention regarding food leftover behaviour seems to be significantly determined by individuals' Perceived Behavioural Control. Maio & Olson (1995) also suggested that the greater the Perceived Behavioural Control, the stronger an individual's intention to carry out that behaviour. The TPB proposes that individual behaviour is determined mostly by behavioural Intentions and that behavioural Intentions are a function of an individual's Attitude towards the behaviour, the Perceived Behavioural Control and Subjective Norms (Ajzen, 1991). In other words, the theory proposes that perceptions of behavioural control will result in a stronger intention to perform the desired behaviour (Sheehan *et al.* 1996 and Thorbjørnsen *et al.*, 2007). Overall, this means that stronger personal Perceived Behavioural Control is considered to be related to a higher intention to avoid food waste (Visschers *et al.*, 2016).

The Path analysis conducted in this study showed that Pro-environmental Identity, on its Self-identity dimension, significantly predicted Intention in a positive way. This was the case for both High FPM and Low FPM groups. These results show that the Intention to reduce the amount of that is being wasted at home is likely to increase when individuals want their friends and families to think of them as being someone who is concerned about environmental issues. At the same time, this is reinforced if people think of themselves as being environmentally friendly and imagine themselves as being the type of person who would try to reduce the amount of food waste at home. The Value-Belief-Norm theory offers a framework that observes the causes of behaviours connected with

non-activist environmentalism and this theory refers that people usually behave in relation to the environment (Stern, 2000). Furthermore, a study by Bamberg *et al.* (2015) on the determinants of intention in the pro-environmental situation also showed similar results to the current study. Arlt *et al.* (2011) further argued that environmental awareness is connected to both to pro-environmental intentions and pro-environmental behaviour.

Moral Identity is also shown to be a significant positive predictor of Intention, similar to other studies (Chan and Bishop, 2013; Largo-Wight *et al.*, 2012). It could be argued here that perceived moral obligation further increases the explanation of the intention, making a significant contribution to the prediction of intention. Perceived Moral Identity is the degree to which an individual is morally obliged to perform a particular behaviour, and so it may be relevant in cases where consumers consider the effect of their decisions upon others (e.g. donating blood, drink-driving) (Hart *et al.* 1997, Lam 1999). Extending the argument of moral identity to the area of food waste, it is shown in this study that people that have a clear and salient idea of what it means to be a moral person actively intend not to generate large amounts of food waste. In particular, the Internalization dimension of Moral Identity is the one aspect that supports these findings. This aspect refers to individuals' moral perceptions, such as feeling good to be a person that has specific morally-perceived values (such as being caring and compassionate) but also recognising that these characteristics are essential elements of a person's overall being.

It has been suggested that, in some contexts, individuals may need to consider both perceived social pressures and subjective feelings of moral commitment or

obligation to perform or refuse to perform a certain behaviour (Schwartz & Tessler, 1972; Pomazal & Jaccard, 1976; Gorsuch & Ortberg, 1983). Moral obligations are estimated to influence intentions, together with attitudes, subjective norms and perceptions of behavioural control. Beck & Ajzen, (1991) explored the effect of moral values on intention in the context of three unethical behaviours: cheating on a test or exam, shoplifting, and lying to get out of taking a test or turning in an assignment on time. They established that it was logical to propose that moral matters might influence behaviours and that an individual's degree of perceived moral obligation could predict intention to perform the desired behaviour.

7.5 Research Objective 4

Finally, the fourth research objectives that this study proposed was to better understand the factors affecting the gap between intention and behaviour that individuals exhibit related to food waste in the home. Theories of behavioural decision-making, such as the Theory of Planned Behaviour (Ajzen, 1991), Theory of Reasoned Action (Fishbein, 1979) and the Theory of Interpersonal Behaviour (Triandis, 1977), emphasise the role of intentions as the most immediate and important predictor of individuals' behaviour. Considering the theories mentioned above, the relationship between intention and behaviour was examined in this study, with a particular focus on the moderating effect of Food Planning Management (FPM) on the intention-behaviour relationship.

Perceived Behavioural Control (PBC) and demographical variables (house type, age, gender, income, marital status and presence of children) were investigated.

The analysis suggests that for indirect effects (i.e. the mediation effect) there is a significant indirect effect from PBC to Behaviour, which is an increase in the Intention score due to the PBC variable causes an indirect decrease of wasteful Behaviour. Regarding the mediation effect of Intention on PBC to Behaviour, it was significant both on the Low FPM group and High FPM group. It could be inferred from the results of the present study that PBC is an important variable for explaining intention, and existing research support this observation. The PBC element of the TPB reflects personal beliefs and intentions with regard to how easy or difficult performing the behaviour is perceived to be and is expected to reflect not only external factors but also internal factors (Cheema and Soman, 2006, Brockner, 1992, Berkowitz, 2005). Supporting the outcome of this study, an earlier study by Schwartz (1977) suggested that an individual's Attitudes and PBC were the main predictors of intentions to participate in physical activity. When taking into consideration the influence of PBC on Intention, Ajzen (1991) similarly suggested that PBC was expected to predict Behaviours by means of Intention. In another application of the TPB, Csikszentmihalyi (1999) highlighted that the interaction between Intentions and PBC were independently predictive of Behaviour. That is, under conditions where volitional control is moderately low (i.e. where Intention is only weakly associated with the Behaviour) increased level of PBC should facilitate the application of intentions into action. For this study, it can be concluded that Perceived Behavioural Control motivates consumers to decrease the food waste at home even if they do have weak Intention to do so.

The TPB hypothesizes that individual Behaviour is determined by behavioural

Intentions, where behavioural intentions are a function of an individual's Attitude towards the behaviour, the Subjective Norms and the PBC surrounding the performance of a particular behaviour (Ajzen, 1991). In addition, a more recent study also suggests that behavioural Intention with respect to food leftover behaviour appears to be greatly determined by the Perceived Behavioural Control (Lorenz *et al.*, 2017). Earlier on, Brockner (1992) also argued for a relationship between PBC and Behaviour and suggested there is an interactive effect of PBC on the Intention-Behaviour relationship. The rationale for this was that increased feelings of control would increase the extent to which individuals were eager to employ additional effort in order to successfully perform a specific behaviour. Overall, this would suggest that stronger personal Attitudes and Subjective Norms opposing food waste, as well as more Perceived Behavioural Control of avoidance of food waste, are indeed related to a higher Intention to avoid food waste. Whereas a higher perceived risk of consuming leftovers or foods that had passed their use-by dates resulted in a lower intention to avoid food waste (similar to Visschers *et al.*, 2016).

Contrary to the present hypothesis of the TPB, some of the authors have argued that the conceptualisation of PBC has been controversial (Kraft *et al.* 2005, Trafimov *et al.* 2002) proposing that there was inconsistency in the labels used for the PBC components (Rhodes & Courneya, 2003). Consequently, researchers argue that the importance of PBC would vary depending on the situational context of the study. In some cases, the desired behaviour can be relatively straightforward, and the likelihood of actual or perceived barriers to action might be significant or might not affect the Behaviour. In this study, the construct of PBC bears little relevance to this and previous studies.

Nonetheless, it is recommended that the level of Perceived Behavioural Control would be higher if the level of self-confidence was higher. This would possibly decrease the influence of PBC as a predictor of Intention and Behaviour.

Regarding the moderating effect of FPM on the Intention to Behaviour path, the trajectory coefficient was tested for significant differences between groups using the critical ratios method. It was revealed that FPM did not have a moderating effect on the impact of Intentions on Behaviour. Stefan *et al.* (2013) supports this study's finding and indicate that food planning actions have an indirect effect on food waste Behaviour by means of Intention. In other words, food planning management does not cause a decrease in food waste at home via Intention. As noted earlier, planning (FPM) of all aspects related to food shopping (such as before, during and after the event) is an important aspect concerning the topic of food waste in the home. However, this study did not find that planning would help bridge the gap between Intentions not to waste food in the home and the later related Behaviour. This could be explained as due to the fact that if individuals do not already have a strong and clear Intention not to waste food, planning might not be sufficient to change the behaviour. Similarly, for those individuals with a high level of Intention not to waste food in the home, planning might not make a difference since they already have low levels of waste in the home.

At the model level, the ANCOVA test showed that no significant paths could be identified between groups (Home Type, Age, Gender, Income, Marriage, the presence of Children). Similar to the findings of this study, Koivupuro *et al.* (2012) identified no correlation between age and Intentions the influence when the effect

of socio-demographical, behavioural and attitudinal factors on the amount of avoidable food waste were studied. Moreover, studies by WRAP (2014) established no relationship between gender and the levels of waste generated at home, although it was found that households that included female respondents had about 22% more food waste than those with only male respondents. However, a more recent study established that age was significantly related to intention to avoid food waste (Visschers *et al.*, 2016).

This study found that the only moderator with a significant interaction term was Home Type (i.e. semi-detached house, detached house, terraced house, flat). The direct effects were also significant in terms of the relationship between Home Type and Intention, as it was assumed. The analysis also indicated that the indirect effect of Intention on Behaviour varied by the type of house, although it was consistently negative. For participants who reported currently living in semi-detached houses, Intention did not have any effect on Behaviour. On the other hand, living in a terraced (i.e. the 25-44 age group) or detached (i.e. the 65+ age group) house had a positive significant effect on Behaviour, with the moderation of Intention.

The effect of Intention on Behaviour was less strong for those participants who lived in flats and other types of houses (i.e. the 18-24 age group). Household type, therefore, can be considered an important moderator and could potentially affect the gap between the Intention not waste food in the home and the actual behaviour.

7.6 General Discussion

This study allows the researcher to conclude that there is an evident lack of clarity on what constitutes food waste in the home. The conceptual limitations of the wasting of food suggest that individuals distance themselves from the idea of food waste being a problem within their own homes and transfer the blame somewhere else. This particular lack of knowledge highlighted by the focus groups is in line with previous research that suggests that, although various classifications do exist in the literature, there is an imperative need to reach a consensus on a definition of what precisely constitutes food waste in the household (Buzby & Hyman, 2012; Koivupuro, 2012; Ferreira, Martins, & Rocha, 2013).

Analysis of both qualitative and quantitative data enabled a further understanding of the attitude, normative and control beliefs in relation to household food waste behaviour. In terms of attitudinal beliefs, many participants held negative attitudes towards food waste and admitted to feeling upset, guilty and even angry about the major global problem that wasting food has become. As previous research indicates (Peloza *et al.*, 2013; Zemack-Rugar *et al.*, 2012) the vast majority of individuals experience some degree of guilt and unhappiness when rationalising the issue. Nevertheless, most continue to engage in wasteful behaviour even when the overall attitude towards the food waste issue is quite strong. However, further investigation revealed that the financial aspect is perhaps the more important determinant in regard to individual negative attitudes towards wasting food at home.

The data in relation to normative beliefs were less conclusive, with some

evidence of both positive and negative influence. As expected, close family members tend to have a relatively high influence in forming initial beliefs, and the majority of participants admitted to having integrated these beliefs into their own current behaviour to a certain degree, whilst also admitting that the desired behaviours (i.e. not wasting food at home) did not always materialise. A clear inference can be made at this point that children are indeed strong influencers. Although previous research has recognised the relationship between the presence of children and the amount of food waste generated by households, generally children have been seen as one of the main forces in driving up the amount of waste. This study, however, suggests that whilst that may be the case, children are also, and increasingly, the driving force behind parents becoming more engaged with the food waste issue. At the same time, a broader societal outlook on the issue of wasting food seemed to influence personal views. A strong sentiment amongst the participants was that overall society does not seem to care and that, even when people become more conscious about the seriousness and gravity of the food waste concern, there is still a tendency to blame someone else for the waste problem.

Identified control beliefs suggest a number of factors that limit the degree of control over food waste avoidance behaviour, thus making it difficult to reduce the extent of domestic food waste. As previous studies propose (Brunsø *et al.*, 2004, Grunert, 2011), situational and lifestyle factors are the main inhibitors, whilst financial factors are perhaps the most important cause in trying to reduce the amount of food waste in the home. Although the majority of participants indicated a strong belief in their own capability to manage the issue, they also confessed that sometimes they felt unsupported in their home and admitted that

the approval of own family members would contribute to a significant change in an individual, as well as household behaviour.

Further, there was some evidence of a real lack of engagement with issues surrounding food waste, with many participants agreeing that tackling food waste was not a priority in their lives at this particular time. Even more, because they were already behaving sustainably in other ways (i.e. recycling or composting), they felt it was fine to throw food away as long as this was not done on a regular basis. In contrast, some mentioned feeling guilty whilst for others, the moral aspect of food waste conjured up mental images, such as the picture of children dying of hunger or homeless people. Indeed, those participants that seemed to actively avoid the generation of large amounts of food waste appeared to have a clear and salient idea of what it means to be a moral person. Some also indicated that their motivation was a more recent development resulting from becoming increasingly aware of the negative environmental and social impact of food waste. Consequently, participants admitted to feeling remorseful when their behaviour resulted in food going to waste. This is in line with earlier research which argued that individuals with more positive general environmental values and attitudes are more likely to have higher levels of 'non-waste' behaviour (Fielding, McDonald, & Louis, 2008; Mellström & Johannesson, 2008). The moral considerations identified by this study, such as homelessness, seemed sufficiently important for some participants to translate into a direct change in behaviour (i.e. noticeable decrease in the amount of food waste generated by the household). However, the admission that the behaviour was not sustained in the long term may suggest that although morality can play an important part in initiating the desired behaviour, further

elements are needed to successfully sustain it.

Food-related practices, either whilst shopping or within the home, have been shown in this study as being important contributors to the actual amount of food wasted within the home. Behaviours such as buying larger quantities of salad in a desire to follow a healthier diet, buying more food products than initially planned just because of the offers available at the time, and even the inability to see clearly the fridge contents at home, were all cited as being strong determinants on the amount of food waste ultimately generated at home. People who do not check their food stocks prior to the shopping trip are put in the position of estimating their inventory, from memory, when they make the purchase decisions in the store. However, earlier studies suggest that the process of estimating inventories is biased and could lead to either overstocking (in the case of stockout adverse households) or to stockout (in the case of overstock adverse households) (Chandon & Wansink, 2006; Meyer & Assuncao, 1990). Overstocking is an important contributor to food waste since it increases spoilage of food in the overstocked categories. When faced with the need to estimate their inventories, Chandon and Wansink (2006) found that 28% of people underestimate their actual inventories, whilst 23% overestimate them. During the focus group discussions, a larger proportion of participants admitted to frequently underestimate their stock, which made them buy items they already have at home, and so increasing the food spoilage rate.

Preparing a shopping list before going shopping is another behaviour that can influence food waste, as the shopping list can help individuals to be more

organised in store and only buy what they need. A 2007 WRAP report indicated that 36% of people reported preparing a shopping list before shopping and sticking to it whilst they were in the shop (WRAP, 2007), with a more recent survey revealing that households that use shopping lists tend to waste less overall (WRAP, 2014). Many focus group participants recognised that, when planning their meals in advance of the shopping trip, they should be more organised regarding the type and amount of food items that they need to buy in order to have the right amount of food items required. Another important aspect in the post-shopping stage, mentioned during the focus groups and supported by the quantitative analysis, was the storage capacity. Previous research argued that storage space capacity is positively correlated with the amount of food wasted (Chandon & Wansink, 2006; WRAP, 2007, 2011). The analysis suggests that households with larger cupboard/fridge capacity tend to waste more in comparison with low storage capacity households, as large storage capacity households often engage in an inefficient consumption of the purchased food items by neglecting or forgetting some of the already purchased food.

Regarding sociodemographic differences, this study supports previous research findings (Gearhardt and Brownell, 2013a, WRAP, 2013a), whilst also arguing that the presence of children is, in fact, a stronger influencer than previously recognised. Moreover, this study found younger people to be equally concerned with the food waste issue as the older participants. Nevertheless, earlier arguments (WRAP, 2014) that older people had a higher proportion of food being thrown away due to it not being used within the recommended date are supported by this study.

7.7 Summary

In this chapter, overall study findings were presented and discussed in the light of current literature. First of all, research objectives were discussed in relation to relevant literature. Accordingly, the nature and incidence of food waste behaviours, the factors that influence food waste behaviour, the mediating factors affecting the gap between intention and behaviour and the factors that have an impact on intention to reduce food waste were discussed. Attitudinal beliefs, positive and negative influence on food waste behaviour, factors that limit the degree of control over food waste avoidance behaviour, food waste management, habits and effects of sociodemographic differences in terms of food waste behaviour have also been detailed.

Chapter 8 Conclusion and Implications

8.1 Introduction

This chapter provides an overview of the study. It summarises the findings revealed by this study, both qualitative and quantitative. Additionally, it presents the implications of the study in terms of theory and practice. Finally, it depicts the research limitations and further research areas.

8.2 Conclusions

This study aimed to reach a better understanding of the factors that affect food waste behaviour within the home and to explore strategies for bridging the gap between intentions and actual behaviour. As such, the study has looked to improve the theoretical and practical understanding of the food waste related behaviours in the household. In order to conduct the present study, a mixed research method was implemented based on earlier related studies. Concerning the objectives of this study, there were four research questions proposed to be investigated, namely to establish to the nature and incidence of food waste behaviours in the home, to identify the factors influencing household food waste behaviour, to establish the factors that have an impact on the intention to reduce food waste at home and to recognise the mediating factors affecting the gap between intention and behaviour that individual exhibit related to food waste in the home. As such, this study investigated household food waste behaviour from a broad perspective, including both demographic and psychological factors in one model. This had the advantage of identifying the most important factors to focus on interventions that aim to reduce the amount

of food wasted in households.

The qualitative analysis examined participants' views about their food waste behaviour and habits in focus group interviews. Regarding their knowledge, understanding and awareness of food waste at home, it was highlighted that there is a lack of agreement on the definition of food waste, with the majority of participants, mentioned the associated visual and olfactory aspects like 'mould', 'bad smell' and 'messy'. Besides, many disassociated themselves from the issue of food waste in the home and instead looked at supermarkets, restaurants and food producing companies as being the main culprits, whilst also blaming other people (like their fellow housemates for example) for the lack of awareness, as these 'other' individuals were seen as being to blame, as they were inclined to create the majority of food waste.

In terms of their attitudes, many participants held the belief that wasting food would increase an individual's feelings of guilt about the environmental aspect of the problem. However, they mostly considered the food waste from the aspect of the financial loss, and they confessed getting over this feeling quickly reasoning that food waste is unavoidable. However, some felt shame at disposing of food because many people were starving around the world. When subjective norms and food waste were argued in the groups, some of the participants recognised that family members' beliefs and attitudes sometimes positively influenced their own beliefs and behaviour. For example, mothers were trying to reduce food waste at home by using leftovers and not considering any of the use-by and best- before dates. As another point, partners were regarded as both supportive and unsupportive. From the point of the PBC,

many participants referred to various lifestyle factors (such as time constraints, working long hours, dieting requirements, lack of cooking skills and a more general knowledge about food) as obstacles that hinder food waste as they chose to consume ready meals or takeaways, and so the food that was not eaten ended up in the bin. As well, several situational factors, like the lack of storage space and planning, the use- by and best-before date labels used by food producers and retailers, were also mentioned in this context by many participants. Regarding the Self-efficacy aspect, this can influence the choice of activities, level of effort and persistence when performing a behaviour. Participants recognised that whether or not they reduce the amount of food wasted at home is entirely up to them and that they felt confident that they would be able to reduce this amount if it was entirely up to them. Concerning environmental and moral considerations in food waste, those participants with strong environmental self-identity admitted being more likely to act in an environmentally friendly manner and to reduce the amount of food wasted at home, without any external incentives. They indicated that attitudinal feelings and moral identities could contribute to behavioural intentions, but also indicated that these behaviours were not continuous over a long period of time. When the participants were asked about Food Planning Management habits, some reported that they threw food in the bin due to lack of space, being too close to the use-by and/or the best-before dates, or just simply food looking or smelling off. A few participants recognised their seasonality of waste behaviour and that they threw away more food in the summer, whilst others threw away a particular type of food in winter. Regarding the kind of food that was most likely to be wasted, the discussions identified that bread, vegetables and fruits were most likely to end up in the bin. Nevertheless, no

clear differences were identified between respondents' sociodemographic classification and the type of food wasted.

When suggestions for reducing the amount of food waste generated by households were discussed, some of the focus group participants recommended that people should use local businesses more to purchase their food, think about the causes of food waste from several viewpoints, get advice about consumption habits, start growing their own fruit and vegetables, and make regular trips to shop for food instead of buying large quantities during big shops. Others stated that people should ensure they allow for both weekly food shopping plans and meal plans, write shopping lists and stick to them in the pre-shopping stage. A significant number of focus group members underlined that people should buy what they need and perhaps limit the household fresh food purchase, and check dates while shopping. Many of the participants advised that more people should use cookbooks and perhaps learn to cook, but also how to use up ingredients in new ways, share some of their meal with others, use leftovers more, learn to preserve foods, compost or freeze vegetables and fruits, and possibly add up cost of items that are planning to throw away. During the focus group discussions related to current ongoing programs in the UK and abroad, many participants suggested that food should be distributed evenly, supermarkets should have a more significant ratio of healthy food to junk food, and the government should add an additional food tax to include wastage or have a separate wastage tax. Others suggested that people could be educated to increase their awareness of the food waste problem. Moreover, they should eat seasonally and use best-before & use-by dates carefully and recycle leftovers.

Finally, the focus group analysis did not highlight any significant differences for either household size or household income. On the other hand, children's influence within the home appeared to be very important. In addition, the younger participants focused on the future aspect of the global impact, whilst older participants were interested in solutions for an immediate impact. Regarding environmental awareness and concern, both male and female participants appeared equally to be aware of the problem.

An exploratory factor analysis was completed with the aim of deriving one or more 'best' models for the associations between the observed variables and potential underlying factors, to enhance the interpretability of reserved factors. Consequently, the Behaviour, Intention, Attitude, Subjective Norm, Perceived Behavioural Control, Self-Efficacy, Pro-environmental Identity, Moral Identity and

Food Planning Management factors yielded significant results indicating good fit in terms of model values. At this stage, a confirmatory factor analysis was conducted in order to confirm the factorial structure and conduct modifications for the path analysis. In this section, all scales were tested in a specific version of the hypothesised model consistent with the research design. Items loadings under 0.50 were removed due to poor validity. The fit for the respecified model was considered satisfactory or good. Overall, the models for Intention, Attitude, Subjective norms exhibited good fit whilst Perceived Behaviour Control and Self- Efficacy were all within the acceptable range. Finally, models for Pro-environmental identity was adequate, and models for Moral Identity were satisfactory. Path Analysis was conducted to estimate the moderating effects concerning the FPM. Attitude, on its Waste Aversion scale, Social Norms

Pressure, and Self-efficacy dimensions were significant and negative predictors of intentions while Self-identity on the Pro-environmentalism Identity scale, Moral Identity, on its Internalization scale, and PBC dimensions were significant and positive predictors. On the other hand, PBC and Intention were negative predictors of Behaviour. For indirect effects, a significant indirect effect from PBC to Behaviour was discovered in both on the Low and High FPM groups. Attitude (Waste Aversion) maintained a negative effect on Intention, whilst PBC had a positive impact on Intention. As a final point, PBC and Intention had a negative impact on Behaviour. As a final step of the analysis process, Regression Analysis was conducted on the Intention – Behaviour path in order to evaluate the effects of potential moderator variables. It was found that the only moderator with a significant variable was HomeType.

8.3 Study's implications

Theoretical Implication

The contribution of this study to theory is twofold, offering an overall understanding of the factors affecting food waste intentions and behaviours in the home, as well as a methodological contribution. Although the issue of food waste is receiving increased attention nowadays from governments and international institutions in an effort to decrease the amounts generated by households, at present, there is a lack of research investigating this from a consumer behaviour perspective. Given that this study aimed to explore the nature and extent of food waste behaviour at home, as well as investigate strategies for bridging the gap between intention and actual behaviour, the findings here provide

additional theoretical insights into how people behave in relation to wasting food in their own homes. Prevention of food becoming waste is perhaps one of the most realistic actions that could be achieved by changing consumer habits (such as purchasing less, eating the right size portions or reusing leftovers), and having a clear understanding of why and what we waste, could prove critical to changing consumer behaviour to prevent food waste.

There are a number of results that are original to this study. Firstly, it was found by this study that the higher the level of individual self-efficacy, the level of intention to reduce the amount of food wasted by the household reduces, which contradicts the theoretical beliefs. Secondly, in terms of individual pro-environmental identity, on its Self-identity dimension had a positive impact on intentions; however there was no significant relationship observed by this study both the New Environmental Paradigm (NEP) and the Dominant Social Paradigm (DSP) were shown not having an influence on individuals' intentions to reduce the amount of food waste in the home. Thirdly, notable differences were highlighted in this study between the two groups of participants, namely those individuals who exhibited a high level of FPM and those with a lower level, in particular in terms of the pressure dimension of social norms and the capability dimension of the PBC.

The findings of this research are concordant with but extend upon previous research. The household food waste problem is worldwide in its prevalence, and it is widely acknowledged in the literature that the behaviour of individual households is vital to reducing waste. At this level, a combination of influences, which may be fundamentally economic in many situations, may be the

predominant factors in guiding behaviour. Notwithstanding this, there is evidence to suggest that all the dimensions of attitude are, to a greater or lesser extent, relevant to a deeper understanding of behaviour in this context together with the environmental and moral implications of domestic food waste. Looking back at the literature review in Chapter 3, it is clear that there is a discrepancy among intentions and behaviours. Indeed, daily behaviours do not seem to follow the professed intentions, despite general overall knowledge on individuals' part regarding the growing problem of food waste in the household and its impact on the environment. In addition, much of the research has generally explored factors that affect attitudes towards behaviour (Bagozzi, 1981, Tucker and Speirs, 2003, Barr and Gilg, 2007), but mostly overlooked the existing gap between intentions and actual behaviour. This study aimed to not only investigate the causal relationships among the Attitude, Subjective Norms, Moral Identity, Pro-Environmental Identity, Self-Efficacy, Perceived Behaviour Control and Intention but also to understand the mediating factors between Intention and Behaviours. The findings, therefore, help to provide a better understanding of which factors are important in forming individuals' intention to actively reduce the amount of food that is thrown away by the household

Contributing to methodology, this study has brought together constructs that were previously examined independently in various contexts. The construct of Self-Efficacy, Pro-Environmental Identity and Moral Identity in relation to food waste in the home have all previously been studied independently, as discussed in the literature review. The interrelationships of the three constructs reveal measurement model which can be used to predict not only households' intentions to reduce the amount of food waste in the home but ultimately behaviours as

well.

Various aspects related to the food waste problem and the patterns in the home, food waste prevention policies, household influences on food waste behaviour and food planning management practices in the home were investigated in light of relevant behavioural theories and models. Consequently, the present study has addressed this problem by reaching a better understanding of the factors that influence household food waste generation behaviour, whilst demonstrating the multidimensional perspective that should be undertaken to address the food waste prevention issue. Even more, researchers have not yet reached an agreement with regard to the relative significance of various demographic factors and their influence on food waste behaviours within the household (DEFRA, 2009b). In this regard, this paper has identified differences between socio-demographic variables and has also offered a better understanding of the complexities of household food waste generation, how people act, and which factors influence their behaviour. In this study, the differences between socio-demographic groups were explored to identify the best practices to support people to reduce their food waste.

The measurement model developed in this study and the procedures used to ensure validity and reliability both qualitatively and quantitatively could be useful for academics and researchers conducting further research into food waste behaviours in the home. Furthermore, this study also contributed to the theory by modifying the TPB model. Extending this framework to include including new determinants of Intentions, such as Self-efficacy, Pro-Environmental Identity and Moral Identity, supports the TPB's ability to the food waste behaviour in the

home. The extended TPB highlights the importance of these additional factors as clear determinants of the desired behaviour. The study's findings reveal that the extended TPB has good explanatory power in interpreting food waste intentions and behaviour in the home. The measurement model used in this study could be used further to investigate other situations, such as consumer food waste in restaurants, or to look at consumers with different cultural background. By using this measurement model to measure consumer food waste intentions and behaviours in diverse contexts, researchers may enrich an area to the extant literature.

Implications for Practice

In many parts of the world, there is an increased engagement in the long-term effort to develop a sustainable economy; this transition towards a circular economy, in which the generation of food waste is minimised, has proven to be a strong challenge for the overall EU and UK economy. Indeed, the issue of food waste has become critical for the entire global food chain. Wasting food behaviour is related to embedded knowledge of how individuals understand and think about food within the context of everyday life. The results of this study can be taken into account regarding influencing policy and marketing communications aimed at changing wasteful behaviour at home. Indeed, the findings from this study have practical implications for waste management, as the results may aid in creating evidence-based interventions for household food waste reduction. As this study's aim was to improve practical knowledge and understanding of the food waste related behaviours in the household, the contextual factors identified will add a broader perspective to present literature for prospective researchers and policymakers.

Over the last several decades, some attempts have been made to quantify the global food waste, motivated by the need to highlight its scale in relation to global malnutrition. Nevertheless, so far the assessments are reliant on limited datasets collected across the food supply chain at different times and extrapolated to the larger picture, with the most often cited estimate is that 'as much as half of all food grown is lost or wasted before and after it reaches the consumer' (Lundqvist et al., 2008). In the USA studies show that 25% of food was wasted by households annually (Kantor, 1998), which amounts to \$48 billion (Jones, 2004). More recent data reported by the US Environmental Protection Agency estimated that food waste accounted for 12.7% on municipal waste stream (EPA, 2011). In Australia, despite a lack of data, a submission of the Senate enquiry estimated that food waste represents 15% of the total amount of waste that goes to landfill each year (Morgan, 2009). In South Korea, reports suggest that food accounts for approximately 27% of the total household waste (Baek, 2009), whilst the Dutch Ministry of Agriculture, Nature and Food Quality estimates that households throw away around 11% of the total food purchased (Thönissen, 2009). Between 2007 and 2012, the total amount of household food waste in the UK fell by 15% (WRAP, 2013b), and avoidable food waste dropped by 21%, due to rising food prices and changes to labelling to simplify use-by date advice, combined with several campaigns aimed at raising individuals' awareness of the food waste problem. However, the latest figures (WRAP, 2016) show that the food industry has failed to meet a previous commitment to cut household food waste by 5% between 2012 and 2015. Indeed, the estimated amount of annual household waste has risen from 7.0 million tonnes in 2012 to 7.3 million tonnes in 2015, an apparent increase of 4%.

The Incidence of Household Food Waste

Based on characteristics associated with their current and projected stage of economic development, the global population has been divided into three principal groups: (1) newly developing countries that are beginning to industrialise, with population growth rates expected to be high to very high, and characterised by a predominantly young age profile; (2) late-stage developing countries that are currently industrialising rapidly, which are experiencing decelerating rates of population growth and increasing affluence and age profile; (3) fully developed, mature, post-industrial countries, with stable or declining populations which are declining in age. Each of these groups has quite specific food waste concerns. In the newly developing countries, most wastage arises at production and storage level, whilst consumer wastage is reduced to an absolute minimum by the simple process of purchasing only enough food for the day, or even a meal; similarly, it is not unusual for families to buy food twice or even three times a day. At the opposite end, in the developed post-industrial countries, more efficient farming practices and better transport, storage and processing facilities ensure that a higher proportion of the food produced reaches the final consumer. However, characteristics associated with modern consumer culture means that in these countries the between 30% and 50% of the food that has been bought is thrown away by the consumer (FAO, 2012, Rayner and Lang, 2012). Studies like Rayner and Lang (2012) and Fox and Fimeche (2013a) have shown that, in the most 'advanced' and affluent societies, the larger amounts of food are in fact wasted at the consumer end of the chain. The same studies have blamed the labelling of many foods as an actual reason for food waste, and shown that

many consumers have a poor understanding of the 'best before' and 'use by' dates. The consensus is that these dates are generally quite conservative, as they are driven by the retailer's desire to avoid legal action. Even more, promotional offers and high-pressure advertising campaigns, including bulk discounts and 'buy one get one free' offers, actively encourage consumers to buy large quantities, often in excess of their actual needs, which often leads to substantial food wastage in the home. Studies in the UK, for example, have highlighted that 1 billion-worth of the food wasted annually is still 'in date', and so it is perfectly edible (WRAP, 2008). Despite a worldwide and significant increase in food prices in the last years, food represents quite a small part of the average household spending. Recent findings show that the average family spends 11% of its budget on food (ONS, 2011), which some studies even arguing that this goes somehow into explaining why food is not valued more highly. Even more, Doron and Douglas (2012) claim that it is partially due to a long-term national policy of 'cheap food' that food is being especially undervalued. In the UK, WRAP has conducted extensive research at the household level and concluded that although many people think they waste very little, everyone wastes food to some extent (WRAP, 2017, WRAP, 2014, WRAP and Women's Institute, 2008). According to WRAP, 30% of households were classified as high food wasters, 27% as medium food wasters and 43% as low food wasters. The waste analysis conducted by (WRAP, 2017) further revealed that even households who claimed not to waste food were throwing away 88kgs/year. These studies have also managed to identify some differences between socio-economic groups in the UK, such as that larger households waste more food overall than smaller households, however on per capita basis they waste less per person.

Research also indicates that families with children report over-purchasing of food (with main reasons given for this being pester power and to avoid running out of things), and also being more sensitive to date labels and often cooking separate meals for children. Further studies in the UK (Osner, 1982, Wenlock *et al.*, 1980a, Wenlock and Buss, 1977, WRAP, 2013a) agree that food wastage was significantly influenced by the composition of the household, with adults wasting more than children. However the presence of children in households does not seem to lead to more waste per capita (WRAP and Women's Institute, 2008). Overall, it is agreed that single person householders tend to throw away more per capita, and households with children tend to waste more than households without children, although authors agree that wastage rates vary with children's age. Contrary to conventional opinion, WRAP (WRAP, 2017, WRAP, 2014) indicated older people waste as much food as younger people on per capita basis, although they might appear to waste less due to smaller household sizes. Further studies in the UK (Brook Lyndhurst, 2007, Dowler, 1977) and also Australia (Hamilton *et al.*, 2005) suggests that young people waste more than older people, given the fact that generally older people household frequently contain fewer people.

When related to income, WRAP and Women's Institute (2008) results show that managerial and professional households produce less food waste than less affluent households, although there is no difference on a per capita basis, as less affluent households tend to consist of more people. The majority of studies appear to suggest that there is a lower food wastage in high-income households (Brook Lyndhurst and Waste Watch, 2007, Osner, 1982). Nevertheless, there are other studies which found little or no correlation between income and food

wastage (Dowler, 1977, Wenlock *et al.*, 1980b).

What Types of Food Are Wasted by Households?

Studies agree that overall wastage rates for fresh fruits and vegetables are highest and research has identified that the most perishable food items account for the highest proportion of food waste, with fresh fruit and vegetables usually among the most wasted items, followed by bakery and dairy products, meat and fish (Mellström and Johannesson, 2008 , WRAP, 2017, Thönissen, 2009, Morgan, 2009). And although compositional analysis suggests the opposite, people tend to believe that more prepared food than raw ingredients is thrown away (WRAP, 2007c). There is, however, a noticeable variance in the wastage rates for different food types: WRAP (2013a) recognised that 7% of the total milk purchased is wasted, 36% of bakery products and over 50% of lettuce/leafy salads. While the food categories are not entirely consistent across studies, (Thönissen, 2009) found an unusually large proportion of food waste consists of dairy products and argues that the constant rise of food prices, together with shrinking incomes are driving up consumption of fatty foods and reducing the amount of fruit and vegetable consumers buy. Food waste makes up one of the largest share of the household waste stream. In terms of weight, the most commonly wasted foods as reported by WRAP are potatoes, sliced bread, apples, meat and fish (WRAP, 2014). Their report further identifies other patterns in household food waste such as the fact that in the UK 45% of all salad purchased is thrown away. Overall, at least 8% of all the food wasted that could have been eaten is still in-date when thrown away. Even more, WRAP states that 46% of the still edible food that is wasted is fresh, raw or minimally

processed and nearly 25% of the still edible food is thrown away whole or unopened, with the most common items to be thrown away whole being fruits.

Recognising the factors that affect food waste behaviour within the home could enable practitioners to devise strategies enabling the reduction of the amount of food wasted by households. Although there has been a considerable increase in the local authority provisions of food recycling schemes over the last decade, with 61% of UK local authorities currently collecting food waste from households, the bigger issue of reducing the amount of food that is being wasted still remains. It has been recognised by this study that the prevention of food waste should take priority when devising any type of initiatives at the consumer level.

During the focus group discussion, participants were asked to reflect on solutions that would enable households to reduce the amount of food that is currently wasted. Many recommended that governments should apply an additional tax on food wastage, but also that people they should only be allowed to waste a certain amount of food (controlled by strict measurement of their actual waste):

'Possibly you can have a wastage tax so you have to monitor how much you waste and if you say you waste 10 kilos a week you get taxed on 10 kilos worth of wastage' (FG1)

'But maybe people have those food waste bins and obviously if it gets over a certain amount, then tax that amount because they're going to be more conscious about what they're throwing away and will be like 'Why throw it away so I could use it.' So I think that would possibly work' (FG1)

Supporting the suggestions by this study's participants, Husaini *et al.*, (2007) also recommend that the local authorities should charge householders established fees for handling their food waste and argued that various countries currently charge waste-related taxes (such as unit-based pricing, pay-as-you-throw scheme etc.). Other governments also employ financial instruments which can be based on weight, volume or both volume and weight. For example, South Korea and Seattle, Washington currently employ food-waste disposal taxes in excess of landfill costs (Kravitz 2015; Mazzoni 2013). In support of this recommendation, a recent study (Yildirim *et al.*, 2016) found that 31.5% of the individuals would throw less if they had to pay higher taxes based on what they threw. Nevertheless, economic research on food waste has only recently started to emerge and so far studies are only in the preliminary stages of measuring the degree of food waste in various regions, and recording household food waste external costs (Aschemann-Witzel *et al.*, 2015, Buzby and Hyman, 2012, Love *et al.*, 2015). As a result, the probability of the UK government introducing such tax seems improbable at present.

A number of participants in this study highlighted the importance of checking existing stock prior to going food shopping, as this was suggested as one way to reduce food waste at home. Similarly, earlier studies suggest that overstocking is a significant contributor to food waste as it increases spoilage and hence waste (Chandon & Wansink, 2006; Meyer & Assuncao, 1990). Fox & Fimeche (2013) recommend that policies should discourage retailers from wasteful practices that lead to overstocking due to excessive purchasing by consumers. Nevertheless, as highlighted by many participants, checking existing stocks before shopping for food is also a household responsibility.

Consequently, the recommendation from this study is that consumers are encouraged to perform this behaviour (i.e. stock checking) regularly. At the same time, they could be further supported by a reduction in supermarkets' practices which encourage general over-purchases.

Other participants suggested that people should use the food that is no longer considered fit for human consumption to feed the animals, use it for composting to grow their own fruits and vegetables, and even cook most the food as soon as it is purchased:

'Yes, exactly, you can feed animals, you can use it for fertilisers and stuff like that so just because food goes off it doesn't actually mean it's completely useless' (FG4)

'I think that it varies across the different food groups. It depends what food we are talking about wasting. However, I would say where you can cook up in advance - if you know and make a batch of it, like batch cooking and freeze it into a container so that you've got your homemade ready meals. But that doesn't apply to everything really. You could apply it to meat and vegetables' (FG2)

Several participants stated that animals should be fed to reduce the amount of food waste at home. Ruiz *et al.* (2018) likewise emphasised that animals should be fed by transforming the household food surplus into animal feeding when the food reaches the stage where it cannot be deemed as safe for human consumption. Other schemes, such as the Australian NSW-EPA (2012) project, showed that giving uneaten food to pets and animals is a common disposal method amongst. During this study, many people admitted feeding their pets any household food leftovers. However, as there as numerous conflicting

information in the media, many also are cautious of considering this as a constant way of disposing of some of the food they themselves are not comfortable consuming, as they see it as possibly being harmful to animals.

It was also suggested by many participants that more people should grow their own food and cook mostly using what they have grown as a solution to the food waste issue. This solution is indeed supported by the concept that growing fruits and vegetables, and using this own grown food, can create cognitive understanding and awareness of the implications of food waste, which in turn may lead to changes in food waste behaviour (Schwartz, 1977; Denisov & Christoffersen, 2001; van Birgelen *et al.*, 2009).

The vast majority of the participants in this study recognised that people should be educated more about the issue of food waste in the home, which would lead to having a higher level of awareness. Also, many suggested that individuals should be encouraged to eat seasonally, recycle leftovers, and be more conservative in following the best-before and use-by dates:

'And educate people on how to use it all, like every single bit of it (educate people on how to use the food that they buy)' (FG7)

'I think awareness is the key. Because I don't think enough people know and unless your university students were made aware of these things for our studies and stuff. It comes to light where it's just general everyday people going about their business and... Raising awareness, I think it's the key!' (FG7)

'Encourage people to eat seasonally because then you've got different foods different times. More of a variety' (FG1)

'I would use the date thing (Best-before & use-by) with people, because some

people I know are like 'Oh no, would never eat that' after it says so on the pack'
(FG2)

'I've literally seen them throw my litter box before coming here, its how recycling is changing' (FG3)

'And one other way that it can be used - I'm not exactly sure the details of it, but you can use it to make energy can't you?' (FG7)

Supporting the recommendations of this study on how to reduce the amount of food wasted in the home, Parr (2013) also concluded that families had less leftover food when they were provided with relevant support and education. Food materials were composted by the participants in Parr's study, with little effort. Therefore, the recommendation is that this system could be used for other families, as it created a minimum amount of food waste at home. More specifically, it is suggested that marketing campaigns could be run by various stakeholders, such as the government and supermarkets, to educate consumers on the topic of food waste reduction.

The importance of individual awareness was stressed by many participants. Likewise, the European Commission is presently contributing to awareness raising on food waste prevention by means of the production of communication materials presented in all EU languages. In order to increase the level of awareness, practical tips are provided on how individuals can limit food waste, with a specific focus on supporting a better understanding of the best-before and use-by dates that are displayed on food packaging (European Commission, 2018). In particular, Stuart (2009) argued on the necessity to promote awareness of the 'non-financial cost of wasting food'. Some of the other studies underline

the need to create awareness for reduction of food waste, such as a range of pro-environmental actions, including eco-shopping, energy conservation, recycling and environmental activism (Fielding, McDonald *et al.* 2008, Nigbur, Lyons *et al.* 2010, Whitmarsh and O'Neill 2010, Gatersleben, Murtagh *et al.* 2012).

Similar to some of this study participants' propositions, Barr (2007) suggests that consumers should be educated on how to interpret use-by dates of products, how to plan food shopping ahead, how to store food products and how to use leftovers. The argument here is that this particular type of communication would increase the level of awareness about the impact of food waste, and consequently encourage people to waste less at home. An example of creating awareness to reduce food waste at home is the 'LoveFoodHateWaste' campaign currently running in the UK, with the aim of increasing general knowledge and understanding about the problem (WRAP and Women's Institute 2008, WRAP 2010). Within this campaign, it was noted that preventable food waste dropped by 21%, due to increased awareness about the monetary value of the food being thrown in the bin, combined with a move by the government to simplify use-by date labelling.

Some of the participants in focus groups highlighted that the food that was wasted should be recycled and used to produce alternative forms of energy. This view is supported by previous research that suggested that recycling could generate significant improvements in waste reduction (Shove 2003, Bulkeley and Gregson 2009). The recommendation of this study is that invested stakeholders, like energy producing-industries, national agencies, universities, governments, researchers and individual professionals, should

work in the field of food waste recovery and valorisation, either within the bio-refinery concept or following circular economy in the area of food recycling.

During the discussions in this study, participants suggested that non-profit supermarkets should be run by governments for farmers and offer a fair price. Research in the UK has also argued that some of the supermarkets should sell relatively cheaper food in relation to consumers' income (Slimani & Margetts, 2009). Similar to the view of the participants, the Slow Food Earth Markets Farmer project has been ongoing in Austria, Bulgaria and Italy and following specific Slow Food criteria to support local farmers, producers and citizens since 2005.

Therefore, this study helps practitioners and policymakers develop an increased awareness of the implications of food waste with the clear aim of ending wasteful behaviour in the home. As already discussed, many issues that pose a threat to global environmental sustainability are due to human behaviour and so they can be improved with changing the appropriate behaviour, so as to decrease its environmental influences, such as changing purchasing behaviour or implementing more balanced domestic actions. The present study provides a better understanding of the food waste problem and can support policymakers and businesses to develop more effective policies and practices that inspire and encourage desirable behaviours, particularly in terms of consumption. One specific suggestion resultant from this study's findings is that future policies should discourage retailers from wasteful practices that result in excessive purchasing by consumers.

In addition, analysis of avoidable food waste provided insights into the nature of consumers' food shopping practices, at each level identified in this study. From this point of view, focus groups have provided a deeper understanding of how practices are interrelated and how they affect food waste concerning food sharing practices, cooking habits, cooking with recipes, development of cooking skills, weekly shopping planning, assessment of the quantity of foods buying, food storage or management, leftovers management and food composting practices. These findings allow for the development of a more profound cognitive understanding, but also increase awareness of the implications of food waste, which could lead to changes in behaviour.

Perceived behavioural control has been found here to be a strong significant predictor of both intention to reduce household food waste, as well as self-reported food waste behaviour. Such information can be applied in educational programs campaigns with the aim of explaining personal volitional control over food waste, and the capacity for the individual to willingly act on the behavioural intention. One way this education could be conveyed is by informing the individual how they can reduce the household food waste, perhaps by solutions. Emphasising the positive outcome of reduced food waste could work as an effective determinant of behaviour, and eventually, work to change attitudes towards food waste. As the subjective norms were also found to be a significant predictor of behavioural intentions to reduce household food waste, in terms of practical implications, social groups that the individual perceives as important could positively influence the individual to reduce the household food waste. In itself, this could prove impactful in terms of campaigns aiming to reduce food waste, perhaps by having a public figure in the community to positively influence

the attitudes of individuals to reduce the amount of food wasted in the household. Nevertheless, these approaches should take into account the findings of this study which showed that individuals might not react the way that they are expected to if they perceive these interventions as an excessive pressure to perform (i.e. to reduce the amount of food waste in the home).

Furthermore, concerning the implications for food waste policymakers, this study allowed for several proposals in response to the view of social practices to reduce food waste. For example, there would be long-term financial gains by understanding how people produce waste as the strategies employed would be able to focus on resolving these issues rather than take a general approach.

8.4 Study's limitations

This study contributes to present literature by its methodological approach and its findings; however, there are several shortcomings to be covered in the future research section.

Most important to note is that this study has investigated the views of UK only participants. This approach makes it difficult to draw inferences and make assertions about household food wasting behaviours on the broader provision of food waste behaviours in the home, given the many sociodemographic and cultural differences between countries. Additionally, this study is cross-sectional in its approach rather than longitudinal, therefore changes in influential factors and associated behaviours cannot be accounted for over time. Although this does not invalidate the findings of this study, future research

should account for any differences over time.

For the qualitative data collection, there are a few limitations that need highlighting. First, although focus groups have provided an insight into the phenomenon in question, findings have been arrived at from samples in specific geographic locations. Extending investigations into the national and international field may broaden the validity of the findings. Secondly, given the nature of the focus groups, it was not possible to observe participants' behaviours outside the discussion environment. Thirdly, the use of a convenient sample does not allow to generalise the results to the entire population. Furthermore, semi-structured interviews through the use of focus groups were employed to get an overview of why food waste occurred in the sample. When performing interviews, a participant's replies can be unspecific and sometimes may not reflect the whole truth. To improve the internal validity of this study, observations would need to accompany the discussions in order to confirm the reliability of the participants' responses.

Another limitation of this study is that the self-reported individual food waste behaviours were not validated, a situation which often yields unworlly biased estimates of household food waste as consumers may tend to report what is closer to perceived moral norms than to the actual amount (Schoeller, 1990a, 1990b). The conceptual limitations of the wasting of food suggest that individuals distance themselves from the idea of food waste being a problem within their own homes and that they lay the blame somewhere else for the problem. Therefore, the response concerning food waste in their homes may not reveal their actual feelings because they want to appear as doing 'the right

thing’.

There are also limitations that reflect several issues with the scales used in the questionnaire survey. For the Attitude dimension, the EFA analysis suggested the removal of several factors, among which were the reversed-coded items; later, following the CFA analysis, the initial 3 factor model was reduced to 2 factors, due to possible cross-loadings into the error terms of other factors. For the Subjective Norms dimension, the EFA analysis suggested the removal of one item, which resulted in 2 factors being extracted for further analysis. Similarly, the EFA analysis suggested the removal of one item for the Self-efficacy scale and the Moral Identity scale.

This study’s findings indicated several non-significant results when the hypothesised relationships were tested. In specific, non-significant results were noted for the Waste Efficiency dimension of the Attitude construct, the Support dimension of the Social Norms construct, the Capability dimension of the PBC construct, both the NEP and DSP dimensions of the Pro-environmental Identity construct and finally the Symbolisation dimension of the Moral Identity construct. Whilst the non-significant outcomes were noted and discussed in the previous chapters, they should be noted as limitations of this study.

Further limitations of this study are consistent with the inherent weaknesses of survey research. The strengths and weaknesses of surveys have been well documented (Babbie, 2001). Surveys allow researchers to reach large populations on any given topic and offer important strengths in measurement. They save time and are relatively inexpensive to execute, in particular, in online

settings. By their very nature, surveys are also relatively inflexible and offer narrow opportunities to capture rich qualitative data in return for generalizability to the broader population.

8.5 Directions for future research

Taking these above limitations into consideration, suggestions have been developed for future research. One of the suggestions is that the present study should be replicated with a larger sample size. Future studies should be encouraged to adopt a longitudinal approach to appreciate if the habits, behaviours and opinions concerning food waste are temporary or they change over a longer period of time. Additionally, the timing of the study should also be considered, as seasonality can be a factor in food waste production.

Highlighted as one of the study's limitations, the participants used in this study currently live in the UK and so only explain the food waste behaviours in the region. Therefore, further studies should focus on other countries that have similar circumstances in terms of climate, food consumption and socio-cultural aspects. A comparative study could contribute to the knowledge and provide new insights into factors that affect household food waste behaviour. It could also affirm the use of the developed TPB model in predicting intention and behaviour. Future studies could also test the developed TPB model on specific types of households to ascertain its applicability and generalizability.

Earlier research has shown that some of the strategies currently used to motivate people can lead to a positive change in individual pro-environmental behaviour (Rothman *et al.*, 2004, Bamberg and Möser, 2007). However, long-term

maintenance of these behaviours has proven to be a problem, as people seem to react favourably to the strategies initially, but their behaviour declines over time, and more importantly, behaviour returns to baseline if the source of motivation is withdrawn (Kantor, 1998). Given this, further research is necessary to understand how the required and acquired behaviours can be better sustained in the long term.

The results of this study showed a negative relationship between the Pressure aspect of Social Norms and individuals' Intentions to reduce the amount of food wasted in the home. This would suggest that the higher the social pressure from significant others to perform, the less likely is that the intentions to reduce will increase. This finding contradicts the theorised relationship; even though Social Norms have been consistently found to be a weak predictor of Intentions (Ajzen, 1991, Terry and Hogg, 1996), there are studies which have shown that Subjective Norms have a high explanatory power and help in predicting certain behaviours (Cialdini *et al.*, 1990, 1991, Schultz, *et al.*, 2007, Goldstein *et al.*, 2008). Therefore, additional research is crucial for a more in-depth understanding of if and how pressure and/or support from those who are important to us might influence our intentions to reduce the amount of food that is currently being discarded by households.

Similarly, this study's findings show a negative relationship between Self-efficacy and Intentions, which contradicts previous findings (Godfray *et al.*, 2010). The findings here suggest that an individual's self-reliance or self-esteem in their capability to accomplish the specific task of reducing food in the home negatively influences their intentions toward the expected behaviour.).

Given this, further research is necessary to understand further how self-efficacy affects individual task determination.

This study grouped participants according to their level of FPM, into High and Low groups. The outcomes showed some interesting results, in that there are significant differences between the two groups, in particular regarding the (a) Pressure dimension of the Social Norms on Intentions (not significant for the High FPM group, and significant and negative for the Low FPM group); (b) the Control dimension of the PBC on Intentions (not significant for the Low FPM group, and significant and positive for the High FPM group); (c) the NEP dimension of the Pro-environmental Identity on Intentions (not significant for the Low FPM group, and significant and positive for the High FPM group); and (d) the Capability dimension of the PBC on Behaviour (not significant for the Low FPM group, and significant and positive for the High FPM group). Given these differences, it would be interesting to understand in more depth how and why these differences arise between these two groups, not only from a theoretical perspective but also for its evident implications for practitioners.

Finally, further studies should provide more insight on how to reduce food waste, as well as the amount and specific causes of avoidable food waste. Therefore, it could be beneficial to conduct detailed observations and perhaps ethnographic studies about the type of food waste in households. This could be done by conducting home visits and observing families in a natural setting. What is more, observations could enable researchers to establish deeper insights into this critical area of contemporary household behaviour with important economic, social and environmental implications.

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Appendices

Appendix 1. Additional information for Tables 2-6

Research and Innovation

'A la carte menu' menu

Hvidovre Hospital, in Denmark, led by Chef Mogens Pedersen Fonseca, changed how food services are operated to reduce food waste produced via the previously rigid patient catering system. Following on four years of extensive work to modify the kitchen and hospital facilities and rethink the cooking strategy, Mogens Fonseca Pedersen and his one hundred employees were able to offer anytime 'a la carte' order options to patients, while remaining within budget limitations. The programme has helped the hospital avoid 40 tonnes of food waste per year, and the 'a la carte' style encourages portion management; money saved through the initiative has been reinvested to further reduce food waste and improve quality of hospital food services.

Carrefour

Types of waste (such as plastic, organic waste and scrap metal), which are produced in smaller quantities, are sorted according to the local waste-recovery systems available. In Spain, Carrefour has benefited from the introduction of biomethanisation units. This treatment recycles organic waste that has been sorted by the stores and produces compost and electricity from biogas. It is less costly than conventional waste management systems and reduces greenhouse gas emissions. Carrefour also uses this treatment in Belgium, where all

consolidated stores sort waste from their grocery, bakery, fruit and vegetable sections. In France, the biomethanisation of waste was successfully tested at the store in Lomme (Nord) and has since been deployed in nine other hypermarkets in the Nord-Pas de Calais region. In 2010, the efforts made by these 10 stores resulted in the collection of over 1,126 tonnes of organic waste, which were then reused via biomethanisation. With the opening of centres in the west and south of the country, other stores in France also carried out methanisation tests in 2010. The Group's aim regarding biomethanisation is to work with government and local authorities to promote the development of such treatment centres in France. Other solutions, such as composting, are also being studied. In 2010, over 373 tonnes of organic waste were recovered at nine French hypermarkets for use as compost. Carrefour stores in France also donated during year 2010 24,000 tonnes of limited-term storage goods. In Brazil, Carrefour reuses its organic waste as animal feed. As part of the Fazenda Brasil project, in which 52 stores participate, food products that are no longer fit for human consumption are used to feed animals at partner farms. These include products such as rice, flour, pasta, vegetables, grains and bread. In 2010, over 200 tonnes of food were reused in this way, saving over €18,500.

Cooperative framework for supply chain improvement

In 2006, there was a commitment from industry of 20 million euros to work on food waste issues. To fulfil this commitment, Wageningen University and Research Centre works with government actors and businesses to optimise supply chain processes for private sector companies, using a process of monitoring, modelling, fact finding, scenario analysis and business model

integration. Wageningen University, among other research organisations, provides expertise to help businesses to understand the primary opportunities for waste reduction in their supply chains and to incorporate long-term processes for waste reduction in their production activities.

Eurest restaurant and food campaign

150 units of the Eurest catering organization are participating in efforts to quantify food waste, publicise results to staff and customers, and explain the impacts of food waste and how it can be prevented, including using a spreadsheet to measure waste, with a graph entitled "so much waste we produce every single day" which is available to guests and staff. Through these types of initiatives and by having units measure waste once a month, Eurest has reached 22,055 guests. The initiative, which has been continuing for over half a year, has led to a reduction of 23 % in food waste quantities produced. During the European Week for Waste Reduction, 25 Eurest restaurants and 2 coffee shops in 15 different locations in Sweden weighed and measured the waste resulting from food preparation and made available this information to staff and guests.

UROOPEN

Packaging is part of the solution to tackle food waste. Packaging prevents food spoilage, ensures food quality and safety along the supply chain and at home, informs consumers on how to use and store packaged food products, increases shelf-life and provides portion sizes answering the multiple needs of consumer lifestyles and demographic changes. Packaging innovation and new

technologies play a key role in food waste prevention. The packaging supply chain, represented by EUROOPEN*, strives to further innovate and develop new technologies that make packaging more active and intelligent in tackling food waste. As part of these efforts and to encourage continuous improvements by the packaging supply chain, EUROOPEN set up a dedicated task force on 'Food Waste' and developed best practice examples of packaging innovations and technologies that help prevent food waste. These examples can be viewed in the attached document.

Fish Chips

Hospitality and restaurant sector players in Denmark formed a partnership, using state and EU Fisheries Fund, to develop an Omega 3 rich fish chip product from otherwise inedible fish waste. As of the end of 2009, the team was in the final stages and testing, having already negotiated agreements with manufacturers and buyers. While concrete results are not yet available, given that over 50% of fish is discarded as inedible waste in Denmark, according to a 2010 CHI1 study, this is an excellent use for a product that would otherwise be food waste.

Food and Drink Federation's Five-fold Environmental Ambition

The Food and Drink Federation's Five-fold Environmental Ambition started with member commitments to play a role in tackling climate change by reducing CO₂ emissions by 20% by 2010 against a 1990 baseline, sending zero food and packaging waste to landfill from 2015, making significant reductions in levels of packaging reaching households in line

with WRAP's Courtauld Commitment, embedding environmental standards into food transport practices and reducing overall transportation and reducing waste use. The association has already made progress on the waste portion of the Ambition, to send zero food and packaging waste to landfill from 2015. Members established baselines from their 2006 waste volumes and have since this initial reporting prevented more than half a million tonnes of food waste from being created. The project has also included a joint initiative with WRAP to carry out waste prevention reviews at thirteen member company sites across the UK, working closely with FareShare, to encourage member food redistribution and encouraging members to sign up for the original Courtauld Commitment which seeks to reduce domestic food waste by 155,000 tonnes by 2010 as compared to 2008.

Food Waste Recovery, 1st Edition

'Food Waste Recovery: Processing Technologies and Industrial Techniques' acts as a guide to recover valuable components of food by-products and recycle them inside the food chain, in an economic and sustainable way. The book investigates all the relevant recovery issues and compares different techniques to help you advance your research and develop new applications. Strong coverage of the different technologies is included, while keeping a balance between the characteristics of current conventional and emerging technologies. This is an essential reference for research outcomes.

Key Features:

- Presents a holistic methodology (the so-called "5-Stages Universal Recovery Process") and a general approach (the so-called "Universal Recovery Strategy") to ensure optimized management of the available technologies and recapture of different high added-value compounds from any waste source
 - Includes characteristics, safety and cost issues of conventional and emerging technologies, the benefits of their application in industry, and commercialized applications of real market products
 - Demonstrates all aspects of the recovery process such as preservation of the substrate, yield optimization, preservation of functionality of the target compounds during processing, and more
- Readership: Food technologists, researchers, scientists, engineers, professionals and students working or studying in food and by-products processing area

Food Waste Recycling Partnership Scheme

In order to promote good food waste management practice and to gain experience on food waste source separation and recycling, EPD launched the "Food Waste Recycling Partnership Scheme" together with commercial & industrial (C&I) sectors in 2009. A Working Group comprising representatives from the Government and the C&I sectors has been set up in Dec 2009 to plan and manage the operation of the Scheme.

Personal Carbon Allowances White Paper

The Carbon Trust is a world-leading organisation helping businesses, governments and the public sector to accelerate the move to a low carbon economy through carbon reduction, energy-saving strategies and commercialising low carbon technologies. The White Paper explores the concept of Personal Carbon Allowances - investigating how it could work in practice, reviewing what a personal carbon allowance would include, and looking at how big a personal carbon allowance should be. It includes learning's and feedback from a four-week consumer trial in Great Britain which set a personal carbon allowance of 20Kg CO₂ per day. The White Paper also explores the increasingly important role that business and brands have to play in driving awareness of sustainability and investigates whether personal carbon allowances could help consumers to understand how the carbon footprint of specific products and services relate to a total daily allowance. Providing easy-to-understand environmental information in a credible and relevant way is a significant challenge, but also an exciting opportunity.

Reducing the environmental impacts of food

Final Report: <https://www.rvo.nl/content/reductie-milieudruk-voedsel-eindrapportage-1e-fase-voedselverspilling>

Save Food from the Fridge

This project is about traditional oral knowledge which has been accumulated from experience and transmitted by mouth to mouth. Particularly focusing on the food preservation, it looks at a feasible way of bringing that knowledge into everyday life. Presented design looks at re-introducing and re-evaluating traditional oral knowledge of food, which is closer to nature. Through the objects of everyday life, design can introduce traditional oral knowledge into people's lives through their experience of using it. These Dutch "ancient wisdoms" is now coming within a book and in the self-designed food storage containers for consumers.

Slow Food Chefs' Alliance

The chefs involved in the Alliance initiative embrace the Slow Food philosophy, choosing local ingredients, respecting seasonality and working directly with small-scale producers, getting to know them and promoting their products. The close link between farmers and chefs ensures timely delivery of products and thereby avoid post-production losses.

Slow Food Presidia

Presidia are groups of small scale producers who safeguard native breeds and local plant varieties, engage in quality production at risk of extinction, protect unique regions and ecosystems, recover traditional processing methods. There are more than 250 Slow Food Presidia in Europe involving more than 1600 small-scale producers: fishers, butchers,

shepherds, cheesemakers, bakers and pastry chefs. Slow Food technical support to Presidia aims to address issues relating to food processing, also to minimise production and post-production losses.

Sodexo Campus Food Waste

Sodexo employees at eight college campuses cut kitchen waste by about one third, simply by tracking and monitoring food waste, according to the preliminary findings from the first eight weeks of a pilot study that is part of the company's commitment to stop wasting food to curb climate change and improve business practices. Sodexo is partnering with LeanPath, a technology company providing food waste tracking systems, to conduct the review. The pilot study focuses on kitchen - or pre-consumer - waste, not what customers throw out. The pilot study system features a tracking station where Sodexo employees enter data about what they are throwing out and why. By tracking the reason for throwing away items, Sodexo is able to correct the problem to prevent future food waste. Sodexo employees at those eight sites have dramatically reduced overproduction, spoilage, expiration and trimmings by participating in the pilot study. In September Sodexo launched "Stop Wasting Food," a campaign to engage its customers and employees in reducing food waste to curb climate change.

Tesco 'Buy One Get One Free Later'

As part of their pledge to not send any waste to landfill this year and specifically to target food waste reduction, grocery retailer Tesco launched a 'Buy One Get

One Free Later' initiative to allow customers buying perishable goods to collect their free item the following week. Under the offers, consumers will be able to postpone getting their free second promotional product until a later shopping trip. The programme works through a voucher system; products included in the initiative are those which are considered "short-code life-perishable products" with short sell dates such as yoghurts, salads, vegetables and cheese. The initiative does not include products with longer sell dates such as cans of beans and pasta sauce.

Awareness, Information and Education

Anti-waste workshops - Cooking Classes - Training program

Bruxelles Environment, a local authority in Brussels, has put in place a training program geared at helping households to reduce their food waste production via cooking training. The cooking workshops are offered for free to the local community to highlight techniques and benefits of the food waste reduction. 1000 people were trained in 2009.

Appetite for action

Appetite for Action is a new, free educational website for all Primary Schools in the UK and Ireland that helps schools tackle a range of sustainability issues through the topic of food. Developed in conjunction with teachers, the website offers schools access to free resources, from lesson plans and fact sheets through to activity ideas and films, helping pupils to reduce food waste, grow their own fruit and vegetables,

understand composting and reduce waste to landfill. Plus the opportunity to take part in a school challenge to reduce their schools CO₂ impact. Schools can choose to take part in a challenge around food, waste or growing and students get the opportunity to create an online team profile, measure their activities, develop a blog on the actions taken and search out other similar schools. All challenge participants will receive a United Nations Environment Programme Certificates and enter the competition to win £3,000.

“Buon Fine”

The ‘Buon fine’ (‘Good end’) project aims to recover still edible, unsold food products and donate them to charities and people in need. This project, carried out on a national level, is managed locally by the co-operatives. In 2011 it involved 471 shops, ten superstores and twenty supermarkets and allowed the donation of 276 tonnes of food products that accounted for an overall economic value of 1,556,864 Euros.

‘Calling Time on Waste’

The widely-disseminated brochure titled ‘Calling Time on Waste’, prepared and published by the National Waste Prevention Programme run by Ireland's EPA, is a guide on resource efficiency in the bar trade. The document, which spans approximately twenty pages, breaks down various waste streams which occur in bar/restaurant settings, explains their impact, provides practical tips for their reduction and prevention, and offers a succinct waste management

checklist. The brochure also frames waste prevention in economic terms, offering examples such as “By re-tendering for waste collection, implementing a source segregation scheme and reducing food waste a pub saved £14000 per annum on waste charges”.

Coop Denmark

In banana bunches there is often just one or two bananas which are damaged but for this reason the consumer does not buy the whole bunch. This attitude has led, so far, to throw away 6,000 bananas every day. This is why Coop Denmark decided to launch the initiative “Single Bananas”, i.e. to sell every banana separately.

DiscoSoup / Schinppeldisko

In 2012, Nadja Flohr-Spence from the Slow Food Youth Network in Germany came up an idea to raise awareness of food waste that has now become a global phenomenon - the **DISCO SOUP**. The idea is simple: People come together in a public space to communally prepare a soup from vegetables that would otherwise have gone to waste (simply because of their appearance) to the backdrop of live music and a festive atmosphere.

DIVE! - Documentary film

Documentary film about food wasting in the US, mainly in the retail sector.

<http://www.divethefilm.com/default.aspx>

Do you have an amusement park in your fridge?

A household of four people in Sweden throw away edible food each year to a value of 3000-6000 SEK. (Approximately 300 – 600 EUR) Food that, if well managed, just as easily could have been eaten. So why not do something fun for the money instead? For example, go to the amusement park? The idea of the campaign is to create awareness of the problems of food waste by telling people what they can do instead with the money they save if they stop wasting food.

The campaign is an initiative of the National Food Agency, the Swedish Environmental Protection Agency and the Swedish Board of Agriculture.

Dutch Nutrition Centre: Information for consumer on food waste

The 'Voedingscentrum' gives objective information for consumers how to reduce their food waste, related to 'buying, cooking en storing' food.

Eetmaatje (Measure cup)

The 'Eetmaatje' helps consumers to measure the right portion of uncooked pasta, rice and couscous. In 2014 the Netherlands Nutrition Centre (Voedingscentrum) launched the 'Eetmaatje' because people often cook too much pasta, rice and other similar products. People overestimate a portion or simply use the entire package which makes pasta and rice one of the most wasted food products.

However studies show that 60% of consumers want to waste less by measuring portion sizes. By cooking the right portions of pasta and rice, most households can cut their food waste by 2.5 kg (5%) a year. The 'Eetmaatje' is a tool to help do just that.

Eroski - Food redistribution

Among other activities related to food donation, Eroski also donates food directly in-store: in 2011 almost 492,000 kilos of damaged goods (products with deformed packaging, for example) and more than 217,000 kilos of fresh food products. Eroski's commitment to freshness means that foods are delivered daily. Yoghurts, desserts, eggs and sliced bread are removed from sale sufficiently in advance of their best before date to provide the time margins necessary for the donated products to reach their final destination in perfect condition. Eroski has strengthened the elements in the refrigeration chain and collaborated with the Spanish Federation of Food Banks (FESBAL) in order to guarantee the products' freshness.

European Community of Consumer Cooperatives (EUROCOOP)

Economic progress in the 20th century has spread access to food and higher quality to the majority of population in industrialised countries. The average consumer currently devotes less disposable income to the purchase of food, which is available in huge quantities at relatively low prices. This increase in consumption magnifies disposable waste, too. Food waste in industrialised countries accounts for 40% and occurs mainly at retail and consumer level,

whereas, in developing countries, it occurs at post-harvest and processing levels.

European Week for Waste Reduction

3-year project targeted on waste reduction and on promoting awareness of waste reduction strategies. Program promotes sustainable waste reduction across Europe by encouraging cooperation between different stakeholders. Main aim is to induce positive changes of the Europeans consumptions habits.

Every Crumb Counts

In Europe, almost half of the food produced never makes it to the table. Food wastage is a missed opportunity to feed more people, a waste of resources and a source of greenhouse gas emissions, with negative economic consequences. FoodDrinkEurope, together with an important number of key stakeholders, formed a Joint Initiative to help reduce edible food wastage and build a sustainable food supply chain. 'Every Crumb Counts' is a joint initiative involving stakeholders across Europe's food supply chain. Launched in June 2013, in the presence of key European policy-makers, NGOs and industry representatives, the Joint Declaration secured pledges from co-signatories to work towards preventing edible food waste, promoting a life-cycle approach and proactively feeding into solutions and initiatives.

FoodSave

FoodSave is a Mayor of London programme providing free support to small and

medium-sized food businesses (SMEs) across London. The programme aims to help these businesses reduce their food waste and put any surplus to good use, by making small and manageable changes such as reducing portion sizes, stock rotation or donating food to charities and farms. FoodSave aims to support over 200 food businesses by March 2015, with goals to reduce over 180 tonnes of food waste, divert over 1,000 tonnes of food waste from landfill and save businesses collectively over £360,000 a year.

Food Surplus Entrepreneurs Network

The Food Surplus Entrepreneurs Network (FSE Network) is the European community connecting social innovators reducing food waste or valorizing food surplus. It is a learning network facilitating exchange and collaboration between food surplus entrepreneurs. Furthermore, it gives visibility to these innovations to encourage replication. The FSE Network supports social innovators in four ways: It has a virtual, international platform which connects 160 social innovators to share best practices. It organises international events to physically bring together social innovators from across Europe. It connects social innovators on a city or regional level in Local Community Hubs to solve challenges together. It showcases the movement of Food Surplus Entrepreneurs on its online map and social media. Moreover, the FSE Network helps local governments to reduce food waste through social innovation. It guides cities and municipalities on how they can work towards the Zero Food Waste City.

FoodDrinkEurope: Preventing food wastage in the food and drink sector

FoodDrinkEurope has published a progress report showcasing the concrete actions being taken by Europe's food and drink manufacturers to tackle food wastage both within their own operations and up and down their supply chains.

The report, entitled 'Preventing food wastage in the food and drink sector', presents the results of an internal survey amongst FoodDrinkEurope members to identify the progress made in preventing food wastage and their future plans. This survey comes as a follow-up to the launch in 2013 of FoodDrinkEurope's industry toolkit 'Maximising food resources: A toolkit for food manufacturers on avoiding food wastage', published in parallel to a joint declaration on food wastage, entitled 'Every Crumb Counts'. The survey was carried out to assess uptake of the toolkit, raise awareness about food wastage as a major societal issue and propose solutions. The report highlights targeted actions taken to further prevent food wastage across Europe and involving large, medium and small companies alike, covering many different sectors.

Food Waste Reduction: Case studies from the contract catering industry

Food waste is a very important challenge and opportunity for the food supply chain, including the contract catering sector. Food Service Europe members are very active across Europe in reducing food waste and sharing good practices, at local, national and EU level. This is a consolidation of good practices to reduce food waste in the contract catering sector.

FoodwasteTV

YouTube channel with food waste related videos (tips how to prevent and reduce losses)

<https://www.youtube.com/user/foodwastetv>

Foodwise

FoodWise is a national campaign that's organised by the action group Do Something!. The aim of campaign is to get Australians to reduce the environmental impact of their food consumption. In short, we want people to become FoodWise. Initially, the FoodWise campaign focused on getting people to reduce their food waste. However, recent research shows that many people are unaware of the 'paddock to plate' environmental impact of food. In order to change that situation, they've expanded their campaign to help people reduce this impact Campaign partners and content contributors include The Australia Institute, The Food Safety Information Council, Greenpeace, Growcom, Biological Farmers of Australia and the major food charities OzHarvest, Fareshare, Second Bite and Foodbank.

FORWARD

FORWARD – Food Recovery and Waste Reduction - is a two-years transnational project co-funded by the European Commission under the Lifelong Learning Programme. Its main aim is the reduction of food waste and the promotion of unsold food recollection in favour of charities, thanks to training and use of ICT

resources.

The main outcome is an innovative platform hosting the three main results of the project:

- A free online training course for food supplier and charities focused on the reduction of food waste and methods to recovery and redistribute it.
- An educational game simulating the process of recollection of food waste and the relationship between food suppliers and charities
- A user-friendly brokering platform to allow the natural matching of demand and supply of food waste. Any user, all over the world, can search or publish a donation announcement and find a counterpart, so to favour the creation of contacts and network between food producers/sellers and organisation able to organise the recovery.

Koelkaststicker ja/nee (Fridge Sticker yes/no)

The 'Koelkaststicker ja/nee' helps consumers to store 12 different fruit, vegetables and eggs in the right place: yes or no in the refrigerator. In 2015 the Netherlands Nutrition Centre (Voedingscentrum) launched the sticker because the right storage keeps products fresher for longer. One main reason for wasting fruit and vegetables is spoilage. By storing products the right way, food perishes less fast and thus reduces food waste.

Generation awake

A campaign called Generation Awake is educating Europeans about making

more sustainable and eco-friendly choices in their everyday lives in order to be 'smarter' consumers. The website and virtual guide centres around the idea, that we are all consumers and our shopping choices and daily habits have an effect on the planet and our own future as a human race. Generation Awake is providing plenty of facts related to our: water supply, quality of air, waste streams, energy usage, food habits etc. and educates readers on alternatives in order to promote more sustainable choices.

'Great Taste, Less Waste'

Following on a survey conducted of their customers, Morrisons Supermarkets found that two thirds of UK households are allowing fruit to go to waste by keeping it in the fruit bowl instead of the refrigerator, where it can last up to fourteen days longer. The same survey found that customers wanted to help more to reduce food waste, with 67% of customers stating that supermarkets have a duty to ensure the right packaging so that food stays fresh, but only 12% believing that supermarkets "get packaging right".

The survey led Morrisons Supermarkets, in 2009, to instate a campaign to help customers reduce food-related waste. The initiative has included providing storage advice, offering 'market street' portion choice, providing information on labelling, distributing tips for leftover cooking and 'packaging laboratory: keep it fresh' tests to identify what type of packaging can extend the life of specific fruit and vegetables. Activities are coordinated in-store and information is disseminated in the store as well as through the supermarkets' website and magazine. The campaign has the stated goal of helping customers reduce the on average £600 of food thrown out per household annually.

Green Cook

Green Cook is aimed at reducing food wastage and to make the North-West Europe a model of sustainable food management, by in-depth work on the consumer / food relationship thanks to a multisectoral partnership. Tools and methods are under experimentation to help consumers to improve their food management while controlling their purchasing power. They aim at changing behaviour or altering the offer (at the supermarket, in the restaurant or in the canteen). It is alas hard for them to be generalised, because of the complexity of the levers that have to be activated. GreenCook's ambition is to create this lever effect, by generating a dynamic that motivates all of the food players and by throwing path breaking bridges with the fields of health, welfare and economic development. Its diversified partnership intends to show the added value of united, transversal action, and to influence EU policies, in order to get a new European sustainable food model to emerge.

International Food Waste Coalition (IFWC)

In partnership with the Food and Agriculture Organisation of the United Nations (FAO), SKOOL is the first action-driven programme to help schools adopt a comprehensive approach to reducing food waste, and to enable children to play a part in this.

Our ambition is to deliver targeted packages to those involved along the value chain - to educational teams, to cafeteria and to kitchen staff - on implementing methods to reduce waste along the whole food chain. The SKOOL programme is based on three linked projects to address food waste and loss along the food

chain:

- Children's awareness: to bring back the value of food - we give children the opportunity to become involved by using teaching materials and interactive food waste assignments/activities in schools during lessons or extracurricular time. The fao and the ifwc have developed a comprehensive education kit to be used in schools to allow pupils to learn about, to understand and to take action
- Food optimisation: to rethink processes and practices - by tracking food waste in kitchens and at the children's level, we can understand more about why schools waste food and where. Once this is done, we can then identify actions to reduce this which we can test with schools and kitchen staff. We have teamed up with leanpath, a food waste monitoring and tracking system, in order to optimise the process and to reduce food waste in the kitchen
- Improved organisation of collaboration between the different players in the supply chain - leveraging the power of the value chain - food optimisation helps us identify the reasons for waste resulting from regulations, contracts, markets, logistics, industry and producers. After collecting information from food optimisation, the ifwc initiated discussions to look at the opportunities for collaboration across the value chain. The coalition will work on setting up guidelines on how to implement collaborative action to reduce food waste along the value chain.

"Io non spreco: adotta un nonno a pranzo"

Socially-useful and consumer education projects for children, undertaken in collaboration with the Municipality of Milan: The schools participating in the project welcome the grandfathers followed by the social services of the city for lunch with the children.

Io non spreco: snack-saver bag

Recovery of fruit, bread, puddings, and snacks if not eaten at school for later consumption at home: each child in the classes participating in the "Io non spreco" initiative is provided with a snack-saver bag, made from washable, reusable, recyclable material.

To date, the following have signed up to the project: 77 Primary schools and 22,050 bags distributed

Love Food Hate Waste

Love Food Hate Waste, an awareness campaign, sponsored by WRAP in the UK, aims at raising awareness on the need to reduce food waste, via the dissemination of information on reducing consumer and household food waste to achieve environmental and economic benefits. The focus of the campaign is on easy practical everyday activities which can lead to waste reduction. Since the campaign launched in 2008, WRAP estimates that 137,000 tons of food waste have been prevented.

Love Food Hate Waste Australia

Love Food Hate Waste aims to raise awareness about the impact of food waste in NSW and reduce how much 'good' food we waste. Love Food Hate Waste is managed by the Environment Protection Authority (EPA) partnering with corporate, government and not-for-profit organisations committed to reducing food waste in NSW.

Love Green

The Love Green wants to encourage broadcast and other media to contact them and to create their own Love Green in their respective markets. Since summer 2011 in television shows on Sat.1 and ProSieben are regularly contributions about sustainability and environmental protection. Those contributions are also later available on the LoveGreen website. In addition to various sustainability issues many other articles and information are available on the website.

Menu Dose Certa

The Menu Dose Certa project aims to reduce food waste by 48.5 kilos per year per restaurant client by 2011 and attempts to change attitudes and behaviours by raising awareness on the problem of food waste. The goal is to support restaurants in creating menus that generate notably less food waste. The project is a partnership between LIPOR, the Association of Portuguese Nutritionists, the local authorities of Espinho and local restaurants. The initiative combats food waste in restaurants, increases public awareness of the issue, and promotes a balanced diet. The initiative kicked off at the Cristal restaurant in Espinho,

generating significant media attention at regional and national level. The project will continue to be expanded with a competition among participating restaurants to produce the best recipe for a Right Serving Menu, in terms of serving size and nutritional value. Winning menus will be collected in a recipe book promoted in local media.

Narrative Label

In 2012, Slow Food launched the first edition of the SlowPack prize 2012, held as part of Salone del Gusto 2012, open exclusively to the food producers both from Italy and the rest of the world who exhibit their products at the event. This contest aims to encourage producers to reflect on the impact that non-eco-friendly packaging has on the environment and on the flavor, aroma, and safety of their products, while awarding those who use environmentally friendly packaging.

"Restaurant fines"

Kylin Buffet in UK has begun charging customers £20 if they do not finish the food on their plate from the all-you-can-eat Chinese food buffet. The restaurant in Saudi Arabia is charging customers who fail to eat everything on their plates, claiming that wasting food is contrary to the principles of Islam. Malaysian restaurant owner from Danish city Hjørring charging customers 4EUR as an ecological fee for their food leftovers

Restos Glücklich

The vision of RESTLOS GLÜCKLICH e.V. is that food surplus is more valued again. With our projects we want people to consume more consciously and recycle more of the food they store at home. We offer for example cooking classes and run a small restaurant in Berlin-Neukölln.

We are in direct contact with supermarkets, whole sellers and farmers in order to get the products they can no longer sell, mainly vegetables, fruit and bread. Food surplus does not mean that this is already spoiled or that the “best before” date has passed. It is truly an unfortunate fact that a lot of food is discarded, because it simply takes away storage space, the shape is not right or just the packaging is damaged. The team behind RESTLOS GLÜCKLICH e.V. works mainly voluntarily. The prices we ask for our dishes in the restaurant allow us to invest profit in educational projects and cooking classes on the topics relating to food and how each of us can reduce food waste at home.

Réduisons nos déchets

ADEME's national awareness campaign aimed to informing households about waste production and its prevention, for this purpose uses multiple communication channels: online resources, radio broadcasts, etc. The website offers specific practical tips related to food waste reduction at home and while shopping. Target of the program is to reduce annually 390 kg of the waste produced in France.

School waste heroes

School Food Waste Heroes Activity Pack has been developed from research by WRAP (Waste & Resources Action Programme) www.wrap.org.uk into the extent of food waste in schools.

The pack challenges students to become heroes by getting them to lead a group of stakeholders across the school, including caterers and lunch time supervisors, to reduce food waste in their school. The pack suggests a step-by-step approach, with a set of actions and all the supporting resources needed to help them in their task

SIG5 Food Waste Recovery

The SIG is aimed to:

Create an expert network to fill in the gap between academics, research institutes and food industry in terms of high added-value compounds recovery from agricultural by-products and food wastes

- Provide training activities on the several aspects of food waste recovery
- Exchange ideas, methodologies, scale up and commercialisation experiences from the source to the final product
- Implement education and research that can lead to the potential exploitation of food wastes and agricultural by-products as a nutraceuticals resource
- Develop and coordinate common research activities and programs in the frame of food waste valorisation and corresponding bioproducts processing

The main objectives of the SIG are the development of a network in food waste recovery field and the support of collaborations, common research and teaching projects.

- Organising webinars, seminars & e-learning course
- Organising collaborations & common publications
- Submitting applications in joint calls (COST ACTION, Horizon 2020 etc.)
- Registered users would be able to participate in moderated discussion forums after login

The SIG is open to all interested people from academia and food industry as well as individual experts to actively contribute and collaborate.

Slow Food Earth Markets

Earth Markets are community-run markets where local producers offer healthy, quality food directly to consumers at fair prices and guarantee environmentally sustainable methods. Earth Markets are run so as to minimise environmental impact, for instance with waste reduction, biodegradable consumables, recycling, and energy-saving measures. Workshops are also organised at the markets to raise consumer awareness on the importance of eating local seasonal products and reduce food waste.

Still Tasty

StillTasty's food storage information is drawn from multiple sources. A primary

source is the food safety research conducted by U.S. government agencies, including the United States Department of Agriculture, the U.S. Food & Drug Administration, and the U.S. Centres for Disease Control and Prevention. StillTasty's content also incorporates research from state government agencies as well as several non-profit organizations and associations that conduct studies on food storage and safety. In addition, StillTasty has directly contacted food and beverage manufacturers to obtain information on optimal storage methods for specific foods and details on storage times as they pertain to both food safety and food quality.

Stop Food Waste

Web page managed by EPA, contains plenty of information for municipalities and households about the food waste prevention (cooking recipes, food storage tips, how to compost, etc.)

Stop Spild Af Mad

Stop Wasting Food is Denmark's largest movement of private consumers against food waste - a nonprofit NGO, created by the consumers for the consumers. The movement is founded to raise public awareness about food waste through campaigns, publicity, press, discussions, debate, events and other information channels - and to equip consumers to minimize food waste. Stop Wasting Food also inspires consumers to act locally, for example by donating edible surplus food to shelters for homeless people.

Taste the Waste - Documentary film

Documentary film about food wasting in the EU. <http://tastethewaste.com/>

Teller statt Tonne

Good quality, but curved and knobbly vegetables have no chance in the food trade. Supposedly they are despised by the customer due to their shape or texture - or they just do not fit into the packaging standards of middlemen. As a result, producers have to throw quality goods often. To counteract food waste, Slow Food Germany launched the action Teller statt Tonne ("plate instead of the bin"). Volunteers gather discarded vegetables and other foods from local producers, prepare a dish distributed freely to the passersby. When sharing a meal together at long tables, visitors can then inform and learn what they can do personally against food waste.

The Co-operative Group

Perforations in plastic packaging are used to manage the levels of moisture in products, and their size and distribution can have a significant impact on product quality and shelf life. During 2012, The Co-operative Group moved from forming packaging perforations with mechanical punches to using computer-guided lasers which have greater control on hole size and placement, allowing greater perforation flexibility. Trials of various perforations, under a variety of different commercial storage conditions for tomatoes, indicated a perforation specification which led to a 33–50% reduction in moisture, but no greater incidence of mould growth, and noticeably less dehydration, especially of the

vine. The result is higher quality, fresher produce, a day's extension to shelf life and a reduction in product wastage.

The S Group

In grocery stores, products approaching their "Best before" date are sold at a discounted price in order to minimise the amount of food waste. Food loss in S Group's grocery trade was approximately 33,000 tonnes in 2012. The loss proportionate to the sales volume, or loss by weight, was 1.96 per cent. Throw-away loss proportionate to S Group's grocery retail decreased by 5.3 per cent from the previous year. Some of the regional co-operatives have been working together with charities to donate bread, canned foods and other non-perishable food products in particular. The new guideline from the Finnish Food Safety Agency Evira clarifies the policies of donating foodstuffs and associated responsibilities and also makes it easier to donate products with "Use by" dates. The bio-waste which is still left after the donations is either composted or treated in a biogas plant or bio ethanol plant.

The Spanish Confederation of Consumer and User Cooperatives (HISPACOOOP)

HISPACOOOP, a consumer organization, carried out a project, which was funded by the National Consumer Institute, with the aim of raising awareness and educating consumers about good habits and responsible behaviours in order to reduce food waste. They had a number of different activities consumer awareness. Included in these activities was a conference to debate this problem, and a leaflet with practical recommendations about how to plan, prepare and

preserve food and how to reuse leftovers. It provides information about “best before” and “use by” date labels. Moreover, a study was done on food waste in Spanish households. It revealed information about the food waste produced by more than 400 Spanish households, what kind of products is frequently thrown away and the reasons why households waste food. The conclusion of the analysis was the behaviour and habits of consumers related to food management, through almost 3.500 online and onsite surveys. The study was completed by a list of recommendations to reduce food waste in the household.

Trash Hunger, Not Food: A Guide to End Campus Food Waste

Food waste on university and college campuses is rampant. Currently, over 1 million kg of food is wasted every year at US universities alone. This guide, and its companion website, provides information about campus food waste, resources for reducing food waste at a personal and institutional level, and success stories about students who successfully changed the way their campus handles leftover food.

Waste

Tristram Stuart is the winner of the international environmental award, The Sophie Prize 2011, for his fight against food waste. Following the critical success of Tristram’s first book, *The Bloodless Revolution* (2006), ‘a genuinely revelatory contribution to the history of human ideas’, Tristram has become a renowned campaigner, working in several countries to help improve the environmental and social impact of food production. His latest international prize-winning book, *Waste: Uncovering the Global Food Scandal* (Penguin, 2009), revealed that

Western countries waste up to half of their food, and that tackling this problem is one of the simplest ways of reducing pressure on the environment and on global food supplies. Feedback's campaigns and events, including Feeding the 5000 (where 5000 meals, made entirely from quality food that would have been wasted, are given away for free), The Gleaning Network UK/EU and The Pig Idea have been launched with partner organisations including UNEP, EU and grassroots groups in dozens of countries across the globe.

Policy, Awards, Self-Imposed Certification

European Food Processing Implementation Award

The HighTech Europe Network of Excellence comprises 21 industrial and research partners from all over Europe as well as one research institute from Australia. The network promotes knowledge transfer and the introduction of high-tech technologies to food markets, in order to strengthen the competitiveness of the European food industry, especially of SMEs. HighTech Europe aims to establish a European Institute for Food Processing to harmonize excellence in food processing research. If you want to learn more about the project or the Associated Membership Platform please visit. European Food Processing Implementation Award honouring successful innovations in food processing and improvement of food quality that have been developed along knowledge transfer chain within the last 3 years. It will serve as an incentive for cooperation between the research and food industry.

European Waste Reduction Awards

The most outstanding actions carried out during each edition of the European Week for Waste Reduction are rewarded every year during a European awards ceremony. Prizes are granted for the most outstanding EWR actions carried out by Project Developers from each of the following categories:

- Administration/public authority
- Association/NGO
- Business/industry
- Educational establishment
- Other (for example hospital, retirement home, cultural institution...)

Green Business programme

Greenbusiness.ie offers Irish business assistance in improving resource efficiency and is designed to complement other existing business support services from the likes of Enterprise Ireland. Assistance is delivered through the provision of online site assessment and benchmarking tools, a telephone helpline and on-site support. Greenbusiness.ie is publicly funded through the National Waste Prevention Programme (NWPP) and acts semi-independently from this programme. All information provided to greenbusiness.ie is held confidentially and is only used to effectively assist businesses. No information or data submitted is used for the purposes of enforcement.

The National Waste Prevention Programme was launched by the Minister of the Environment, Heritage and Local Government in April 2004. The National Waste Prevention Committee (NWPC) includes a stakeholder group that meets

periodically to provide strategic direction for the Environmental Protection Agency in implementing the NWPP. The aim is to deliver results on waste prevention and minimisation and launch a range of programmes that help raise awareness, encourage technical and financial assistance, deliver training and encourage resource efficiency.

Green Hospitality Award Scheme

This is a voluntary programme that aims to develop environmental best practice within the wider hospitality sector. The Green Hospitality Award (GHA) Scheme, for the hotel and catering sector, is organised by the National Waste Prevention Programme, a part of the Irish EPA, involves waste measurement and waste reduction targets, with a specific focus on food waste, with an award for top-performers. GHA now has a membership of 150 hotels and 10 major catering businesses all working to reduce waste/energy/water use including food waste. GHA requires certified members to implement specific criteria and they are independently inspected to ensure compliance. 100 of these will achieve award status in 2010. 120 properties were surveyed in 2009 and showed a 6,000 tonne reduction in waste; while no breakdown of this figure is available in relation to food waste, food waste does compose a large percentage of waste produced in this sector.

Green Seal Standards

The Green Seal Standard for Restaurants and Food Services, GS-46, establishes requirements for restaurants and food service operations that have

been operating for at least three months whose primary business is preparing and serving food to the general public or private consumers. This includes full-service, limited-service, non-commercial, and catering operations. The standard is based on life cycle research and focuses on leadership environmental improvement in the key impact areas — food, waste, and energy. Metrics, performance, and practices are combined in this standard to help operations make meaningful environmental improvement. In addition, organizational commitment is included to ensure the environmental efforts are long lasting. The standard can serve as a tool to help operations begin to take action to improve their operation and is available for Green Seal certification.

Green Your Restaurant

The GRA was founded with the mission of creating an ecologically sustainable restaurant industry, and from day one, their goal have been to make the process as simple and effective as possible. Because they realize that restaurateurs have enough on their plates without worrying what kind of paper towel to order, or where they'll get next months supply of eco-friendly dish soap.

With the world's largest database of environmental solutions for the restaurant industry, and almost twenty years of experience, the Green Restaurant Association is the expert in helping restaurants become more environmentally sustainable.

Love your leftovers

After receiving thousands of entries, 10 of them have been chosen; each receives

a £100 Sainsbury's voucher. Winning leftover tips could be found on the web page along with judges' comments.

New Irish legislation on separate food waste collection (SI 508 of 2009)

Designed to promote the segregation and recovery of food waste arising in the commercial sector, this regulation sets up the source separation of food waste from major commercial premises. The regulation facilitates the achievement of the targets set out in Directive 99/31/EC on the landfilling of waste notably as regards the diversion of biodegradable municipal waste (BMW) from landfill sites to composting and anaerobic digestion plants and to other forms of biological treatment

Phasing out of EU Commission Regulation

With Commission Regulation (EC) No 1221/2008 of 5 December 2008, the European Commission approved the phasing out of regulations on the size and shapes of fruit and vegetables. This legislative change reduces the aesthetic requirements for many fruits and vegetables thereby preventing the unnecessary discard of various types of produce, which are aesthetically imperfect but perfectly edible. This change should lessen the burden of legislation as well as allowing shoppers more choice by ensuring that fruits and vegetables with slight abnormalities will not be thrown away. The current list of fruit and vegetables impacted are: apricots, artichokes, asparagus, aubergines, avocados, beans, Brussels sprouts, carrots, cauliflowers, cherries, courgettes, cucumbers, cultivated mushrooms, garlic, hazelnuts in shell, headed cabbage, leeks, melons, onions, peas, plums, ribbed celery, spinach, walnuts in shell, water melons, and

witloof/chicory. The exception from marketing standards could be extended to another ten products such as apples, citrus fruit, kiwifruit, lettuces, peaches and nectarines, pears, strawberries, sweet peppers, table grapes and tomatoes to further reduce the production of food waste due to aesthetical concerns.

Sustainable Restaurant Association

The Sustainable Restaurant Association is a not for profit membership organisation helping restaurants become more sustainable and diners make more sustainable choices when dining out. They help their member restaurants source food more sustainably, manage resources more efficiently and work more closely with their community. Their independently verified Sustainability Rating system means diners can choose a restaurant that matches their sustainability priorities. They recognise restaurants as one, two or three star sustainability champions depending on how they rate against a wide range of criteria covering 14 areas of sustainability.

Food Redistribution

Approved food

Approve Food and Drink Company, a UK – based food redistribution programme, specialise in selling dry food products that are near or past their "best before" date at a discounted rate through their website. While sales and revenue figures are not available, the company has received a large amount of mass media publicity, indicating an impact of consumer awareness. Company represents an innovative private-sector approach to avoiding food waste via resale.

Auchan Spa

Auchan has a partnership with “Banco Alimentare”, a ONG that collects food near to the expiration date but still edible from Hypermarkets and give it to organizations which take care about poor people. In 2012 20 Hypermarkets Auchan offered an amount of food to “Banco Alimentare” equivalent to 600.000 €. The Hypermarket Auchan in Piacenza gave to the Italian Red Cross an amount of food corresponding to 22.150 €. What’s more, every year in November there is the day of food collection: clients who shops in our Hypermarkets can give freely a part of their shopping to the volunteers of “Banco Alimentare” and it provides to send the food to poor people. Moreover, Auchan applies a discount to the goods which are near to the expiration date, so that the clients can buy them paying till 50% less than the normal price and the food waste is reduced. The goods who are more sold are milk products, cold cuts and pasta: they are often located in a specific place and clients can recognize them by special stamps or posters. To reduce the wood waste, Auchan has a Self-discount format: the food is sold without packaging, so that clients can buy only the amount of food they need. Finally, Auchan sells portions just for single people: in this way we help them buying only the food they really need, avoiding the food waste that can be caused by larger portions.

Bennet

Bennet - Italian company of the retail trade - has been committed, since 2004, in the recovery of the residual stock of consumption goods, in order to donate

it to charitable associations recommended by NGO (Banco Alimentare) or Public Institutions. The 69 hypermarkets located in the north of Italy, redistribute the residual stock of goods fulfilling the terms of regulation n. 155/25/06/2003. In 2012 have been distributed about 500 tons of goods, which could be compared to 1 million meals donated. The final goal is to give a social and environmental value to the residual stock of goods.

'Buon Samaritano' (Good Samaritan)

Comune di Torino and Amiat have implemented the "Good Samaritan" project, which collects uneaten meals from school canteens and products that are still edible from supermarkets and donates them to charity organizations to prevent them from being sent to landfill sites. According to the organisation, every day it is possible to recover 150 kilos of bread and 50 kilos of fruit to prepare approximately a thousand meals. Over the years the amount of food recovered has increased significantly, reaching more than 25,000 kilograms of bread and nearly 13,000 kg of fruit in the school year 2007 to 2008. In total in 2008, the organisation recovered over 81,000 kg of food.

City Harvest London

City Harvest London is the largest London-based charity in the food redistribution field. Since 2014 City Harvest has grown rapidly in its achievable mission to end hunger by matching waste and want. The charity collects surplus food from London supermarkets and restaurants and delivers to other charities that serve meals to the least fortunate. City Harvest currently diverts 6 tonnes of edible

surplus food every week from being sent to landfill, and delivers to more than 130 charities which feed thousands of people facing difficult times. We welcome open dialogue, knowledge sharing, exchange of best practices, and partnership opportunities with other organisations.

Close Bakery

Bread and rolls from previous day are being sold in selected bakeries instead of throwing into the trash. It's available in many German cities.

"Daily Menus for Homeless"

Six restaurants joined a project launched in 2010 by businessman Richard Hošek and the town council. Unsold meals prepared as "menu du jour" are given to homeless people at the corp of The Salvation Army at Mlýnská st. In 2011 were gained 6515 daily menus and 7135 daily soups from 17 participating restaurants. Thanks to that were issued 13,650 servings of quality food for homeless people.

FareShare

In place since 2004, the FareShare charity promotes the message that "no good food should be wasted", diverting edible food and drink products from industry organisations to disadvantaged populations. The organisation also provides warehouse training for the unemployed and helps food industry businesses to track and reduce their greenhouse gas emissions. The organisation redistributed food contributing to 8,6 million meals in 2010/11, and helped businesses reduce their CO2 emissions by 1800 tonnes during the same period. FareShare's future

goal is to redistribute 20,000 tonnes of food annually and to support 100,000 vulnerable people every day.

Fondazione Banco Alimentare Onlus

Since 1989 the Fondazione Banco Alimentare Onlus has been recovering surplus food from the food supply chain and, through the Rete Banco Alimentare (Food Bank Network) made up of 21 Food Bank organizations, has been redistributing it for free to 8,669 charitable organizations, which provide food aid to 1,909,986 poor and marginalized throughout Italy. Therefore the Food Bank Network recovers and redistributes food, which is still edible and not expired but would be sent to landfill because no longer marketable. Saved from waste, food recovers value and becomes wealth for those in need. The main sources of food are: agriculture, food production, food distribution, catering sector and the European Union. In 2014, thanks to the daily activity of 1,869 volunteers, it was possible to recover and save 40,767 tons of perfectly edible food and 1,043,351 ready meals. We also collected 14,965 tons of food through public collections.

Food Cycle

Food Cycle empowers local communities to set up groups of volunteers to collect surplus produce locally and prepare nutritious meals in unused professional kitchen spaces. These delicious meals are then served to those in need in the community.

"Every Meal Matters"

The 'Every Meal Matters' - Food Donation Guidelines have been developed as a continuation and reinforcement of the food and drink industry's broad commitments to tackle food waste following the 'Every Crumb Counts' joint food wastage declaration, FoodDrinkEurope's food wastage toolkit and progress report. By setting out a simple framework of practical steps that can be taken, these guidelines aim to help food and drink manufacturers, retailers and wholesalers anticipate and prepare for any potential surplus that may arise in the business. This in turn should then enable more effective partnerships to be formed with FEBA Food Bank members and other food donation organisations for the resource efficiency and other benefits of donation to be more readily realized.

"Happy Hour in bakery"

Fresh bread and rolls from the actual day are being sold with discount in the last working hour in Hofpfisterei Bakeries across Germany. First half of the last "Happy Hour" with 25% discount, second half of the last "Happy Hour" with 40% discount.

Next Door Help

Next Door Help is the first Italian platform of item-sharing against food waste: through the online platform users can publish or look for a geolocated announcement on food leftovers, thus having the chance of exchanging food surpluses and avoiding they go to waste.

OLIO

OLIO is a free app connecting people with their neighbours and with local shops so surplus food and other items can be shared, not thrown away.

Phenix

PHENIX is a social business that helps companies reduce waste by awakening the potential of their surplus. PHENIX aims to give a second life to products, and put the bin out of business, by creating innovative value chains for recovery of unsold food products and thus contributing to a more circular economy. We structure and simplify flows of donations, resale and recycling of unsold food products. Our expertise is coupled with a digital tool and a network of qualified partners enabling us to offer a wide range of complimentary solutions and channels for product recovery, with the ultimate ambition to reach zero waste. PHENIX enables its clients to improve their social and environmental impact while generating significant economic gains. PHENIX also organizes events to raise awareness on issues of food waste and involve stakeholders in anti-waste approaches. Since its creation in 2014, PHENIX has diverted over 4 000 tonnes of food from the trash, accounting for over 5.6 million meals distributed via our partner charity organizations.

Qui Foundation Onlus

Pasto Buono is a project that aims at saving unsold and healthy food from the catering sector. It represents the main project supported up to now by QUI Foundation. It started in Genoa in 2007. Through Pasto Buono, every day,

volunteers from non-profit organizations, territory associations and Red Cross collect healthy and yet unsold food from restaurants, self services, patisseries, bars, bistros and other food shops, and transforms those waste in resources for poor people. Since now Pasto Buono collected and donated more than 800 thousand meals all around the Italy. With his partners, Pasto Buono works daily in order to create a retailers/shopkeepers network available to convert in pasto buono the surplus; manage the planning of harvesting and allocation surplus, and in particular circumstances, operate directly with beneficiaries; inform and support families and retailers in order to improve on their daily diet and decrease the wastefulness and make aware and involve in the project Subjects and Institution, public or private, that in different ways could join to the project and support it.

Siticibo

Siticibo is a programme managed by the Fondazione Banco Alimentare Onlus (FBAO), which was established in Milan in 2003. Siticibo is the first implementation of the Italian Law No. 155/2003, the so-called Law of the Good Samaritan, and aims to recover the cooked meals and fresh surplus food from the catering and events (hotels, hospitals and company canteens, school canteens, retailers, etc.). In 2009 Siticibo started to recover fresh surplus food (e.g. fruit, vegetables, yogurt, pasta, delicatessen) also from the distribution sector. In 2014 Siticibo recovered 319 tons of bread and fruit and 1,043,351 ready meals from the collective catering sector and 4,307 tons of food from the distribution sector.

SOLAAL

SOLAAL contributes to providing fresh products given by farmers for the most deprived people, through food aid associations. SOLAAL is an answer to the needs of the most deprived. Food aid associations regularly warn of the lack of fresh fruit and vegetables in people's diet. Moreover, the most deprived people are prone to diseases linked to an unbalanced diet (diabetes, cardio-vascular disease, obesity etc.).

SOLAAL's aims:

- Promote donations from farmers
- Facilitate giving these donations at a national and local level
- Tackle food waste
- Ensure that the beneficiaries of food aid get a balanced diet

Since 2013, the year of its creation, SOLAAL contributed to the donation of 9 500 tons of agricultural products, that is the equivalent of 19 million meals. SOLAAL is unique in the EU: there is no other charity organizing donations directly from the farmers to food aid associations. SOLAAL gathers 31 representatives of agricultural sectors, industries, food retailers. The president is Angélique DELAHAYE, a vegetables producer and MEP.

Lebensmittel sind kostbar

The initiative aims to reduce food wastage by 10% until 2014 through awareness raising, partnership with schools, cooperation with business partners and other institutions. Spar is already a business partner and has setup a project to further

reduce wastage and analyse the reason together with the BOKU University in Vienna.

Team Austria

Team Austria is a volunteer organization which collects „unsellable food“ from retailers, which is then redistributed to social markets or people in need. 390 volunteers every week redistribute about 20 tons of food and thus help enhance nutrition for about 10,000 adults and children.

We Love Food

Slightly damaged products, fruits and vegetables from the day before or just "best before" food are cooked by EDEKA staff. Delicious jams and jellies are then prepared. Portions of different kinds of vegetables and outer salad leaves are offered to the rabbit breeders, pieces of sausages are offered to the pet owners. Fresh and every day different dishes are selling very well (30 servings a day).

Food Waste Measurement

Winnow

Winnow has developed a revolutionary system, designed for commercial kitchens to track and monitor food waste. The system can then feed data and reports back to decision makers so that they adjust behaviour to minimise waste. Winnow was founded in 2013 and today has over 1,000 sites installed or contracted. To date, on average across all sites, Winnow has been able to reduce food waste by 65% within the first 12 months, have an average ROI of 5X, and is able to link the

introduction of our system to average savings in food costs of 3-8%. Major clients include Compass Group, Elixor and AccorHotels. We are in 17 countries today, with more in plan.

Appendix 2. Focus Groups - Recruitment Questionnaire

Q.1 Have you ever taken part in a Market Research group discussion or depth interview on any subject?
 Yes Continue
 No Go to **Q6**.

Q.2 How many Market Research group discussions / depth interviews have you taken part in?
 1-3 Continue
 4-6 Continue
 More than 6 Do not recruit

Q.3 And when was the last time you helped with any market research group discussion/depth interview?
 In the last 6 months Do not recruit
 More than 6 months ago Continue

Respondents are not to have taken part in more than 6 group discussions/depth interviews – and not within the last 6 months.

Q.4 What subjects have you been interviewed on before?
 (Write) _____
Please ensure that respondent has not been interviewed on this subject before.

Q5. Please take full demographic quotas.

<u>SEX</u>		<u>WORKING STATUS</u>	
Male.....		Full time.....	
Female.....		Part time.....	
		Non working / retired / stay at home....	
<u>AGE</u>		<u>MARITAL STATUS</u>	
Under 21.....	Do not recruit	Married/cohabit.....	
22-31.....		Single.....	
32-41.....			
42-51.....			
52-61.....		<u>PRESENCE OF CHILDREN</u>	
62-75.....		<u>AGES OF CHILDREN</u>	
Over 75 years.....	Do not recruit	Yes.....	
		No.....	
<u>CLASS</u>		1-4 years.....	
ABC1C2.....		5-10 years.....	
DE.....		10-15 years.....	
		Over 15 years.....	

'Because of my carbon footprint'

I walk wherever possible

I cycle wherever possible

I like to car share

I take public transport wherever possible

Please ensure that all respondents have 'an awareness' of environmental issues.

They should recycle at least 3 out of 4 listed

Please aim for agreement to 1 of the 'Food waste' statements

Please aim for clothes recycling and 1 of the 'Carbon footprint' statements

Q9. Listed below are statements about the relationships between humans and the environment. For each one, please indicate whether you:

1. Strongly agree
2. Mildly agree
3. Are Unsure
4. Mildly disagree
5. Strongly disagree

Q1	The earth has plenty of natural resources if we just learn how to develop them.	1	2	3	4	5
Q2	Humans are severely abusing the environment	1	2	3	4	5
Q3	The so-called 'ecological crises' facing humankind has been greatly exaggerated	1	2	3	4	5
Q4	If things continue on their present course, we will soon experience a major ecological catastrophe.	1	2	3	4	5
Q5	Humans have the right to modify the natural environment to suit their needs	1	2	3	4	5

Scale values

	Pro-environmental identity	
	High	Low
Q1	5,4	1,2
Q2	1,2	5,4
Q3	5,4	1,2
Q4	1,2	5,4
Q5	5,4	1,2

Appendix 3. Survey Questionnaire

Screenener questions

Q1 To what extent, if at all, are you responsible for food shopping in your home?

- I am responsible for most or some of it
- I am not responsible for any of it

Q2 And to what extent, if at all, are you responsible for the preparation/cooking of food in your home?

- I am responsible for most or some of it
- I am not responsible for any of it

Q3 What is your age?

Q4 What is the number of adults (*including yourself*) living in your house?

Q5 What is the number of children (*i.e. 16 and under*) living in your house?

Q6 What is your marital status?

Food Planning Management + Behaviour

Q7 Which of these statements best describe your food shopping habits?

- I buy almost all of my food in a main shop
- I buy some food in a main shop and some in 'top-ups' shops
- I mostly buy food in smaller, 'top-up' shops

Q8 How often do you go for your main food shop?

- More than once a week
- Once a week
- Once a fortnight
- Once a month

Q9 Where do you mostly go for your main food shop?

- Supermarket
- Local shop
- Farmers' market
- Box scheme delivery
- On-line supermarket

Q10 Where do you mostly go for your 'top-up' food shop?

- Supermarket
- Local shop
- Farmers' market
- Box scheme delivery
- On-line supermarket

Q11 Please think about the last time you did a main grocery shop (this might include shopping in a supermarket, grocery store or on- line).

Before that particular shop, did you check what you already had at home for each of these items? (Yes – No - I don't buy this type of food)

- Fruit
- Vegetables
- Bread
- Fresh meat
- Fresh fish
- Milk
- Ready meals
- Tinned or dried food
- Frozen food
- Salad leaves

Q12 Please think about the last time you did a 'top-up' grocery shop (this might include shopping in a supermarket, grocery store or on-line).

Before that particular shop, did you check what you already had at home for each of these items? (Yes – No - I don't buy this type of food)

- Fruit
- Vegetables
- Bread
- Fresh meat
- Fresh fish
- Milk
- Ready meals
- Tinned or dried food
- Frozen food
- Salad leaves

Q13 In the last month, how often have you wasted food at home?

(Never...Every day)

Q14 To what extent do you plan your food shopping trips? (Please select all that apply)

- I keep a 'running list' during the week of things I need to buy
- I write a shopping list to take with me to the shop
- I have a very clear list in my head
- I have some ideas of the kind of things I want to buy
- I shop on-line and I use my list of favorites to help me remember what to buy
- I plan the meals to be cooked in the next few days
- I check what food is already in the house
- None of the above

Q15 Generally, to what extent do you stick to your shopping list?

- I buy everything on my list
- I buy most items on my list
- I buy some items on my list
- I buy some extra items not on my list
- I buy quite a lot of extra items not on my list
- I mostly decide what to buy as I do the shopping
- I usually buy the same things each week

Q16 Over a month, how much food do you waste at home? (None at all - A large amount)

Q17 Over the last month, what percentage of the following did you throw away because they had gone over the best-before date on the packaging? (0% - I mostly ignore this information)

Note: The 'best before' dates are more about quality rather than safety - when this date runs out, it does not mean that the food will be harmful if eaten, but it might begin to lose some of its flavor and texture.

- Fresh meat
- Pre-cooked meat
- Milk
- Dried goods
- Ready meals
- Fruit juices
- Bread or other bakery items
- Fresh fruit
- Fresh vegetables
- Frozen items

Q18 "The amount of food that I currently waste at home in a month is ..." (Very low - Very high)

Q19 Over the last month, what percentage of the following did you throw away because they had gone past the use-by date on the packaging? (0% - I mostly

ignore this information)

Note: The 'use-by' dates refer to safety - food can be eaten up to the end of this date but not after, even if it looks and smells fine.

- Fresh meat
- Pre-cooked meat
- Milk
- Dried goods
- Ready meals
- Fruit juices
- Bread or other bakery items
- Fresh fruit
- Fresh vegetables
- Frozen items

Q20 To what extent do you decide what you are going to eat for your main meals?

- I know what all of the main meals will be for the next week
- I know what most of the main meals will be for the next week
- I know what a few of the main meals will be for the next week
- I usually decide on the day

Q21 "The number of times that I have wasted food at home in the last month is ..." (Very low - Very high)

Q22 On average, how many times do you eat your evening meal outside of your

own home? (e.g. at restaurants, friends' or parents' house, etc.)

- Almost every day
- Several times a week
- Once a week
- Several times a month
- Less than once a month
- Never

Q23 To what extent do you currently waste food at home each month? (Not very much - A great deal)

Q24 Which of the following items have you stored in the freezer in the last month? (*Please select all that apply*)

- Uncooked fresh meat or fish
- Ready meals
- Fresh bread or other bakery products
- Any food at/near their use-by date
- Home-made meals
- Fresh milk
- Leftover cooked meat or fish
- Any food at/near their best-before date

Q25 "In the last month, I have wasted food at home ..." (Not at all - Frequently)

Attitudes

Q26 'I try to reduce the amount of food waste at home because ...' (Strongly disagree - Strongly agree)

- I want to reduce my impact on the environment
- There are food shortages everywhere else in the world
- It's a chance for me to save money
- I want to manage my home efficiently
- I want to have the healthiest diet possible

Q27 To what extent do you agree with each of the following statements?
(Strongly disagree - Strongly agree)

- Wasting food at home makes me feel ashamed
- I don't feel guilty if I waste food at home
- Wasting food at home makes me feel sad
- Wasting food at home makes me feel like I've failed
- I feel cross with myself when I waste food at home
- I don't worry about wasting food
- Wasting food is about wasting other resources (e.g. water, money, etc.)
- Many people in our society do not care how much food they waste at home
- Wasting food at home is inevitable
- Please select 'Strongly agree'

Q28 Q29 'I think that wasting food in the home is ...'

- Pleasant - Unpleasant

- Good - Bad
- A serious issue - Not an issue

Subjective Norms

Q29 To what extent do you agree with each of the following statements?

(Strongly disagree - Strongly agree)

- People whose opinions I value think I should reduce the amount of food waste at home
- People whose opinions I value would approve of me reducing the amount of food waste at home
- It is expected of me to reduce the amount of food waste at home
- I feel under social pressure to reduce the amount of food waste at home
- My children support my efforts to reduce the amount of food waste at home
- My spouse/partner supports my efforts to reduce the amount of food waste at home

Perceived Behavioral Control

Q30 How much control do you feel you have over reducing the amount of food waste at home in the next month? (Not at all - Very much so)

Q31 Thinking about your own food related behaviour at home, to what extent do you agree with each of the following statements? (Strongly disagree - Strongly agree)

- I find it difficult to reduce the amount of food I waste at home because I

don't have enough time

- If I wanted to, I could easily reduce the amount of food currently wasted at home
- I trust I can reduce the amount of food waste at home
- I find it difficult to reduce the amount of food I waste at home because there are more important things to worry about
- The amount of food I throw away costs me very little
- I don't need to reduce the amount of food I waste because I compost most of the food waste at home

Q32 To what extent do you see yourself as being capable of reducing the amount of food waste at home in the next month? (To a high extent - To a low extent)

Q33 How much personal control do you feel you have over reducing the amount of food waste in your home, in the next month? (Very little control - Complete control)

Q34 To what extent do you agree with each of the following statements? (Strongly disagree - Strongly agree)

- I don't want to compromise on the choice of fresh food I have at home
- I need to buy a wide range of foods to ensure I can provide healthy food for my family
- I don't know how I can reduce the amount of food waste in my home
- Whether or not I reduce the amount of food I waste at home is entirely up

to me

- If it were entirely up to me, I am confident that I would be able to reduce the amount of food at home in the next month
- I can't help generating food waste because my children don't always finish their food
- Please select 'Strongly disagree'

Q35 How confident are you that you will be able to reduce the amount of food waste in your home, in the next month? (Very confident - Not very confident)

Q36

Pro-environmental Identity

Q37 Listed below are statements about the relationship between humans and the environment. To what extent do you agree with each of the following statements? (Strongly disagree - Strongly agree)

- I think of myself as an environmentally friendly consumer
- I would not want my family and friends to think of me as someone who is concerned about environmental issues
- Humans have the right to modify the natural environment to suit their needs
- The balance of nature is very delicate and easily upset
- Humans were meant to rule over the rest of nature
- Nature is strong enough to cope with the impacts of modern industrial nations
- Plants and animals have the same rights as humans to exist

- Humans are severely abusing the planet

Intention

Q38 To what extent do you agree with each of the following statements?

(Strongly disagree - Strongly agree)

- I intend not to waste any food at home in the next month
- I believe I have the ability to reduce the amount of food I waste at home in the next month
- I will try not to waste any food at home in the next month
- I plan not to waste any food at home in the next month

Q39 To what extent do you agree with each of the following statements?

(Strongly disagree - Strongly agree)

- I think of myself as someone who is very concerned with environmental issues
- I would be embarrassed to be seen as having an environmentally friendly lifestyle
- Reducing the amount of food waste at home is an important part of who I am
- I think of myself as the type of person who would try to reduce the amount of food waste at home
- I believe that it would be morally right for me to reduce the amount of food waste at home from now on
- I would feel guilty if I were to waste the same amount of food at home from now on

Moral Identity

Q40 The following are some characteristics that may describe a person: caring, compassionate, fair, friendly, generous, helpful, hard-working, honest, kind. The person with these characteristics could be you or it could be someone else. For a moment, visualize in your mind the kind of person who has these characteristics.

Imagine how that person would think, feel and act.

When you have a clearer image of what this person would be, please answer the following questions: (Strongly disagree - Strongly agree)

It would make me feel good to be a person who has these characteristics

- Being someone who has these characteristics is an important part of who I am
- A big part of my emotional well-being is tied up in having these characteristics
- I would be ashamed to be a person who has these characteristics
- Having these characteristics is not really important to me
- Having these characteristics is an important part of my sense of self
- I strongly desire to have these characteristics
- The types of things I do in my spare time (e.g. hobbies) clearly identify me as having these characteristics
- Having these characteristics is reflected by my membership in certain organisations
- The kind of books and magazines that I read identify me as having these

characteristics

- I am actively involved in activities that show others that I have these characteristics

Demographics

Q41 What is your gender?

Q42 What is your employment status? *(Please select all that apply)*

- Employed full-time
- Employed part-time
- Unemployed
- Retired
- Stay-at-home / Homemaker
- Student full-time
- Student part-time

Q43 What is your annual household income (before tax)?

Note: This information will only be used to apply classification codes to our data, your answers will be anonymous and confidential, and nobody will be able to see the answers you have given

Q44 Your education. *(Please select all that apply)*

- NVQ Level 1, Foundation GNVQ, Basic Skills
- 5+ O levels (passes)/CSEs (grade 1)/GCSEs (grades A*-C), School Certificate, 1 A level/2-3 AS levels/VCEs, Higher Diploma

- NVQ Level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First/General Diploma, RSA Diploma
- Apprenticeship
- 2+ A levels/VCEs, 4+ AS levels, Higher School Certificate, Progression/Advanced Diploma
- NVQ Level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma
- Degree (for example BA, BSc)
- Higher Degree (for example MA, PhD, PGCE)
- NVQ Level 4-5, HNC, HND, RSA Higher Diploma, BTEC Higher level
- Professional qualifications (for example teaching, nursing, accountancy)
- Other vocational/work-related qualifications
- Foreign qualifications
- No qualifications

Q45 Which of these best describes your home?

Q46 Do you have access to any of the following? *(Please select all that apply)*

- Private garden
- Allotment
- Patio / Yard / Balcony
- Shared garden
- Compost bin
- Local authority food waste collection
- None of these

Q47 What is your ethnic group? *(Please choose one option that best describes your ethnic group or background)*

- White
- Mixed / Multiple ethnic groups
- Asian or Asian British
- Black or Black British
- Other ethnic group *(please specify)*

Q48 Please provide the first part of your postcode.

Note: This information will only be used to apply classification codes to our data, your answers will be anonymous and confidential and nobody will be able to see the answers you have given

Appendix 4. Survey Introduction and Debrief

Introduction

We would like to invite you to take part in a short survey (15-20 minutes) about the food that you buy, eat and throw away. Our primary aim is to understand your thoughts about the environment, food consumption and waste; therefore, your views on this subject would be particularly appreciated.

Note: When we use the term food waste in this survey, we are referring to food that doesn't get consumed because it is thrown away before it becomes inedible.

Many thanks in advance for your contribution to this research.

Please click Next to confirm you wish to participate and begin the survey.

End comments

Once again, we would like to thank you for taking the time to complete this survey, we really appreciate your views! This research is part of an academic research project at Plymouth University and reports of the findings may be submitted for future publication. Be assured that the information you provide is anonymous and all answers you provide will be kept strictly confidential - only broad trends will be reported and it would not be possible to identify any individuals.

If you have concerns about any aspect of this study or would like to find out more, please get in touch with the researcher, Mihaela Bishop

(mihaela.bishop@plymouth.ac.uk) who will do their best to answer your questions. If you are interested in the results of this study and you would like to receive a short report of the findings, or any future publications, please include your e-mail/postal address below.

Your email/postal address:

Appendix 5. UK Population National Statistics

		UK statistics	This study
Gender	Male	33.8%	46.0%
	Female	66.2%	53.5%
	Other	0%	0.5%
Presence of children	Yes	62.3%	24.8%
	No	37.7%	75.2%
Married	Yes	n.a.	56.0%
	No	n.a.	44.0%
Household	Semi-detached house	31.5%	30.4%
	Terraced house	24.8%	22.4%
	Detached house	22.9%	24.3%
	Flat/apartment	20.8%	21.7%
	Other	0%	5.0%
Age	18-24	13.3%	13.6%
	25-44	38.6%	28.7%
	45-64	35.9%	37.2%
	65+	12.2%	20.4%