Water, Engineering and Development Centre
Loughborough University UK

Piloting a methodology to understand waste reduction behaviour in Charnwood

by

Joseph Hopkins

A research project submitted in partial fulfilment of the requirements for the award of the degree of Master of Science of Loughborough University

August 2011

Loughborough University

Piloting a methodology to understand waste reduction behaviour in Charnwood

Joseph Hopkins

I would like to thank my family, friends and coursemates, who have encouraged me and taken an interest in what I have been studying. Especially “thank you” to all those who helped practically, by distributing and filling in the questionnaire, and to Débora “Nama”, who has supported me all the way through.

Thanks to those at Charnwood Borough Council, Loughborough University and J. Sainsbury’s who provided invaluable insight from their experiences. Also thank you to all the staff at WEDC, who have helped direct my thoughts at various points throughout the course of this research, notably Julie, whose grace and wisdom in the supervision of this project reassured and encouraged me on many occasions!

Contents

Glossary of terms

CBC – Charnwood Borough Council

DEFRA – Department for Rural Affairs

EU – European Union

NGO – Non-Governmental Organisation

UK – United Kingdom

US – United States of America

WCA – Waste Collection Authority

WEEE – Waste Electrical and Electronic Equipment

WRAP – Waste & Resources Action Programme

List of Figures and Tables

1. Introduction

This report documents the design, execution and findings of an Individual Research Project, completed as part of an MSc. in Water and Waste Engineering. The first two chapters set the context for the research, the methodology describes it and the final three chapters present and discuss the findings and evaluate it, making recommendations for developments.

Problem Statement

Waste disposal in the UK is reaching a critical point. Aside from the EU Directive 1999/31/EF requiring a heavy reduction in waste sent to landfill (Jamasb & Nepal, 2010, p.1341), there is a decreasing number of options for landfill sites. New solutions for managing waste will have to be adopted to avoid a situation of needing to export waste for disposal in other countries (Arratia, 2010). In 2004 household waste accounted for around 9% of the total waste produced in the UK (Wastewatch, 2008, p.2), so whilst construction and quarrying still account for the majority of waste creation in the UK, there is a sizeable impact to be made from reducing household waste. Due to a focus in government policy, the volume of household waste has seen a steady decline in the last five years to just over 23 million tonnes, and an increase in the percentage of this that is recycled to 40.1 per cent (DEFRA, 2011, p.1). This is not enough to avert the problems that will exist in the future. Reducing the volume of waste that is produced by households is one of the keys to combatting the waste problem that is being faced by the UK.

Reducing household waste has been attempted through a number of means by a number of stakeholders, from local waste collection authorities to commercial supermarkets and product designers. Repeated exhortations to consumers to “Reduce, reuse and recycle” have often left the public confused and powerless as to how to make a difference. Having said this,

recycling in the UK has become integrated as a way of life for some social groups. Waste collection authorities are required by law to provide a kerbside recycling service for at least two materials, with many offering a service for four or more (Timlett & Williams, 2009, p.499). Large amounts of money and time have been invested in researching ways to "market" recycling, and encourage use of these facilities. It is now well understood who is likely to be a recycler, and at whom campaigns can be more effectively targeted. The problem is that recycling is only part of the solution. As highlighted in much of the literature, recycling is the "least preferred" of the three objectives to "reduce, reuse and recycle". It does not change peoples' lifestyle significantly, much less their attitude towards waste. It changes peoples' behaviour only at a very late stage of the waste production process, just before they dispose of the waste.

"Reduce" and "Reuse" activities, however, are often much more time consuming and thoughtful acts that require forethought and planning on the part of the consumer. For example, reusing a "bag for life" requires a shopper to purchase and remember to take the bags with them into the store. Using non-disposable nappies requires parents to buy and learn to use a style of nappy that may be unfamiliar to them – let alone work out a wash schedule and find storage for the excess nappies. Getting people to change their behaviour at this deeper, more intrusive level is the challenge that waste reduction promoters will face much more often, if waste levels are to be reduced significantly in the UK (Bulkely & Gregson, 2009). The behaviours of reducing and reusing waste also haven't been as intensely studied in the literature, despite their being an equally important pursuit as a means of solving the UK's waste problem. Understanding the predictors of waste reduction and reuse behaviour could lead to smarter policy decisions that could make a contribution to the reduction in waste sent to landfill in the UK.

1.1. Research Aim, Objectives and Questions

"Piloting a methodology to understand waste reduction behaviour in Charnwood"

Research Aim

To test a new methodology for mapping waste reduction behaviour, and use it begin to understand the patterns of waste reduction behaviour in Charnwood.

Research objectives

- To design and evaluate a research methodology to test for relationships between different waste reduction behaviours
- Quantitatively identify patterns in waste reduction behaviour in Charnwood
- To use qualitative research methods to investigate up to four waste reduction activities, to identify specific motivators and barriers
- Identify areas for further research

Research Questions

Objective	Questions
To design and evaluate a research methodology to test for relationships between different waste reduction behaviours	What are the relevant variables for measurement?
	What research tools are most appropriate to measure those variables?
	How can current research methodologies be in this area improved upon?
Quantitatively identify patterns in waste reduction behaviour in Charnwood	Are there patterns within the population, with regards to waste management activities?
	What are those patterns, and how strong are they?
To use qualitative research methods to investigate up to four waste reduction activities, to identify specific motivators and barriers	What motivates people to do the activities they do?
	What are the barriers to waste reduction activities?
	How does the experience of behaviour change and environmental experts shed light on this?
Identify areas for further research	What are the findings that need more investigation?
	How can this research be improved on?

Table 1

1.2. Charnwood

Waste Management in Charnwood

This study takes the Charnwood area of Leicestershire, UK, as the study area, for which the Waste Collection Authority (WCA) is Charnwood Borough Council (CBC). CBC was one of the collaborators in the production of the Leicestershire Municipal Waste Management Strategy (LMWMS), published in 2006. Charnwood Borough Council introduced its first waste management strategy in 2007, which outlined the councils' intent to reduce waste and maximise the value recovered from unavoidable waste through many different approaches. This Zero-Waste strategy was written to last five years but was re-examined and 'refreshed' in 2009 (published 2010) in light of progress made and a new Environmental Services contract with Serco (Charnwood Borough Council, 2010, p.9). The Zero Waste strategy covers the more direct elements of waste management such as promoting reduction, reuse and recycling, as well as those aspects that are more indirect, such as managing service contracts, involving stakeholders in the strategy, education and monitoring (Charnwood Borough Council, 2010).

Although there is a legal requirement in the UK for WCAs to provide kerbside recycling facilities for at least two materials, decisions about which materials to offer recycling services for and how to promote and run those services is delegated to Waste Collection Authority (Timlett & Williams, 2009, p.499). This makes most recycling schemes in the UK very different from council to council, something which is discussed in more detail in the literature review. The following section sets the scene for the research by describing the waste collection setup that exists in Charnwood.

Loughborough town

Loughborough is the largest settlement in Charnwood Borough council's jurisdiction, with a population of around 56,000 (Leicestershire County Council, 2005, p.6). A key characteristic of Loughborough's population is the change throughout the year owing to the presence of the University. An estimation puts the number of residential students at up to 25,000 (Leicestershire Constabulary, n.d.), which equates to over 35% of the town's population. Given that the majority of this population migrates out, during of University holidays, there are obviously big implications for the towns' waste production. Evidence has shown that recycling participation amongst transient populations such as this is problematic (Timlett & Williams, 2009, p.504).

Household waste collection

Household waste is collected in Charnwood on a fortnightly basis in a kerbside collection scheme, a decision made in light of evidence that showed that this had been effective in reducing waste generation in other areas[1]. Solid waste is collected on alternate weeks, with commingled recycling collection on the weeks between. A free bulky waste collection service is also offered to residents. There is no financial incentive offered for participation in the recycling scheme, but local law enforcers have the authority to issue fines for waste which is not presented for collection in the proper way[2].

The method of collecting recyclables has changed recently in Charnwood, and is expected to change again within the next twelve months with a renewed private contract for waste management. It was as a result of public consultation that commingled recyclable collection was introduced in 2009 (Charnwood Borough Council, 2010, p.11).

[1] Interview with Zero Waste Officer, Charnwood Borough Council
[2] Interview with Zero Waste Officer, Charnwood Borough Council

Other waste management facilities

There are three public waste disposal sites (TIPS) in the borough (Charnwood Borough Council, n.d.), run by the council, and alternative solutions ranging from a wide variety of second hand and charity shops in Loughborough and the surrounding villages, and an online Freecycle group dedicated to the Loughborough area (Freecycle, 2010). At particular times of the year, when students are moving out of homes in the early summer, there are also private collectors who patrol some streets, collecting bulky waste and scrap metal.

Recycling

At first glance, recycling levels are at a comparable level to many other borough councils, in the region (shown in the following table). However when taking into account the fact that green waste collections only make up a small proportion of waste in Charnwood, recycling rates could be considered to be higher per household in Charnwood compared with elsewhere in the UK (Charnwood Borough Council, 2010, p.11).

Table 2: Recycling rates for Waste Collection Authorities in the UK

Council	Type	Household waste (kg)	Waste recycled (kg)	Recycling rate (%)
Daventry District Council	Collection	33,877	15,985	47
Blaby District Council	Collection	36,158	16,188	45
Kettering Borough Council	Collection	35,908	16,075	45
Derby City Council	Unitary	110,659	49,418	45
Oadby and Wigston Borough Council	Collection	16,705	7,352	44
Lincoln City Council	Collection	36,923	16,232	44
North East Derbyshire District Council	Collection	39,800	17,098	43
Broxtowe Borough Council	Collection	40,439	17,314	43
Charnwood Borough Council	**Collection**	**55,274**	**23,618**	**43**
Corby Borough Council	Collection	23,202	9,663	42
Derbyshire Dales District Council	Collection	31,980	13,178	41
Chesterfield Borough Council	Collection	40,886	16,680	41
High Peak Borough Council	Collection	36,312	14,767	41
Erewash Borough Council	Collection	44,820	18,179	41
Leicester City Council	Unitary	113,900	46,175	41
Mansfield District Council	Collection	42,339	16,394	39
Northampton Borough Council	Collection	75,084	28,698	38
Nottingham City Council	Unitary	118,526	42,044	35
Gedling Borough Council	Collection	43,167	15,226	35
Wellingborough Borough Council	Collection	28,261	9,768	35
Ashfield District Council	Collection	45,501	15,083	33
South Holland District Council	Collection	29,236	9,600	33

Table 2. *(DEFRA, 2010)*

Recycling promotion in Charnwood

The council employs two 'Zero Waste Officers' whose role it is to promote waste reduction, and participation in the kerbside recycling scheme. They do this through a number of education schemes and campaigns in the local area[3]. As with all local authorities in the UK, recycling rates have targets, and so resources are naturally focussed on promoting use of the recycling services. Waste reduction is harder to measure than recycling rates, and so harder to prove the impact a certain initiative is having (a topic further explored in the literature review) therefore harder to justify spending budget on. Waste reduction messages are naturally disseminated as part of the Zero Waste campaign, but for the reasons mentioned above, fewer campaigns have targeted this.

Development of the research and research question

As is right in research, in the process of reviewing the relevant literature and designing the data collection the focus of the study has evolved over time, on the journey through the research cycle. This section lays out the thought process behind how the final project aim and objectives were decided upon.

The research was initiated by an interest in the socio-demographic differences that were assumed to exist in attitudes to recycling in the UK, particularly gender differences. It soon became apparent that while having some indirect bearing on attitudes to recycling, gender had little predictive power over a persons' propensity to recycle or not, and other socio-demographic variables have a relatively small impact on recycling attitude and behaviour (Cox and others, 2010). It was discovered that there were other, external situational factors that were considered to have a much larger impact on participation levels in recycling, than the socio-demographic factors of interest. Additionally, after focussing on the UK context it became clear that while recycling participation is a relatively well-studied and understood

[3] Interview with a Zero Waste Office, Charnwood Borough Council

topic, reduction and reuse of waste is much less well understood. It also probably is even more critical, with greater scope for impacting levels of household waste over the next 50 years (Bulkely & Gregson, 2009). For this reason, then, it was decided to study waste reduction and reuse behaviour, although a specific research question had not been identified at this stage.

From further reading on these more specific subjects, gaps and opportunities for further research were identified, and a visual model (proposed later in the literature review) for conceptualising waste management activities designed. Based on recommendations in recent journal articles, and from gaps identified in the literature to date, the research question was formulated to contribute to the existing knowledge.

2. Literature Review

2.1. Conceptualising waste management

Solid waste is described and explained by a couple of widely-accepted conceptual frameworks in the literature. Despite their ubiquity, the process of this literature review highlighted a particular abstruseness with terminology and specific definitions in the waste management sector. It is worth visiting each of these concepts and explaining them before continuing, for the purpose of clarity.

The waste hierarchy

The literature on waste management often refers to the 'waste hierarchy', a model by which a relative preference for several waste disposal options is expressed, based on the environmental impacts of each option.

Figure 1 shows a typical depiction of the waste hierarchy, with landfill and incineration at the bottom and more favourable options such as avoidance and reuse towards the top. The literature presents a rather more complex version of the hierarchy, with a general lack of consensus on the specific definitions of what level activities are represented on. It is also not fool-proof, as there are occasions when, for example, reuse activities would be preferable to reduction activities, such as the use reusable bags in preference to disposable bags, albethey reduced in volume.

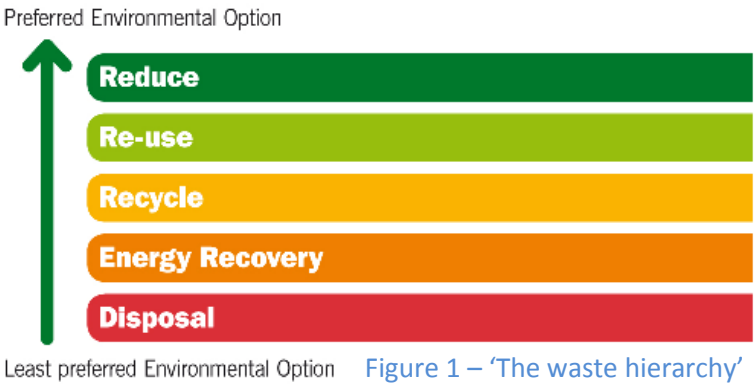


Figure 1 – 'The waste hierarchy' (Leicestershire County Council, n.d.)

The waste stream

Another conceptual model that is often referred to in literature on waste management is that of the 'waste stream', which travels from source(s) to ultimate disposal. This 'stream' can be diverted (Bulkely & Gregson, 2009, p.931), intercepted (Nexant Inc., 2004), analysed (e.g. Mulholland, 2006, p.324) and controlled (e.g. Rogoff & Williams, 1994, p.181) as can a stream of water. Relevant characteristics of this stream are its volume, composition, patterns of flow – as well as the long term changes in any of these characteristics that might be anticipated due to socio-demographic or technological changes. The diagram in Figure 2 shows how waste can accumulate along the whole production cycle.

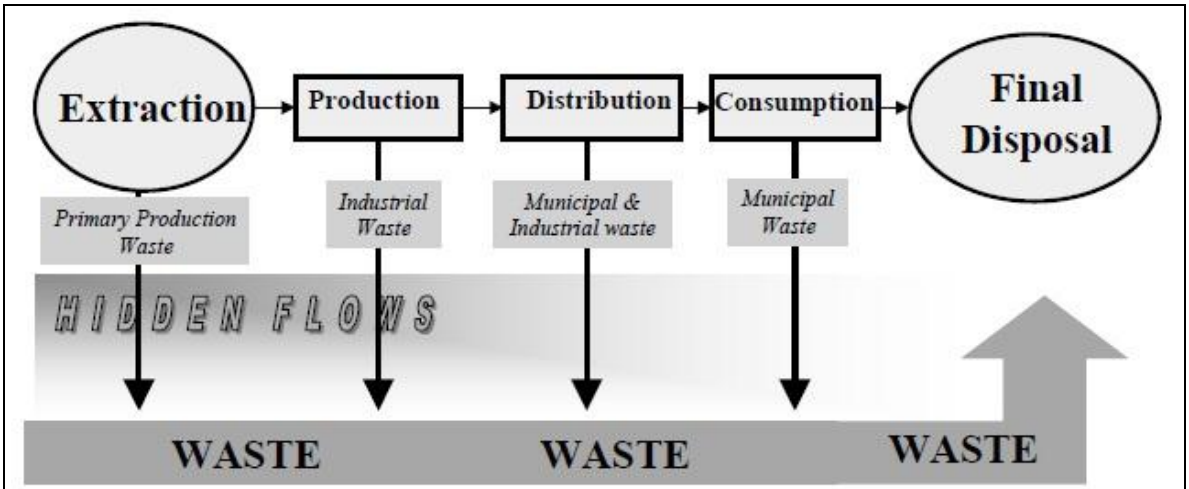


Figure 2 – 'The waste stream' (OECD, 2000, p.11)

In addition to these two concepts, there are a number of words, such as elimination, minimisation, prevention, diversion, avoidance and reduction that are used to describe the desired effect of interventions – but these are considered more thoroughly in the following section.

2.2. Waste Management Terminology

The catch-all phrase "Reduce, Reuse, Recycle", plucked straight from the top of the Waste Hierarchy (Figure 1) has been used for a number of years as a simple-to-remember tool for promoting waste management behaviour change. But these words, and many others, are often used seemingly interchangeably in the literature despite author's efforts to try and convey very concise points. How distinct, or not, these concepts are in peoples' minds is not just a matter of semantics, because confusion over what constitutes waste reduction/recycling has been found to be a significant barrier to communicating effective messages to the public (Cox and others, 2010, p.200).

So what options are available, for households wanting to minimise the waste they create? For clarification's sake, '*waste minimisation*' is the phrase that is most consistently used in the literature to refer to the broader effort to send less solid waste to landfill, including activities such as avoidance, recycling, reuse and incineration (Hogg and others, 2007a p.5). Having said this, with the exception of garden waste, incinerating waste is not a commonly adopted solution at the household level. The remaining options, reducing waste, reusing waste and recycling are the three main activities in which individuals participate in the UK to directly minimise the waste they produce.

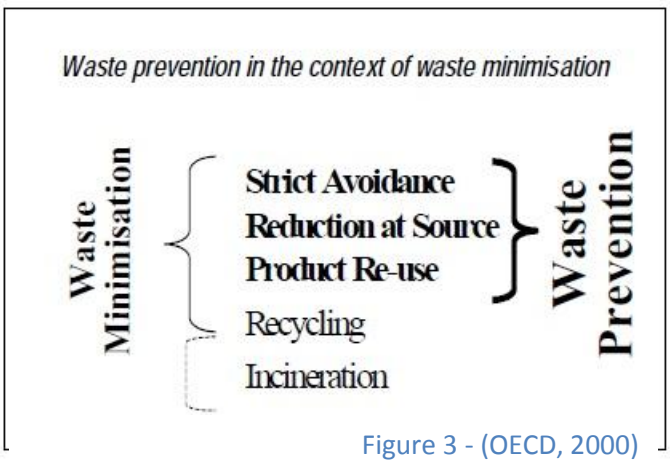


Figure 3 - (OECD, 2000)

In the literature, however, a clear preference for reduction and reuse activities is expressed as waste minimisation in its' purest form, often being termed '*waste prevention'* (Hogg and others, 2007a p.5). It should be noted that perhaps contrary to

the publics' opinion[4], recycling does not fit into this definition of 'waste prevention' that was set out by the OECD (2000) (see Figure 3) and is prevalent in much of the literature (eg Hogg and others, 2007a ; Cox and others, 2010; Dorset County Council, 2008). This is perhaps because, as highlighted by Bulkely and Gregson (2008), recycling doesn't tackle the fact people produce waste, it simply minimizes the negative effect of their waste production. In contrast, the phrase 'waste reduction' is used in the literature to describe the specific activities that are carried out by individuals that result in a smaller volume of "potential waste" entering the domestic environment. This can be activities such as buying products with less packaging and avoiding using plastic bags. The words 'avoidance' and 'strict avoidance' are also used occasionally as a way to describe waste management behaviour (Cox and others, 2010, p.195) although they appear to be less prevalent in the literature, and in this study are assumed to be implied in the term 'waste reduction' as explained above.

The final inconsistencies in the literature are the use of the words 'behaviour(s)' and 'activity(ies)', which are generally used indiscriminately. This research attempts to promote the use of the word "activity(ies)' to denote specific actions performed either occasionally or repeatedly by individuals, where 'behaviour(s)' in contrast refer to a commitment to a broader range of activities as part of one's lifestyle. In the interests of keeping the flow of language, however, this has not been kept to rigorously and discretion has been used to convey meaning in as eloquent a way as possible.

2.3. Predicting Waste Management Behaviour

Owing to the focus on implementing recycling on a national scale in the UK in recent years, there has been an abundance of research carried out to identify models to understand household waste management behaviour. This has included studies that have focused on the

[4] Found to be the case in interviews conducted during this study

predictors of (Swami and others, 2011), barriers to (McDonald & Oates, 2003), and motivators of (Seacat & Northrup, 2010) waste minimisation behaviour, respectively. As pointed out by Tonglet, Philips and Bates (2004), a weakness of the literature is the tendency for the majority of it to focus on recycling, not prevention behaviour.

Predictors

The body of literature on this subject is large, and comes from a breadth of different areas of social science that test and explores various motivations and predictors of waste management behaviour. As will be explored later in the literature review, different behaviours within waste management have different 'profiles', and most of the research that exists refers specifically to recycling, but Barr (2007) helps to understand the broader picture by proposing three groups of 'predictors' of waste management behaviour. These are;

- **environmental values**
- **situational variables** (those variables which are particular to a person or context, and external to (although not affected by) their personality) and
- **psychological factors** (those which are intrinsic and directly related to a person's personality), with examples shown in the table below:

Environmental values	Situational Variables	Psychological Factors
The built environment	Socio-demography	Perceived efficacy of action
The natural environment	Access/Provision	Active concern/obligation
	Abstract Knowledge (of environmental matters in general)	Citizenship beliefs (Acceptance of personal responsibility)
	Specific Knowledge (of waste collection timetables and waste legislation and policy)	Concern/Threat based motivation
	Policy instruments	Perception of problem
	Behavioural experience	Convenience

Table 3. *adapted from Barr (2007)*

Notes on Socio-demographic variables

In a UK context, where there is a legislative requirement for WCA's to provide kerbside recycling services, the socio-demographic factors, that initially sparked interest in this topic, are becoming less relevant than before as recycling becomes a social norm. Where differences remain, they may be more a result indirect psychological and other situational variables, such as with gender, where women are more inclined to have positive waste management behaviours, but only indirectly as a result of being less Machiavellian and more conscientious than men on the whole (Swami and others, 2011, p.25).

Additionally, where it may still make a difference, there is conflicting evidence in the literature about the link between age and waste management behaviour. While typically, younger people are considered to be the more likely recyclers (Barr, 2007, p.439), there is evidence that suggests older people are "more likely to report positive waste management behaviour" (Swami and others, 2011, p.25). A preliminary questionnaire survey for this study[5], revealed that people in the age group 18-30 are considered to be least likely to be receptive to introducing recycling into their waste management behaviour. This is perhaps surprising considering the huge scaling up of recycling in the UK over the period of time this age group has been growing up.

The same survey revealed 'level of education' as the socio-demographic variable that was expected to be the most reliable predictor of recycling participation. This is reflected perhaps in the literature (Brook Lyndhurst, 2009a; Barr, 2007; Cox and others, 2010), in as much as higher income households more often participate in recycling schemes, although, as with the other socio-demographic variables mentioned the generalization is broad.

[5] A survey on recycling predictors was sent out to Recycling Education Officers across the UK, details can be found at the end of this chapter

Other variables such as race, marital status, cohabitation status are hardly touched on in the literature, which instead focuses more on other situational and psychological variables.

Taking a slightly different approach to looking at socio-demographic variables, Hampshire County Council in the UK found success by targeting people at certain stages of their lives, who might be more receptive to lifestyle changes (e.g. reaching retirement, becoming a parent and sending a child to school) and enabling them through pre-existing community groups (Brook Lyndhurst, 2010). No evidence was found, however, of longitudinal any study that examined the "stick-ability" of waste management behaviours.

A final word on this issue to consider is that, when it comes to waste prevention behaviour (as opposed to simply recycling), for the large part different activities are carried out by different groups of people, because of restricted access, lack of skills or other reasons (Brook Lyndhurst, 2009a, p.23). This makes generalizing about who does "waste reduction" as a singular effort, difficult.

Other Waste Management Activities

The usefulness of one waste management activity as a predictor of participation in another waste management activity is something that is little investigated in the literature. Besides the well accepted generality that there can in fact be a negative correlation between recycling and waste reduction behaviours (eg. Tucker & Douglas, 2007, p.5) no research was found that looked at the relationship between different waste minimisation activities. That is to say, whether or not some waste minimisation activities are typically done alongside one another.

2.4. Changing Waste Management Behaviour

There have been many attempts to change the publics' waste management behaviour, made by national and local government, commercial supermarkets as well as charities and interest groups. They have used a number of tools to try and achieve this, through legislation, incentivising change, informing and education, providing easily accessible services.

The Four E's model

DEFRA's approach the promoting behaviour change is encompassed in the Four E's; encourage, enable, engage and exemplify (HM Government, 2005, p.26). Reviewing the tools used by stakeholders in the UK to change the publics' waste management behaviour, it is clear that most have fallen under the first three of these tactics, rather than latter (Sharp, Giorgi & Wilson, 2010, p.260). This is perhaps understandable, as it is arguably harder for a collective local authority to change *individual's* behaviour change by example but it highlights a gap nonetheless in the approaches taken by LAs. Table 4 gives a summary of various tools that have been studied to a greater or lesser extent, for effectiveness in waste minimisation in the UK.

Enabling	dedicated project support staff, guidance, action plans, monitoring and feedback, special events, training, doorstep teas, directories on services, equipment provision
Engagement	branding, printed literature, events, website, media and PR, community outreach or small group challenges
Encouragement	financial incentives, fines, reward cards, freebies, competitions and prize draws
Exemplify	use of council staff for pilot schemes, using recycled materials for publicity

Table 4. *Adapted from Sharp, Giorgi & Wilson (2010)*

Tools

Financial incentives have been shown to be effective to a point, although ultimately not particularly cost effective (Bulkely & Gregson, 2009, 5p.625). A community-based model for changing behaviour was piloted in Hampshire (Brook Lyndhurst, 2010) and found that communicating specific, socially acceptable, "actionable lifestyle changes" was effective.

It was found by Dorset County Council, that when promoting waste prevention, the best result was gained by promoting singular activities rather than trying to tackle a range of waste management behaviours in a single campaign (Dorset County Council, 2008, p.28). In a similarly focused way, providing personalised feedback on their recycling performance to households was found to be a highly cost effective tool for changing behaviour.

Intention-Behaviour relationship

It is important, especially when studying an action which is viewed as having a 'moral' element, to study both the intention and the behaviour of the subject. An "intention to recycle", for example, doesn't always result in "recycling behaviour". Inconvenience, peer pressure and even something as simple as forgetfulness can change someone's behaviour from their intended behaviour. How significant a relationship there is between intention and behaviour is the subject of some debate in psychology, with some arguing that experience of a behaviour is the strongest predictor of a person's future behaviour (Macey & Brown, 1983). Research by Barr (2007), however, found strong evidence for a relationship between intention and behaviour for waste reduction, reuse and recycling behaviour. This is in contention with much of the literature, that otherwise contests that waste minimisation at a household level is a largely "random" process that is *not* highly subject to a set of strongly held values and principles.

Barriers

In an effort to extract and summate the literature, Fell, Cox and Wilson (2010) categorise the barriers to waste minimisation into four headings; environmental, behavioural, economic and political. Those barriers as identified in a review of the literature by Cox and others (2010) are shown in the list below;

- Apathy (Tonglet, Phillips & Bates, 2004)
- It's someone else's responsibility (Obara, 2005, p.16)
- Inconvenience (Brook Lyndhurst, 2009b, p.29)
- Costs (Salhofer and others, 2008, p.256)
- Weak Self efficacy/sense of powerlessness
- Lack of social norms – this is also highlighted in a later waste prevention study in Hampshire, the findings of which were that some suggestions for waste reduction activities were considered "too weird or too green" for the participants to accept (Brook Lyndhurst, 2010, p.34)
- Dominance of recycling
- Forgetfulness
- Consumer identity

A desire to replace broken equipment with more fashionable items is a barrier to repairing WEEE and old clothes (Cooper, 2005).

There was no mention found in the literature however, of a 'lack of knowledge of how to reduce waste' being a barrier.

2.5. The difference between recycling and reduction/reuse

Although they are contributing towards the same goal, there is evidence to suggest that people's intentions and behaviours on reducing, reusing and recycling their waste differ significantly. A study by Barr (2007, p.467) found that predictors for waste reduction and

reuse behaviour are very different to those for recycling, which was subsequently described as "highly normative behaviour". This suggests that recycling has been absorbed and accepted more fully into UK society than reduction and reuse. This is possibly unsurprising, according to Bulkely and Gregson (2009, p.933) whose review of UK Waste Policy highlights a strong bias in recent years towards promoting diversion tactics such as recycling at the expense of policy which focuses on prevention of waste.

Bulkely and Gregson (2009) go on to highlight several critical differences between recycling and waste prevention behaviours, not least the altogether more "individual" and "private" nature of waste prevention. Whereas recycling happens within a given timeframe, in a relatively public manner (think of a street lined with recycling bags, waiting for collection) – waste reduction happens very much more within, as Bulkely and Gregson term it, the "black box of the household". Activities are a personal, lifestyle choice, with no strict timeframe and little if any social stigma for not partaking. That is beginning to change for some waste *reduction* activities. For example the initiative of Sainsbury's to hide plastic bags under the till area in their stores has the intended effect of making customers feel uncomfortable about asking for plastic bags to use[6].

So far, however, efforts to encourage waste reduction and reuse have followed the same behaviour change methods as have been employed (successfully) to increase participation in recycling schemes (Cox and others, 2010, p.214). However, given that this recycling promotion has been supported by the introduction of a very convenient service, and given the much more "private" nature of waste prevention behaviour, the classic behaviour change methods for recycling may not necessarily be as effective for prevention.

[6] In an interview with an Environmental Project Manager, J. Sainsbury's

The “Third sector” offers an alternative solution to many UK households for disposing of bulky goods, through depositing them at a charity shop, or even giving to strangers through websites such as Freecycle™. The primary objectives for these organisations are the associated social benefits of reuse (Brook Lyndhurst, 2009b, p.50)

Household WEEE (Waste Electrical and Electronic Equipment) has been paid special attention in recent years, due to it being one of the fastest growing waste streams in the UK recently (Ongondo, Williams and Keynes, 2011, p.743). Consumers have expressed their feelings that it often is cheaper and easier to simply replace these goods than to repair them, and some further felt that this was an intentional design-effect (Obara, 2005, p.16).

2.6. Drilling down into Waste Reduction behaviour

More recently, as recycling rates have begun to level off and waste reduction and reuse have come more to the fore (Bulkely & Gregson, 2009), a body of literature is emerging that focuses in on, and picks apart waste reduction and reuse behaviours in more detail (e.g. Tucker & Douglas, 2007; Tonglet, Phillips & Bates, 2004). This is particularly important, given the differences in motivators, intention and behaviour between these activities and recycling as discussed previously.

This body of literature is relatively small, and because there are so many more independent activities involved there is potential for a lot more investigation. Two recent literature reviews have highlighted this in identifying large gaps in the knowledge (Cox and others, 2010; Brook Lyndhurst, 2009a).

Difficulties with 'Scaling up' waste reduction behaviour

A review of evidence by Tucker and Douglas (2007, p.5) highlighted the difference in 'visibility' of waste prevention activities, as compared to recycling. Those who participate in recycling present their recycling receptacles on the kerb on a regular basis, whereas waste minimisation efforts often occur in the home (or even more privately, in the mind – through decisions about what and when to buy products). This could be a limitation to scaling up minimisation, due to inhibiting effect this has on the sharing of ideas on how to minimise waste. The same review, along with others (eg. Bulkely & Gregson, 2009), have also found social stigmas associated with some waste prevention activities that could be further barriers to their widespread acceptance.

2.7. Gaps

Problems with reducing waste

It should be borne in mind however, that there are still conflicting paradigms informing policy on waste management and environmental and developmental issues. While waste managers are trying to drastically reduce the volumes of Municipal Solid Waste produced, combustion of municipal solid waste is seen as a real, and cleaner alternative to coal as a renewable energy source (Jamasb & Nepal, 2010, p.1341). These policies are clearly in contention, and literature could be found that reconciled these two apparently divergent paradigms in sustainable development for the UK.

Furthermore, while UK development policy is tends to favour to developments which concentrate populations in high-density urban environments, it is known that this is detrimental to recycling rates (Timlett & Williams, 2009, p.505).

Whose responsibility?

While the literature review to this point looks at responsibility for waste creation at the household level, an opinion often stated by members of the public is that those with the biggest responsibility for minimising waste are manufacturers themselves[7]. The major supermarket chains in the UK have signed up to, in recent years, to commitments to reduce the waste they produce as a result of pressure from the government and consumers[8]. However, there is only passing comment to this distribution of responsibility in the literature reviewed, with little investigation as to what drives the development of waste policy in the commercial sector.

Longitudinal studies

There was no evidence in this review, of longitudinal studies that looked at how a group's waste management had changed over time. Specifically it would be of use and interest to know which waste minimisation activities were adopted into people's routines, and which were abandoned after only a short time. This is possibly because of the young nature of the field, and the lack of time that has been available to researchers, but longitudinal research is also more costly than cross-sectional research, and requires more planning.

Innovation

Where innovation and ideas come from in waste management, and critically how ideas can be spread amongst the public and become commonplace is an area of investigation that was not encountered in this review of the literature.

Lack of model

Despite the growing body of knowledge that exists now on the minimisation of household waste, there are some apparent shortcomings in the way the subject is studied. While most

[7] This is the opinion gathered in interviews with participants during data collection for this research
[8] Interview with Environmental Project Manager, J. Sainsbury's

studies have separated out different waste minimisation activities for questionnaires and asked for respondents' intentions and behaviours on them – when analysing and writing up the results, it is peoples' attitudes towards "waste minimisation" as a general activity, that have been reported. This presumes that people have a personal "waste minimisation" agenda, and doesn't allow to results to be interpreted in a way that acknowledges the fact that some people may take part in waste minimisation activities for reasons other than waste minimisation. Obara (2005, p.17) touches on this phenomenon, in reporting a contradiction between people's questionnaire and interview responses when asked how they felt they could reduce their waste further. The survey showed a high proportion of people were engaging in waste reduction activities, but that they found it difficult to identify these activities as being "waste reduction" in interviews. One explanation this author offers, and which is already commonly accepted in the literature (is that people reuse bottles and bags not to reduce their waste, but simply for convenience. This fragmented and multi-motivation nature of waste prevention activities is identified in Tucker and Douglas' (2007) work, and highlighted again in Cox and others' (2010) review of waste prevention studies, but little work has been done in addressing the aforementioned findings. The significance of this realisation has big policy implications. It implies that waste reduction, whilst happening in a piecemeal way, is far from the public's consciousness and that a better understanding of the public's real motivations behind the activities could result in more effective marketing strategy.

This research attempts to address this issue head-on, and use quantitative methods to begin to identify patterns in peoples' waste reduction activities, and qualitatively explore motivations for specific waste reduction activities. This was recommended by Tucker and Douglas (2007, p.18), and also intends to respond to the call from Bulkely and Gregson (2009,

p.930) to “open up the ‘black box’ that is the household and engage with household practises”.

As called for by Fell, Cox and Wilson (2010, p.285), a model is put forward, shown below in Figure 4, as the basis on which the research proceeded. In this model, circles represent activities, large and small, which contribute to the reduction, reuse and recycling of waste. Each activity is seen as having a connection (or none) to other activities, based on common motivators, preconditions, barriers etc. For example, it may be found that someone who rejects junk mail is also more likely to routinely take their own bags shopping, because it might transpire that those two activities have very similar motivators, and enabling environments, so the activities are often found together in one household. An activity like receiving e-statements from the bank, however, could primarily be motivated by convenience, and so have connections with different activities. In this way, there is scope to understand waste reduction behaviour as a “network” of activities, some of which have shared motivators and participants.

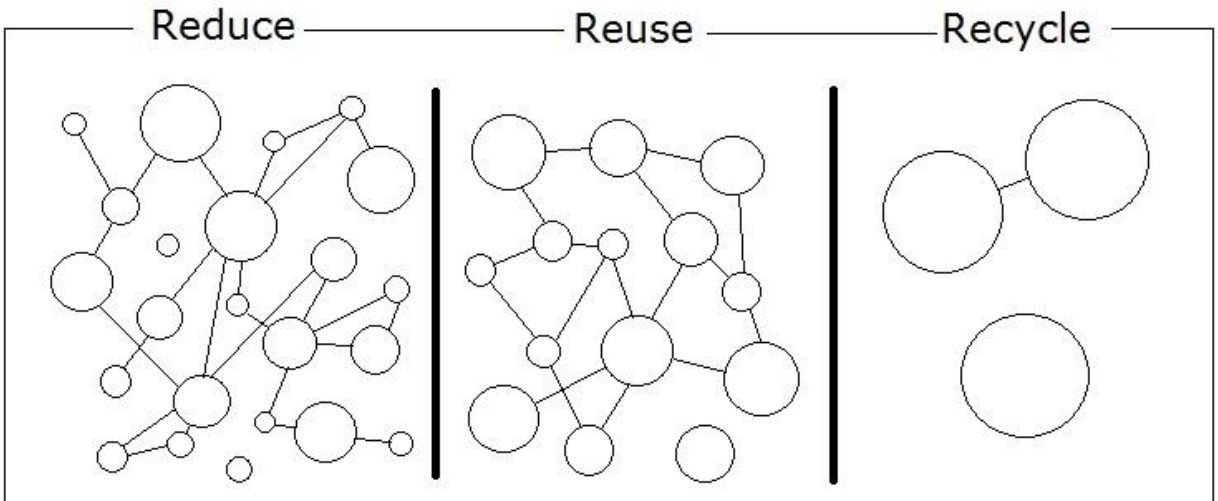


Figure 4 – Proposed model of Waste Management Behaviour

Purchasing and supermarket-related activities

Having identified the issue of the fragmented nature of waste reduction behaviours, and acknowledging the need highlighted by Tucker and Douglas (2007, p.18) for each activity to be studied in depth, a handful of activities were been identified for further qualitative investigation in this research. Given the results of the analysis of the quantitative data, and in light of the co-operation of J. Sainsbury's, it was decided that those activities that related to purchasing goods, particularly from supermarkets, should be chosen for in-depth study. These are namely; the adoption of re-useable bags, the purchase of products with less packaging and the reduction of food waste. As a side note, whether or not the use of re-usable bags when shopping in a supermarket is reduction (in plastic bags consumed) or reuse (of re-useable bags) is up for debate, however in this study, it will be considered and referred to as a reduction activity.

A compilation of case studies compiled by WRAP (2011) documents the promotion and adoption of re-useable bags in the UK, led predominantly by the large supermarket chains incentivising customers. Limiting the number of plastic bags used by the public for shopping not only benefits the environment, but can also benefit both customers (with store-rewards) and the business (from reduced costs in producing disposable bags)[9].

Organic waste contributes the largest volume of waste emanating from the household (Parfitt, 2002, p. 15), and only around 2% of this food waste source is collected separately for treatment such as composting or anaerobic digestion (Hogg and others, 2007b, p.2). Yet there is remarkably little research in existence that looks at where the sources of organic waste come from within the home, and if interventions have been successful in reducing this.

[9] From an interview with an Environmental Project Manager, J. Sainsbury's

A very recent report from WRAP (Terry and others, 2011) has looked into mapping where food waste arises in the supply chain – however it stops short of unpicking household behaviours.

2.8. Methodologies

Current methodologies have consisted largely of studying self-reported behaviour, rather than actual behaviour (eg. Obara, 2005; Barr, 2007) which as highlighted by Swami and others (2011) is a method for which the reliability is becoming increasingly questionable due to the political climate in the UK surrounding environmental issues. Relatively fewer studies have actually tried to observe or quantitatively assess peoples' waste management behaviour. Those that have (e.g. Brook Lyndhurst, 2010; Dorset County Council, 2008) have done so to study the effect of a particular campaign on waste generation.

Those studies that have attempted to collect data on volume/mass waste generated have struggled to keep accurate records because of the geographical spread of participants and unwillingness of participants to have their waste analysed (Brook Lyndhurst, 2010, p.8). Self-weighing on the part of the participants has also been unsuccessfully attempted, due to issues of motivation and the time required to collect, digitize and analyse the diary information (Brook Lyndhurst, 2010, p.8).

While this study and others makes a clear distinction between waste reduction, reuse and recycling, it is worth bearing in mind that in an everyday context to the general public there is often little distinction between these terms, and they may be used interchangeably (Swami and others, 2011, p.25). This makes piloting of questionnaires and interview questions especially important.

Cox (2010) highlights a key weakness of the studies carried out so far as being that households were asked about different waste prevention activities in each study, making it difficult to draw comparisons between studies. Given this, due attention will be given to compiling and utilizing an aggregated list of waste reduction activities, using information from previous studies, on which to question respondents. This is difficult to minimise through methodological means, but it must be borne in mind when interpreting and discussing results.

Types of people in recycling studies

Four types of people are identified in the literature, sustained-recyclers, non-recyclers, new-recyclers and stopped recyclers (Timlett & Williams, 2009, p.505). As is highlighted by Tucker and Douglas (2007), survey research into topics such as this carry a high risk of unintended bias from being self-selecting, people who are willing to take part in these types of study are more likely to be those active and interested in environmental issues.

Behaviour Intention vs. Behaviour

Barr (2007) makes the distinction in his study, between "behaviour intention" and "behaviour" – asking people to report on whether they are willing to reduce/reuse/recycle, as well as whether they actually do, a salient point worth consideration.

2.9 Notes on the literature search

The search for journal articles was conducted primarily using the Metalib search engine, to search the 'Zetoc' and 'Web of Science' and other relevant databases. Search terms such as "household", "municipal", "waste", "reduction", "recycling", "minimiz(s)ation", "prevention" and "avoidance" were used in varying combinations to find articles that were generally relevant. They were ranked according to how current they were, scanned and prioritised for relevancy and read accordingly. To find journal articles on more specific activities, terms such as "plastic bags" and

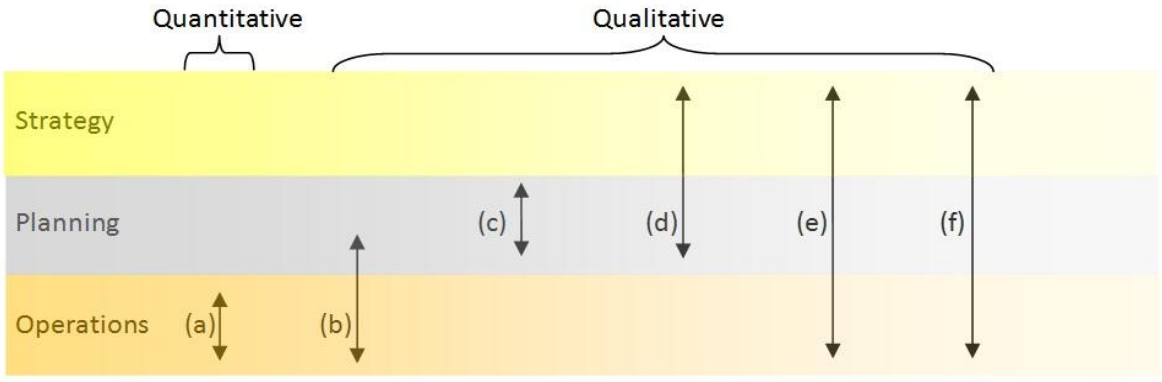
"food waste" were added. This resulted in a collection of relevant literature, from which other relevant articles could be found and sourced. Books on research methodologies and general psychological behaviour theories were sourced from the University library, through searching the library database. Perhaps owing to the relatively young nature of the subject, however, there were few books found on the subject of waste minimisation, and those that were, were outdated. The other supporting articles, such as online news articles and government reports were found through Google searches, and searches of the DEFRA online archives. The quality and trustworthiness of these sources was always interrogated, making sure that they came from official sources and were peer-reviewed when available.

While the literature review was ongoing, a preliminary pilot survey was sent out to the recycling team in every waste collection authority in the UK, to ask what the relevant issues that they encounter are. This helped inform the research at a very early stage, and direct the search for literature. 82 responses were garnered and where the results were relevant, they have been referred to in this literature review.

3. Methodology

With a lack of existing research in this area, it was necessary to design a new methodology for this research. The design was heavily informed at every stage by current methodologies employed in the sector for similar studies. This chapter discusses the design process, and explains the methods used for collecting, preparing and analysing the data. It is primarily in the analysis methods that this research diverges from previous work.

The data collection consisted of three main stages. Firstly, a quantitative questionnaire survey collected data on waste management behaviour and attitudes. The second stage was two focus group sessions that were carried out in light of the preliminary findings of the first stage. Finally, these two data sources were complimented with interviews from a range of stakeholders, including a Waste Manager at J. Sainsbury Plc. and Zero Waste officers from the local council. As can be seen in the Figure 5 below, the data sources spanned the breadth of levels of waste management, from the strategy level to the operational of waste management behaviour and this depth, combined with a breadth of methods, ensured the research questions were fully addressed.



(a) Questionnaire Survey
(b) Focus groups
(c) Interview with product design expert
(d) Interview with Sainsbury's Environmental Project Manager
(e) Interview with Loughborough University Environmental Services
(f) Interview with Charnwood Zero Waste Officers

Figure 5.

3.1. Quantitative tools

The quantitative research instrument was a twenty-four question questionnaire that was distributed as explained in this chapter. An example can be found in Appendix 1. The questionnaire took inspiration from Barr's description of a questionnaire used for a similar study (2007). It looked at respondents' frequency and motivations for performing (or not performing) several waste management activities, as well as taking basic socio-demographic information for later analysis. 17 solid waste reduction and reuse activities were studied, along three other general environmental activities, including water, energy and fuel conservation. To assess frequency of behaviour, respondents were asked to tick one of five boxes, saying how regularly they did that activity. The options were "Never", "Rarely", "Sometimes", "Usually" and "Always", mirroring the options used by Barr (2007). The waste reduction and reuse activities and their sources are listed in the table below;

Activity	From…
1 Avoid buying disposable products	Barr (2007)
2 Burn garden waste	Dunn, Convery and Gallagher (2008)
3 Buy fruit and vegetables loose	Barr (2007)
4 Deliberately buy products with less packaging	Barr (2007)
5 Freeze and reuse leftovers	New
6 Limit the number of Christmas/Birthday cards you send	New
7 Opt for e-bills and online statements from your bank	Pikkarainen and others (2004)
8 Print paper on both sides	New
9 Reject junk mail	Salhofer and others (2008)
10 Repair inexpensive broken electrical items	Barr (2007)
11 Take your own bags shopping	Barr (2007)
12 Cycle or walk if you don't need to drive	New
13 Give old clothes to a charity shop/friend	Bulkely & Gregson (2009)
14 Keep scrap paper for notes	Barr (2007)
15 Limit the length of your showers	New
16 Pass on unwanted furniture/computer/TV to a relative or friend	Ongondo, Williams and Keynes (2011)
17 Reuse glass jars and plastic bottles in your home	Barr (2007)
18 Sell/give away unwanted items on Ebay/Freecycle	Dorset County Council (2008)
19 Switch off lights when you leave a room empty	New
20 Trade in your mobile phone	Geyer & Blass (2010)

Table 5.

One problem identified within the research to date in this area, is that each study looked at different activities within waste reduction behaviour (Cox and others, 2010, p.215). For this reason, the literature was searched for previously studied activities, and these were used in the survey along with a number of "new" activities that had not been found in the literature. The activities listed in Table 5 above are grouped into 'families' and colour coded. A 'family' is a group of activities that have commonalities, the reasoning for which is below:

- Red denotes activities which involve changing behaviour at or before purchase.
- Green denotes those activities which involve salvaging value from something that has fulfilled its' primary purpose.
- Yellow activities are decisions that affect how much waste would be created
- Grey activities are other environmental activities that related to reducing consumption/production of waste

On the questionnaire, on the same line as each activity, there were a series of nine tick boxes, one for each potential "motivation" for doing the given activity. The motivation options offered to the respondents to tick were informed by collecting and grouping suggestions put in interviews with a wide range of potential respondents. All the suggestions put forward were analysed and grouped with similar motivations until a reasonable number remained. The nine options shown in Table 6 were available to respondents to tick:

"Save money"	"Reduce waste"	"Help society"
"Save time"	"Not sure"	"Convenience"
"I always have"	"I feel obliged"	"Other"

Table 6.

Respondents were invited to tick up to two motivations for each activity. Because the purpose of the research is to investigate “alternative motivations” for the given activities, two responses were allowed to deter people from just ticking “Reduce waste” – as they may be inclined to do, knowing the nature of the research. The reason for providing a list of possible answers, rather than just inviting respondents to write their own answers for coding, is that in a pilot, respondents found it too onerous a task to consider their motivation for each of 20 activities, yielding often repetitive answers if any at all. The tick box system was considered the best way to elicit the more honest answers from respondents with minimal effort from them.

Both an online version and a hard-copy of the questionnaire were made available to respondents. The two versions were identical in content, with questions appearing in the same order, on the same page, with the same wording. The only difference was in how respondents selected their motivation for each activity, being a drop down list on the online version, and a series of tick boxes on the hard copy, due to the limitations of the software being used to write the online survey. This was deemed to be too insignificant to affect the results, but it was found that for some activities, when people filled the form out online, they would select the same motivation twice for one activity. This was obviously not available to those filling out the hard copy, and resulted in an unnatural increase in some motivations for some of the activities. In the cases where this occurred, the motivation was only included once per activity per respondent - for inclusion in the analysis.

Initially, there was no preference for whether the questionnaires were filled out by the respondent themselves, or by the researcher who would administrate the questionnaire.

However, it became clear after a few of the latter style of responses, that this was not effective. Respondents would tend to give “yes/no” answers the questions as opposed to indicating the subtleties of Always/Usually/Sometimes/Rarely/Never offered. This could have been down to the individuals, how the questions were posed, or an expression of the sensitive nature of discussing waste management, but none-the-less provided second-rate data. Additionally, when asked what motivated them to do the activities, they struggled to identify only two, and took a long time to decide – which extended the process, frustrating the respondent and limiting the rate of collection. As a result, the four surveys that were collected in this way were held back from inclusion in the analysis, and all further questionnaires were given to respondents to be self-administered.

3.2. Qualitative tools

There were two tools that were primarily used for the qualitative elements of this research, focus groups, and key informant interviews. Key informants were;

- Zero waste officers from Charnwood Borough Council
- Environmental Project Manager, J. Sainsbury’s Plc.
- Environmental Manager, Loughborough University
- Product Design expert, Loughborough University

The focus groups each looked at one or two waste reduction activities, and identified some of the barriers, motivations and “personal preferences” of participants toward the given activity. This helped to build a more detailed picture of the activity, to compliment and shed light on the results of the quantitative questionnaire survey.

The interviews and focus group sessions were recorded and some notes were made during them. These records were then downloaded to a computer and played back, during

which a fuller set of notes were made and themes and ideas identified. No formal coding was done as this was deemed too time intensive for the scope of the project and there were too few informants for this. The themes and ideas identified in the quantitative data sets were used to inform the researchers' understanding of the subject, during the design the research and also to help "unpick" some of the peculiarities that presented themselves in the quantitative data analysis.

Participants in both the quantitative and qualitative tools were assured anonymity before they participated, and completed questionnaires were kept confidentially and no personal information was held longer than necessary or used for any other purposes. The research did not involve minors, or touch on a topic that was sensitive enough to require special ethical considerations.

3.3 Quantitative Sampling

An explanation of the sampling methods used for this study is set out in the following section. The scope of this research was to design test a new methodology for understanding waste management activities. Naturally, therefore, the actual results, though interesting, were of secondary importance and the sampling slightly less important.

The research, which began in the first half of 2011, was able to take advantage of National Recycling week, which fell on the week beginning the 20th June 2011. This set a useful precedent for asking people to take part in a survey about waste management. There were some significant challenges however in collecting data for this research, for a number of reasons. The time limitations on this study were the biggest barrier to thorough sampling. The short time available wasn't enough to guarantee an adequate

number of responses from a single sampling method, so a multi-method strategy was adopted. While random sampling would have been preferred, when this was attempted in Loughborough town centre it was found to be too slow and labour intensive for the purposes of this simple pilot study. Response rate was low, and the time it took respondents to complete the survey was longer than many were willing to commit in that setting. Given these difficulties, a number of tactics were used to collect as much data as possible in an opportunistic manner, while keeping each result traceable and collecting socio-demographic data to enable retrospective sampling at a later date if necessary. The nature of the statistical analysis method chosen required that at least 40 responses be gathered[10]. A decision to aim for 100 responses allowed the researcher to split the results, based on different socio-demographic variables and perform analysis on both halves to compare results.

The method of statistical analysis selected is most appropriately employed with random sampling[11], however time and financial limitations meant that gathering enough information in a totally randomly selected way would have proven impossible. Instead, questionnaire surveys were distributed to a number of workplaces, and staff were invited to complete them. Those work places from which responses were elicited included council offices, church offices, a school, a University, an engineering consultancy and an international NGO. Additionally, some random sampling was attempted in the city centre but the response rate was too low to justify continuing with this method. There are weaknesses with the sampling method used, given that people in the same workplace are likely to share common influences and share patterns of behaviour, however the spread of professions goes some way to ameliorating that.

[10] Statistics consultation 20th June 2011
[11] Statistics consultation 14th June 2011

It *was* possible to allow a small level of sampling to occur, by screening respondents prior to inviting them. The criterion to which the sample was required to conform is given below;

- Roughly even split of males and females
- No respondents under the age of 18[12]
- A spread of ages that roughly represented Charnwoods population
- Because the research is primarily concerned with the *relationship* between the different activities, it is logical that participants have to be participating in at least one of the activities for their replies to be relevant.

Local media were approached to encourage the public to take part in the research, one local newspaper and two local radio stations, but no interest was received. The final distribution means for the survey was through a local Women's Institute online forum.

3.4 Qualitative Sampling

The key informants were selected and approached at an early stage in the research. They were selected because of their likelihood of being able to bring a unique insight or the way the research should be designed, and on the interpretation of the results.

The key objective in the focus groups was to identify some of the barriers, specific motivations and any other "issues" with a given waste management behaviour that weren't likely to be picked up by the questionnaire survey. The survey by its nature is designed to collect broad snapshots of the publics' behaviour rather than the more

[12] Under 18's were deemed to have too little involvement in waste management (and purchasing) behaviour to provide useful data in this study

detailed and complex aspects of personal behaviour and reasoning. Given that this was the "focus" of the groups, the makeup of the group was intended to be quite a broad mix of socio-demographics, to capture issues for many different "types" of person. The first group consisted of eight administrative staff (between the ages of 22 and 54) who shared an office at Loughborough University. The second group consisted of six individuals from a range of professional backgrounds (between the ages of 21 and 64) all of whom were members of a local church congregation. Both groups had a roughly even split of males and females.

The qualitative research was spread over the course of designing, piloting, collecting and analysing the questionnaire survey, so it was able to inform the process at every stage.

3.5 Quantitative analysis

In the first instance, the hard copies of the questionnaire were copied into the online version of the questionnaire, so that the results could be downloaded into an electronic .CSV file. This allowed for the data to be coded easily and prepared for analysis. The volume of data that was collected was too great to make descriptive analysis possible from simply looking at the raw data.

When considering methods for analysing the data, there were two subjects at hand. The first was to investigate the extent to which people actually reported that they did or didn't do the tested activities. This produced simple information on which activities were practised to a greater or lesser extent, but it was also possible to find correlations between the activities, so that one could see which activities were more commonly associated with each other. The second subject at hand was investigating and comparing the motivations that people declared for each activity, and comparing the "motivation profiles" for each activity. These two subjects were analysed separately, and from this

point on are referred to as the "Participation" and "Motivation" data, respectively. The Results and Analysis chapter also has a section preceding these two, titled "General" – this contains all the results of the general analysis. The methods used for all analysis are detailed in the following sub-sections.

General

The general analysis consisted of calculating the socio-demographic and socio-economic makeup of the sample. This ensured that any conclusions drawn could be understood in the context of who the respondents were. There were specific questions about age and gender on the form, which the majority of respondents filled out. This was compiled and analysed and presented in a table and charts, for interpretation. The socio-economic data was collected using respondents' postcodes as a proxy for socio-economic status. By using a pre-built database, each response was assigned a letter from A to J. This letter gave an indication of the level of deprivation for the respondent, with "A" meaning that that postcode was in the top decile of deprivation, "J" being the lowest decile of deprivation. To simplify this, respondents with letters A-E were classified "Deprived" and respondents with letters F-J were termed "Privileged" (as compared to the average). This was presented in a table and is included in the Results chapter.

The results of these analyses, while saying nothing about waste

Notes on the Index of Multiple Deprivation (IMD)

The IMD is a poverty indicator that measures levels of deprivation across England. It divides the country up into small areas called "Lower Layer Super Output areas", of which there are 32, 482 in the UK, which represent around 1500 people[10]. The IMD uses several variables to provide a score for each and then ranks them in order of deprivation. This is based on a number of factors, such as income, employment, health, education and skills, barriers to housing and services, living environment and crime levels.[10] The database that was used to for this research returned a letter from A-J indicating which decile of deprivation the postcode was in.

[13] Michael Kerrigan to Joseph Hopkins, 15th June 2011

reduction, help to understand which groups of people the sampling managed to reach. This helped not only to understanding how representative the sample was likely to be of the wider population, but also allowed the sampling methods employed in this study to be critiqued.

Participation

The Participation data was prepared initially by removing invalid responses (such as those from outside the study area) and tallying the extent to which people reported that they did each activity. This gave a simple but useful overview of which were the most popular activities. A graph was produced to show this data. This data was also used later in drawing diagrams to illustrate the more complex analysis.

To analyse whether there were any correlations between activities, the raw data was inputted to SPSS for bivariate correlation analysis. This relatively simple method of analysis was chosen as it allows correlations between two variables to be ascribed a numeric value known as Spearman's ρ (Rho) on a scale between -1 (perfect negative correlation) and +1 (perfect positive correlation). The scale below shows one interpretation of the value for Spearman's ρ,

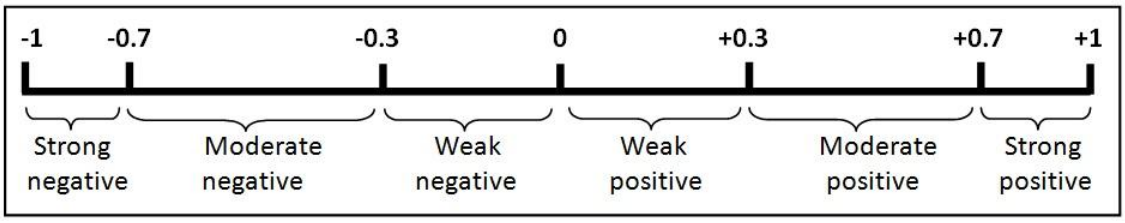


Figure 6. *Cohen (1988)*

As well as this ρ value, which indicates the strength of the correlation, bivariate correlation analysis also provides a "Sig." value for each relationship which indicates statistical significance of the value given for Spearman's ρ. In other words, it shows the likelihood (from 0 to 1) that the value of ρ *isn't* a coincidence. When the table of results was produced by SPSS, values that were statistically significant to less than 0.01 (i.e. a less

than 1% chance that the relationship is circumstantial) were automatically highlighted. Of those values, the ones that were higher than 0.3 were selected as being strong enough for inclusion in the diagrammatic representation. There were only a handful of correlations higher than 0.4, which was to be expected given that only broad patterns and trends are being sought. Values of greater than 0.7 that showed a strong relationship between two activities would have suggested that everybody who did one activity almost invariably did the other – which was never an expected finding. The diagrams were constructed using an online diagram building tool. The sizes of the circles for each activity were calculated to represent the extent of participation and the strongest, statistically significant correlations represented by a solid line between activities. This was repeated for male-only and female-only respondents for easier comparison.

Motivation

The "Motivation" data needed some additional preparation before analysis because a number of people had offered their motivation for doing an activity even when they had reported that they "Rarely" or "Never" do that activity. It was considered that people may have been answering the question "Why do you Rarely/Never do this" – but this could not be assumed. Given this, answers regarding motivation were removed from the data where the respondent had stated that they rarely or never participate in the activity. What remained, then, was a true representation of answers to the question "Why do you *do* [the given activity]?".

Partly because of this, and partly because respondents had the opportunity to tick none, one or two of the options given to them, there was a very different number of responses for each activity. If an activity was Sometimes/Usually/Always practised by all respondents, who each filled out two motivations for that activity, then there could have

been 294 “votes” spread between the motivations. If an activity was only Sometimes/Usually/Always practised by only ten people, each of whom only gave one motivation, then only ten “votes” would have been spread across the motivations. This meant, for example, that the number of times “Help Society” was voted for as a motivation for “Taking goods to a charity shop” had to be presented and understood as a proportion of the number of times a motivation was declared for that activity rather than a raw figure that could be directly compared directly with the other activities.

The weighting of each motivation (its relative recurrence) was calculated for each activity to find that activities’ “top reported motivation” and “second reported motivation”. These were then included in a diagram that presents the data visually, solid lines representing a shared top motivation and dotted lines representing a shared second motivation.

3.6 Qualitative Analysis

With the participants’ permission, the interviews and focus groups were recorded and downloaded for playing back at a later date. The recordings were reviewed and notes were made on the ideas and themes that came out of the discussion. These were used to inform the discussion in Chapter 5.

3.7 Choosing which data sets to use

Because there were so many responses from outside the Charnwood area, it was possible to analyse the results from both of the data sets, “Charnwood” and “outside Charnwood”, and compare the results to see if they were similar. This was done initially to give an indication as to whether the Charnwood results were representative of the wider UK population. As was mentioned earlier, there was a big socio-demographic difference in

these two sets of data, so the two sets were adjusted for analysis, to have similar socio-demographic makeups, for fair comparison.

Once the two samples had been selected randomly, prepared and analysed, the results from each data set were compared for similarity. This was done twice, firstly with the two samples adjusted to have a similar gender balance, and a second time to adjust the samples to have a similar age balance.

Both times when this was done, the results for the two data sets were found to be very different, with very few correlations actually appearing in both data sets. This indicates one of four things;

(i) that the behaviour of Charnwood residents is noticeably different to the behaviour of the non-Charnwood residents,

(ii) that the sample sizes weren't big enough for the analysis methods to pick up any genuine patterns,

(iii) that there is a flaw with the methodology, or

(iv) that the hypothesis of "patterns of behaviour" is wrong (or at least an oversimplification).

When the results were split Male/Female and analysed separately, again the two data sets produced very different correlations, and when split Over 30/Under 30 again, the results were very different for the two sets. These results were perhaps to be anticipated, given that they are fairly significant variables, but one would expect Charnwood results to show at least some similarities to the non-Charnwood results.

In light of this apparent lack of reliability of the results for the smaller samples, the two data sets, "Charnwood" and "outside Charnwood" were merged and all further analysis

was carried out on all 147 of the UK questionnaire results. This decision was made after considering the general theory that confidence in statistical results can be increased by taking a larger sample size (Sackett, 2001, p.1227).

$$\text{Confidence} \propto \frac{\text{Signal}}{\text{Noise}} * \text{Sample Size}$$

Adapted from Sackett, 2001, p.1227

To increase confidence of being able to pick up any signal, or pattern in the population, one must reduce noise (which, in the case of this study is "unexplained behaviour") – or increase the sample size.

This helped to ensure that any relationships identified in the Results and Discussion chapters have a larger chance of being true patterns that exist in the population. This means that the results can no longer be claimed about Charnwood exclusively, but are actually UK wide.

4 Data and Analysis

As explained in the last section of the Methodology chapter, preliminary analysis suggested that the study would benefit from the largest sample size possible, so this and the following chapter display and discuss the results of the full 147 valid survey responses and the qualitative methods.

4.1 General

There were 158 submitted survey questionnaires, eleven of which were foreign from mainland Europe, China, the US and Nigeria. The overseas responses were discarded, leaving 147 UK results remaining for analysis. The sampling method employed returned a high proportion of responses from outside of Charnwood. In all, 68 responses were received from Charnwood residents, meaning up to 79 were from parts of the UK outside of Charnwood – although eleven respondents didn't provide a postcode, so their location could not be identified. A number of the "Non-Charnwood" respondents are likely to be from surrounding districts because of the nature of the sampling methods employed but without intensive analysis, it was impossible to know the extent of this.

This chapter summarises the data and analysis in tables, diagrams and charts, and describes what they show. Discussion of the results, including the findings of the interviews and focus groups, are included in the following chapter.

For interests' sake, and to give an overview of the numbers obtained, aggregated results of the questionnaire survey are shown in Table 7 on the following two pages. It was necessary however, to keep the data disaggregated for the purposes of the majority of the analysis, because the analysis was concerned with testing which behaviours were associated with other behaviours.

	1 Avoid buying disposable products	2 Burn garden waste	3 Buy fruit and vegetables loose	4 Deliberately buy products with less packaging	5 Freeze and reuse leftovers	6 Limit the number of Christmas/Birthday cards you send	7 Opt for e-bills and online statements from your bank	8 Print paper on both sides	9 Reject junk mail	10 Repair inexpensive broken electrical items
Always	11	3	20	15	47	27	45	28	60	5
Usually	42	5	69	32	60	28	39	55	42	23
Sometimes	59	17	41	57	20	22	28	33	17	46
Rarely	19	22	10	23	8	31	13	18	14	42
Never	16	99	8	20	13	38	23	14	15	31
Other	7	61	19	8	8	27	26	12	20	35
Not sure	11	17	6	5	2	8	3	3	10	6
I always have	6	7	17	8	13	34	8	10	32	14
I feel obliged	0	3	4	6	5	12	3	2	4	3
Reduce Waste	76	9	58	80	49	20	61	88	49	29
Help Society	15	18	6	22	2	3	5	10	4	1
Convenience	19	20	41	30	41	19	67	24	34	22
Save Time	8	6	2	4	35	28	25	7	32	15
Save Money	30	3	42	12	75	28	22	60	0	61

Table 7

Save Money	15	60	3	34	29	11	26	30	83	26										
Save Time	4	12	2	2	26	3	4	6	2	6										
Convenience	33	22	9	33	20	24	46	16	4	10										
Help Society	26	10	82	8	3	48	8	20	20	5										
Reduce Waste	87	16	56	69	23	38	58	32	47	19										
I feel obliged	10	9	5	2	5	4	1	1	9	0										
I always have	10	22	25	20	16	15	18	9	28	8										
Not sure	4	3	7	8	12	4	5	18	2	17										
Other	12	32	8	5	21	18	10	22	3	48										
Never	8	5	7	11	34	16	12	41	2	70										
Rarely	9	13	9	15	38	17	21	27	2	30										
Sometimes	26	34	18	35	34	47	47	31	12	13										
Usually	57	43	49	35	27	40	32	35	59	15										
Always	48	47	60	46	10	22	31	9	68	14										
	11 Take your own bags shopping	12 Cycle or walk if you don't need to drive	13 Give old clothes to a charity shop/friend	14 Keep scrap paper for notes	15 Limit the length of your showers	16 Pass on unwanted furniture/computer/TV to a relative or friend	17 Reuse glass jars and plastic bottles in your home	18 Sell/give away unwanted items on Ebay/Freecycle	19 Switch off lights when you leave a room empty	20 Trade in your mobile phone										

Table 7

General Analysis continued…

The two sets of data, "Charnwood" and "Non-Charnwood" were comprised of very different socio-demographics, as shown in the table below;

Table 8	Gender		Age		Homeowner	
	Male	Female	18-30	31+	No	Yes
Charnwood	26%	74%	35%	65%	37%	63%
Non-Charnwood	51%	49%	67%	33%	69%	31%
Whole Sample	40%	57%	50%	48%	54%	43%

*not all respondents gave personal details, hence some values do not sum to 100%

Socio-economic status

The collection of postcode data for respondents allowed for the socio-economic status of the respondents to be approximated. The results of the analysis of this information are shown in the table below:

Table 9	Charnwood	Outside Charnwood	Whole sample
Deprived*	39.6%	41.2%	40.6%
Privileged**	60.4%	58.8%	59.4%

*in the 50% most deprived of UK LLSOAs

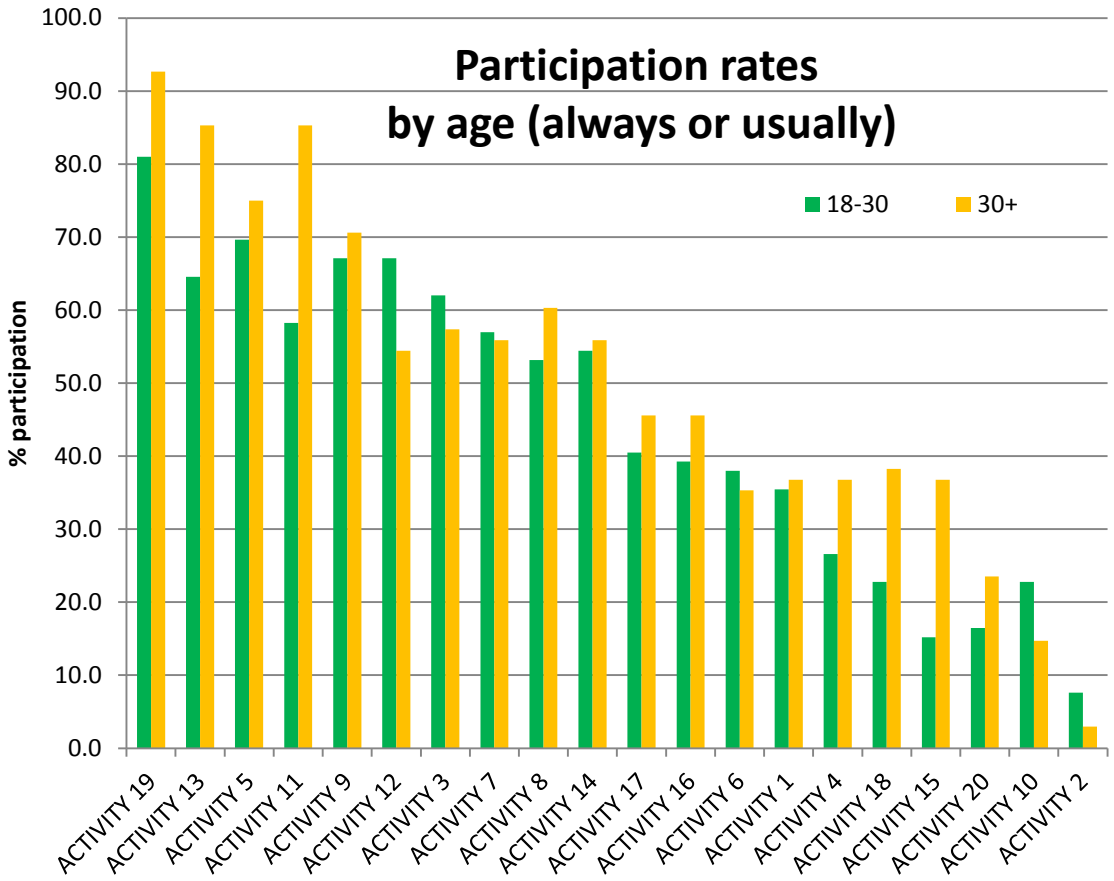
**in the 50% least deprived of UK LLSOAs

The relevance of and discussion on these data are found in Section 5.1 of Discussion chapter.

4.2 Participation Analysis

The participation results are on two levels. The first level charts the raw data, and concerns the extent to which participants actually reported doing each individual activity. These are shown in Table 10 and Charts 1 and 2. Discussion of these data can be found on page 64, in the Discussion chapter.

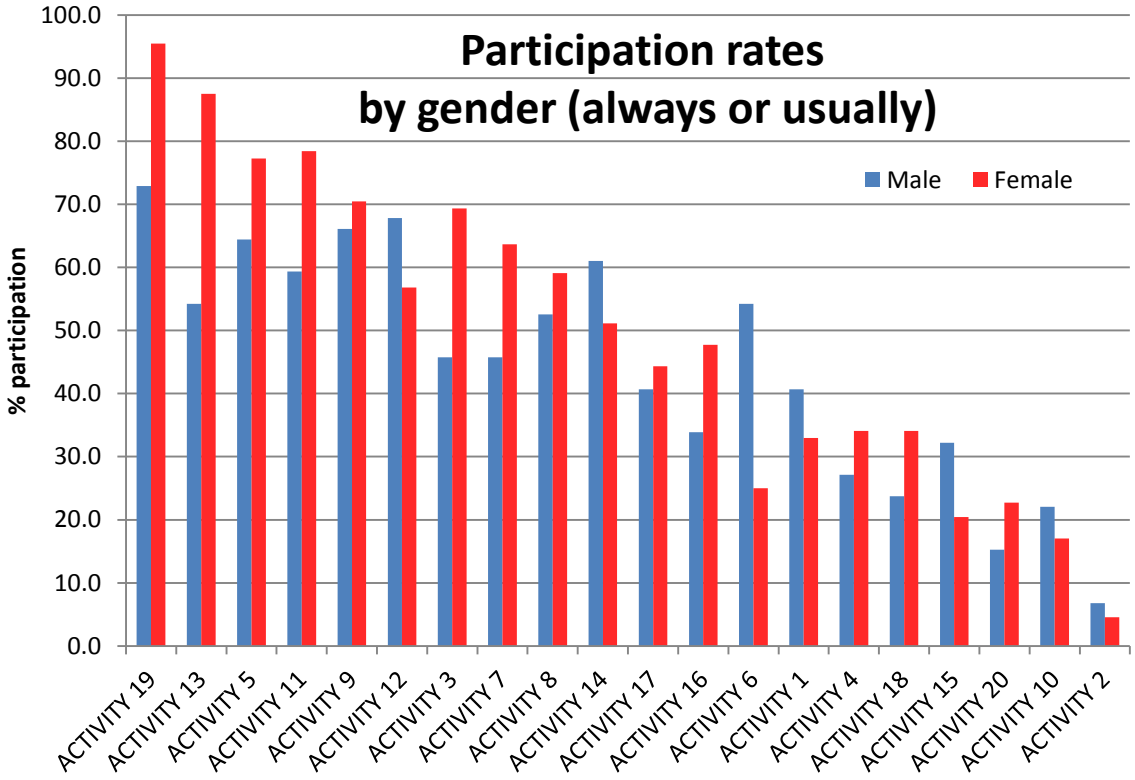
Chart 1 - Age



More likely to Always or Usually..

18-30:	31+:
Trade in their mobile phone	Take own bags shopping
Repair inexpensive broken electrical items	Give old clothes to a charity shop or friend
Burn garden waste	Limit the length of their showers
Cycle or walk if you don't need to drive	Sell/give away unwanted items on Ebay/Freecycle
	Switch off lights when leaving a room empty
	Deliberately buy products with less packaging

Chart 2 - Gender



More likely to Always or Usually..

Men:	Women:
Cycle or walk if they don't need to drive	Switch off lights when they leave a room empty
Keep scrap paper for notes	Give old clothes to a charity shop/friend
Limit the number of Christmas/Birthday cards they send	Freeze and reuse leftover food
Avoid buying disposable products	Take their own bags shopping
Limit the length of their showers and baths	Buy fruit and vegetables loose
	Opt for ebills and statements online
	Pass on unwanted furniture/goods to family members or friends
	Sell/give away unwanted items on ebay/freecycle

Table 10

Rank	Activity	Activity 'family'
1	19 Switch off lights when you leave a room empty	General environmental activity
2	13 Give old clothes to a charity shop/friend	Salvaging value from waste after its generation
3	5 Freeze and reuse leftovers	
4	11 Take your own bags shopping	Changing purchasing behaviour
5	9 Reject junk mail	Avoiding waste before its creation
6	12 Cycle or walk if you don't need to drive	
7	3 Buy fruit and vegetables loose	
8	7 Opt for e-bills and online statements from your bank	
9	8 Print paper on both sides	
10	14 Keep scrap paper for notes	
11	17 Reuse glass jars and plastic bottles in your home	
12	16 Pass on unwanted furniture/computer/TV to a relative or friend	
13	6 Limit the number of Christmas/Birthday cards you send	
14	1 Avoid buying disposable products	
15	4 Deliberately buy products with less packaging	
16	18 Sell/give away unwanted items on Ebay/Freecycle	
17	15 Limit the length of your showers	
18	20 Trade in your mobile phone	
19	10 Repair inexpensive broken electrical items	
20	2 Burn garden waste	

This table shows the 20 activities in rank order, according to which were practised "usually of always" by the greatest proportion of people. They are colour coded to reflect the *family* of activity that they fall under, as described in the Methodology chapter on page 32.

The results of the second 'level' of analysis of the quantitative data are on the following pages, in Tables 11, 12 and 13. These are the tables to the bivariate correlation analysis which show the correlations between activities. Each table is followed directly with a corresponding diagram. There are three tables, one for all respondents, one for male respondents and one for female respondents. The correlations of greater than 0.3 have been highlighted in yellow and those of greater than 0.4 highlighted in orange. There was one correlation of greater than 0.5 and this has been highlighted in red. The asterisks by the numbers indicate statistical significance (as indicated below each table). No asterisk means the correlation has more than a 5% chance of being due to chance.

Following each table is a diagram illustrating the majority of the significant data in the preceding table. The size of the circles represents the relative levels of participation, and the blue lines between the circles show where there is a relationship (statistically significant to the 0.01 level) greater than 0.3. Red lines indicate a negative correlation. It should be noted that the diagrams are for illustration purposes, and that whilst the majority of relationships are represented, not all could not be included. Discussion of both the tables and diagrams on the following pages can be found beginning at page 65 in the Discussion chapter.

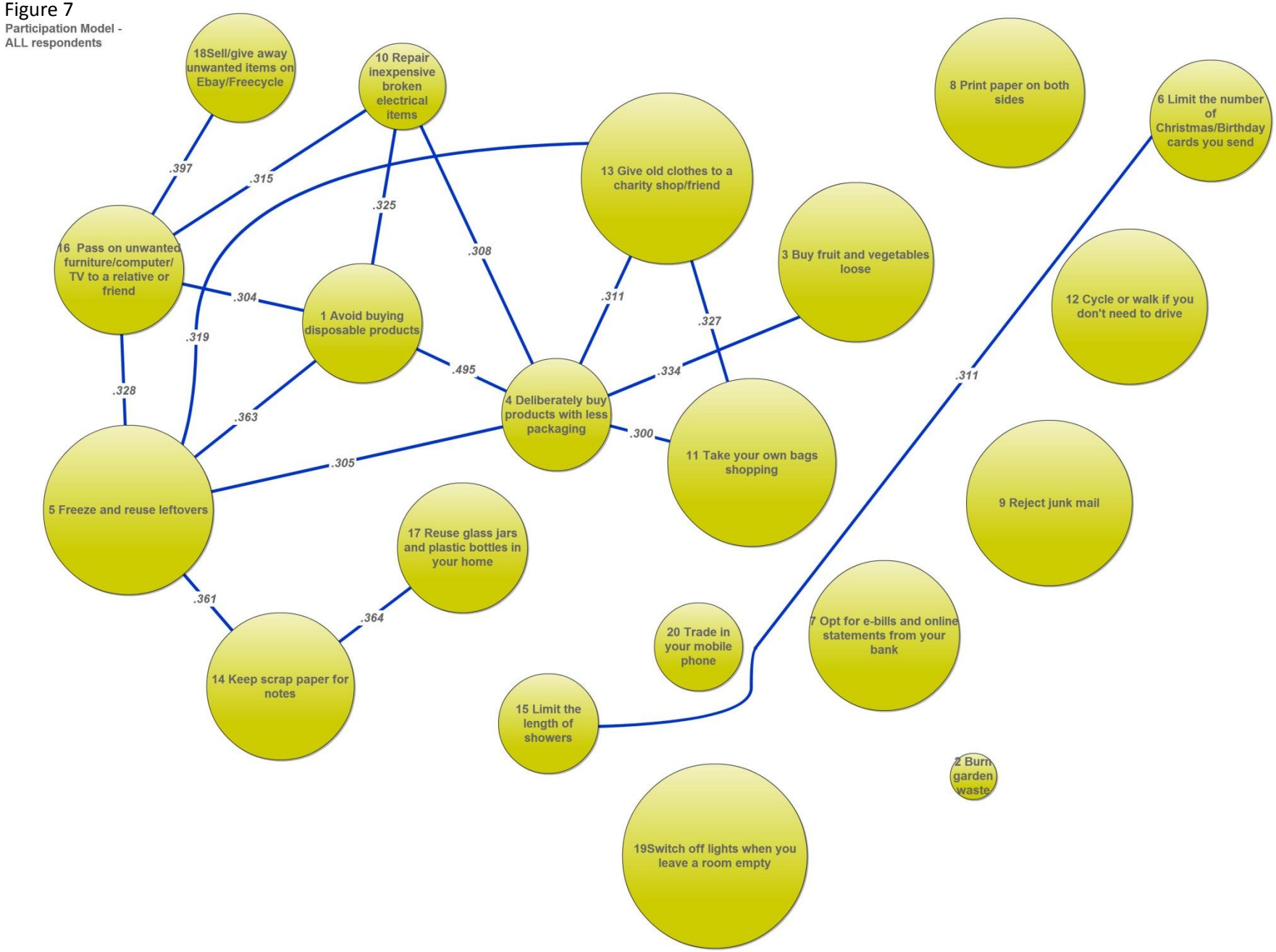
Spearman's ρ ALL	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive	13Give old clothes to a charity shop/friend	14Keep scrap paper for notes	15Limit the length of your showers	16Pass on unwanted furniture/computer/TV to a relative or friend	17Reuse glass jars and plastic bottles in your home	18Sell/give away unwanted items on Ebay/Freecycle	19Switch off lights when you leave a room empty	20Trade in your mobile phone
1Avoid buying disposable products	1.000	.171*	.229**	.495**	.363**	-.038	.019	.291**	.049	.325**	.276**	.157	.185*	.113	.183*	.304**	.108	.139	.153	.043
2Burn garden waste	.171*	1.000	-.104	.083	-.007	.115	-.205*	-.009	-.129	.128	.005	-.115	-.150	-.121	.161*	.141	-.033	-.022	.094	.052
3Buy fruit and vegetables loose	.229**	-.104	1.000	.334**	.155	-.140	.153	.119	.118	.203*	.286**	.012	.248**	.067	.095	.198*	.148	.096	.196*	.043
4Deliberately buy products with less packaging	.495**	.083	.334**	1.000	.305**	-.065	.142	.278**	.265**	.308**	.300**	.140	.311**	.149	.260**	.307**	.192*	.135	.219**	-.003
5Freeze and reuse leftovers	.363**	-.007	.155	.305**	1.000	-.087	.211**	.156*	.025	.294**	.299**	-.116	.319**	.361**	.163*	.328**	.110	.209**	.151	.088
6Limit the number of Christmas/Birthday cards you send	-.038	.115	-.140	-.065	-.087	1.000	.024	-.015	-.090	-.011	-.103	.128	-.148	-.133	.311**	.037	.043	.022	.034	-.055
7Opt for e-bills and online statements from your bank	.019	-.205*	.153	.142	.211**	.024	1.000	.119	.180*	.026	.156	.034	.134	-.005	.069	.018	.026	.201*	.156	.043
8Print paper on both sides	.291**	-.009	.119	.278**	.156*	-.015	.119	1.000	.176*	.140	.246**	.136	.183*	.147	.186*	.066	.118	.087	.071	.074
9Reject junk mail	.049	-.129	.118	.265**	.025	-.090	.180*	.176*	1.000	-.025	.111	.062	.031	.070	-.052	.034	.120	-.011	-.055	-.022
10Repair inexpensive broken electrical items	.325**	.128	.203*	.308**	.294**	-.011	.026	.140	-.025	1.000	.202*	.174*	.073	.223**	.282**	.315**	.123	.018	.078	.113
11Take your own bags shopping	.276**	.005	.286**	.300**	.299**	-.103	.156	.246**	.111	.202*	1.000	.019	.327**	.164*	.219**	.113	.035	.175*	.187*	.106
12Cycle or walk if you don't need to drive:	.157	-.115	.012	.140	-.116	.128	.034	.136	.062	.174*	.019	1.000	.022	-.004	.192*	.040	.033	-.034	.115	-.158
13Give old clothes to a charity shop/friend :	.185*	-.150	.248**	.311**	.319**	-.148	.134	.183*	.031	.073	.327**	.022	1.000	.280**	.113	.241**	.120	.173*	.223**	.070
14Keep scrap paper for notes :	.113	-.121	.067	.149	.361**	-.133	-.005	.147	.070	.223**	.164*	-.004	.280**	1.000	.158	.169*	.364**	.103	.056	.154
15Limit the length of your showers:	.183*	.161*	.095	.260**	.163*	.311**	.069	.186*	-.052	.282**	.219**	.192*	.113	.158	1.000	.163*	.169*	.069	.245**	-.060
16Pass on unwanted furniture/computer/TV to a relative or friend :	.304**	.141	.198*	.307**	.328**	.037	.018	.066	.034	.315**	.113	.040	.241**	.169*	.163*	1.000	.198*	.397**	.211**	.268**
17Reuse glass jars and plastic bottles in your home :	.108	-.033	.148	.192*	.110	.043	.026	.118	.120	.123	.035	.033	.120	.364**	.169*	.198*	1.000	.143	.000	.111
18Sell/give away unwanted items on Ebay/Freecycle :	.139	-.022	.096	.135	.209**	.022	.201*	.087	-.011	.018	.175*	-.034	.173*	.103	.069	.397**	.143	1.000	.045	.251**
19Switch off lights when you leave a room empty :	.153	.094	.196*	.219**	.151	.034	.156	.071	-.055	.078	.187*	.115	.223**	.056	.245**	.211**	.000	.045	1.000	-.043
20Trade in your mobile phone :	.043	.052	.043	-.003	.088	-.055	.043	.074	-.022	.113	.106	-.158	.070	.154	-.060	.268**	.111	.251**	-.043	1.000

*. Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

Table 11

Figure 7

Participation Model - ALL respondents

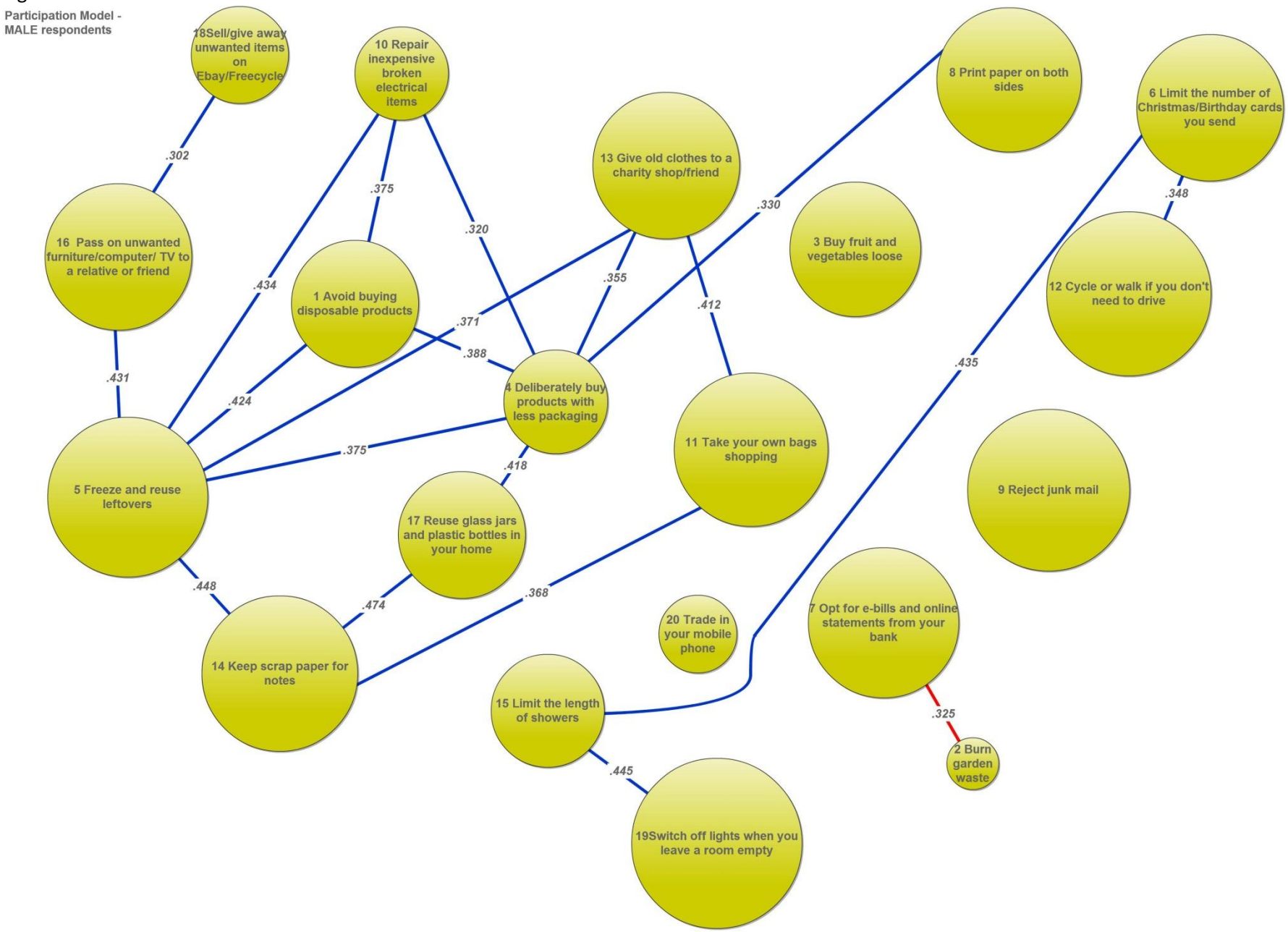


Spearman's ρ MALE	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive:	13Give old clothes to a charity shop/friend :	14Keep scrap paper for notes :	15Limit the length of your showers:	16Pass on unwanted furniture/computer/TV to a relative or friend :	17Reuse glass jars and plastic bottles in your home :	18Sell/give away unwanted items on Ebay/Freecycle :	19Switch off lights when you leave a room empty :	20Trade in your mobile phone :
1Avoid buying disposable products	1.000	.176	.179	.388**	.424**	.087	-.094	.307*	.011	.375**	.083	.078	.151	.134	.287*	.262*	.195	.149	.073	.049
2Burn garden waste	.176	1.000	-.230	-.022	-.057	.105	-.325**	-.161	-.185	-.057	-.258*	-.199	-.350**	-.264*	.085	.112	-.194	-.221	.159	-.113
3Buy fruit and vegetables loose	.179	-.230	1.000	.297*	.160	-.098	.162	.141	.245*	.257*	.150	-.059	.278*	.123	.120	.192	.144	.181	.045	.082
4Deliberately buy products with less packaging	.388**	-.022	.297*	1.000	.375**	.050	.030	.330**	.335**	.320**	.137	.059	.355**	.268*	.291*	.286*	.418**	.086	.147	-.106
5Freeze and reuse leftovers	.424**	-.057	.160	.375**	1.000	.032	.236	.245*	.093	.434**	.158	-.024	.371**	.448**	.235	.431**	.411**	.279*	.041	.067
6Limit the number of Christmas/Birthday cards you send	.087	.105	-.098	.050	.032	1.000	-.060	.045	-.083	-.074	.158	.348**	.040	-.301*	.435**	.114	-.007	.008	.259*	-.243
7Opt for e-bills and online statements from your bank	-.094	-.325**	.162	.030	.236	-.060	1.000	.199	.255*	.094	.092	-.024	.048	.139	-.007	-.078	.075	.064	.081	.168
8Print paper on both sides	.307*	-.161	.141	.330**	.245*	.045	.199	1.000	.097	.122	.278*	.127	.271*	.182	.165	.064	.041	.148	.049	.015
9Reject junk mail	.011	-.185	.245*	.335**	.093	-.083	.255*	.097	1.000	.005	.074	.048	-.087	.034	-.198	.032	.205	.125	-.064	.007
10Repair inexpensive broken electrical items	.375**	-.057	.257*	.320**	.434**	-.074	.094	.122	.005	1.000	.141	.143	.227	.207	.247	.321*	.147	-.002	.127	.101
11Take your own bags shopping	.083	-.258*	.150	.137	.158	.158	.092	.278*	.074	.141	1.000	.078	.412**	.368**	.179	-.062	.072	.067	.033	.068
12Cycle or walk if you don't need to drive:	.078	-.199	-.059	.059	-.024	.348**	-.024	.127	.048	.143	.078	1.000	-.014	-.130	.195	-.015	-.090	-.068	.060	-.020
13Give old clothes to a charity shop/friend :	.151	-.350**	.278*	.355**	.371**	.040	.048	.271*	-.087	.227	.412**	-.014	1.000	.336**	.181	.220	.187	.283*	-.012	.182
14Keep scrap paper for notes :	.134	-.264*	.123	.268*	.448**	-.301*	.139	.182	.034	.207	.368**	-.130	.336**	1.000	.027	.181	.474**	.244	-.018	.209
15Limit the length of your showers:	.287*	.085	.120	.291*	.235	.435**	-.007	.165	-.198	.247	.179	.195	.181	.027	1.000	.081	.009	-.070	.445**	-.143
16Pass on unwanted furniture/computer/TV to a relative or friend :	.262*	.112	.192	.286*	.431**	.114	-.078	.064	.032	.321*	-.062	-.015	.220	.181	.081	1.000	.245	.302*	.231	.083
17Reuse glass jars and plastic bottles in your home :	.195	-.194	.144	.418**	.411**	-.007	.075	.041	.205	.147	.072	-.090	.187	.474**	.009	.245	1.000	.172	.004	.214
18Sell/give away unwanted items on Ebay/Freecycle :	.149	-.221	.181	.086	.279*	.008	.064	.148	.125	-.002	.067	-.068	.283*	.244	-.070	.302*	.172	1.000	-.025	.096
19Switch off lights when you leave a room empty :	.073	.159	.045	.147	.041	.259*	.081	.049	-.064	.127	.033	.060	-.012	-.018	.445**	.231	.004	-.025	1.000	-.094
20Trade in your mobile phone :	.049	-.113	.082	-.106	.067	-.243	.168	.015	.007	.101	.068	-.020	.182	.209	-.143	.083	.214	.096	-.094	1.000

*. Correlation is significant at the 0.05 level (2-tailed).; **. Correlation is significant at the 0.01 level (2-tailed)

Table 12

Figure 8


Participation Model - MALE respondents
18Sell/give away unwanted items on Ebay/Freecycle
10 Repair inexpensive broken electrical items
13 Give old clothes to a charity shop/friend
8 Print paper on both sides
6 Limit the number of Christmas/Birthday cards you send
16 Pass on unwanted furniture/computer/ TV to a relative or friend
1 Avoid buying disposable products
3 Buy fruit and vegetables loose
12 Cycle or walk if you don't need to drive
4 Deliberately buy products with less packaging
11 Take your own bags shopping
9 Reject junk mail
5 Freeze and reuse leftovers
17 Reuse glass jars and plastic bottles in your home
20 Trade in your mobile phone
7 Opt for e-bills and online statements from your bank
14 Keep scrap paper for notes
15 Limit the length of showers
2 Burn garden waste
19Switch off lights when you leave a room empty
.302
.375
.320
.330
.348
.434
.355
.412
.371
.388
.431
.424
.435
.375
.418
.448
.474
.368
.325
.445

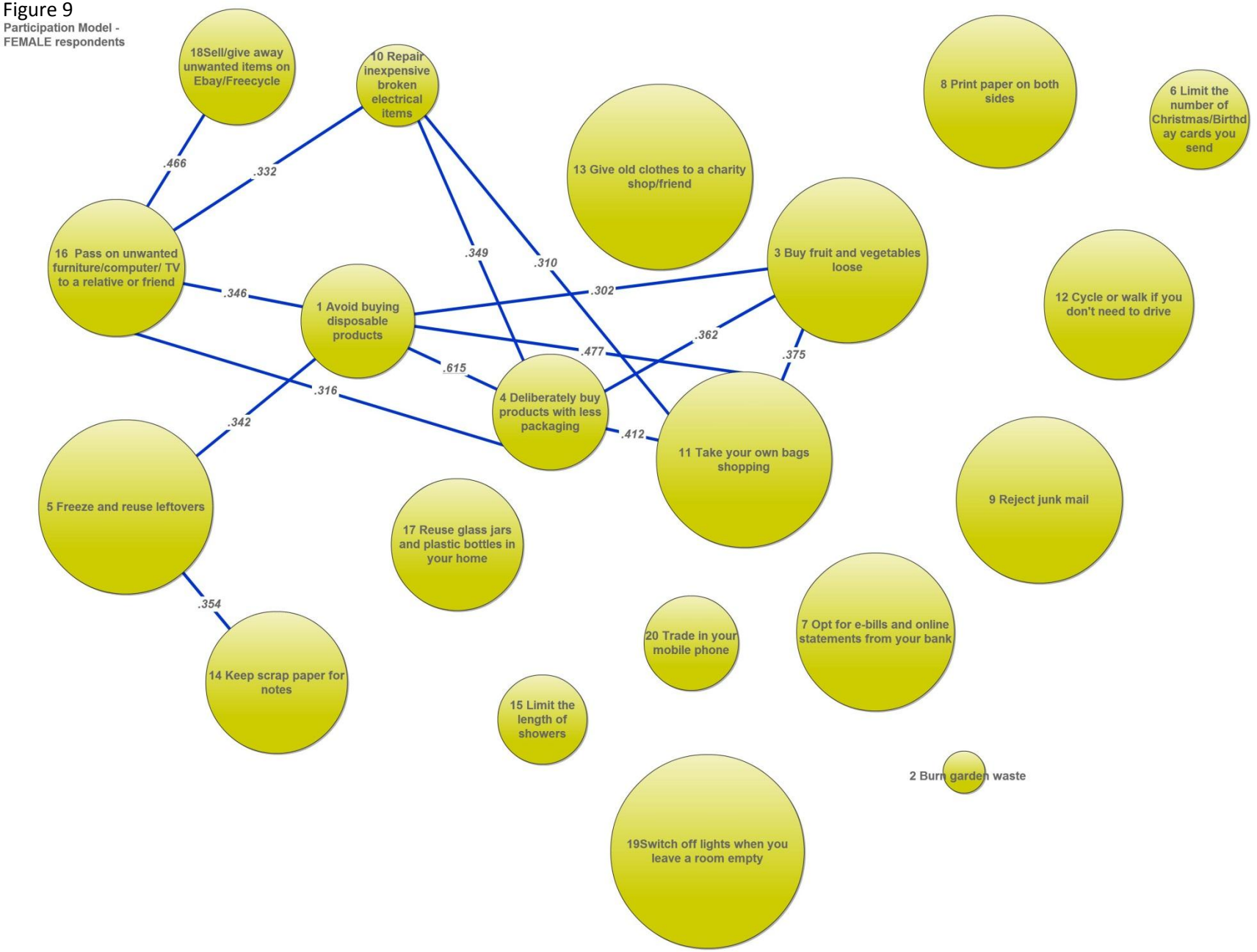
Spearman's ρ FEMALE	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive	13Give old clothes to a charity shop/friend	14Keep scrap paper for notes	15Limit the length of your showers	16Pass on unwanted furniture/computer/TV to a relative or friend	17Reuse glass jars and plastic bottles in your home	18Sell/give away unwanted items on Ebay/Freecycle	19Switch off lights when you leave a room empty	20Trade in your mobile phone
1Avoid buying disposable products	1.000	.167	.302**	.615**	.342**	-.175	.111	.278**	.088	.291**	.477**	.224*	.254*	.099	.081	.346**	.040	.131	.232*	.024
2Burn garden waste	.167	1.000	.043	.229*	.051	.101	-.095	.130	-.060	.278**	.281**	-.068	.047	-.008	.221*	.158	.086	.135	.030	.207
3Buy fruit and vegetables loose	.302**	.043	1.000	.362**	.050	-.048	.080	.145	-.006	.211*	.375**	.151	.110	.032	.139	.185	.173	-.008	.268*	-.043
4Deliberately buy products with less packaging	.615**	.229*	.362**	1.000	.149	-.097	.172	.260*	.147	.349**	.412**	.238*	.189	.048	.262*	.316**	.026	.131	.251*	.006
5Freeze and reuse leftovers	.342**	.051	.050	.149	1.000	-.116	.129	.115	-.091	.253*	.340**	-.151	.137	.354**	.128	.242*	-.060	.102	.206	.047
6Limit the number of Christmas/Birthday cards you send	-.175	.101	-.048	-.097	-.116	1.000	.135	-.057	-.051	-.003	-.208*	-.109	-.148	-.031	.183	.022	.077	.099	-.058	.117
7Opt for e-bills and online statements from your bank	.111	-.095	.080	.172	.129	.135	1.000	.093	.088	.000	.136	.102	.051	-.085	.135	.043	.012	.247*	.168	-.115
8Print paper on both sides	.278**	.130	.145	.260*	.115	-.057	.093	1.000	.265*	.167	.254*	.134	.135	.119	.188	.064	.185	.024	.097	.124
9Reject junk mail	.088	-.060	-.006	.147	-.091	-.051	.088	.265*	1.000	-.029	.088	.081	.068	.094	.086	.019	.065	-.149	-.075	-.077
10Repair inexpensive broken electrical items	.291**	.278**	.211*	.349**	.253*	-.003	.000	.167	-.029	1.000	.310**	.170	.047	.239*	.313**	.332**	.110	.089	.084	.161
11Take your own bags shopping	.477**	.281**	.375**	.412**	.340**	-.208*	.136	.254*	.088	.310**	1.000	.045	.100	.049	.298**	.198	.047	.206	.251*	.085
12Cycle or walk if you don't need to drive	.224*	-.068	.151	.238*	-.151	-.109	.102	.134	.081	.170	.045	1.000	.130	.076	.174	.070	.098	.054	.199	-.228*
13Give old clothes to a charity shop/friend	.254*	.047	.110	.189	.137	-.148	.051	.135	.068	.047	.100	.130	1.000	.314**	.103	.285**	.183	.038	.353**	-.062
14Keep scrap paper for notes	.099	-.008	.032	.048	.354**	-.031	-.085	.119	.094	.239*	.049	.076	.314**	1.000	.274**	.164	.291**	.028	.112	.121
15Limit the length of your showers	.081	.221*	.139	.262*	.128	.183	.135	.188	.086	.313**	.298**	.174	.103	.274**	1.000	.237*	.298**	.213*	.081	.039
16Pass on unwanted furniture/computer/TV to a relative or friend	.346**	.158	.185	.316**	.242*	.022	.043	.064	.019	.332**	.198	.070	.285**	.164	.237*	1.000	.171	.466**	.192	.351**
17Reuse glass jars and plastic bottles in your home	.040	.086	.173	.026	-.060	.077	.012	.185	.065	.110	.047	.098	.183	.291**	.298**	.171	1.000	.129	-.003	.048
18Sell/give away unwanted items on Ebay/Freecycle	.131	.135	-.008	.131	.102	.099	.247*	.024	-.149	.089	.206	.054	.038	.028	.213*	.466**	.129	1.000	.065	.319**
19Switch off lights when you leave a room empty	.232*	.030	.268*	.251*	.206	-.058	.168	.097	-.075	.084	.251*	.199	.353**	.112	.081	.192	-.003	.065	1.000	-.051
20Trade in your mobile phone	.024	.207	-.043	.006	.047	.117	-.115	.124	-.077	.161	.085	-.228*	-.062	.121	.039	.351**	.048	.319**	-.051	1.000

*. Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed)

Table 13

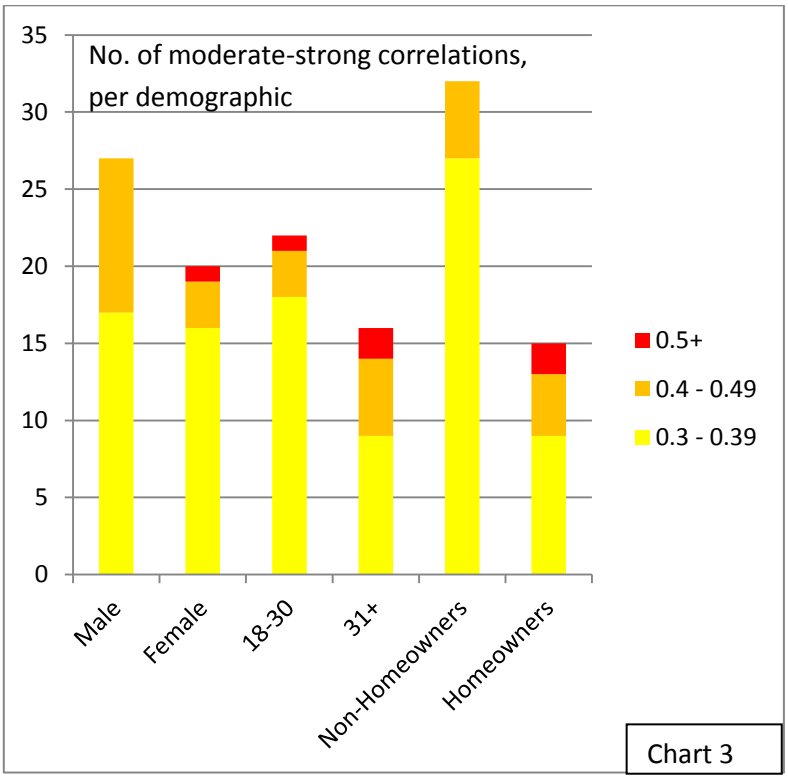
Figure 9

Participation Model - FEMALE respondents



Additionally, bivariate correlation analysis was performed to compare results for 18-30 respondents vs. 30+ respondents, and "home owning" respondents vs. "non-home owning" respondents. For brevity's sake, the full tables are not included here, but can be found in the appendixes. By way of summary, the number of statistically significant correlations that were "moderate" or stronger for each demographic are summed up in Table 14 and the corresponding Chart 3 below.

Table 14		Male	Female	18-30	31+	Non-Homeowners	Homeowners
Stremgth of correlation	0.3 - 0.39	17	16	18	9	27	9
	0.4 - 0.49	10	3	3	5	5	4
	0.5+	0	1	1	2	0	2
	Total (> 0.3)	27	20	22	16	32	15

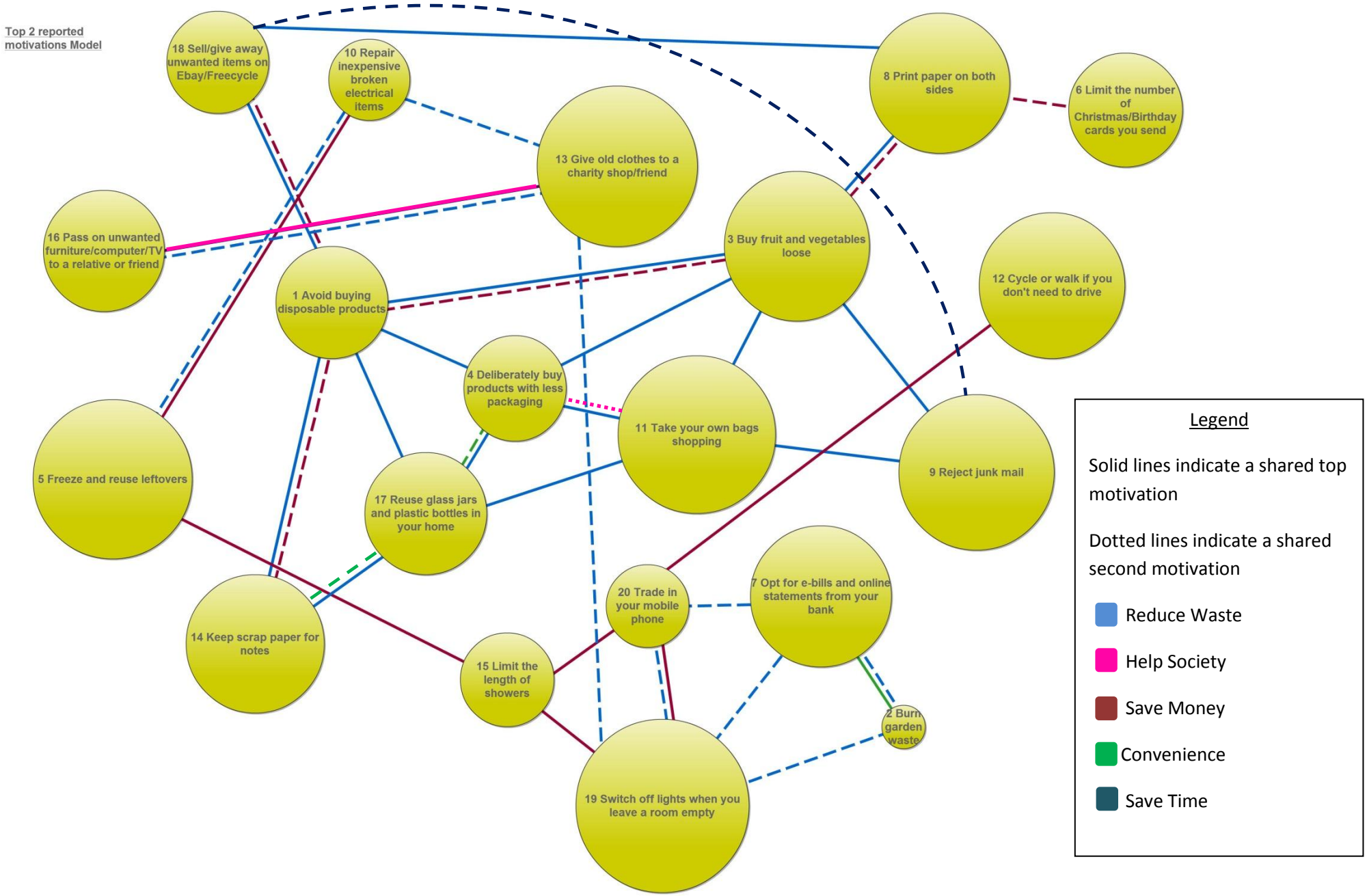


The interpretation and relevance of these data is explained further in the Discussion chapter under the heading "Analysis of the analysis" on page 68.

4.3 Motivation Analysis

The weighting for each motivation is shown in the table below. For each activity, the motivation with the highest weighting is highlighted in bold red, whilst the motivation with the second highest rating is marked in faded red.

Table 15.	1Avoid buying disposable products (n 136)	2Burn garden waste (n 37)	3Buy fruit and vegetables loose (n 173)	4Deliberately buy products with less packaging (n 136)	5Freeze and reuse leftovers (n 203	6Limit the number of Christmas/Birthday cards you send (n117)	7Opt for e-bills and online statements from your bank (n 175)	8Print paper on both sides (n 180)	9Reject junk mail (n 161)	10Repair inexpensive broken electrical items (n 102)	11Take your own bags shopping (n 178)	12Cycle or walk if you don't need to drive (n 168)	13Give old clothes to a charity shop/friend (n 179)	14Keep scrap paper for notes (n 155)	15Limit the length of your showers (n 98)	16Pass on unwanted furniture/computer/TV to a relative or friend (n 134)	17Reuse glass jars and plastic bottles in your home (n 144)	18Sell/give away unwanted items on Ebay/Freecycle (n 91)	19Switch off lights when you leave a room empty (n 193)	20Trade in your mobile phone (n 52)
Save Time	0.05	0.11	0	0.01	0.15	0.22	0.12	0.02	0.19	0.03	0.01	0.05	0	0.01	0.26	0.01	0.02	0.01	0.01	0.02
Save Money	0.18	0.08	0.23	0.07	0.35	0.21	0.13	0.32	0	0.44	0.08	0.35	0.01	0.22	0.3	0.07	0.18	0.27	0.42	0.42
Convenience	0.09	0.27	0.19	0.13	0.16	0.15	0.34	0.08	0.19	0.04	0.13	0.1	0.03	0.18	0.07	0.15	0.23	0.05	0.01	0.04
Help society	0.09	0.08	0.03	0.13	0.01	0.01	0.02	0.05	0.02	0.01	0.15	0.06	0.45	0.05	0.03	0.34	0.06	0.2	0.1	0.08
I always have	0.03	0.08	0.09	0.04	0.06	0.12	0.01	0.03	0.2	0.11	0.04	0.12	0.14	0.11	0.06	0.1	0.09	0.08	0.14	0.1
Reduce Waste	0.53	0.14	0.34	0.55	0.23	0.15	0.33	0.48	0.3	0.25	0.48	0.1	0.31	0.43	0.23	0.27	0.39	0.32	0.24	0.33
I feel obliged	0	0.03	0.02	0.04	0.02	0.02	0.02	0.01	0.02	0.02	0.06	0.05	0.03	0.01	0.03	0.02	0.01	0.01	0.05	0
Not sure	0.02	0.08	0.02	0.02	0	0.03	0	0.01	0.02	0.01	0.02	0.01	0.01	0	0	0.01	0.01	0.01	0.01	0.02
Other	0.01	0.14	0.08	0.01	0.01	0.09	0.03	0.02	0.06	0.09	0.03	0.17	0.03	0.01	0.02	0.03	0.02	0.04	0.02	0


Top 2 reported motivations Model
18 Sell/give away unwanted items on Ebay/Freecycle
10 Repair inexpensive broken electrical items
8 Print paper on both sides
6 Limit the number of Christmas/Birthday cards you send
13 Give old clothes to a charity shop/friend
16 Pass on unwanted furniture/computer/TV to a relative or friend
3 Buy fruit and vegetables loose
12 Cycle or walk if you don't need to drive
1 Avoid buying disposable products
4 Deliberately buy products with less packaging
11 Take your own bags shopping
9 Reject junk mail
5 Freeze and reuse leftovers
17 Reuse glass jars and plastic bottles in your home
20 Trade in your mobile phone
7 Opt for e-bills and online statements from your bank
14 Keep scrap paper for notes
15 Limit the length of showers
2 Burn garden waste
19 Switch off lights when you leave a room empty
Legend
Solid lines indicate a shared top motivation
Dotted lines indicate a shared second motivation
Reduce Waste
Help Society
Save Money
Convenience
Save Time

Distribution of motivations (all activities) – *discussed on page 69*

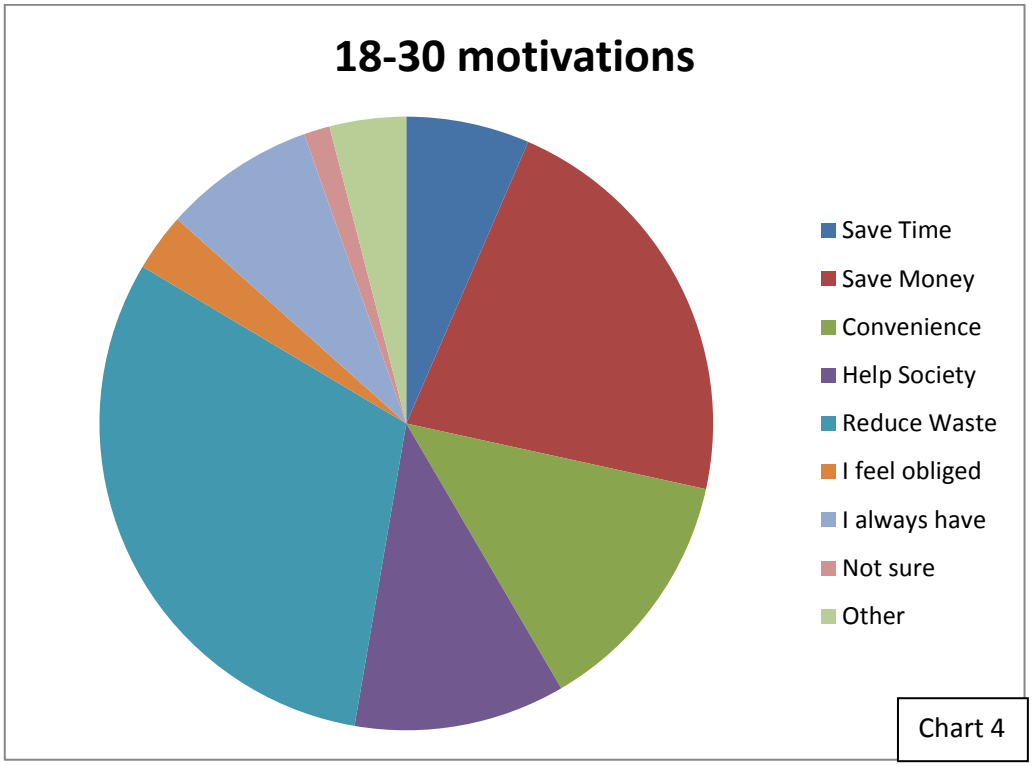


Chart 4

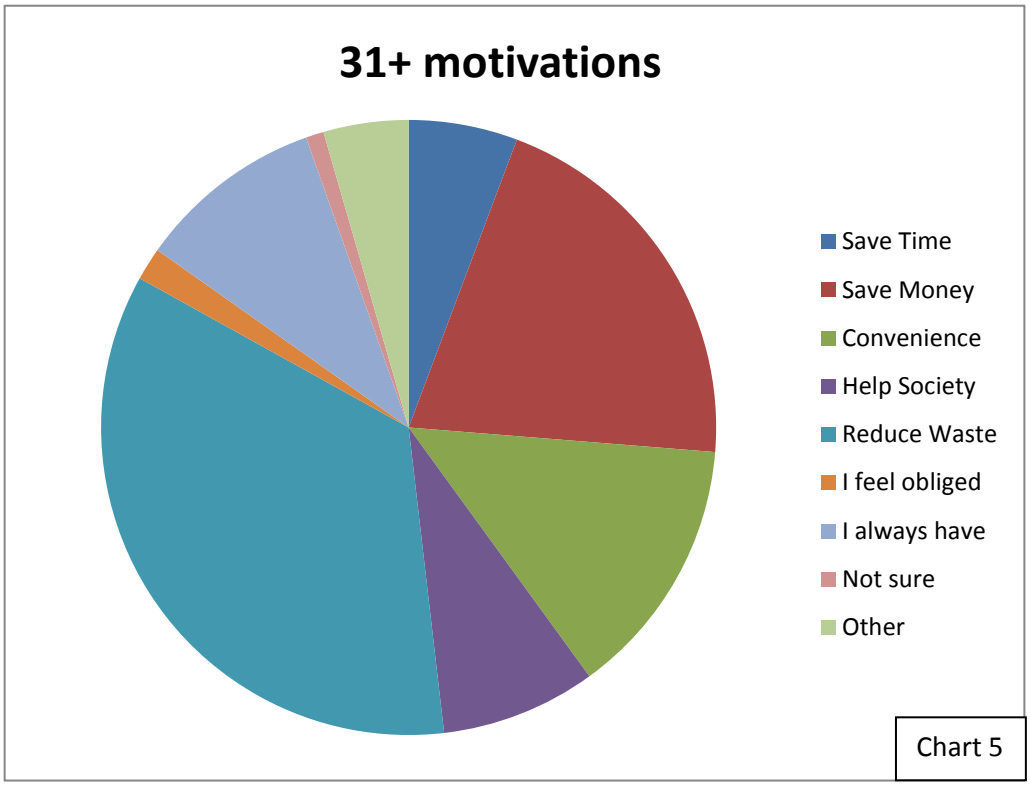


Chart 5

Distribution of motivations (all activities) – *discussed on page 69*

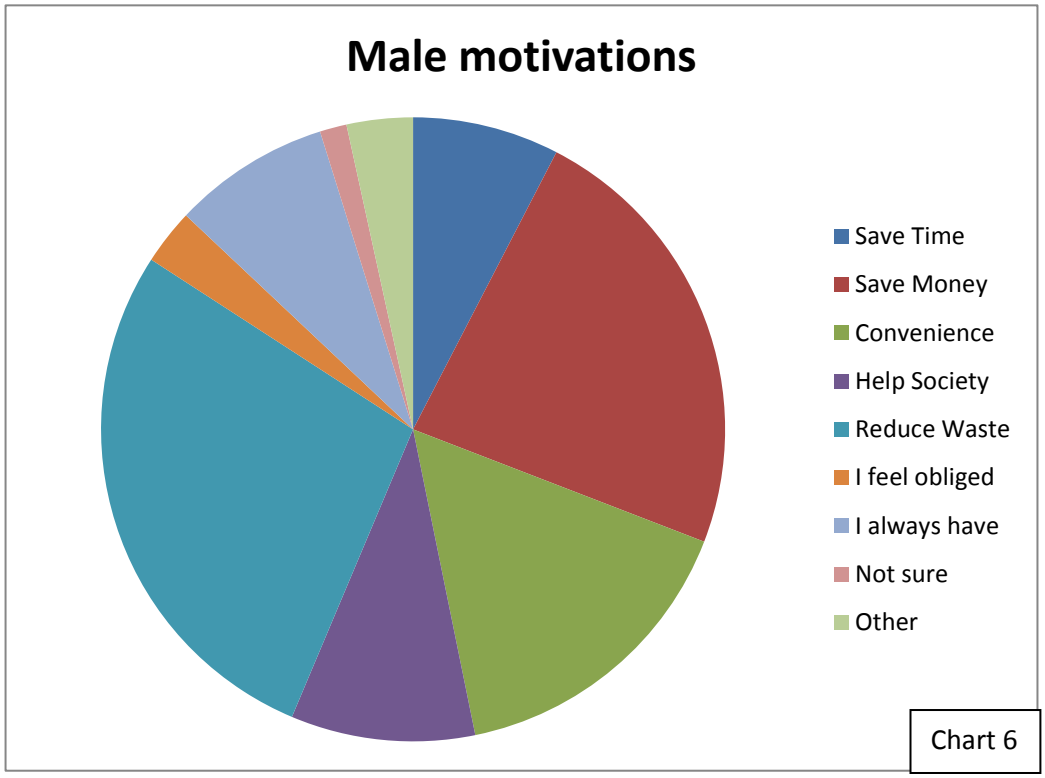


Chart 6

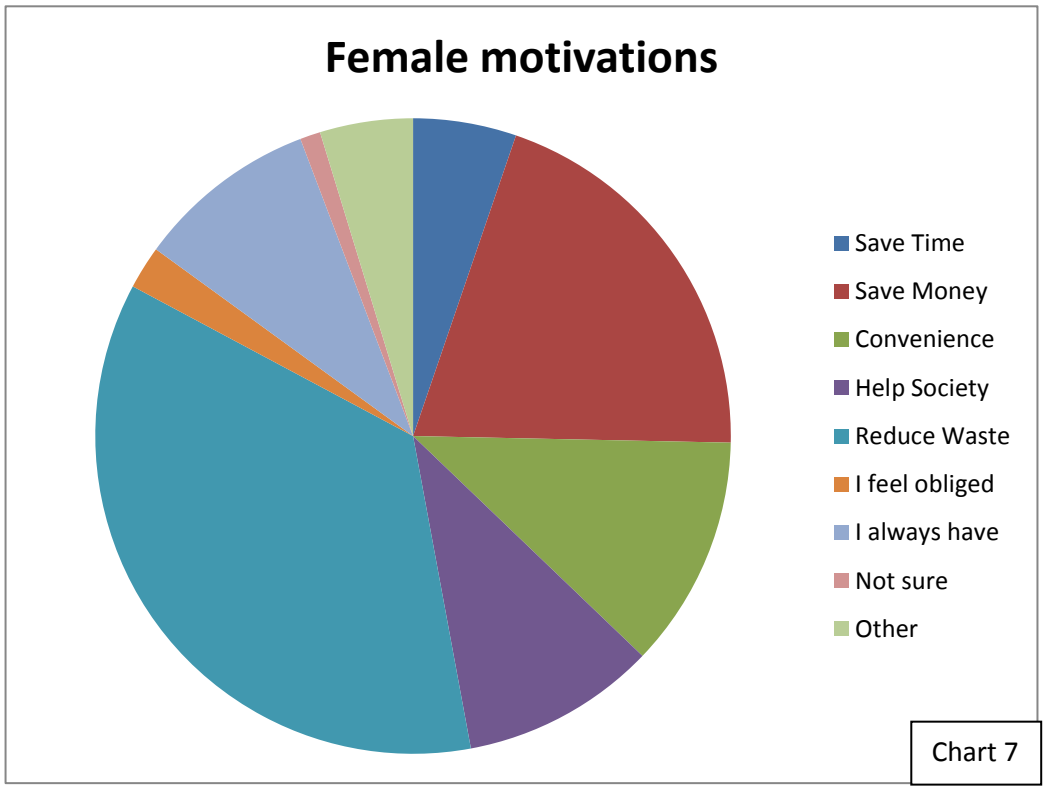


Chart 7

5 Discussion

The following chapter contains a discussion of the results that were presented in the previous chapter. It first discusses the results that were found, and in section 5.3 considers some of the potential causes for the disparity in results that led to the decision to use all 147 questionnaire responses.

5.1 Quantitative data

There were three stages to the analysis –

(i) the general analysis of the socio-economic/demographic data which helps to understand the makeup of the sample,

(ii) the data on participation, that is the five-point Lickert scale on which participants reported how often they carry out each activity, and;

(iii) the data on motivation where respondents selected up to two options, from a list of 9, that were most closely in line with their personal motivation for carrying out each activity.

These issues were analysed separately (although the results of some influenced the interpretation of others) and the diagrams and charts shown in the Data and Analysis chapter are described here.

General

For the whole sample, females were overrepresented when compared to the national average, along with 18-30's. As Table 8 (page 48) indicates, the status as a homeowner is reflected quite accurately in the age of respondents. This is supported as well by a correlation of 0.564 between the older age category and being a homeowner. From Table 9 (page 48) it can be seen that the socio-economic spread of the respondents was remarkably similar for both the "inside" and "outside of" Charnwood data-sets. In both

sets there was tendency for responses to come from more privileged areas, but this supports the findings of Cox and others (2010) that lower income areas are likely to be less concerned with environmental issues.

Participation

As explained in the Data and Analysis chapter, there were two levels on which participation data was used. The first level, which consisted of just charting the raw data, revealed which activities were more or less likely to be practised by various demographics. The tables accompanying Charts 1 and 2 show which activities each demographic is considerably more likely to practise (as compared to the other demographic). The results are consistent with what one would expect to find, according to gender roles within the home and the technologies and mentalities of the different age groups. Women, for example, are more likely than men to take clothes to charity shops, and younger people are more likely to trade in their mobile phone. Perhaps the main exception was that the 31+ age group were more likely to sell or give away items over the internet. The activities in rank order of participation (for the whole sample) are shown in Table 10 (page 51), along with the colour codes that were used to group them into activity 'families' when they were introduced in the Methodology chapter on page 31. It can be seen that there is a good spread of activities, no family group is apparently preferred, and in fact the top five activities come from all four families of activities.

The second level of analysis, the bivariate correlations, looked at the covariance of activities. The diagrams A, B and C show a combination of the two levels of analysis. The area of the circle for each activity is representative of the % of the total population who reported doing that activity sometimes, usually or always. Larger circles represent more participation, so it can be seen that across the sample, the least practiced activity by a

long way was burning garden waste. When comparing the diagram for male participation with the diagram for female participation, (areas represent % of males and % of females who practise each activity, respectively) it can be seen that for most activities a greater proportion of women are active than men. The few activities that men are more likely to do than women are burning garden waste and reducing the number of Christmas/Birthday cards they send.

On the same diagrams, solid lines represent correlations between activities (with red lines being inverse correlations) – the number on each line signifying the strength of the correlation. These correlations between activities vary from the understandable to the seemingly inexplicable. For instance there is a strong relationship between participation in deliberately buying products with less packaging, and avoiding buying disposable products, two activities which seem similar. One can imagine that the kind of person who thinks about how much packaging is on items is likely to be the same kind of person who avoids buying disposable products. Again, the relationship of .364 between keeping scrap paper for notes, and reusing jars and plastic bottles in the home is understandable, given the shared 'thrift' mentality that both these behaviours exhibit. However there are other activities which have strong participation relationships that are seemingly very different – such as the reported relationship between reducing the number of Christmas/birthday cards one sends, and the tendency to limit the length of one's showers. Besides a general environmental concern, there is little that obviously links these two activities.

The diagram for all respondents shows four activities which appear to have a higher number of strong relationships with others, they are; freezing and re-using leftovers, passing on unwanted household items to friends/relatives, avoiding buying disposable products and deliberately buying products with less packaging. This doesn't necessarily

mean they are the most practised activities, just that people who do one often are more likely to do the associated activities. Seven of the activities appear to be unlinked to any others which suggests that they are independent of other activities. This is key to interpreting the results of the bivariate correlations – understanding that covariance doesn't necessarily mean that *many* people practise an activity, simply that when people practise one, they tend to practise the other.

Gender

Given that there were the aforementioned gender difficulties when people were reporting their behaviour (often due to different gender roles within the home) it was decided to produce two diagrams to illustrate the difference, if any, in male and female behaviour. As can be seen in Tables 12 and 13 (pages 55 and 57), there was a fairly large difference between the two genders' behaviours.

Activities which appear to have strong covariance, in the diagram for female respondents, are those activities in the 'family' of activities which relate to making decisions about purchasing. "Choosing products with less packaging", "avoiding disposable products", "buying fruit and vegetables loose" and "taking reusable bags shopping" are almost all covariant (the former two having the strongest correlation of all activities) amongst female respondents. This indicates that when a female is a participant in one of those activities, she is likely to be concerned with doing the others. This is interesting and could be a reflection of gender roles in UK households, if women are seen to have the primary responsibility for buying food for the family.

For male participants, the links between these four "purchasing" activities were much less pronounced, however there were two activities, "Deliberately buying products with less packaging", and "Freeze and reuse leftovers" which each had correlations with a considerable number (six) of other activities. These two activities could perhaps be described as 'indicator' activities that would point towards a man being a participant in several other waste reduction activities. This is an idea discussed further in the following section.

Analysis of the analysis

The diagrams A, B and C, primarily show where correlations are, and the strength of them. The bivariate correlation analysis data was also used, however, to compare the *extent* to which there were patterns in different socio- demographic groups. For example it can be seen from Table 14 and the corresponding Chart 3 on page 59 that there were more moderate-strong relationships found for men than women, for 18-30's than 30+'s and for non-home owners than for homeowners. This is particularly interesting because it suggests that within the group "males" there are stronger patterns of waste management behaviour – that is to say that activities are coupled together more strongly and whether or not a man practices one activity is more likely to be a predictor of whether he practises another. With women, there are fewer of these relationships, meaning that less can be told from her participation in one activity, about whether or not she will participate in another. The implication is that women's waste management activities are decoupled from one another whereas men are more polarised in their participation – very broadly speaking they are likely to either participate in many, or they hardly participate at all. Perhaps this is because women have adopted more of the behaviours into their daily routines more than men, whereas men tend to either be "environmentally concerned", in

which case they will do many of the activities, or not[14]. The effect is even more pronounced for the different age brackets and the status as a homeowner/non-homeowner. 18-30 are the polarised age bracket here, with 30+ being the group who appear to have "normalised" some of the waste management behaviours more. Between Homeowners and non-Homeowners, the difference is marked. There is more than double the number of correlations for non-Homeowners than there are for Homeowners. This suggests that non-Homeowners are more polarised in their waste management behaviour. Those who do one activity are more predictably practisers of other activities. Again, this does not show Homeowners' waste management behaviour is *less* than Non-Homeowners – it simply shows that for one reason or another, their participation in activities are decoupled. Waste management activities, then, are tied to other factors for Homeowners. It could be that Homeowners are more likely to be settled into routines, are older, or committed to particular activities which are easier to do in their local context – and so activities are part of a lifestyle choice that is associated with "being a homeowner", rather than "being environmentally aware".

Motivation

The results of the motivation elements of the data are much more consistent than the participation data. It can be seen from Charts 4, 5, 6 and 7 on pages 62 and 63 that the combined motivations for carrying out all of the activities were very similar for all socio-demographic groups considered. Younger respondents were marginally more inclined to act out of a concern to help society, but less likely to be motivated by a concern to reduce waste. Equally, males reported a slight tendency to act on convenience and out of a concern to save money when compared with women, at the expense of reducing waste.

[14] Comments from Focus group A

These differences are so marginal, however, that it is hard to draw any firm conclusions from them.

Nonetheless, what is clear from the four charts and the preceding Table 15 (page 60), is that people's motivations for carrying out many waste reduction activities are in fact quite diverse. The majority of activities have two dominant motivations, while the other motivations have a much lower weighting. This undoubtedly reflects the fact that participants could only tick up to two boxes, and shows that the majority of people ticked at least one of the top two motivations. The results show that whilst waste reduction is the main motivator for most of the activities studied, there are clearly many other motivations at play. It is possible as well, that the role of waste reduction has even been over-stated in the results of this survey, because participants knew the nature of the survey and could have either consciously, or sub-consciously selected answers which they felt showed them in a better light.

It is interesting to note that when comparing the diagram for motivation with those for participation, there are only very few similar connections between activities. None of the correlations between activities 1, 10 and 16, for example, were found to be reflected in the motivation model. Similarly, while activities 1, 14, 3, 18 and 8 all share their top two motivations, none of them have a correlation when looking at the participation model. This significance of this can't be told without further investigation. It either lends weight to the possibility that there is a methodological problem with the participation section of the analysis, or it confirms that people's attitudes towards and thoughts about waste management behaviour don't translate into what they actually say they do. The reasons for *this* could be manifold; it may be too far down their personal agendas to worry about,

they may lack the skills or facilities to practise some activities, or they may simply have not had the idea of doing many of the activities. These thoughts are all discussed and explored further in the following section, the discussion that came out of the qualitative research.

5.1 Qualitative

The qualitative research revealed a huge level of complexity behind the data collected in the questionnaire survey, and was critical in highlighting some of the limitations of the quantitative method. While it had its place, the quantitative method was unable to highlight some of the detailed "conditions" and caveats that were attached to people's behaviour. To illustrate, people were very receptive to many of the activities and were even under the impression they practised them, but when exploring their actual behaviour in focus groups, it was discovered that actually they don't participate in that activity as much as they thought they did. This was often for very circumstantial reasons like *forgetting* to take reusable bags out of the boot of the car, or because the charity shop was shut on the day they remembered to take a donation in – so instead a trip to the local tip was made on the way home. Many of the attitudes and stories relating to waste reduction and reuse behaviour stemmed, in spite of the findings of the quantitative research, from a desire for convenience. There was a general consensus in both focus groups that the activities discussed, while a good and honourable thing to aspire to, were something to be pursued when convenient, and when one remembered to.

While many activities were touched on in the discussions, they mostly focused on just those activities that were in the family of activities to do with purchasing – as these were the ones that seemed to share interesting relationships. The barriers and motivations identified in the focus groups and interviews are listed below, starting from the Charnwood-specific, to the more general.

Barriers

i) Transient population

Some of the interviews were able to speak much more effectively about the issues specifically encountered in Charnwood. The transient student population meant that intensive information education campaigns were always being required because of the new arrivals. Another effect of the transient population was the loss of education (and by implication, the money and energy that had been spent on educating those students) that occurred as students moved out of Loughborough at the end of their studies.

> “it’s ongoing every year, you never really achieve anything because after they move out of halls, things change for them, they move into houses on their own so every year we have to do doorknocking, education”.
>
> Environmental Manager, Loughborough University

ii) Broken glass effect

The broken glass effect is the phenomenon of people taking less care of their community and environment when they see others around them neglecting it. This negative reinforcement in some communities was identified as an obstacle to rolling out waste management behaviour in Charnwood.

iii) Poor charging structures

Especially for food waste, the cheap price of food and “buy one get one free” offers on fresh produce were seen as a real barrier by all, to reducing waste. In a slightly different context, from the students who paid a flat rate for catering in halls on Loughborough University campus, there will be an estimated 150 tonnes of food wastage from

overcatering and plate scrapings. Which stems at least in part, from an attitude of "I have already paid for it, therefore I have to right to take (and waste) it".

iv) Lack of self-efficacy

Specifically in the University context, there was a reported attitude of 'why should I bother to reduce/recycle when so few other people do'. Flatmates appeared to influence each other both positively and negatively in waste management.

v) Forgetfulness

Forgetfulness as a barrier was a theme throughout many of the activities discussed in the focus groups, particularly forgetting to take reusable bags to the store. Sainsbury's are trying to reduce this by putting signs in car parks to remind customers to use reusable bags.

In contrast, when discussing activities that reduce energy consumption, namely "switching lights off when leaving a room", the key informants were of the opinion that it is a case of getting people to form habits, rather than trying to change their values to change behaviour.

> "I don't think it's that they get won over, as such, I think it has to be a habit thing".
>
> Environmental Manager, Loughborough University

vi) Throwaway society

Buying to excess and throwing away when something appears to have lost its primary value is a mindset that is ingrained in people's consciousness, which is promoted by supermarkets, although there was acknowledgement that the situation is improving.

vii) Time constraints and apathy

Apathy, or at least the impression of apathy was a theme common in the interviews with those informants who are on the front line of encouraging the public to reduce their

waste in Charnwood. That people don't feel they have the time or will to do small things which reduce their waste was a recurring impression.

viii) Other priorities

The interviews with key respondents cast some interesting light on the results. There were conflicting opinions from different informants about the extent to which waste reduction is a priority for members of the public. One senior manager of J. Sainsbury's called on information collected in customer satisfaction surveys and stated that it is an issue regularly very near the top of the priority list for its' customers, above even the price of goods. Newer policies from supermarkets like Sainsbury's to begin to offer half price deals rather than "buy one get one free", which increase food waste, came from a demand from customers for more responsible marketing. The experience of those who are engaged more on the front line of behaviour change, such as the District council Zero waste Officers and the head of environmental services at Loughborough University, found this priority for people in waste reduction not to be the case.

> "if you look at our customer survey, packaging comes out number two, it is *very* high on their agenda"
>
> Environmental Project Manager, Sainsburys

> "people want convenience, and they'll pay for it – to go along, to a supermarket, pick up a bag of carrots and put them in their trolly and not even think about the packaging they come in"
>
> Zero Waste officer, Charnwood Borough Council

ix) Sharing and driving of innovation/ideas

The difficulty in sharing ideas for waste reduction between people was highlighted in some interviews, as a barrier to stepping up waste reduction behaviour.

Sainsbury's have run campaigns called "love your leftovers" and "feed your family for £50 for a week", which centre around shopping efficiently and reusing left-over foods for which they have won awards. This is one vehicle for helping to share ideas and innovation in reducing waste. Education campaigns in schools and the town centre by the Council have also helped to spread ideas amongst the public. In Loughborough University, recycling is promoted amongst the students using a competitive system and the competition is driven by identifying and utilising key individuals in those communities who care about recycling and can influence others. They are known as 'champions' and although this is a recycling initiative rather than waste reduction, the use of peer pressure has been effective in rolling out behaviour change.

Motivations

Saving money, convenience and force of habit were the two biggest motivations for people to do things that reduce their waste, as identified by the Zero Waste Officers. This is supported by the quantitative results in Charts 4, 5, 6 and 7 on pages 62, which show that after reducing waste, saving money and convenience are the top two motivations for the studied activities. Habit, and "inheriting behaviour from parents" however, didn't come across as strongly in the quantitative data, although the section "Analysis of the analysis" presents an argument that some waste reduction activities have become habitual and absorbed into lifestyles of particular demographics.

> "the biggest [motivator] is if you can show financial benefits, then that's the biggest motivator for people, is money"
>
> Zero Waste officer, Charnwood Borough Council

Share of responsibility

An interesting theme that recurred in the focus groups, was an unwillingness to take primary responsibility for waste reduction. It was seen as the manufacturers responsibility to "do their part" to help people reduce their waste. When put to the Sainsbury's informant at interview, it was clear that this message had been coming through over the last few years, and that action was being taken in the design of packaging. The reduction in packaging volume also has an economic benefit to manufacturers, in the reducing of taxes payable, which helps them to pass savings on to customers as well as increase their profit margin. An interview with a product design expert also identified a driver of reducing the amount of packaging as being a reduction in the costs of transporting goods for distributors. Reducing packaging also brings its' challenges to retailers though, in changing consumers' purchasing habits, not only in the way they interact with the products, but also in the way purchase them. Refillable products, for example, often have the effect of reducing the frequency with which people buy products. This means retailers have to persuade people to part with larger amounts of money less often, which affects the balance sheets of both customers and the business, but also that customers visit stores less frequently which is in contention other marketing priorities.

Along slightly different lines, the environmental project manager saw commercial opportunities for Sainsbury's in trying to fill the gaps that ever increasingly stretched councils are leaving behind. Less frequent collections and fewer recycling facilities, offer a good incentive to supermarkets like Sainsbury's to provide solutions to the problems the situation creates.

The future

During the focus groups it was clear that there was very little sense of urgency when it came to changing waste management behaviour. To investigate this further, the groups

were asked what they thought the longer term consequences would be if UK households didn't change their behaviour to produce less waste. There was mostly very little recognition of the problem, other than generally feeling that it would be an inconvenience. An attitude of "somebody will sort that problem" was the norm. During the interviews, this subject of the future of waste management again came up, and when asked, the Sainsbury's informant saw little future in solutions that involved members of the public taking the initiative, or where high labour costs would be required such as self-service refill containers to cut down on packaging waste. Instead his vision of the future was one where reducing food waste was the primary focus, with a greater range of sizes of product on offer (to suit different size families). Although this would presumably increase the amount of packaging/kilogram of food sold, the sheer volume of food waste in contrast to packaging waste and the advent of smarter and more responsible packaging from producers would make that solution more effective. A longer shelf life for products was also anticipated for products, to help reduce the amount of food that is spoiled before consumption, and hence wasted.

From the product/packaging design point of view, the major problem was considered to be the extent to which behaviour is embedded in people's routines. The introduction of new concepts such as refillable products is often met with mistrust by consumers, but even if it is well received people are reluctant to change their patterns of consumption. Echoing the findings of the 'motivations' analysis, the product design expert believed that people actually took part in many waste minimisation activities, but sometimes weren't even aware of the waste reduction they were doing because the behaviour was so deeply embedded in their routines as "the way they do things", and that changing these routines could be managed in the long term, by designing products to influence consumers to use (and dispose of) them in a particular way.

5.2 Discussing the Methodology

This section discusses and critiques the methodology that was used, suggests potential weaknesses of the methodology, and what might be done to improve it for future studies.

What worked well

It was found, as was expected, that the quantitative and qualitative methods both gave very different insights to the research. The results of each set of tools helped to contextualise the results of the other, for a more holistic view to be presented in the discussion above. The research benefitted from using the two styles and future studies on the complex nature of household waste management would benefit from using both. The focus groups gave a good opportunity to probe further into people's activities, and justifications for doing, and not doing them. The interviews gave a unique perspective on the problem that would not have been available through any other method, and some of the key informants gave key information which added to the research. There was a tendency for the key informants to give very broad answers, however, whereas this study was concerned with isolating barriers and motivations for individual activities. This could be improved by taking a more structured and focused approach to the interviews. The strength of the qualitative tools was really to help identify some of the barriers and surrounding "issues" that were relevant to waste reduction behaviour, but also some activities more specifically.

The quantitative tools, however, were where the distinctions between the different activities came to the fore much more strongly. Particularly with the motivations, it is clear to see from Table 15 (page 60) that each activity really does have its own unique profile. There were also a strong set of results for the participation models that were proposed in Diagrams A, B and C, but for the reasons discussed in Section 3.7 in the Methodology, caution should be taken when reading these results. There are several possible reasons for the apparent disparity in results between different socio-demographics, as are explored in the following section.

What could have gone wrong

The wrong activities were examined – The questionnaire survey covered a broad range of common and less common activities, which was considered to be a strength of the survey. It is possible though, that the activities were too specialist, a problem that was identified in some of the feedback received from survey respondents. Those activities that required special skills (for example, computer skills for online bank statements) or circumstances (for example, having a garden to burn garden waste from) were not relevant to some respondents and were underrepresented. Another instance this presented itself was in the seeming differences in gender roles in the home that meant that some participants did not know whether to answer for themselves or their household. Some male respondents for example never froze and reused leftovers, because their partner always cooked and it was not a waste stream they had any control over.

The wrong scale was used – The scale was taken directly from a previous similar study (Barr, 2007) when no problems were reported, and was appropriate for the analysis method here. Although it is possible that using a seven or nine point Likert scale may have improved the results, getting people to use the full range of options may have proven problematic.

There are big regional/demographic differences – there is of course, the possibility that there are indeed, big differences between the different socio-demographics and geographical regions being studied, and the results of the analysis are a true reflection of the patterns that actually exist, although it seems unlikely.

Self-reporting of behaviour was inaccurate – as has already been identified in this research, there is a tendency for people to over-report their own environmental behaviour, and given that this was research was self-reported, this exaggeration of

participation in activities could have contributed to the seeming randomness of the results.

Sample size was not large enough – It is possible that the incongruity of the results is simply a result of not having a large enough sample size within which patterns of the population could emerge. Although several relationships have a statistical significance greater than 0.01 this does not give an indication of how far the sample is representative of the population (especially with the difficulties in sampling in this study).

Too much randomness in the activities being studied – It is possible that waste minimisation behaviour is simply too random and subject to external conditions to be studied with a broad research instrument such as was employed here. There is a relationship between the activities, but there are so many caveats and "conditional factors" that are unique to individuals, that the patterns are obscured.

There is no relationship – Following on from the previous point, it must be considered that there is no reliable relationship between the activities and that the results found here are simply products of chance – and that repeating the research would produce entirely different results.

6 Conclusion

The results of this research and the above discussion provide an interesting contribution to the existing body of literature. The primary aim of this research was;

> To test a new methodology for mapping waste reduction behaviour, and use it begin to understand the patterns of waste reduction behaviour in Charnwood.

The research was successful in collecting and analysing data on waste reduction behaviour and the methodology enabled patterns identified and conclusions to be drawn. The extent to which the methodology was successful will ultimately depend, however, on the findings of further studies that will either be able to support or challenge the results of this study. Certainly the "motivations" aspect of the research showed strong and encouraging results that were in line with what was expected. The qualitative tools used also gave strong results which contextualised the quantitative data well, and filled in the gaps that it missed. The two styles were very successful in complimenting each other.

Understanding the *patterns* of waste reduction behaviour specifically in Charnwood wasn't achieved by quantitative means, however it was the qualitative instruments that gave the best insight to the issues in the local context. Given that the quantitative analysis was done on responses gathered from around the UK, the results can't be claimed to be Charnwood specific. However in as much as they are a sample of the UK population, and Charnwood is in the UK, they can be said to cast some light on the Charnwood situation and frame the context of the qualitative results.

The discrepancies between the results of the analysis on the different data sets suggest that either waste minimisation behaviour is highly reliant on socio-demographic variables (which would not be supported by the review of the literature in previous chapters), or that conversely it is a very complex problem and seemingly random much of the time. Either way, the quantitative tools selected for this research are unlikely to be appropriate for studying this as they stand and would need reviewing and modifying for future studies.

Objective	Achieved?
To design and evaluate a research methodology to test for relationships between different waste reduction behaviours	Completely – a methodology was designed, informed by previous studies that attempted to address a gap in the literature, identified by a number of authors. This has been critiqued and evaluated, and relevant improvements made.
Quantitatively identify patterns in waste reduction behaviour in Charnwood	Partially – patterns were identified quantitatively for respondents from all over the UK. Charnwood specific information was gathered better in qualitative methods
To use qualitative research methods to investigate up to four waste reduction activities, to identify specific motivators and barriers	Completely – barriers and motivations to certain activities were identified and investigated successfully in line with the methodology, and behaviour change experts were able to cast invaluable light on the findings.
Identify areas for further research	Completely – the methodology has been critiqued, with recommendations for developing and improving it.

Table 16.

6.1 How the results can be used

The results of this study show that there is merit in furthering the methodologies piloted in this study on a greater scale, to better understand behaviour. With continuing research into this field, it would be possible to understand how each of the waste management activities relate to one another, and what motivates people to do them, so that behaviour change campaigns can be more effectively targeted. In this way, it is envisioned that people could be "led", activity by activity, through behaviour change.

6.2 Recommendations

There are a number of ways to develop and build on the research that is described in these pages, besides the improvements mentioned in the discussion. This section highlights those developments or improvements.

Multivariate Analysis

The analysis method performed on the data collected was a relatively simple one, and could be developed on in further studies if the methodology is developed. Bivariate correlations crudely show relationships between two variables but take no account of intermediate variables. Multivariate analysis, although more intensive and requiring a greater level of interpretation skill, is capable of showing the finer points of relationships between variables, including the extent to which apparently strong relationships are mediated (or not) by a third variable, which would be beneficial to this field of research.

Focus on one or two activities

The research could be improved massively in future by focusing on three or four of the waste management activities and investigating further the relationship between them for the purposes of understanding how people who do one could be persuaded to take up the others. The results of this research suggest that the relationship between “Avoiding buying disposable products” and “Deliberately buy products with less packaging” are two behaviours that are more closely linked than others.

Give different activities different weightings

Different activities have different environmental impacts, and more in depth studies could consider this when investigating which activities would have the biggest impact in contributing to reducing municipal solid waste in the UK.

More qualitative research methods

The qualitative research tools used in this study proved to be invaluable in extracting some of the finer points that seemed to be pervasive in the data. In fact one of the main conclusions to come out of this research was just how much peoples' waste management behaviour is dominated by circumstances, rather than dictated by strongly held positions and values.

Longitudinal studies

As highlighted in the literature review, this area of research is lacking in longitudinal studies that examine the "stickability" of behaviour change interventions, once the experiment period is over.

References

Arratia, R. 2010 Sustainability efforts at InterfaceFLOR. In: The Guardian website [online]. http://www.guardian.co.uk, 2011 [viewed 27 July 2011] Available from: http://www.guardian.co.uk/sustainable-business/blog/sustainability-efforts-interfaceflor-cutting-waste

Barr, S. 2007. Factors Influencing Environmental Attitudes and Behaviors: A U.K Case Study of Household Waste Management. *Environment and Behavior,* **39**(4)**,** 435-473

Brook Lyndhurst, 2010. *Waste prevention in Hampshire: Small Changes Big Difference.* London: DEFRA

Brook Lyndhurst, 2009a. *Household Waste Prevention Evidence Review: L2m1 – Technical Report.* London: DEFRA

Brook Lyndhurst, 2009b. *Enhancing Participation in Kitchen Waste Collections.* London: DEFRA

Bulkely, H and N. Gregson, 2009. Crossing the threshold: municipal waste policy and household waste generation. *Environment and Planning*, **41**(1), 929-945.

Charnwood Borough Council, 2010. *Zero Waste Strategy.* Loughborough, UK: Charnwood Borough Council.

Charnwood Borough Council. n.d. *Recycling & Waste Disposal Site (TIPS).* In Charnwood Borough Council website http://www.charnwood.gov.uk, 2011 [viewed 27 July 2011] Available from: http://www.charnwood.gov.uk/pages/waste_disposal_site_tips

Cohen, J, 1988. *Statistical power analysis for the behavioural sciences.* 2nd ed. Hillsdale, USA: Lawrence Erlbaum Associates, Inc., Publishers.

Cooper, T. 2005. Slower consumption reflections on product life spans and the "throwaway society". *Journal of Industrial Ecology,* **9**(1-2), 51-57

Cox, J, S. Giorgo, V. Sharp, K. Strange, D.C. Wilson and N. Blakely, 2010. Household waste prevention – a review of evidence. *Waste Management & Research,* **28**(3), 193-219

DEFRA, 2011. *Local Authority collected waste management statistics for England – Provisional Quarter 1 of 2010/11.* London: DEFRA.

DEFRA, 2010. *Local Authority Collected waste for England 2009-10 – annual statistics.* In DEFRA website http://www.defra.gov.uk, 2011 [viewed 27 July 2011] Available from: http://www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/

Dorset County Council, 2008. *Household Waste Prevention Activity in Dorset. WR0116.* London: DEFRA.

Dunn, L, F. J. Convery and L. Gallagher 2008. An investigation into waste charges in Ireland, with emphasis on public acceptability. *Waste Management,* **28**(12), 2826-2834

Fell, D, J. Cox and D. C. Wilson 2010. Future waste growth, modelling and decoupling. *Waste Management and Research,* **28**(3), 281-286

Freecycle Loughborough. Freecycle™. © 2010. [viewed 27 July 2011] Available from: http://groups.freecycle.org/Loughborough_Freecycle/posts/all.

Geyer, R, and V. D. Blass. 2010. The economics of cell phone reuse and recycling. *International Journal of Advanced Manufacturing Technology,* **47**(5-8), 515-525.

HM Government, 2005. *Securing the future: The UK Government Sustainable Development Strategy.* Norwich: The Stationery Office

Hogg, D, D. Wilson, J. North, O. Errey, M. Astley, M. Buchert, A. Hermann, A. Tukker and E. Johnson, 2007a. *Household Waste Prevention Policy Side Research Programme.* London: DEFRA

Hogg, D, J. Barth, K, Schleiss and E. Favoino, 2007b. *Dealing with Food Waste in the UK*. Banbury, UK: WRAP

Jamasb, T and R. Nepal, 2010. Issues and options in waste management: A social cost-benefit analysis of waste-to-energy in the UK. *Resources, Conservation and Recycling,* **54**(12), 1341-1352.

Leicestershire Constabulary, n.d. *Welcome to Loughborough local policing unit.* In: Leicestershire Constabulary website [online]. http://www.leics.police.uk, 2011 [viewed 27 July 2011] Available from: http://www.leics.police.uk/policing/3_north_bcu/13_loughborough/

Leicestershire County Council, 2005. *Charnwood Community Profile 2005.* Leicester, UK: Leicestershire County Council.

Leicestershire County Council, n.d. Waste Minimisation. In: Leicestershire County Council website [online]. http://www.leics.gov.uk, 2011 [viewed 27 July 2011] Available from:

http://www.leics.gov.uk/index/environment/waste/reduce_and_reuse/waste_minimisation.htm.

Macey, S. M, and M. A. Brown, 1983. Residential energy conservation: The role of past experience in repetitive household behaviour. *Environment and Behaviour*, **15**(2), 123-141.

McDonald, S and C. Oates, 2003. Reasons for non-participation in a kerbside recycling scheme. *Resources, Conservation and Recycling,* **39**(4)**,** 369-385.

Mulholland, K.L, 2006. Clean Chemical Processing: Cleaner Production and Waste. *In:* Abraham, M. A, ed. *Sustainability Science and Engineering: Defining Principles.* Oxford, Elsevier Ltd., 2006. p.311.

Nexant Inc. 2004. *Industrial Process Heat Recovery.* San Francisco, USA: Energy Design Resources.

Obara, L. 2005. *Is Waste Minimisation a Challenge Too Far?: The Experience of Household Waste Management and Purchasing in the UK.* Cardiff, UK: BRASS Centre.

OECD. 2000. *Strategic Waste Prevention.* Paris: OECD.

Ongondo, F. O, I. D. Williams and S. Keynes, 2011. Estimating the impact of the "digital switchover" on disposal of WEEE at household waste recycling centres in England. *Waste Management,* **31**(4), 743-753.

Parfitt, J, 2002. *Analysis of household waste composition and factors driving waste increases*. Banbury, UK: WRAP.

Pikkarainen, T, K. Pikkarainen, H. Karjaluoto and S. Pahnila, 2004. Consumer acceptance of online banking: an extension of the technology acceptance model. *Internet Research,* **14**(3), 224 – 235.

Rogoff, M. J, J. F. Williams, 1994. *Approaches to implementing solid waste recycling facilities.* Park Ridge, USA: Noyes Publications.

Sackett, D. L. 2001. Why randomized controlled trials fail but needn't: 2. Failure to employ physiological statistics, or the only formula a clinician-trialist is ever likely to need (or understand!). *Canadian Medical Association Journal,* **165**(9), 1226-1237

Salhofer, S, G. Obersteiner, F. Schneider, S. Lebersorger, 2008. Potentials for the prevention of municipal solid waste. *Waste Management,* **28**(2), 245-259

Seacat, J. D, and D. Northrup, 2010. An information-motivation-behavioural skills assessment of curbside recycling behaviour. *Journal of Environmental Psychology,* **30**(4), 393-401

Sharp, S, S. Giorgi and D. C. Wilson, 2010. Delivery and impact of household waste prevention intervention campaigns (at the local level). *Waste Management & Research*, **28**(3), 256-268.

Swami, V, T. Chamorro-Premuzic, R. Snelgar, A. Furnham, 2011. Personality, individual differences, and demographic antecedents of self-reported household waste management behaviours. *Journal of Environmental Psychology,* **31**(1), 21-26

Terry, L. A, C. Mena, A. Willians, N. Jenney and P. Whitehead, 2011. *Fruit and vegetable resource maps.* Banbury, UK: WRAP

Timlett, R.E and I.D. Williams, 2009. The impact of transient populations on recycling behaviour in a densely populated urban environment. *Resources, Conservation and Recycling,* **53**(9), 498-506.

Tonglet, M., P. S. Phillips and M. P. Bates, 2004. Determining the derivers for householder pro environmental behaviour: waste minimisation compared to recycling. *Resources, Conservation and Recycling,* **42**(1), 27-48

Tucker, P and P. Douglas, 2007. *Understanding Household Waste Prevention Behaviour*. Paisley, UK: University of Paisley

Wastewatch, 2008. *Sustainable household waste management*. London: Wastewatch.

WRAP, 2011. *Reducing Carrier Bag Use*. Banbury, UK: WRAP

Appendix 2 – Bivariate Correlations table for 31+

Spearman's ρ
31+

Table 17

	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive:	13Give old clothes to a charity shop/friend :	14Keep scrap paper for notes :	15Limit the length of your showers:	16Pass on unwanted furniture/computer/TV to a relative or friend :	17Reuse glass jars and plastic bottles in your home :	18Sell/give away unwanted items on Ebay/Freecycle :	19Switch off lights when you leave a room empty :	20Trade in your mobile phone :
1Avoid buying disposable products	1.000	.178	.322**	.509**	.453**	-.138	-.005	.217	.086	.324**	.247*	.222	.233	.062	.105	.340**	.106	.175	.110	.129
2Burn garden waste	.178	1.000	-.138	.175	-.129	.068	-.229*	.069	-.108	.248*	-.039	-.100	-.035	-.162	.049	.100	.012	.044	.131	.087
3Buy fruit and vegetables loose	.322**	-.138	1.000	.532**	.163	-.252*	.101	.044	.158	.250*	.418**	.093	.086	.188	.124	.194	.152	.030	.173	.095
4Deliberately buy products with less packaging	.509**	.175	.532**	1.000	.279*	-.129	.121	.067	.119	.472**	.261*	.252*	.153	.147	.214	.408**	.160	.132	.156	.114
5Freeze and reuse leftovers	.453**	-.129	.163	.279*	1.000	-.075	.081	.057	.021	.216	.285*	-.112	.356**	.364**	.137	.324**	.015	.174	.073	.191
6Limit the number of Christmas/Birthday cards you send	-.138	.068	-.252*	-.129	-.075	1.000	.127	-.131	-.069	.025	-.144	.103	-.215	-.042	.227	-.010	.073	.129	-.092	-.060
7Opt for e-bills and online statements from your bank	-.005	-.229*	.101	.121	.081	.127	1.000	-.020	.165	-.063	.118	.151	.181	-.061	.100	.043	-.003	.269*	.026	.085
8Print paper on both sides	.217	.069	.044	.067	.057	-.131	-.020	1.000	.169	-.016	.140	.153	.061	.114	.135	-.071	.056	.074	.039	-.057
9Reject junk mail	.086	-.108	.158	.119	.021	-.069	.165	.169	1.000	-.065	.199	.012	-.086	.075	-.059	-.035	.278*	-.093	-.100	.044
10Repair inexpensive broken electrical items	.324**	.248*	.250*	.472**	.216	.025	-.063	-.016	-.065	1.000	.248*	.125	.079	.194	.353**	.271*	.099	-.037	.033	.100
11Take your own bags shopping	.247*	-.039	.418**	.261*	.285*	-.144	.118	.140	.199	.248*	1.000	.056	.148	.214	.231	.161	.057	.128	.247*	.092
12Cycle or walk if you don't need to drive:	.222	-.100	.093	.252*	-.112	.103	.151	.153	.012	.125	.056	1.000	.006	-.044	.261*	.113	.066	.041	.172	-.191
13Give old clothes to a charity shop/friend	.233	-.035	.086	.153	.356**	-.215	.181	.061	-.086	.079	.148	.006	1.000	.326**	.121	.243*	.018	.122	.176	.075
14Keep scrap paper for notes	.062	-.162	.188	.147	.364**	-.042	-.061	.114	.075	.194	.214	-.044	.326**	1.000	.253*	.217	.248*	.097	.104	.222
15Limit the length of your showers:	.105	.049	.124	.214	.137	.227	.100	.135	-.059	.353**	.231	.261*	.121	.253*	1.000	.091	.224	.083	.204	-.106
16Pass on unwanted urniture/computer/TV to a relative or friend	.340**	.100	.194	.408**	.324**	-.010	.043	-.071	-.035	.271*	.161	.113	.243*	.217	.091	1.000	.014	.440**	.202	.358**
17Reuse glass jars and plastic bottles in your home	.106	.012	.152	.160	.015	.073	-.003	.056	.278*	.099	.057	.066	.018	.248*	.224	.014	1.000	.098	-.083	.052
18Sell/give away unwanted items on Ebay/Freecycle	.175	.044	.030	.132	.174	.129	.269*	.074	-.093	-.037	.128	.041	.122	.097	.083	.440**	.098	1.000	-.018	.294*
19Switch off lights when you leave a room empty	.110	.131	.173	.156	.073	-.092	.026	.039	-.100	.033	.247*	.172	.176	.104	.204	.202	-.083	-.018	1.000	.032
20Trade in your mobile phone	.129	.087	.095	.114	.191	-.060	.085	-.057	.044	.100	.092	-.191	.075	.222	-.106	.358**	.052	.294*	.032	1.000

*. Correlation is significant at the 0.05 level (2-tailed)..; **. Correlation is significant at the 0.01 level (2-tailed);

Appendix 3 – Bivariate Correlations table for 18-30's

Spearman's ρ
18-30

Table 18

	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive:	13Give old clothes to a charity shop/friend :	14Keep scrap paper for notes :	15Limit the length of your showers:	16Pass on unwanted furniture/computer/TV to a relative or friend :	17Reuse glass jars and plastic bottles in your home :	18Sell/give away unwanted items on Ebay/Freecycle :	19Switch off lights when you leave a room empty :	20Trade in your mobile phone :
1Avoid buying disposable products	1.000	.170	.160	.515**	.303**	.043	.038	.332**	.019	.335**	.298**	.117	.144	.143	.242*	.276*	.110	.102	.185	-.033
2Burn garden waste	.170	1.000	-.078	.038	.107	.179	-.169	-.078	-.133	.040	.082	-.140	-.245*	-.076	.277*	.169	-.084	-.080	.057	.021
3Buy fruit and vegetables loose	.160	-.078	1.000	.218*	.151	-.072	.181	.179	.080	.146	.209	-.062	.332**	-.049	.065	.204	.148	.162	.216	.004
4Deliberately buy products with less packaging	.515**	.038	.218*	1.000	.287**	.047	.180	.433**	.344**	.238*	.288**	.109	.355**	.114	.290**	.216	.237*	.110	.309**	-.118
5Freeze and reuse leftovers	.303**	.107	.151	.287**	1.000	-.095	.346**	.250*	-.007	.378**	.272*	-.079	.250*	.355**	.141	.313**	.230*	.228*	.235*	-.033
6Limit the number of Christmas/Birthday cards you send	.043	.179	-.072	.047	-.095	1.000	-.119	.097	-.117	-.074	.005	.130	-.027	-.191	.435**	.092	.010	-.072	.113	-.039
7Opt for e-bills and online statements from your bank	.038	-.169	.181	.180	.346**	-.119	1.000	.264*	.180	.097	.243*	-.103	.117	.058	.046	-.001	.062	.118	.271*	.002
8Print paper on both sides	.332**	-.078	.179	.433**	.250*	.097	.264*	1.000	.197	.283**	.324**	.139	.244*	.166	.219*	.169	.166	.079	.104	.176
9Reject junk mail	.019	-.133	.080	.344**	-.007	-.117	.180	.197	1.000	.023	-.014	.123	.090	.049	-.071	.078	-.038	.049	-.014	-.106
10Repair inexpensive broken electrical items	.335**	.040	.146	.238*	.378**	-.074	.097	.283**	.023	1.000	.245*	.196	.123	.255*	.247*	.390**	.150	.100	.093	.146
11Take your own bags shopping	.298**	.082	.209	.288**	.272*	.005	.243*	.324**	-.014	.245*	1.000	.019	.362**	.079	.174	.071	.045	.192	.230*	.116
12Cycle or walk if you don't need to drive:	.117	-.140	-.062	.109	-.079	.130	-.103	.139	.123	.196	.019	1.000	.119	.045	.157	.017	.009	-.067	.046	-.119
13Give old clothes to a charity shop/friend	.144	-.245*	.332**	.355**	.250*	-.027	.117	.244*	.090	.123	.362**	.119	1.000	.220	.060	.208	.200	.178	.322**	.035
14Keep scrap paper for notes	.143	-.076	-.049	.114	.355**	-.191	.058	.166	.049	.255*	.079	.045	.220	1.000	.028	.110	.481**	.085	.039	.076
15Limit the length of your showers:	.242*	.277*	.065	.290**	.141	.435**	.046	.219*	-.071	.247*	.174	.157	.060	.028	1.000	.199	.110	-.009	.318**	-.032
16Pass on unwanted furniture/computer/TV to a relative or frien	.276*	.169	.204	.216	.313**	.092	-.001	.169	.078	.390**	.071	.017	.208	.110	.199	1.000	.383**	.340**	.242*	.172
17Reuse glass jars and plastic bottles in your home	.110	-.084	.148	.237*	.230*	.010	.062	.166	-.038	.150	.045	.009	.200	.481**	.110	.383**	1.000	.181	.072	.160
18Sell/give away unwanted items on Ebay/Freecycle	.102	-.080	.162	.110	.228*	-.072	.118	.079	.049	.100	.192	-.067	.178	.085	-.009	.340**	.181	1.000	.136	.193
19Switch off lights when you leave a room empty	.185	.057	.216	.309**	.235*	.113	.271*	.104	-.014	.093	.230*	.046	.322**	.039	.318**	.242*	.072	.136	1.000	-.089
20Trade in your mobile phone:	-.033	.021	.004	-.118	-.033	-.039	.002	.176	-.106	.146	.116	-.119	.035	.076	-.032	.172	.160	.193	-.089	1.000

*. Correlation is significant at the 0.05 level (2-tailed).; **. Correlation is significant at the 0.01 level (2-tailed).

Appendix 4 – Bivariate Correlations table for Non-homeowners

Spearman's ρ
Non-homeowners

Table 19

	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive:	13Give old clothes to a charity shop/friend :	14Keep scrap paper for notes :	15Limit the length of your showers:	16Pass on unwanted furniture/computer/TV to a relative or friend :	17Reuse glass jars and plastic bottles in your home :	18Sell/give away unwanted items on Ebay/Freecycle :	19Switch off lights when you leave a room empty :	20Trade in your mobile phone :
1Avoid buying disposable products	1.000	.212	.119	.467**	.323**	.037	.033	.359**	.097	.344**	.205	.158	.131	.125	.280*	.214	.085	-.009	.176	.065
2Burn garden waste	.212	1.000	-.021	.103	.079	.148	-.159	.036	-.103	.041	.078	-.146	-.186	-.121	.219*	.226*	-.041	.122	.067	.002
3Buy fruit and vegetables loose	.119	-.021	1.000	.215*	.155	-.132	.133	.049	.106	.174	.237*	.000	.314**	.046	.087	.116	.173	.003	.243*	.056
4Deliberately buy products with less packaging	.467**	.103	.215*	1.000	.374**	.053	.201	.345**	.348**	.304**	.331**	.179	.366**	.174	.389**	.225*	.213	.096	.328**	-.033
5Freeze and reuse leftovers	.323**	.079	.155	.374**	1.000	-.121	.333**	.269*	.024	.459**	.273*	.024	.334**	.408**	.256*	.351**	.204	.148	.345**	.061
6Limit the number of Christmas/Birthday cards you send	.037	.148	-.132	.053	-.121	1.000	.001	.089	-.180	-.074	.074	.163	-.071	-.188	.401**	.077	.069	.077	.128	.024
7Opt for e-bills and online statements from your bank	.033	-.159	.133	.201	.333**	.001	1.000	.213*	.159	.159	.193	.001	.135	-.077	.054	.034	-.039	.086	.238*	.065
8Print paper on both sides	.359**	.036	.049	.345**	.269*	.089	.213*	1.000	.150	.236*	.335**	.177	.162	.166	.154	.092	.095	.011	.127	.261*
9Reject junk mail	.097	-.103	.106	.348**	.024	-.180	.159	.150	1.000	.103	.027	.035	.011	.088	-.038	.000	.027	-.059	-.033	-.134
10Repair inexpensive broken electrical items	.344**	.041	.174	.304**	.459**	-.074	.159	.236*	.103	1.000	.287**	.181	.095	.307**	.337**	.347**	.142	-.039	.203	.253*
11Take your own bags shopping	.205	.078	.237*	.331**	.273*	.074	.193	.335**	.027	.287**	1.000	.046	.396**	.263*	.277*	.048	.089	.069	.291**	.059
12Cycle or walk if you don't need to drive:	.158	-.146	.000	.179	.024	.163	.001	.177	.035	.181	.046	1.000	.110	-.032	.171	.035	-.111	-.041	.167	-.114
13Give old clothes to a charity shop/friend :	.131	-.186	.314**	.366**	.334**	-.071	.135	.162	.011	.095	.396**	.110	1.000	.245*	.129	.156	.107	.084	.350**	.106
14Keep scrap paper for notes :	.125	-.121	.046	.174	.408**	-.188	-.077	.166	.088	.307**	.263*	-.032	.245*	1.000	.178	.131	.459**	.030	.109	.142
15Limit the length of your showers:	.280*	.219*	.087	.389**	.256*	.401**	.054	.154	-.038	.337**	.277*	.171	.129	.178	1.000	.253*	.210	.063	.389**	.022
16Pass on unwanted furniture/computer/TV to a relative or friend	.214	.226*	.116	.225*	.351**	.077	.034	.092	.000	.347**	.048	.035	.156	.131	.253*	1.000	.331**	.361**	.270*	.289**
17Reuse glass jars and plastic bottles in your home :	.085	-.041	.173	.213	.204	.069	-.039	.095	.027	.142	.089	-.111	.107	.459**	.210	.331**	1.000	.174	.004	.310**
18Sell/give away unwanted items on Ebay/Freecycle :	-.009	.122	.003	.096	.148	.077	.086	.011	-.059	-.039	.069	-.041	.084	.030	.063	.361**	.174	1.000	.141	.326**
19Switch off lights when you leave a room empty :	.176	.067	.243*	.328**	.345**	.128	.238*	.127	-.033	.203	.291**	.167	.350**	.109	.389**	.270*	.004	.141	1.000	-.110
20Trade in your mobile phone :	.065	.002	.056	-.033	.061	.024	.065	.261*	-.134	.253*	.059	-.114	.106	.142	.022	.289**	.310**	.326**	-.110	1.000

*. Correlation is significant at the 0.05 level (2-tailed).; **. Correlation is significant at the 0.01 level (2-tailed).

Appendix 5 – Bivariate Correlations table for Homeowners

Spearman's ρ
Homeowners

Table 20

	1Avoid buying disposable products	2Burn garden waste	3Buy fruit and vegetables loose	4Deliberately buy products with less packaging	5Freeze and reuse leftovers	6Limit the number of Christmas/Birthday cards you send	7Opt for e-bills and online statements from your bank	8Print paper on both sides	9Reject junk mail	10Repair inexpensive broken electrical items	11Take your own bags shopping	12Cycle or walk if you don't need to drive:	13Give old clothes to a charity shop/friend :	14Keep scrap paper for notes :	15Limit the length of your showers:	16Pass on unwanted furniture/computer/TV to a relative or friend :	17Reuse glass jars and plastic bottles in your home :	18Sell/give away unwanted items on Ebay/Freecycle :	19Switch off lights when you leave a room empty :	20Trade in your mobile phone :
1Avoid buying disposable products	1.000	.106	.383**	.565**	.401**	-.076	.035	.152	-.031	.325**	.291*	.202	.236	.101	.045	.423**	.184	.262*	.173	-.030
2Burn garden waste	.106	1.000	-.231	.045	-.113	.104	-.235	-.093	-.157	.218	-.113	-.089	-.113	-.111	.100	.033	-.030	-.203	.131	.099
3Buy fruit and vegetables loose	.383**	-.231	1.000	.523**	.150	-.144	.225	.222	.112	.233	.357**	.052	.110	.141	.084	.278*	.137	.194	.137	.011
4Deliberately buy products with less packaging	.565**	.045	.523**	1.000	.162	-.190	.079	.178	.110	.306*	.198	.130	.207	.144	.070	.422**	.202	.144	.073	.001
5Freeze and reuse leftovers	.401**	-.113	.150	.162	1.000	-.026	.071	-.018	-.026	.071	.282*	-.271*	.318**	.304*	.033	.316**	.036	.226	-.058	.101
6Limit the number of Christmas/Birthday cards you send	-.076	.104	-.144	-.190	-.026	1.000	-.008	-.050	.025	.063	-.197	.044	-.173	-.055	.238	.019	-.067	.053	-.115	-.088
7Opt for e-bills and online statements from your bank	.035	-.235	.225	.079	.071	-.008	1.000	.065	.207	-.124	.234	.025	.197	.068	.123	.057	.092	.371**	.058	.039
8Print paper on both sides	.152	-.093	.222	.178	-.018	-.050	.065	1.000	.169	.019	.010	.205	.105	.115	.139	-.070	.214	.106	.011	-.243*
9Reject junk mail	-.031	-.157	.112	.110	-.026	.025	.207	.169	1.000	-.195	.163	.104	.011	.045	-.109	.037	.246*	-.001	-.086	.082
10Repair inexpensive broken electrical items	.325**	.218	.233	.306*	.071	.063	-.124	.019	-.195	1.000	.102	.164	.069	.143	.207	.288*	.093	.090	-.089	-.046
11Take your own bags shopping	.291*	-.113	.357**	.198	.282*	-.197	.234	.010	.163	.102	1.000	.049	.145	.072	.077	.159	.057	.209	.119	.093
12Cycle or walk if you don't need to drive:	.202	-.089	.052	.130	-.271*	.044	.025	.205	.104	.164	.049	1.000	-.025	.052	.277*	.125	.187	.008	.047	-.194
13Give old clothes to a charity shop/friend :	.236	-.113	.110	.207	.318**	-.173	.197	.105	.011	.069	.145	-.025	1.000	.367**	.059	.296*	.185	.226	.070	-.005
14Keep scrap paper for notes :	.101	-.111	.141	.144	.304*	-.055	.068	.115	.045	.143	.072	.052	.367**	1.000	.163	.250*	.265*	.202	-.023	.159
15Limit the length of your showers:	.045	.100	.084	.070	.033	.238	.123	.139	-.109	.207	.077	.277*	.059	.163	1.000	.011	.137	.042	.045	-.171
16Pass on unwanted furniture/computer/TV to a relative or friend :	.423**	.033	.278*	.422**	.316**	.019	.057	-.070	.037	.288*	.159	.125	.296*	.250*	.011	1.000	.070	.430**	.151	.220
17Reuse glass jars and plastic bottles in your home :	.184	-.030	.137	.202	.036	-.067	.092	.214	.246*	.093	.057	.187	.185	.265*	.137	.070	1.000	.153	-.028	-.097
18Sell/give away unwanted items on Ebay/Freecycle :	.262*	-.203	.194	.144	.226	.053	.371**	.106	-.001	.090	.209	.008	.226	.202	.042	.430**	.153	1.000	-.049	.113
19Switch off lights when you leave a room empty :	.173	.131	.137	.073	-.058	-.115	.058	.011	-.086	-.089	.119	.047	.070	-.023	.045	.151	-.028	-.049	1.000	.058
20Trade in your mobile phone :	-.030	.099	.011	.001	.101	-.088	.039	-.243*	.082	-.046	.093	-.194	-.005	.159	-.171	.220	-.097	.113	.058	1.000

*. Correlation is significant at the 0.05 level (2-tailed).; **. Correlation is significant at the 0.01 level (2-tailed).